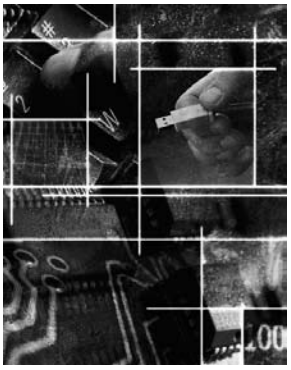

A Task-Oriented Framework for Stand-Alone Technology Integration Classes

Thomas C. Hammond

Abstract

A long-standing challenge for schools of education is how to prepare teachers to effectively integrate technology into classroom instruction. A widespread practice in training preservice teachers is the stand-alone technology class. These classes have evolved over time. This article suggests a further development in stand-alone technology classes: a task-oriented framework. In this approach, instruction focuses on common classroom activities of teachers and students, such as collaboration, research, presentation, and composition. Technologies appropriate for each activity are then explored. The task-oriented framework described here was developed in the context of a stand-alone technology course for preservice secondary humanities teachers.

American society is placing a large bet on technology in K–12 education. Schools (and hence taxpayers) are spending billions of dollars each year on educational technology (Hayes & Grunwald, 2004; Goolsby & Guryan, 2005). The challenge to schools of education is to prepare teachers to take advantage of this technology in the classroom.

Accordingly, many teacher preparation programs have placed an emphasis on preparing teachers to teach with technology, and they are experimenting with models that will provide teachers with the skills, attitudes, and strategies to allow them to integrate technology into their instruction. These strategies include stand-alone technology courses, modeling, mentorship, collaboration, multimedia projects, workshops, field experiences, integration, faculty training, and access-driven approaches. These strategies can be used singly or in combination, and the most successful teacher education programs seem to use several strategies at once (Kay, 2006). Like their teacher candidates, teacher education programs can move through progressive stages of adoption and implementation of technology integration (Toledo, 2005).

The best measure of the success of instruction in technology integration is actual use of technology in the classroom. Unfortunately, a disconnect appears between teachers' training and their classroom practice. Large-scale research studies (Milken Exchange on Educational Technology, 1999), small-scale qualitative studies (Kajder, 2005), and anecdotal reports (Kleiman, 2004) all register a similar pattern: a minority of teachers integrate technology into their teaching. Ironically, as society as a whole becomes more wired, both teachers and their students are increasingly intensive technology users – but not as part of their classroom interaction (Rainie, 2006). While students are independently applying technology to many aspects of their education (Kim & Bagaka, 2005; Levin & Arafeh, 2002), teachers are struggling to find meaningful ways to use technology to enhance teaching and learning.

Schools of education and education researchers need to develop instruction for preservice teachers that will result in powerful uses of technology in the classroom. One common strategy for preparing teachers to use technology is the stand-alone technology course. While such a course has its limitations in fostering teacher use of technology (Pierson, 2004; Willis & Sujo de Montes, 2002), it is a staple practice in schools of education. A survey of 88 teacher education institutions found that nearly three-quarters of these institutions use such a course (Pierson & Thompson, 2005). The stand-alone course provides an expedient means to ensure that teacher-candidates achieve a minimum competency with technology and that they are exposed to a variety of tools and techniques. It can be used successfully in conjunction with other technology integration strategies. From an administrative standpoint, the stand-alone course is relatively easy to staff and schedule. Other strategies, such as modeling by methods professors or technology-intensive fieldwork, require comparatively more training, coordination, and equipment to ensure that the desired technology training is taking place. A stand-alone course, on the other hand, offers a single point of control and access (Pierson, 2004).

Stand-alone technology courses have evolved over time. At their inception, the courses were generic, addressing all grade levels and all content areas indiscriminately. An omnibus course, however, can prepare teachers to *use* technologies but fail to prepare them "to effectively *infuse* technologies into their own instruction" (Christensen, Knezek, & Parker, 2005, p. 188). These one-size-fits-all approaches have given way to more differentiated strategies that target specific contexts. One contextual strategy is to situate the technology instruction throughout the teacher education curriculum. The University of Houston, for example, re-structured its three-hour course into three one-hour courses spread over sequential semesters (Pierson, 2004). The sequence allows greater "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" (Pierson & Thompson, 2005, p. 32).

