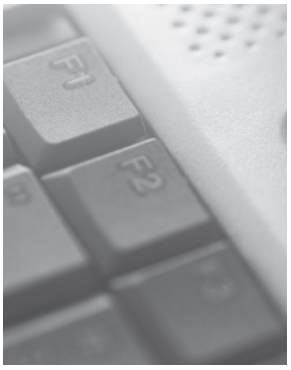

The Re-Envisioned Educational Technology Course: If Addition Isn't Possible, Try Division

Melissa Pierson and Mary Thompson

Abstract

This paper presents a new model for the required preservice technology integration course. We situate our model within the literature on the dominant stand-alone model, as well as the alternative models that have been explored. We then detail our restructured model of three one-hour courses that include focus on Introduction and Development, Integration and Evaluation, and Implementation and Assessment. We will highlight the challenges we have faced as well as our plans for continued course development. We argue that not only is our technology integration class sequence a feasible transition from stand-alone educational technology courses to a fully integrated model, but it also has unique merit for the cognitive development of our students in and of itself.

Setting the Stage for Change

Those beginning their careers as teachers at the turn of the 21st Century overwhelmingly have received their introduction to teaching with technology through a single educational technology course. Eighty-eight higher education institutions who prepare new teachers indicate that the single introductory technology (73%) three-credit-hour (60%) course persists as the dominant model, albeit with an emergence of emphasis on integrating technology into the curriculum over mere productivity or personal uses (Hargrave & Hsu, 2000).

The primary purpose of stand-alone technology courses is to introduce the usage of technology tools (Mehlinger & Powers, 2002). As these courses are often taught early in the teacher preparation program, introducing technology as part of instruction is difficult. Because the single stand-alone course must provide an overview of a whole range of technology skills and tools, it often cannot be responsive to students' needs in learning about using technology for their particular teaching contexts (Mehlinger & Powers, 2002), leaving many students either bored or frustrated (Ross & Wissman, 2001). In fact, schools, colleges, and departments of education report that the formal stand-alone course does not correlate well with either technology skills or the ability to integrate technology into teaching and learning (Milken Exchange on Educational Technology, 1999). Despite these limitations, the single stand-alone course has proved persistent because of advantages that include providing an overview of technologies needed, time to practice technology skills, the assurance for other faculty that students will have a certain skill base upon completion of the course (Mehlinger & Powers, 2002), as well as allowing for efficient use of faculty time and experience (Wetzel, 1993).

A range of attempts to restructure this mainstay of preservice degree plans has been described, including innovative and constructivist teaching techniques (Gunter, 2001), providing preservice teachers with models and practice for integrating technology into their teaching by working on technology-based projects with elementary school children (Stuhlmann, 1998), course delivery by videotape (Ross & Wissman, 2001), and the most radical approach—recommended as the ideal to be attained (Milken Exchange on Educational Technology, 1999)—of dropping the existing stand-alone course altogether in favor of an infusion model delivered throughout the entire teacher-preparation curriculum (Eifler, Greene, & Carroll, 2001). In this fully integrated model, the skills that students are required to learn are matched to the other required teacher preparation courses and taught by those course instructors or by cooperating technology specialists (Mehlinger & Powers, 2002). The appeal of an integrated approach appears to be that students are exposed to technology multiple times in multiple ways, and required to use technology for multiple assignments. This extended exposure time is less possible in a single-semester course.

