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The Introductory Technology Course: A Tool for Technology Integration

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Two years ago the Arizona State University West (ASUW) College of Education accepted a challenge to redesign the preservice curriculum. Teams of faculty met to create a program that aligned with the new state and national teacher education standards and that prepared new teachers to help their K-12 students meet state academic standards. In addition, the faculty considered areas where the curriculum needed strengthening, based on reports from ASUW graduates. One of these areas was technology.

Well-prepared teachers are the key to K-12 student use of technology tools and applications. Yet, approximately "two-thirds of all teachers feel that they are not at all prepared or only somewhat prepared to use technology in their teaching" (Kerry, 2000, p. 39). A more recent study of Arizona K-12 teachers (specifically, in school districts that accepted ASUW students

for field experiences) yielded similar results (Wetzel, Zambo, Painter, Wilhelm, & Williams, 2002). These teachers had a mean score of 2 (*emergent skills*) on a 4-point scale (with 1 = *entry level skill* and 4 = *proficient skills*) that measured self-reports of technology integration in their classrooms. This result suggests that ASUW preservice teachers have few good models of technology integration in their K-12 field experiences. ASUW decided to take on the challenge of better preparing its graduates for their eventual placements in K-12 urban schools.

Context

ASU West is an urban campus established 16 years ago. Today roughly 900 students are enrolled in teacher education. Many ASUW students are older than traditional students. They are predominantly female, and about 20% are members of minority groups. Roughly 60% of the teacher education students at ASU West are first generation college students. Each semester, approximately 300 students are admitted to the College of Education (COE) Teacher Preparation Program at the beginning of their junior year. Most ASUW students matriculated at one of five community colleges located in the metropolitan area for their freshman and sophomore years, at which time they completed their lower division arts and sciences courses. Only 2 years ago did the university begin enrolling freshman and sophomore level students into lower division coursework. The students take a required computer literacy course prior to their acceptance into the COE.

The existing curriculum had provided a one semester credit hour course in technology integration. In addition, many COE faculty had received training on technology integration through a Preparing Tomorrow's Teachers to Use Technology (PT3) grant. Retaining the one credit hour course was not an option, because students consistently commented that 1 hour a week was not enough time to prepare them to integrate technology into their professional practice. One of the key issues was determining whether to continue a standalone technology course or to rely on technology integration in other teacher education courses.

Related Literature

A review of the literature was informative. It suggested that the answer is not "either/or" but "both/and." Brent, Brawner, and Van Dyk (2003) studied the factors that influence student teachers' use of technology and concluded, "Experiences with technology should be included in methods classes and integrated throughout the entire preparation program" (p. 65). Also, in a survey of graduates of 416 teacher education institutions, Moursund and Bielefeldt (1999) found that "formal stand-alone IT [Information Technology] coursework does not correlate well with scores on items dealing with technology skills and the ability to integrate IT into teaching" (p. 2), and that IT instruction delivered in a general education course is more effective than IT instruction in standalone courses. These researchers concluded,

> To increase the technology proficiency of new teachers in K-12 classrooms, training institutions should increase the level of technology

> integration in their own academic programs. In particular: IT instruction should be integrated into other courses and SCDE [Schools, Colleges, and Departments of Education] activities, rather than being limited to stand-alone classes. (p. 2)

However, in this study the researchers did not distinguish between stand-alone courses emphasizing technology integration and those focusing primarily on IT skills. In a follow up study, Bielefeldt (2001) surveyed 64 of the 416 respondents scoring highest on factors associated with preparation of students to use technology in their programs. He found that these institutions relied heavily on their introductory technology courses, but they had also emphasized the importance of following up with use of technology in other coursework. The researcher concluded that in the high performing institutions, the required course supported the integration of technology into the rest of their courses.

On the other hand, the course designers agreed with Erickson (1989), who expressed concern that integration may also fail if students are not explicitly instructed in the use of many powerful technologies. Thus, the standalone course seems to have merit if it is accompanied by technology integration in the context of other courses.

This position is also supported by Strudler and Wetzel (1999), whose study of colleges of education thought to be exemplary in their integration of technology across the curriculum revealed that these exemplary programs included the required educational technology course and also emphasized the integration of technology in general education courses. An additional insight from the ASUW PT3 project was that the required educational technology course could play a vital role in technology use across the preservice curriculum; however, this educational technology course needed to be coordinated with the other courses in the semester so that students would be engaged by and learn from technology experiences in all of their courses (Kelley, Wetzel, Padgett, Williams, & Odom, 2003).