A second strategy for providing an enriched context for technology integration instruction is to focus the stand-alone technology course on a single content area or a group of related content areas. The University of Virginia, for example, offers three variations of its stand-alone technology course, one for elementary teachers, one for secondary humanities (language arts, social studies, and foreign languages), and one for mathematics and science teachers (Friedman & Kajder, 2006). This strategy of focusing on content areas takes its cue from the observation that "The successful pre-service educational technology class can no longer be just a training course on software use; rather, it must be a methods course that seeks to model appropriate technology use across content areas" (Whitaker & Hofer, 2002, p. 1338).

Regardless of the strategy used, the goal of a stand-alone technology course is to arm teachers with an organized, accessible body of knowledge. Melissa Pierson (2004-2005) created a powerful metaphor for teachers' pattern of use of technology. She contrasted her toolbox, kept out in the

garage, with a pair of pliers, kept handy in a kitchen drawer. The pliers, by virtue of their familiarity and proximity, are used reflexively for all tasks—"for tightening and loosening, for digging and twisting, and even for the occasional pounding, cutting, and splitting"—regardless of their suitability. The toolbox, stocked with more appropriate tools, remains unused. "So, why do I keep reaching for this overworked pair of pliers? The truth is, I am usually either too lazy, too much in a hurry, or frankly just uncertain of the contents of my toolbox" (p. 43). She compares her use of the pliers with teachers' use of PowerPoint, which is called into service again and again as a medium for instruction, for review, and for student project work. In the context of technology instruction, then, Pierson recommends,

> While we fill the toolboxes of our future and practicing teachers and arm them with the knowledge to use the tools for educational purposes, let's go a step further to assist them in organizing those toolboxes so that their knowledge and skills are easy to access when needed. (p. 43)

One strategy for stocking the toolbox is to introduce teachers to software applications and concepts, one at a time—PowerPoint, Inspiration, Paint, webquests—and then link them to potential classroom uses (Mouza, 2002). However, this strategy places the emphasis on the tool rather than on the classroom implementation (Flick & Bell, 2000; Garofalo, Drier, Harper, Timmerman, & Shockey, 2000). A more effective strategy may be to reverse the sequence: First identify key tasks of teaching and learning, and then explore appropriate technological tools that support these tasks (Mason et al., 2000; Pope & Golub, 2000). A task-oriented approach, rather than a tool-oriented approach, to teacher technology training could help provide the organized, accessible toolbox described by Pierson.

A Task-Oriented Framework

The concept of a task-oriented framework evolved during instruction of a stand-alone technology course for preservice secondary humanities teachers at the University of Virginia. The course, EDLF 345: Teaching with Technology, is taken by both undergraduate and graduate teacher candidates. Undergraduate students typically take the class after their introductory teacher education course and before their first methods courses. Graduate students take the class simultaneously with their methods courses and before their student teaching experience. The task-oriented framework emerged as a response to this diverse body of students. Some undergraduate students have yet to see, let alone write, their first lesson plan, while some graduate students are already immersed in field experiences. By centering the classroom discussion and course assignments around the tasks of teaching and learning, each student can apply his or her training and experience. Undergraduate students are not at a disadvantage, but graduate students are not asked to discuss technology in isolation from their teacher training.

The task-oriented framework takes its cues from verbs, specifically actions that teachers will engage in or will want students to undertake. These verbs—communicate, collaborate, research, assess, compose, present, and publish—are used week by week to provide the focus for the classroom instruction, discussion, and follow-up assignments. The goal is to situate students' thinking in the classroom and in the authentic tasks of teaching and learning content (Flick & Bell, 2000; Garofalo, Drier, Harper, Timmerman, & Shockey, 2000; Mason et al., 2000; Pope & Golub, 2000). In most cases, these verbs align with content standards drawn up by teacher-education associations. The National Council for the Social Studies (NCSS), National Council of Teachers of English (NCTE), and American Council on the Teaching of Foreign Languages (ACTFL), for example, all describe these tasks, often in the same words, in their expectations for what K–12 students will do (NCSS, 1994; NCTE, 1996; ACTFL, 1999). Once the preservice teachers encounter these tasks in their classrooms, the expectation is that they will integrate technologies that are appropriate for the task. For example, as a teacher plans classroom instruction that centers around a collaborative research project, he or she will identify and use technologies that enable collaboration and research.