Considerable challenges are cited by programs that have entirely eliminated the separate technology course. The integrated model is possible only if faculty agree to dedicate some portion of their busy semester to modeling good educational technology usage. The very autonomous nature of teaching at the higher education level prompts "territoriality" to surface when faculty are asked to include technology concepts in syllabi already brimming with what they consider the "real" content of their courses (Mehlinger & Powers, 2002). On average, for the technology skills taught in a single three-hour educational technology course to be taught in this integrated model, each of five or six courses would need to dedicate the equivalent of approximately two weeks of instruction time to technology. If integrated meaningfully, the technology complements the content of those courses; if perceived as an add-on component or if otherwise implemented incompletely, the technology components will remain distinct from the content, resulting in a "stand-alone integrated technology component" (Mehlinger & Powers, 2002, p. 95). In other words, technology is added onto but never really integrated into the course. Faculty teaching in integrated models who do address technology tend to segregate it into one or two special class sessions (Ferris, Roberts, & Skolnikoff, 1997). This disconnect conveys to students that technology is a thing unto itself that must be accomplished for its own sake, a message emphasized when the technology skills are taught by a technology specialist rather than the course instructor.

Select faculty may initially be willing to make changes to their courses to include technology, perhaps because of a perception that it is the right thing to do or even to satisfy program accreditation requirements; however, the instructors may not initially have adequate skills or time to address technology effectively on their own. It is impractical to rely on the individual interests and inclinations of a diverse group of faculty to find the time to stay abreast of new resources and current understanding of best practice (Eifler et al., 2001). Others who may be compelled by the decision of the institution to conform to a completely integrated model may not only lack the appropriate skills and the understanding of the purpose of technology in education, but may in fact doubt that technology has

a place in education (Mehlinger & Powers, 2002) and may be uncertain about their role in technology delivery (Eifler et al., 2001).

We begin this paper by describing the context and current status of our technology integration courses. We will highlight the challenges we have faced as well as our plans for continued course development. We conclude with the argument that not only is our technology integration class sequence a feasible transition from stand-alone educational technology course to a fully integrated model, but it also has unique merit for the cognitive development of our students in and of itself.

Our Context

A significant challenge identified in our teacher preparation program in 2000 was that the educational technology requirement was addressed through a single course taken typically, but not always, by juniors and seniors during the pre-professional development phase of the program. We believed that such a "one shot," disconnected course did not allow students to see ways in which technology could be seamlessly integrated into content area strategies. When surveyed as a part of our needs assessment prior to seeking PT^3 funding, our preservice teachers perceived the importance of technology, but were unsure as to the benefit derived from the single course. A majority was certain, however, that there was little evidence of technology use in any other methods courses. Because students had the option to take this course at any time throughout their program, there was no way to plan for connection to methods courses; in fact, a good number of these students took the course as freshmen and sophomores, even before they were admitted into the teacher education program.

Further limiting the effectiveness of this existing course was the prolonged amount of time it often takes our university's non-traditional students to complete their undergraduate studies. It was conceivable that some preservice teachers who took the course as freshman entered student teaching four years or more after taking the course. Based on anecdotal evidence from our student teachers, we knew the disconnected single course was not effective in producing lasting learning. They reported not remembering how to use technology tools, they were not familiar with new software programs, and they had never even heard of new standards that guided teacher technology use, notably the very state standards over which they would be tested in order to be certified.

Restructuring Efforts

Clearly, advances in technology, along with a continually maturing understanding of what it means to teach and learn with technology, deemed our existing requirement an unacceptable educational technology preparation for our new teachers. We pondered solutions for providing an extended exposure to instructional technology practices and theories so that students would have the greatest chance to make connections to learning from other courses. The obstacles cited in the literature led us away from considering an entirely integrated model except in the most idealistic, long-term vision. We were restricted from increasing the number of credit hours required in our undergraduate degree plans; at a time when traditional teacher preparation programs are in fierce competition with alternative certification entities and under attack by those who would undermine the importance of formal pedagogical preparation, we vitally understood the need to keep our requirements streamlined. Desire for faculty buy-in made us reluctant to eliminate existing methods courses to make room for additional technology courses. Others have suggested that neither a stand-alone course nor an integrated approach provides a complete preparation exclusive of the other (Bielefeldt, 2000; Wetzel, 1993), and that a sequence of courses with authentic, hands-on technology components can affect the way preservice teachers think about teaching (Stuhlmann, 1998).