Based on this discussion, it was decided the college of education would take a two-pronged approach. Responsibility for technology integration outcomes would begin in the required educational technology course and would be coordinated with the general education courses in the same semester. Students' skills and knowledge would be extended and modeled in subsequent semesters throughout the program. Further, the emphasis should not be on mastering information technology skills in isolation, but rather on the blend of pedagogy and student uses of technology to achieve academic goals.

Finally, the required educational technology course should include a field placement in which students experience the use of technology in the K-12 classroom. With these insights, ASUW faculty designed and implemented a three semester credit hour educational technology course. Documents developed in this course and referred to in this article are available at http://coe.west.asu.edu/williams/coe313/, the Showcase website.

The Process

A team of five people, one faculty member from each preservice department (elementary, secondary, and special education) and two senior educational technology professors formed the curriculum team to develop the basic syllabus. They designed the course around technology integration, defined as "the use of technology by students and teachers to enhance teaching and learning and to support existing curricular goals and objectives" (Sun, 2000, p. 55). The development of the course occurred through a collegial process that not only involved the collaboration of course instructors, but integration of many aspects of the course with other courses that students are likely to take simultaneously. The team's beliefs about technology integration are reflected in this process.

Next, the content of the course was aligned with the National Education Technology Standards for Teachers (NETS-T), the Arizona Professional Teaching Standards (APTS), and feedback from ASU West's partner K-12 school districts. Finally, the course, primarily built on constructivist principles of learning, showcases students' projects for assessment.

The basic syllabus design by this group was submitted for curriculum review and approved as part of the newly redesigned teacher preparation program. After the program was approved and scheduled for implementation, another team was formed consisting of the three instructors who would teach the course. They agreed on readings, provided more detail on assignments, and created a schedule of topics and assignment due dates.

The resulting course was implemented and evaluated in spring 2003 and refined during summer 2003. The interactive, Web-based syllabus contains the philosophy, objectives and standards, with links to assessment and resources (see Interactive Syllabus in the Showcase at http://coe.west.asu.edu/williams/coe313/).

Because first semester teacher education students generally enroll in the same five required courses, the course instructors and the general education instructors were able to coordinate activities and assignments across courses. Faculty decided to adopt an electronic portfolio (ePortfolio) and use *TaskStream*, an online Portfolio Assessment and Reporting System (http://www.taskstream.com). The ePortfolio became a linchpin, serving to integrate and make transparent the use of technology across courses.

Situating the technology course in the students' first semester allowed COE 313 instructors to teach students to create their portfolios and add artifacts to it beginning in the first semester and continuing through the rest of the program. The portfolio is organized around the nine Arizona Professional Teaching Standards (APTS). Students provide evidence of their work to meet each standard. In the educational technology course, students design and develop their portfolios and learn technology skills, such as using the most appropriate file formats for their artifacts. Through a coordinated effort, the faculty of the

College of Education agreed upon the standards and artifacts that students were to include in each of their courses.

Because the course instructors stress the importance of reflective practice, students reflect on major artifacts in the portfolio (see ePortfolio Student Samples in the Showcase at http://coe.west.asu.edu/williams/coe313/).

The course has a strong Web presence. First, the course has a Web-based interactive syllabus (see the Interactive Syllabus in the Showcase at http://coe.west.asu.edu/williams/coe313/). The readings and assignments are available from one main document. Second, the course instructors employ *Blackboard* to discuss issues through threaded discussions, post student grades, make announcements, and so on. Third, the ePortfolio is web-based.

Students use skills they learn in COE 313 to complete assignments for other courses they take concurrently. For example,

- In COE 313, they learn to use *TaskStream* and then use *TaskStream* tools to create lesson plans for COE 311 Instruction and Management in the Inclusive Classroom (see ePortfolio Student Samples in the Showcase at http://coe.west.asu.edu/williams/coe313/).
- In COE 311, students are assigned to create a drawing of a model classroom and are required to place this drawing in their electronic portfolio. In COE 313, they learn to use several tools to create this layout, including *Microsoft Word*, *Inspiration*, and scanning a hand-drawn classroom. Students choose the method with which they are most comfortable (see Sample Student Layouts in the Showcase at http://coe.west.asu.edu/williams/coe313/).
- In COE 313, they learn to use a digital camera and edit photos; then they photograph a poster session presentation in COE 315 Child and Adolescent Development and include the photos in their ePortfolios. Another part of their COE 315 project, which is a group venture, requires the creation of a brochure that covers the main points of their presentation. In COE 313, each student creates a brochure using *Microsoft Publisher*, after being provided with examples of exemplary brochures from past COE 315 presentations.
- In COE 313, they learn to use search engines effectively, providing a foundation for the extensive research and writing in BLE 312 (ESL, Diversity, and Culture in Education), as well as for the creation of launch pages and the evaluation of WebQuests.