The task-driven framework has several antecedents. First, it builds upon Dewey's organizing scheme of children's natural impulses: inquiry, communication, construction, and expression. Levin and Bruce (1997) applied this framework to educational technology, classifying educational software into these categories. The task-driven framework expands upon these ideas and applies them specifically to the classroom environment. Second, the task-driven framework aligns with the observation by Bransford, Brown, & Cocking (2000) that "computer-based technologies can be powerful pedagogical tools—not just rich sources of information, but also extensions of human capabilities and contexts for social interactions supporting learning" (p. 230). A task-oriented framework focuses on exactly these extensions of capabilities, such as composition, and the contexts of interaction, such as classroom communication and collaboration. Finally, a task-oriented framework provides a complement to the critical framework developed by Otero, et al. (2005). Their critical framework promotes "the idea that if technology is used, it should be used for a content-specific, pedagogical purpose" (p. 12) and organizes technologies into tools for cognition, communication, management, evaluation, and motivation. While Otero, et al. focus on teachers' actions, the task-oriented framework described below addresses actions by both teachers and students in the context of instruction.

The following section identifies the verbs used in the task-oriented framework, provides a context for their discussion, identifies examples of technologies introduced as being appropriate for each task, and describes follow-up assignments that build upon students' understanding. Each discussion identifies both proprietary and open-source technologies (e.g., Microsoft Office and OpenOffice), but during instruction open-source options are emphasized. Teachers and students will have far more reliable access to free, Web-based tools than applications tied to proprietary operating systems.

Communicate

Teachers will want to communicate—with parents, with students, and with colleagues—and may want students to do the same—with the teacher, with peers, with content experts, or with community leaders. The humanities, which are the focus of the course, all focus upon interaction: in language arts, writing is for reading; in foreign language classes, speaking is for hearing; and history is a dialogue about and with the past. In fact, the content standards drawn up by NCSS (1994), NCTE (1996), and ACTFL (1999) all specifically highlight communication as a key activity for students. An Essential Skill listed by NCSS, for example, includes the ability to "communicate own beliefs, feelings, and convictions" (p. 149).

A variety of technologies exist to expedite or extend communication. Students in this course are therefore introduced to

- Listserves, including the capability to create their own listserves. Students are expected to subscribe to at least one listserve in their area of professional practice, and are encouraged to create their own. Listserves can provide a powerful, relatively simple, private channel for internal communication within a classroom community, and can even be used to bridge different cohorts.
- Teacher-created blogs, wikis, and Web sites. The instruction does not emphasize the technical aspects, such as mastery of specific editing environments or coding practices. Instead, students are encouraged to select the right tool for the context and for their ability level with technology. A wiki can be just as effective as a regular Web

site, but easier to create and manage. Blogs, wikis, and Web sites are more public platforms and therefore fall under greater scrutiny by administrators and community members.
- Text chat and voice chat tools, such as Skype. While these tools would not (typically) be used in the context of classroom instruction, they may be used to collaborate with colleagues or to hold online office hours for students or parents as needed. Because these environments can accommodate multiple actors, teachers will be able to interact with more than one questioner at a time.

As follow-up assignments, students are required to

- Create individual Web sites. Over the course of the semester, students submit their assignments by posting them to their Web site. By the end of the semester, the Web site has grown into a portfolio that represents the students' abilities and thoughts as a tech-using teacher.
- Set up individual blogs. These blogs are used for both reflection (on class discussions or personal experiences) and for planning (by coordinating the workflow of future assignments).

Collaborate

Teachers are often asked to collaborate with colleagues on curriculum or professional development projects, and teachers often employ group work strategies with their students. The collaboration may be synchronous or asynchronous, face-to-face or at a distance.

Technologies used in this course that empower collaboration include:

- Online social software, especially education-specific tools such as Tapped In. Students are directed to both the traditional Tapped In campus (for professional development and interaction) as well as the K–12 Tapped In campus (for classroom uses).
- Student-generated blogs, wikis, and Web sites.
- Online productivity software, such as Google Docs.
- Flickr pools. Flickr is an online photo-sharing service that supports group commenting and annotation of photos. Users can also submit related images to a pool.

As part of students' experience of using technology for collaboration, they

- Subscribe to a Tapped In group set up for the class. This group is used to conduct knowledge management within the classroom community: students who e-mail the instructor with questions are asked to redirect these queries to the Tapped In group. When questions are posted and then answered in Tapped In, they become available to the entire group and not just the individual. Furthermore, succeeding sections of the course can search previous semesters' questions and answers to solve common problems.
- Participate in a simultaneous chat session online. This experience often raises questions for students about their own use of chat technology, and challenges them to think about how a tool that many are familiar with and use in their personal lives can also be used in their professional practice.