To provide an environment in which our future teachers could come to see the appropriate and exemplary use of technology in education, we proposed structural changes to our technology component that would reflect strengths of other models yet still be likely to be accommodated within our program. We opted for a unique plan that allowed us to extend the exposure of our students to the use of technology while at the same time not increasing the credit hours required on degree plans.

We refashioned our existing three-credit-hour required educational technology course into three one-credit-hour sections that would be taken over the three semesters leading up to the student teaching experience. (See Figure 1.) This is not simply a case of a three-hour course being segmented. Rather, we planned this course sequence to provide benefits that went beyond simply increasing the amount of time students had to gain proficiency with technology. The design included an intentional coordination between each of the three courses and the other teacher preparation courses students took each semester, thus scaffolding students by relating technology to other pedagogical concepts over the three semesters prior to student teaching. By extending the exposure to technology interwoven with pedagogical strategies, we believed our preservice teachers would more thoroughly integrate technology into their future teaching.

As with any change to an established course, we faced obstacles in implementing the three-course sequence. Notification of PT^3 grant awards in June left little time to hire a staff, redesign the course, inform the Teacher Education faculty and administration, and implement this change for that immediate fall semester. Surprisingly, we had early and complete support from the Teacher Education program. Advisors alerted students to the change in courses, and the new courses were included on revised degree plans within a semester.

In August, soon after our grant staff was hired, we began contacting the nearly 200 students registered for the existing educational technology course that fall. We advised students that they would be dropped from the existing course, and that they should attend an informational session where they would be allowed to register for the one-hour section. We met the understandable nervousness and uncertainty from students to this change in their expected plan by providing plenty of information. By the second week of classes that semester, we had all but a few students relocated into their new courses and we set about the task of teaching the new courses.

The Existing Course

Our three-course "Technology in the Classroom" sequence emphasizes content-appropriate planning, teaching, assessment, and management strategies for the effective integration of technology into elementary school curricula. The courses are required by all teacher education students seeking elementary or middle level certification, and students must take them consecutively. Regular communication among the instructors of all three courses ensures that we plan and implement these three courses as a cohesive sequence with over-arching goals and similar internal course structures so that students are allowed to develop their instructional technology proficiency in a consistent environment. The courses are aligned to

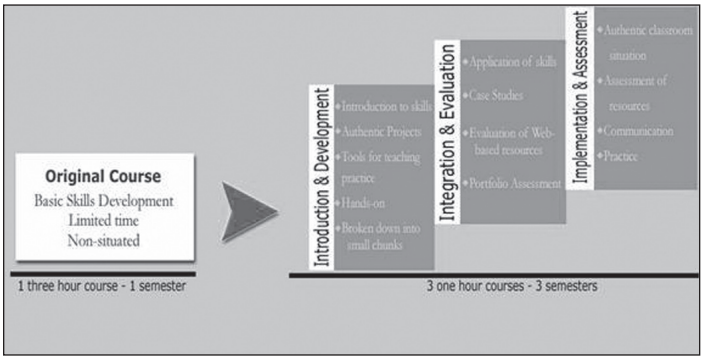

Figure 1.

both the NETS for Teachers and the Texas Technology Applications for All Teachers, on which our graduates will be tested for certification.

Although the later courses do build on the skills and knowledge gained through the earlier courses, they are not simply continuations of the same course. Rather, we have envisioned the three courses through slightly different lenses, which can broadly be described by Introduction and Development, Evaluation and Integration, and Implementation and Assessment.

The Redesigned Course Sequence

Course 1: Introduction and Development

Our first course introduces students to educational uses of technology in a carefully constructed, non-threatening environment. This course is taken during the first semester of the junior year, along with other pre-professional development courses. Students are encouraged to seek connections between technology use and the concepts they are learning in their other generic teaching coursework.

