Addressing the English Language Arts technology standard in a secondary reading methodology course

Efforts to integrate technology into a reading methodology course for secondary English majors are described in this article, with specific examples.

English Language Arts has joined other curricula in defining standards and instructional goals. The 1996 Standards for the English Language Arts (National Council of Teachers of English and International Reading Association) delineated language and processing skills that all students should be able to apply as a result of ongoing K–12 instruction. Designed to guide classroom instruction in general ways, the standards include technological communications in the broad definition of text. Standard 8 specifically acknowledged the importance of the use of technology in students’ learning: "Students use a variety of technological and informational resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge" (1996, p. 39). This thrust aligns with school restructuring efforts across the United States, emphasizing the integration of technology as an active learning tool in the delivery and assessment of high-quality curricula to promote students’ inquiry, interpretation, and sustained engagement (Behrmann, 1988; Collins, 1991; Hoffman & Pearson, 2000; Sheingold & Hadley, 1990).

Technology and learning

Growing emphasis on enhancing students’ self-directed learning focuses on individually and socially constructed meaning (Bruckman & Resnick, 1995; Itzaken, 1994; Kafai & Resnick, 1996; Papert, 1991;
To foster and support critical thinking and reasoning, students must be given opportunities in the classroom to use technology. Technology fosters and supports a constructivist approach to learning when used as a tool in the process of making meaning and supporting inquiry. Technology can facilitate the process of meaning making as well as the sharing of results (Bruce, 1999; Jonassen, Peck, & Wilson, 1999; Papert, 1993). As classroom access to communication and information technologies increases and as vast amounts of information become available in digital format, students will need to be literate across a variety of communication technologies (Pope & Golub, 2000; Scholes, 1998). Several reformers feel that teacher training is key in promoting students' successful manipulation of multiple literacies (Harrington, 1991; Soetaert & Bonamie, 1999).

**Technology in teacher education**

Numerous authors have advocated that preservice teachers must appreciate the potential of technology as a cognitive instructional tool and must enter the teaching field ready to use technology to enhance student learning (Carnegie Forum on Education and the Economy, 1986; Ellery, 1997; Parkay & Stanford, 1992; Simonson & Thompson, 1994; Soloman, 1992). Nurturing this appreciation and readiness requires that preservice teachers experience technology as a natural part of their preparation environment (Byrum & Cashman, 1993; Dugdale, 1994; Handler & Marshall, 1992; Lee, 1996; Nelson, Andri, & Keefe, 1991; Niess, 1991; Northrup & Little, 1996; Office of Technology Assessment, 1995; Pope & Golub, 2000). There is overwhelming agreement that a required technology course in a teacher preparation program must be complemented by faculty who model effective use of technology for instructional and administrative tasks throughout the teacher preparation coursework (Espinoza & Justice, 1994–1995; Handler & Marshall, 1992; Johnson & Harlow, 1993; Novak & Berger, 1991; Pope & Golub, 2000; Strudler, 1991; White, 1995; Widmer, 1994).

Unfortunately, graduates are leaving teacher preparation programs with varied technology expertise. Some reports have indicated that new teachers have limited knowledge of how to work in a technology-enriched classroom or how to use technology in their professional practice (Jerald, 1998; Office of Technology Assessment, 1995; Willis & Mehlinger, 1994). Preservice teachers themselves have reported feeling ill-prepared to integrate technology into their instruction (Fratianni, Decker, & Korver-Baum, 1990; Heinich, 1991; Topp, 1996).

Specific technology standards for teacher education programs have been developed and refined. In 1993, the International Society Technology in Education (ISTE) developed 13 technology standards for all teachers (Wetzel, 1993). Recently, ISTE released a revised set of National Educational Technology Standards for Teachers (NETS•T) (International Society for Technology in Education, 2000). The NETS•T provide a framework to define technology concepts and skills preservice teachers should be prepared to meet (see Table 1).

Teacher education institutions have responded in a variety of ways to the need to integrate technology throughout a teacher preparation program (Byrum & Cashman, 1993; Kortecamp & Croninger, 1995; Office of Technology Assessment, 1995; Novak & Berger, 1991; Soloman, 1992). Since 1991, the Department of Curriculum and Instruction at Iowa State University, Iowa, USA, has continually worked to upgrade the department's technology infrastructure.

Emphasis is placed on improving faculty and student access to technology. One of the first steps taken was to upgrade computers in faculty offices on a rotating basis. In addition, college computer lab schedules are structured to accommodate methods-class instruction. Classroom use of technology applications is simplified by access to portable teaching stations, each equipped with a computer and a projection system. A portable computer lab of 20 laptop computers is also available to faculty. Most recently, a classroom devoted to literacy methods classes was equipped with a teacher station and projector with an interactive whiteboard. During class, students have access to the laptop computers with wireless network connectivity.

The College of Education is equipped with a distance education classroom linking the college to a statewide two-way, full motion interactive fiber-optic telecommunications network. Faculty members schedule the Iowa Communication Network (ICN) classroom to connect preservice
TABLE 1
ISTE National Educational Technology Standards for Teachers (NETS•T)

I. Technology operations and concepts. Teachers demonstrate a sound understanding of technology operations and concepts.

II. Planning and designing learning environments and experiences. Teachers plan and design effective learning environments and experiences supported by technology.

III. Teaching, learning, and the curriculum. Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.

IV. Assessment and evaluation. Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.

V. Productivity and professional practice. Teachers use technology to enhance their productivity and professional practice.

VI. Social, ethical, legal, and human issues. Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply that understanding in practice.