Research

Deep knowledge and understanding of the content domain is central to the practice of every educator. Student teachers' lesson plans are often so content-focused that they are miniature textbooks. First-year teachers spend hours researching and studying to build their content knowledge. Teachers will want their students to engage in a similar, but scaffolded, process of research in pursuit of content knowledge or be spurred by an inquiry activity.

The advent of search engine technologies such as Google have had an unmistakable impact on the way students and teachers research. Instruction on research tools and techniques in this course therefore includes

- Formal Boolean search strategies. While many students are already familiar with the concept, they are often not prepared to explain it to their students. The focus of the discussion, therefore, is on how to guide students through such a process.
- The concept of folksonomy, or user-generated organizational schemes. Functional examples of folksonomy are visited at del.icio.us and Flickr, and their merits and demerits are explored. The discussion focuses on tags, the folksonomic indexing tool, and specifically the possibility of allowing teachers and students to organize their thinking by classroom terms (such as "regiment from the film *Glory*") and not just externally-approved keywords ("54th Massachusetts infantry regiment").
- A survey of online archives and databases, as well as folksonomic information sources such as Wikipedia. When using non-traditional sources such as Wikipedia, the instruction emphasizes the History feature of the articles, allowing teachers and students to research not just the topic but the history of the topic's development on Wikipedia.
- Tools and strategies for saving and organizing online information, such as Furl and del.icio.us. Both tools allow a user to maintain internet bookmarks online, and these bookmarks are flexibly organized through tags or topic categories. Del.icio.us bookmarks can be browsed by others and shared to others' accounts; furl is less interactive but solves the problem of dead links by creating copies of saved pages.

To follow up from this discussion, students are required to visit and blog about online archives and are invited to launch their own del.icio.us, Flickr, or Furl accounts, sharing their individual postings to the classroom pool.

Assess

Assessment is at the heart of learning. Teachers are required to assess their students, and many teachers will also want to develop their students' abilities to assess. Assessment by students can be a self-assessment, a peer assessment, or the evaluation of external products or information.

The most critical understandings about assessment—be clear, be consistent, and be compassionate—have nothing to do with technology. However, several technologies provide unique opportunities for enriching the practice of assessment. Technologies for assessment highlighted in the course include:

- Built-in annotation features, such as the Comments feature found in most word processors and the Notes area found in most slideware. These avenues for feedback are modeled throughout the course.
- Online assessment, such as Zoomerang and Quia. These tools can be used by teachers as computer-based assessments, and they can also be used by students to generate data about the classroom and/or community.
- In-class survey-takers (a classroom performance system). These systems are often expensive and therefore do not receive as much emphasis as free online equivalents. However, classroom performance systems do have the virtue of not requiring access to a class set of computers.
- Flexible analysis tools, such as Excel and Fathom. Both applications provide powerful capabilities for organizing and displaying data, and the latter allows real-time manipulation of data and visual displays.

Best practices in assessment are modeled throughout the course through the use of rubrics, feedback on every assignment, opportunities for revision and resubmission, and structured self-evaluations and peer evaluations. Additionally, several classroom exercises are designed solely to demonstrate the capabilities of technology. In these demonstrations,

students take online quizzes anonymously. Their responses are then scored and the results are displayed in real time.

Compose

Composition is a flexible and powerful behavior. Teachers will need to compose text, visuals, and multimedia for their students. Teachers who engage students in the higher levels of Bloom's taxonomy will find composition to be a rich way to engage students in synthesis or provide a structured medium for delivering analysis or evaluation. Furthermore, content standards in the humanities call for students to create original pieces in a variety of media, and not just text (NCSS, 1994; NCTE 1996; ACTFL, 1999).

Digital technologies are becoming the primary medium of expression in society. Productivity suites, such as Microsoft Office and OpenOffice, offer powerful replacements for pre-digital activities such as text editing and slideware. Graphic organizers such as Visio and Inspiration/Kidspiration make flow-charts and concept maps much more powerful. The more intriguing possibilities, however, are the new canvasses created for student and teacher expression afforded by tools outside of the productivity suites. These tools include:

- Image editors, such as Photoshop, Fireworks, and GImP;
- Audio editors, such as Audacity and GarageBand; and
- Video editors, such as iMovie and Movie Maker.