A concept with which we have struggled is the amount of attention we devote to teaching basic tool use. It has been observed that as teacher education students enter programs with an increasing amount of skills, the technology integration course can focus more attention on actually using the technology tools for teaching and learning (Mehlinger & Powers, 2002). However, we continue to be surprised by students who come to this course with quite incomplete knowledge of software and hardware. So, although we would prefer to abandon the basics to free up increased time for the more creative ventures of curriculum integration, we are continually brought back to the reality of our students' needs. We have compromised by setting our students' learning goals beyond mere button-pushing; rarely do we teach a software skill in isolation. Instead, all discussion of technology tools is framed by a teaching or learning task.

The focus in this first course is the development of educational materials using productivity tools. We have come to the understanding that establishing a vision of a project results in dramatically improved quality. Instead of sitting down in front of a blank screen to decide what to produce, students spend time examining a series of example projects. Armed with a vision of what can be done with various software tools, they proceed with designing and developing the learning product. Competitive spirit leads to progressively sophisticated results with each semester. We refer students who are deficient in basic tool knowledge to a selection of resources, including a "coursepack" of print-based tutorials that we have designed, computer-based tutorials, and free university workshops.

Often students approach us to petition out of the course, citing as justification their experience with using word processing in their jobs or browsing the Internet in their personal lives. These requests are routinely turned down because of our fervent belief that possessing basic computer competence does not determine abilities to teach with technology (Mehlinger & Powers, 2002). We have received enough comments like the following one from students upon completing this first course to justify in our minds our insistence on having students participate in the experience:

> I was computer literate when I took 3111 so I thought it would be a breeze. It was an eye-opening class for me because I learned that there was more to technology than the Internet and Microsoft Word. (C. L., preservice teacher, 2003).

It is during this first semester that we coach students to use national and state technology standards for teachers to identify and reflect on areas for personal growth. Students select a standard-based theme that guides their learning and development throughout the course. All of the assignments can be customized to fit students' skill levels and areas of teaching interest. Students begin chronicling their development as technology-using teachers through a Web-based portfolio.

Course 2: Evaluation and Integration

The focus of our second course shifts from using technology tools to develop and produce learning materials to integrating technology for specific teaching purposes. Students plan meaningful lessons that address state content standards through the use of technology-enhanced tools that were made in the previous class or are already available from online sources. We have come to the conscious decision that teachers do not have to author a unique electronic presentation for each lesson. The very time-intensive nature of this prospect limits the likelihood that future teachers will use technology as a regular feature of their teaching. Quality and relevant resources exist online if students have the skill to find, evaluate, and use them. Students learn to become critical users of online material, understanding the types of resources and the potential each has as a teaching or learning aide. Using the Web as a resource is a theme that continues as students investigate ways to use their online portfolios as multi-function information and instructional tools for the communities of their future learners.

Students in this course are in their final semester based at the university; therefore, they do not have a K–12 context with which to situate the use of technology. One way we have used technology to simulate real classroom context is to bring together experienced classroom teachers and preservice teachers for cross-level online discussions on technology-integrated teaching. Through this virtually situated learning experience, teachers provide descriptions of the learning context and proposed lessons. Students respond with suggestions of how technology might be used to teach those particular concepts, and the teacher implements the proposed lesson. Not only are students able to vicariously experience the teaching of a technology-rich lesson, but they also receive a rare glimpse into an experienced teacher's thought processes in planning, teaching, and evaluating a learning experience.

Course 3: Implementation and Assessment

Due in part to the structure of the preparation program at our university and, to a great extent, in our belief that teaching with technology must take place in an authentic setting, the final one-hour technology course is taken concurrently with the first semester of field placement. The need to conduct this course as an off-campus distance class has also capitalized on the Web-based discussion forums and search skills that students have perfected throughout the course sequence. Students use the discussion forums to communicate with their peers at other schools and with their instructors at the university. They search for, share, and discuss current articles on teaching with technology and are encouraged to implement these new ideas as part of their teaching practice in their assigned classrooms. The ability to capitalize on familiar technologies to support and extend authentic activities in their classrooms is one of the major benefits of the three-semester course design.