Throughout the development of the course, the instructors discussed the theoretical foundation for their teaching. The course is built on a comparison of constructivism and instructivism and the place of technology in the practices associated with each. With this foundation, the instructors use the Instructional Approach to Learning schema developed by the North Central Regional Educational Library (http://www.ncrel.org/engauge/framewk/efp/range/efpranin.htm) to illustrate their framework for technology integration in the course.

However, in addition to developing understanding of student-centered and instructor-centered approaches to technology use, students leave the course with knowledge of issues relevant to technology integration (e.g., fair use, digital divide) and pedagogical concepts.

All instructors can assume that students will have a set of technology skills when they finish the first semester (see the Skills Mastered List in the Showcase at http://coe.west.asu.edu/williams/coe313/). Thus, the course authors have a balance of pedagogical issues (why and when to employ technology) and technology skills (how).

Field Experience

Students participate in a required K-12 field experience each semester. Students prepare for their work in the K-12 classroom by conducting a site-based technology inventory. Typically they discover items such as the location of the computers in the building, sign out procedures for the digital cameras, and the software collections available in the building.

To prepare the students for their field observation, the students watch and analyze two video cases of exemplary technology-using teachers. The first case, viewed in class, is a study of a unit on Louisiana songbirds entitled Bird Rap that has an extensive amount of technology integration. This case can be viewed at the Technology Based Learning and Research (TBLR) site: http://tblr.ed.asu.edu/pt3/.

Using an observation protocol, they examine another online case on their own from the DVL collection (http://tblr.ed.asu.edu/pt3/frameindex.asp?content=NETSdvl/DV_Collection/DV_Collection.asp&topnav=NavigationFramePgs/NETSdvl.htm), matching their preferred grade level and subject matter. Then, using a similar protocol, they observe students in their field placement as they use technology. As part of this protocol, students were asked to compare the use of technology in their field experience to the exemplary cases.

Adapting the Course to Meet Student Needs

At the beginning of each semester, students are surveyed with an online tool to determine their level of comfort with technology and their access to technology at home (see the Personal Technology Profile Survey in the Showcase at http://coe.west.asu.edu/williams/coe313/). This information allows instructors to adapt the course as needed. For example, although COE 313 readings, assignments, and video cases are available via the Web, the survey revealed that many of the students did not have high-speed Internet connections at home. For those without good Internet access, the instructors created a CD with the course materials to make access quicker and easier.

Evaluation and Results

COE 313 was implemented with approximately 200 students in spring 2003 and 300 students in fall 2003 across eight to 10 sections. Informal and formal methods were used to evaluate readings and assignments and student progress toward course goals.

Informal Evaluation

Faculty members teaching COE 313 took student and instructor feedback seriously during the course and made adjustments, keeping course goals in mind. For example, COE 313 instructors had planned that students would have finished their unit on lesson planning in COE 311 by an agreed upon date, providing the foundation needed to produce a technology-integrated lesson plan. When students reported that did not happen, many instructors had to readjust their timelines and the order of topics.

Another level of informal assessment occurred in response to requests from other faculty, For example, during the fall 2003 semester, several professors wanted their students to create *PowerPoint* presentations for their courses and asked when those skills were covered in COE 313. Requests of this type led to the modification of a "skills mastered" list, described in the Discussion section.

Weekly planning meetings were a key aspect of the informal data gathering process in COE 313. The primary purposes of these meetings (which were normally 2 hours in length) were to refine the assignment guides for each major project and to coordinate the sharing of the materials and resources needed to teach the course. During fall 2003, each of the course instructors was in charge of writing or revising specific assignment guides. The other instructors would provide feedback on the guide and rubric. The lead person then was responsible for placing the guide in a shared space in *Blackboard*, where all instructors could access it and tailor the due dates to their section's timelines.

Although an agenda was created for each meeting, impromptu topics often arose ("I'm hearing this concern . . . How are we going to deal with it?"). These concerns were both technical in nature (such as not being able to create a PDF document in one of the labs) and procedural (students indicating they do not have enough time in class to complete the project by the due date).