Each of these applications does for its target medium what word processors do for text: make it malleable. An audio file in Audacity, for example, is represented visually as a set of waveforms that can be cut, pasted, amplified, reversed, compressed, equalized, and so forth. Students can therefore edit images, audio, and video (almost) as easily as they can edit text in a word processor.

Students are called upon to use their composition skills for every assignment in the course, whether creating their Web portfolio or writing a blog entry. Two multimedia assignments, asking students to create a sequence of digital images, a podcast, or a digital movie, specifically engage students in using the editors described above. Again, the emphasis is not on technical mastery but on selecting the right medium to match their self-selected concept and then creating a working version of the product.

Present

PowerPoint (as well as equivalents such as Keynote and Impress) has been the one technology that K–12 educators (and administrators) have enthusiastically embraced. The term *PowerPoint*, in fact, is well on its way to becoming a synonym of *presentation*—yet another trademark becoming a general use term, such as Xerox or Kleenex.

The goal, then, is not to teach students how to use PowerPoint. (After all, would a technology integration class teach students how to use a copy machine?) The goal is to teach students the full range of pedagogical affordances of slideware, such as non-linear formats that can be used to scaffold classroom discussions or to deliver assessments or differentiated instruction. Students in this course are therefore exposed to slideshows that model

- Granulated presentations of content, in which the teacher can visit, re-visit, or omit subsections of the content as needed;
- Prompting for classroom discussion or reflection, with links available to pursue different branches of the conversation;
- Multiple-choice quizzes; and
- Schematic diagrams, whether created in PowerPoint or Inspiration or SketchUp. In this format, the presentation provides macro and micro views of an object, often from a variety of angles.

Following the exploration of the topic, students are asked to prepare either a non-linear slide show or a Flickr pool or a SketchUp object to explore a topic in their content area. As students create their presentation, they also cite the content standard(s) it addresses, describe the classroom context of its use, and describe the intended student outcomes.

Publish

Teachers and students can easily display their digital products. Web server space is cheap or often free, and storage capacity and bandwidth keep increasing. The act of publishing is a powerful motivator for students and provides opportunities for connections with communities outside the classroom.

Strategies for using technology to publish student and teacher work covered in the course include

- Web sites, particularly when used as Web portfolios;
- RSS feeds to automate the delivery of content from a Web site, blog, or podcast;
- Hosting sites, such as the free video hosting available through YouTube or Google Video; and
- Specific-interest forums, such as fanfiction.net or digital film competitions.

The primary vehicle for engaging students in publication is their personal Web site, particularly the portfolio section. Students are encouraged to view their final Web site as a product to be shown to a future prospective employer, student, and parent of a student. By envisioning these audiences, the students fine-tune their work and offer a commentary on how each assignment will (or will not) become part of their future classroom practice.

Limitations and Implications of a Task-Oriented Framework

This strategy of a task-driven framework has several limitations. First, the syllabus must continuously evolve as new technologies emerge or as previously-adopted technologies die off or demonstrate a lack of fit within the classroom context. Second, the course raises far more issues than it can hope to responsibly address, such as netiquette, protection of privacy, and the legal and cultural issues involved with students working online. Third, while students are prepared to integrate technology into their instruction, they do not receive preparation on how to instruct their students about the technologies themselves. For example, a teacher who wishes to integrate student-created blogs into her classroom must lead students through the steps involved in setting up and posting to blogs, explain the goal and purpose of the blogging, deliver guidelines on acceptable use, etc. These limitations to the course must be pointed out to students, and instructors using this framework should provide useful leads for students to follow independently or create a structure for students to collectively fill in these gaps. For example, a class set of del.icio.us bookmarks could be continually updated by the group to point to resources such as the Federal Trade Commission's Kidz Privacy site (e.g., http://www.ftc.gov/bcp/conline/pubs/online/teachers.htm) or to pertinent conversations on EdTechTalk (http://edtechtalk.com/). If collected in accessible, online format such as del.icio.us bookmarks, these resources can be referenced by the students long after they leave the class.