Students conduct two studies within their assigned schools to understand technology use in these authentic settings at both the macro and micro levels. They begin examining the big picture by conducting a survey of the technology infrastructure of their assigned schools (Technology Infrastructure Scavenger Hunt) targeting the teacher technology standards related to school-wide resources, acceptable use policies, safety issues related to technology use in the classroom, and issues regarding equitable access to technology in the school and home. At the micro level, teacher candidates become familiar with the needs of individual students in their classrooms by completing a student technology case study. Each candidate develops his or her own checklist or rubric based on the required state technology standards for the assigned grade level and then uses the tool to evaluate the technology skills of a selected student through observation and conversation. Reflections on these case studies often reveal a great deal of surprise as candidates are confronted with student skill levels that are much different than those they had expected. Both of these experiences,

the evaluation of technology availability and accessibility at the macro level through the Technology Infrastructure Scavenger Hunt and the micro level of the technology skills of individual students prepare the students for a thoughtful, authentic, and needs-based integration of technology into their instructional practice.

The remainder of the semester is spent creating a lesson that effectively integrates technology into their educational context. Students are required to teach lessons as part of their content methods classes. We ask that they select at least one of these lessons into which they will incorporate technology and that this integration is aligned with state technology standards as well as to the identified needs of their individual classroom assignments. Often, this process involves modifying or repurposing a tool or product that they have created during one of the previous courses. Their understanding of the needs of their classroom and the theory behind appropriate technology integration learned in the first two courses is thus applied in the situated context of their individual classrooms. Implementation of their technology projects requires that our teacher candidates take into consideration and discuss with their site-based teacher educators (1) the developmental needs of their students; (2) the content requirements of the teacher, school, and district and how those content standards will be supported or enhanced through the addition of technology to most likely result in success for students; and (3) whether the lesson they are planning is feasible with regards to school technology availability and student technology skills as evidenced by their research studies. After the lesson has been implemented, the students reflect on each of these elements within their lesson and articulate the changes they might make to the lesson in the future. This requirement has become an invaluable tool for allowing students to solidify the ideas that have been discussed and modeled during the previous two semesters of the course.

Cognitive Science Implications For the Three-Course Model

An added benefit that we have discovered in designing the three-semester course sequence is that it allows instructors the time to incorporate important cognitive strategies such as metacognition, reflection, and situated learning into an introductory technology course. Although other institutions acknowledge the importance of these cognitive abilities, instructional technology remains primarily skills-oriented (Brown, 2001). A number of recent articles identify the desirability of including cognitive science concepts within the design structure of educational technology courses (Brown, 2001; DeMiranda & Folkestad, 2000; Pittman, 2002). Knowledge fostered within a framework of cognitive science concepts provides students with instruction that extends beyond basic skills and leads to the ability to apply those skills through high-level reasoning, problem solving and communication (Pittman, 2002). DeMiranda and Folkestade (2000) state that technology courses that incorporate cognitive science concepts lend themselves to bridging the theory of teaching with technology to the actual practice of teaching with technology.

It is our belief that fostering the mental practices that underlie effective teaching requires time, not simply for the course instructor who is traditionally seeking to deliver as much content as possible, but also for the students who must have the time to absorb and benefit from it. In essence, the development of deep and rich cognitive structures cannot be rushed. The three-semester course sequence allows us to gradually scaffold our students' learning as they progress through a carefully structured sequence that eventually finds them ready to apply what they have learned in the authentic classroom environment. We collect multiple forms of data that help us assess our students' growth; of these data, concept maps have yielded the richest information about our students' journey during the three semesters. At the outset of each of our three courses, we ask students to create concept maps depicting their understanding of the use of technology for teaching and learning. Initial analysis of these series of concept maps reveals marked developments in the maturity of the conceptual structures that underlie effective implementation of technology in teaching. The success we have had guiding students through this process indicates that the added time and design effort is rewarded in the development of a teacher who is truly ready to apply the best principles of integrated teaching and technology.