Formal Evaluation

In addition to collecting anecdotal data during the course, data were collected through formal procedures on the value of each of the assigned readings and assignments used to meet course objectives. Course instructors collected information through two end-of-semester questionnaires (see Course Evaluation Forms in Showcase at http://coe.west.asu.edu/williams/coe313/). In addition, both the department chair and the assistant dean led a focus group designed to gather information about the first semester implementation of the entire

curriculum. Summaries of the recommendations were shared with the entire faculty in the new program.

Results from the formal data collection in spring 2003 (questionnaires and focus groups) are discussed in this section, and changes based on those results were made at the beginning of the fall 2003 semester. The first questionnaire completed by students at the end of fall 2003 asked them to rate each of the assigned readings on a 4-point Likert scale. Students responded very positively. On 18 of the 21 readings, students "agreed" or "strongly agreed" that the reading was valuable.

One questionnaire addressed the assignments, which were

1. Lesson Plan with Launch Page.
2. Lesson Plan with Multimedia.
3. Technology-rich Lesson Plan.
4. Analysis of Video Cases.
5. ePortfolio.

Results indicated that all of the major assignments, other than those associated with the video cases, were strongly endorsed by the students. Even though the ePortfolio was incomplete at the time the questionnaire was administered, the students viewed it favorably, although not as strongly as the other major assignments. *TaskStream*, which was used for lesson planning (in both COE 311 and COE 313) and for their ePortfolios, also was perceived by the students as having value.

This is not to say that the students were totally satisfied with the course. The students questioned the value of the reflections done for each major assignment. They had prepared technology-rich lessons for K-12 classrooms, but did not necessarily implement them, making reflection on the quality of these lessons difficult.

Another area of concern was the video case assignments. Both in-class and out-of-class viewings were rated negatively. Also, in the open-ended questions asking the students to comment on the strengths and weaknesses of the course, the following concerns were commonly mentioned:

1. The COE 313 CD was not easy to use and often did not function as intended. For example, the autostart feature did not work on most computers, and *Quicktime* was omitted from the CD so students could not view the videos without downloading a video player to their computer.
2. The field-based assignments (a technology inventory and a field observation) were often viewed as unnecessary and as a burden on their mentor teacher.

Focus Groups

In the focus groups held during the initial semester of the new curriculum (Spring 2003), numerous concerns were raised about all of the courses in the new program. This is not unusual for the initial implementation of any new course or program; a certain level of issues and problems are expected. Only a few concerns were raised in the focus groups that related directly to COE 313, and most were reflected in the survey results.

An analysis of the data over two semesters revealed that students' opinions of the course were generally positive and that the student-identified strengths and weaknesses were generally consistent across sections and instructors. The results of the questionnaires and of the focus groups were confirmed by the results of a dean's level survey of the entire new program.

Discussion

Generally speaking, the students found the course to be well developed and meaningful, but numerous changes were instituted based on the data gathered and analyzed during the first two semesters the course has been offered.

Coordination

From this research, it was clear that students requested more coordination of assignment due dates among the faculty of the all of the first semester courses. Because students and instructors noted the difficulties due to assignments being pushed back in various courses, during the fall 2003 semester faculty realigned assignments and due dates. Subsequent student responses revealed that students no longer had these concerns. Another coordination change was related use of technology in other first semester courses.

Several instructors wanted to integrate technology into their courses, but were unsure of when their students mastered the requisite technology skills. COE 313 instructors had previously distributed a list of the skills mastered in the course, but to address the questions that arose about the specific timing, a column was added that listed the week in the semester by which skills would be mastered (see the Skills Mastered List in the Showcase at http://coe.west.asu.edu/williams/coe313/). Of course, this level of coordination requires that all instructors in COE 313 follow the schedule as closely as possible.

Readings and Assignments

Many changes have been made in the course based on the data gathered through formal evaluation. Significant changes have been made in the readings and in the assignments for the course. Over the two semesters the course has been offered, students have made two common complaints about the course readings. First, there are too many readings, and second, many readings are assigned but not discussed in any depth in class. In response to these concerns, the number of readings was reduced (there were 27 articles in spring 2003, 21 in fall 2003, and

there will be 18 in spring 2004), and a conscious effort was made to hold students more accountable for their readings (through quizzes, in-class discussions, and increased use of the discussion board feature of Blackboard).

Determining how much readings should be directly discussed is a factor to consider in any college course, but because COE 313 classes all meet in computer labs, instructors were particularly sensitive to the need to use the computers effectively and efficiently in class. To this end, a short amount of class time was dedicated to starting a discussion, then students were assigned to continue the exchange using the discussion board. This held students more accountable and made more effective use of class time.