However, a task-driven framework for technology integration, especially when focused on one or a few content areas, offers tremendous potential for helping beginning teachers avoid the cluttered toolbox described by Pierson and instead develop the ability to reach for the appropriate technology tool at the needed instructional stage. As one recent EDLF 345 student reflected, "[By] associating the things I knew how to do (nouns [e.g., word-process]) with the goals I should be helping my students to achieve (verbs [e.g., compose]) … I understood how or why I should incorporate technology into my classroom." By associating technologies with the tasks they empower, teachers will see technology as an integral part of the strategies they employ to meet the demands of

the classroom environment, such as coverage and control. As teachers are introduced to new technologies, such as a new photo-sharing service or a new online video editor, a task-driven framework will allow them to associate these new tools with their purposes: "This is a good tool for collaboration"; "I could see students composing something interesting with that." A task-driven framework, if integrated into teachers' thinking, will never become outdated.

The concept of a task-driven framework for a stand-alone technology course has room to grow further. The description of the verbs provided here were developed in the context of a stand-alone technology course focused upon secondary humanities preservice teachers. Some, but perhaps not all, of these tasks will apply to other fields, such as mathematics, science, or health/physical education. New tasks may be identified. Elementary or special educators are already applying a task-driven approach, but with more fundamental behaviors, such as reading and writing. For example, technology classes for elementary teachers commonly discuss the use of Inspiration/Kidspiration to create concept maps to build reading comprehension or to assist with brainstorming and outlining as steps in the writing process.

A next step, in addition to the refinement of a task-driven framework, is research to trace and compare the impact of various instructional frameworks (or blends of instructional frameworks) used in stand-alone technology classes. To date, research on technology and teacher education has focused on attitudes towards technology or generalized competency (Christensen, Knezek, & Parker, 2005; Willis & Sujo de Montes, 2002). The target outcome, however, is actual classroom use of technology by the instructors, as in the studies of Mouza (2002), Wright and Wilson (2005-2006), and Kajder (2005). The analysis of classroom use should focus on not only the tools used (i.e., the variety and frequency of use), but also the instructional strategy followed (e.g., teacher-centered or student-centered). As one of Kajder's participants recognizes, "Punching buttons is easy to learn. Thinking like a teacher about that button is really different" (Kajder, 2005, p. 18). Finally, any study about teachers' use of technology should consider Kay's (2006, pp. 394-395) call for thorough description of the context, participants, and methods.

A task-driven approach will be a positive element to any framework, as it will allow the focus of technology use to shift from the tool itself to what it allows students and teachers to do in the real world—in the classroom, in the community, in their personal lives—and not just in the context of the stand-alone technology course.

References

American Council On The Teaching Of Foreign Languages. (1999). *Standards for foreign language learning in the 21st century*. Yonkers, NY: National Standards in Foreign Language Education Project.

Bransford, J. D., Brown A. L., & Cocking, R. R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Academy Press.

Christensen, R., Knezek, G, & Parker, D. (2005). Comparative findings from two PT^3 projects: Advances in preservice educators' competence and confidence in technology integration. In S. Rhine & M. Bailey (Eds.). *Integrated technologies, innovative learning: Insights from the PT^3 program* (pp. 187–198). Eugene, OR: International Society for Technology in Education.

Flick, L., & Bell, R. (2000). Preparing tomorrow's science teachers to use technology: Guidelines for Science educators. *Contemporary Issues in Technology and Teacher Education*, *1*(1), 39–60.

Friedman, A., & Kajder, S. (2006). Perceptions of beginning teacher education students regarding educational technology. *Journal of Computing in Teacher Education*, *22*(4), 147–151.

Garofalo, J., Drier, H., Harper, S., Timmerman, M.A., & Shockey, T. (2000). Promoting appropriate uses of technology in mathematics teacher preparation. *Contemporary Issues in Technology and Teacher Education*, *1*(1), 66–88.

Goolsbee, A., & Guryan, J. (April, 2005). *The impact of Internet subsidies in public schools.* (NBER Working Paper No. W9090). Retrieved February 24, 2006, from gsbwww.uchicago.edu/fac/austan.goolsbee/ research/erate.pdf

Hayes, J., & Grunwald, P. (2004, March). *Ed tech trends update: Shifts to assessment and accountability in 2003–2004.* Retrieved December 8, 2005, from http://www.k12schoolnetworking.org/2004/presentations/W202_hayes.ppt

Kajder, S. (2005). "Not quite teaching for real": Preservice secondary English teachers' use of technology in the field following the completion of an instructional technology methods course. *Journal of Computing in Teacher Education, 22*(1), 15–21.