Pragmatic Implications of the Three-Course Model

As with any change process, we encountered resistance in a variety of forms as we worked to institutionalize this innovation. Careful attention to course logistics and a teaching methodology that is inclusive of the individual knowledge and experience of all participants—both learners and instructors—is necessary for successful sustainability.

Logistics of One-Hour Courses

The logistics of replacing a single course that can be taken at any time in the degree plan with three courses that must be taken in order in the three semesters directly preceding student teaching has required substantial organization—by our team, on the part of the college advisors, and by the students themselves. Naturally, some students have found themselves in the unenviable position of having missed taking the first course in the sequence at the appropriate time. The consequences of a student not beginning this course sequence one full year prior to their field-based semester include either taking two courses in one semester or during an emergency summer session, neither of which leads to adequate preparation. Some students have even faced delaying their graduation for a semester, also not an attractive option. A coordinated communication campaign is required so that students will know what course is required, and when. Although ours was indeed a mandated change (students no longer had the option of taking the previous course after the first semester) we sought to understand the process from the students' perspectives. We have experimented with course times that are convenient to students' schedules, we have worked to craft emergency plans for the small and diminishing number of students who have somehow neglected to take the courses far enough in advance of their field work, and teacher education advisors have assisted students in accommodating the one-hour courses within their otherwise three-hour-based course loads. We recognize that change is a cyclical process and that this mutual communication will be an ongoing necessity.

Inclusive Teaching Methodology

Our new three-course sequence of "Technology in the Classroom" was initially structured with loose, very adaptable requirements that encouraged students to demonstrate proficiency with national and state technology standards by integrating technology into the projects assigned in their methods courses (Wetzel, 1993). This effort was a direct response to the isolated nature of our previous educational technology course, in which there was no coordination with methods courses. We envisioned our role in those first semesters as facilitators of our candidates' learning, instructing them on technology tools as needed for projects, making sure they had a solid understanding of technology standards, and scaffolding them as they problem-solved ways to integrate technology. Our highly constructivist plan met an immediate challenge when the methods faculty members were not forthcoming with technology-rich opportunities. For the most part, students encountered in their other teacher preparation courses plenty of options to word process assignments and some opportunity to present electronically, but few other requirements that could logically include technology. As is frequent in constructivist settings (Ferris et al., 1997; Windschitl, 2002), we felt pressure to supply students with the more direct instruction on assignment requirements and technology procedures that they craved, as those are instructional forms with which they were most comfortable.

We have actively resisted the decline back toward an excessively directive method, and have now attained a more effective balance of instructional models, including combinations of small group, independent, discovery, and directed learning, as appropriate. Students are required to demonstrate proficiency with technology standards through a series of projects that can be customized to fit their individual teaching levels and content areas. For example, competency in the use of a multimedia authoring program, one of our state-required technology standards, will appear significantly different when constructed by a preservice teacher with an early childhood emphasis than when created by someone who intends to teach in middle school. And yet, students learn through our customizable assignments that technology can fit equally well in both areas. (See Table 1.)

Rubrics are used to assess students' acquisition of required skills, however the content objectives of the assignment are created by the individual student to fit the needs of his or her future classroom. Open-ended or customizable assignments such as this allow our students to continually focus their attention on the content that is to be taught rather than on the technology that is used to teach it.

Future Directions

We have specific plans to strengthen the cohesiveness of this course sequence, and the three individual courses, in future semesters. The second course functions as the "connection" course, where students really start to see the role of technology within the curriculum. We foresee the participation of even more real school stakeholders in setting the virtual context of this course. Plans are in place to emphasize school technology scenarios and to view Web-based videos (e.g., INTIME [http://www.intime.uni.edu/] and NETS DVL [http://tblr.ed.asu.edu/pt3/]). In addition, we anticipate expanding the school perspectives represented in the course by inviting more teachers, principals, students, and even parents to guest moderate and participate in online discussions of topics related to their perspective on technology use. Considering these perspectives even before students begin their field placements the next semester will open their minds to both the possibilities and the challenges of using technology in real school settings.