In addition to changing how readings were handled, in general, the course authors looked at the student response to each individual article. In some cases, articles were eliminated or replaced, based on negative feedback. In the case of some articles, however, the article was strong, but the handling of it was ineffective.

One assignment that drew relatively high negative response in spring 2003 (a paper that asked students to write at length on their view of technology integration) was eliminated, and the concept covered by the paper was evaluated in the context of other assignments and in-class writings.

As previously noted, students were required to reflect briefly (100-150 words) on the value of each of the major artifacts they include in their electronic portfolio. In spring 2003, this activity was the most negatively viewed aspect of the course's assignments. Only 9% strongly agreed that that assignment had value, 7% strongly disagreed, and an additional 35% disagreed.

Numerous written student comments indicated that the portfolio building and the accompanying reflections should not be an activity that waits until the end of the semester. They found it difficult to reflect meaningfully on assignments done months ago and found it stressful to be doing this amount of reflection in the closing weeks of the semester.

Based on this feedback, in fall 2003, students reflected on each major assignment as they finished it, and started the ePortfolios in the middle of the semester. As noted in the Results section, the feedback was more positive, with 68% of the students agreeing with the value of the reflections. However, a sizeable group of fall 2003 students (32%) did not agree that the reflections were helpful to them.

Thus, two further changes are planned for spring 2004. First, the ePortfolios will be started even earlier in the semester. Second, the reflective process will be made more meaningful to the students, through more thorough discussion of the values of reflection and through the use of scaffolds for students to reflect on specific concepts or artifacts.

Additional changes will be made in spring 2004, based on the students' feedback. The instructors eliminated the technology inventory, one of the two field-based

assignments. The instructors are confident that the instructional goals of that assignment can be accomplished by incorporating it into the remaining field-based assignment, which is an observation of K-12 students as they use technology to learn.

In fall 2003, in order to meet the needs of students with slow (or no) Internet connections, the students were provided with a choice of two CDs, one of which was elementary in focus and one of which was secondary in focus. Two video cases were on each CD. On the elementary CD, there was a primary case and an intermediate grade level case. On the secondary CD, there was a middle school case and a high school case. However, COE 313 students reported that the CD was problematic.

Rather than fix a technology that is being phased out, the course designers are choosing to change this assignment to match the growing availability of DVD technology and high-speed Internet. In spring 2004, multiple copies of the entire TBLR video case collection (in DVD format) will be placed on reserve at the library. The option to view these cases online remains, and students have access to high-speed connections in the ASUW library's technology center.

COE 313 students reported that they are not commonly experiencing exemplary uses of technology integration in their field placements. Consequently, the video cases provide the opportunity for students to view and analyze good models of technology integration in K-12 settings.

Recommendations

Tucker and Codding (2002) reported anecdotally that Harvard Business School invests $800,000 in the development of an M.B.A. course. The course authors would like to report that the design, implementation, and evaluation of this teacher education course were supported by resources of that scale. In fact, course development was supported by a mini-grant of approximately $13,000 from Arizona State University West that allowed the primary course instructors to redesign, implement, and evaluate the course.

Finally, it should be noted that this course follows a 1999 PT3 implementation grant in which 90% of the fulltime teacher education faculty participated in technology workshops and course revision to address the NETS-T. Just as Kerry (2000) noted with K-12 schools, a key first step in creating a technology-integrated curriculum at the postsecondary level is to ensure that the teachers are comfortable with using technology. After creating this foundation of basic technical expertise, it became possible to create a curriculum that infuses technology into many courses, building on the skills the students acquire in COE 313. Securing resources to allow faculty to build technology skills and collaborate is essential.

Developing a culture of collaboration among faculty is crucial. First, faculty members teaching the same course gain from collaboration with each other and, in turn, students benefit. Regular meetings help pinpoint problem areas, improve

instructional activities, and provide consistency for students in different course sections. Collaborating with faculty members teaching other courses need not be as frequent, but should focus on coordination that provides students with coherent and properly sequenced experiences.

Another recommendation would be to establish a systematic approach to course improvement through formal and informal collection and analysis of data. Prior student technology skills and knowledge, as well as student access to technology access outside the classroom need to be continually monitored as a part of those processes, These procedures need not take significant time and can be less formal than those described in this article, but are indispensable for improvement.

This course is situated in a COE that supports technology integration across the curriculum. The real innovation in this course is not the use of a single stellar technology, but rather a cohesive design that allows students to participate in a model of technology integration grounded in one course but flowing to many other courses and field experiences.

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