Kay, R. (2006). Evaluating strategies used to incorporate technology into preservice education: A review of the literature. *Journal of Research on Technology in Teacher Education, 38*(4), 383–408.

Kim, S. H., & Bagaka, J. (2005). The digital divide in students' usage of technology tools: A multilevel analysis of the role of teacher practices and classroom characteristics. *Contemporary Issues in Technology and Teacher Education*, *5* (3/4), 318–329.

Kleiman, G. (2004). Myths and realities about technology in k-12 schools: Five years later. *Contemporary Issues in Technology and Teacher Education, 4*(2), 248–253.

Levin, D., & Arafeh, S. (2002). *The digital disconnect: The widening gap between Internet-savvy students and their schools*. Retrieved June 20, 2006, from http://www.pewinternet.org/pdfs/PIP_Schools_Internet_Report.pdf

Levin, J., & Bruce, B. (1997). Educational technology: Inquiry, communication, construction, and expression. *Journal of Educational Computing Research 17*(1), 79–102.

Mason, C., Berson, M., Diem, R., Hicks, D., Lee, J., & Dralle, T. (2000). Guidelines for using technology to prepare social studies teachers. *Contemporary Issues in Technology and Teacher Education*, *1*(1), 107–116.

Milken Exchange on Educational Technology. (1999). *Will new teachers be prepared to teach in a digital age?* Retrieved June 20, 2006, from http://www.mff.org/pubs/ME154.pdf

Mouza, C. (2003). Learning to teach with new technology: Implications on professional development. *Journal of Research on Technology in Education, 35*(2), 272–289.

National Council of Teachers of English. (1996). *Standards for the English language arts*. Urbana, IL: National Council of Teachers of English.

National Council for the Social Studies. (1994). *Expectations of excellence: Curriculum standards for social studies*. Washington, DC: National Council for the Social Studies.

Otero, V., Peressini, D., Meymaris, K., Ford, P., Garvin, T., Harlow, D., et al. (2005). Integrating technology into teacher education: A critical framework for implementing reform. *Journal of Teacher Education*, *56*(1), 8–23.

Pierson, M. (2004). Extended time and progressive vision for the development of technology-using teachers. *Contemporary Issues in Technology and Teacher Education*, *4*(1), 81–88.

Pierson, M. (2004-2005). The lesson in the yellow-handled, needle-nosed pliers. *Journal of Computing in Teacher Education, 21*(2), 43.

Pierson, M., & Thompson, M. (2005). The re-envisioned educational technology course: If addition isn't possible, try division. *Journal of Computing in Teacher Education, 22*(1), 31–6.

Pope, C., & Golub, J. (2000). Preparing tomorrow's English language arts teachers today: Principles and practices for infusing technology. *Contemporary Issues in Technology and Teacher Education*, *1*(1), 89–97.

Rainie, L. (2006). *How the Internet is changing consumer behavior and expectations.* Speech to ThinkTank06, Seton Hall University, South Orange, NJ.

Toledo, C. (2005). A five-stage model of computer technology integration into teacher education curriculum. *Contemporary Issues in Technology and Teacher Education*, *5*(2), 177–191.

Whitaker, S., & Hofer, M. (2002). Preparing Pre-service teachers: How Far Should We Go?. In Crawford, C., Willis, D., Carlsen, R., Gibson, I., McFerrin, K., Price, J., & Weber, R. (Eds.). *Proceedings of Society for Information Technology and Teacher Education International Conference 2002* (pp. 1338–1339). Chesapeake, VA: AACE.

Willis, E., & Sujo de Montes, L. (2002). Does requiring a technology course in preservice teacher education affect student teacher's technology use in the classroom? *Journal of Computing in Teacher Education, 18*(3), 76–80.

Wright, V., & Wilson, E. (2005-2006). From preservice to inservice teaching: A study of technology integration. *Journal of Computing in Teacher Education, 22*(2), 49–55.

Thomas C. Hammond is an assistant professor of Teaching, Learning, and Technology at Lehigh University. He teaches courses in instructional technology and social studies education. His research interests focus on social studies teachers' use of technology and the student outcomes emerging from technology-mediated social studies instruction. Prior to coming to Lehigh, he taught high school for 10 years in the United States, Haiti, and Saudi Arabia.

Thomas C. Hammond
Center for Technology and Teacher Education
Curry School of Education
University of Virginia
1912 Thomson Road
Charlottesville, VA 22903
tomhammond@virginia.edu