The third course, already taught largely from a distance, will be formally redesigned as an online course. Students will still meet in person for an orientation at the beginning of the semester. From that point, they will work on the existing individual research and curriculum implementation and assessment projects, coming together in online discussion forums to share experiences and question the uses of technology they are witnessing. Optional face-to-face assistance may be offered. A comprehensive Web-based materials collection is in the works, thus providing a resource not only for this semester, but also for when students are teaching in their induction years.

Finally, we envision increased peer collaboration among students in the three courses. As part of our ongoing effort to put students in the driver's seats of their own learning, we see the strength of participating in co-teaching and reviewing of other's work, with campus-based students developing instructional units for peers in the field, and conversely, field-based students sharing the real stories of the classroom to campus-based students. We aim to take direct advantage of the teaching and learning abilities of our students for the benefit of each other.

Another option that allows students to see the potential for integration of technology in other teacher preparation courses is a form of block scheduling. Our teacher preparation program is currently being restructured so that pre-professional development courses are organized in a sequence, demanding increased cooperation and cross-planning among instructors who are blocked concurrently and opening the door for us to highlight discipline-specific technology usage. This increased communication and collaboration could conceivably bring us one step closer to the ideal of the fully integrated technology course.

Table 1. Technology Integration at Two Grade Levels.

Early Childhood
Shannon uses kindergarten content standards to guide her creation of a counting presentation. In her presentation, students are asked to actively participate by counting objects as they appear on the screen and to compare groups using vocabulary such as more, less, or the same.
Middle School
Allison created her own story as a demonstration of what her future students could create. She used a multimedia authoring program to illustrate the story and make it come alive. Allison plans to have her middle school students write and illustrate their own multimedia stories.

Conclusion

We present our model of the subdivided technology integration course as a flexible and effective alternative to the widely-used single-semester stand-alone course. The individual segments can be customized and reconfigured to suit new understandings of current best practice, changes in student population, fluctuations in teaching resources, or modified certification requirements. Some or all can be taught online, by adjunct instructors, or teamed with select methods faculty for more integrated experiences. It should be noted, however, that if these courses are taught by different instructors, care should be taken to establish a clear, shared vision across the course sequence and regular cross-planning to ensure a consistent instructional stance.

Not only do we believe this model can serve as a feasible transitional plan from the stand-alone course to a completely integrated model, but we further see unique merit in the distinct perspectives through which these courses allow us to highlight technology for the cognitive development of our future teachers. We contend that novice teachers who can proficiently use a variety of tools, confidently compose strong curriculum, and effectively implement technology-rich learning environments succeed in doing so only after ample time with which to cultivate these complex talents.

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Dr. Melissa Pierson is an associate professor in the Instructional Technology Program at the University of Houston. Her research interests include the appropriate use of technology in teacher education, the development of technology integration abilities in novice teachers, and the relationship between teaching excellence and expertise with technology. She directed a PT³ grant project aimed at restructuring the preservice technology instruction at the University of Houston, and co-authored the book Using Technology in the Classroom, 6th Ed. *(Allyn & Bacon).*

Melissa Pierson
Associate Professor
University of Houston
256 Farish Hall
Houston - TX, 77204
Phone: 713.743.4961
Fax: 713.743.4990
mpierson@uh.edu

Dr. Mary Thompson is a visiting assistant professor at the University of Houston. She is currently teaching two of the three courses described in this article. Her research interested include finding ways to better enable her preservice teachers to learn about integrating technology into their classrooms.

Mary Thompson
University of Houston
mthompson@pioneer.coe.uh.edu