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via e-mail, SEMs were assigned an “e-pal” from an eighth-grade class in another part of the state, thus emphasizing the power of technology-based communities (Brown & Campione, 1996; Scardamalia & Bereiter, 1996). The SEMs used e-mail during the semester to communicate with their e-pal to discuss literacy activities. SEMs also used this eighth-grade audience for feedback on resources and tasks the SEMs were developing for their curriculum units. A copy of all e-pal exchanges was forwarded to the instructor, allowing verification of SEMs’ e-mail use as well as the opportunity to monitor their ability to communicate curriculum ideas with a middle-grade student.

The following is an exchange between Sara (pseudonym), an eighth grader, and Jenny (pseudonym), an SEM.

Jenny, how are you? School is getting harder and basketball is over so I have more time at night for homework. I really liked the poem that you sent. Did that take a long time to write? We have been reading all different kinds of poems and trying to write our own. Sometimes we have to share them in a group but not in front of the whole class. That is too awful to do!!!! My teacher writes her suggestions on the poem we hand in, but we don’t have to do what she says and change anything. You asked about our tests and they are really hard. Sometimes we have multiple choice and sometimes essay. I think essays are the best. Do you have essays in college? I think that when you are a teacher you should give the essay test. Tell [your students] what it is going to be about, that way they can think it over and their answer will be a bit better. I don’t know really what you could add to your unit. When we finish reading a book the teacher always wants us to do some project or something but sometimes that is a pain. I liked all of your choices but some seemed really hard.

Sara

Sara, Thanks for your e-mail. I am glad that you liked the poem. I will send others and continue to include some that I have written. I am in a poetry writing class this semester, so I have to keep all the drafts of my poetry. It is amazing to look back on how much I work on a piece until it is close to what I want. In some classes I have essay tests, but in other education classes we have projects and presentations too. In my poetry class we meet in small groups and read our poem and get feedback and suggestions from classmates. I have a really cool small group. Some of the poetry is very serious and some of it is really funny. I will keep adding to my unit and ask for your advice in future e-mails. Will you be running track or playing softball? Track was my very favorite sport.

Jenny

Stephanie (eighth grader, pseudonym) and Laura (SEM, pseudonym) also shared literacy experiences.

Hello Laura,

I didn’t write cause [sic] I was sick for a whole week and don’t have a computer at home with e-mail. My mom says that maybe next year we will. I read some when I was sick and really liked the book you told me about. I think Ellis [sic] stepmom was really bad. I think you would like the book my friend had me read called Too Many Secrets by Patricia [sic] something. We finished The Outsiders for school and I really [sic] really liked that book. We wrote poems about parts of that book and shared the poems in groups [sic]. Mine wasn’t so good but some people liked it. Maybe I will send you some of them.

Stephanie

Dear Stephanie, I’m sorry that you weren’t feeling well. So far I have been able to avoid “the bug,” but I have had many classmates out ill, and last week a prof was sick and even cancelled class! Please do send me some poetry; I am especially interested in reading pieces that you have written or that you have just started. I don’t know about the book Too Many Secrets so I will have to look for it at the library. Thanks for the recommendation. I remember reading The Outsiders in ninth grade, and it is still one of my favorites. What did you think about the ending? I look forward to meeting you over the ICN later in the term. Have you done that before? I never have, so it will be fun to actually get to see and hear you and your classmates. I will write more next week. Bye for now.

Laura

At the end of the semester SEMs wrote an analysis of the e-pal communication and what they had learned about using technology to communicate and collaborate with others to nurture student learning, one of the NETS • T professional practice standards.

Use of multimedia. A number of the SEMs had experience using HyperStudio, a multimedia
FIGURE 1
Hyperstudio: Introduction

Meet Your Sec. Ed. 395 e-pal!

Jamie  Eric  Stacy  Kathy

Click on a picture to read each student's personal description.

Use of distance education for videoconferences. During the semester, videoconferences with the e-pal class were scheduled using ICN distance education classrooms. Although some SEMs received a brief introduction to distance education in the required technology course, few students had actually used the distance education system for coursework experiences. An initial videoconference was scheduled after three e-mail communications between the SEMs and their e-pals; the second videoconference took place near the end of the semester. (Fortunately, the campus class was scheduled from 8:00-9:30 a.m., during the eighth graders' homeroom and reading class.) ICN sessions were informal occasions for the classes to find out more about each other's background, reading interests, and opinions about specific books. After brief introductions, SEMs and the eighth-grade students took turns posing questions, either to a specific person or to the entire class. The 50-minute conference sessions were filled with information and opinions. In addition, the eighth graders offered specific advice concerning motivating assignments, fair assessment, and reasonable homework practices.

Use of online discussion technology. One instructional module in the course explored the importance of fostering classroom discussion (Sowder, 1993; Townsend, 1998). SEMs practiced formulating discussion questions, implementing a discussion web (Alvermann, 1991), and assessing a discussion by scoring colleagues' discussion participation (Frazier, 1997). The class participated in whole-class and small-group asynchronous discussions throughout the semester. This activity emphasized how technology can enhance students' individually and socially constructed learning (Bruckman & Resnick, 1995; Papert, 1991; White, 1996) and demonstrated how technology can support learner-centered instructional approaches to address the diverse needs of students. For example, the following task was posted for a threaded discussion on WebCT. For the article “Silent Voices...” provide each of the following: your opinion of the article, a quote from the article and the reason(s) you chose that quote, and a question for discussion. Kerry (pseudonym) responded:

"First off, I want to apologize for this being late. Really really liked this article because speaking up in class is an issue that we deal with every day of our lives as students and will deal with every day as teachers. I could relate with each of these students who spoke in this article. This article was very real and informative. It was nice for me to read in print what I already knew about silent students. I know that classroom discussion is so important for developing students. I was a little surprised that this article didn't focus more on what teachers can do to help students get involved. I think it is definitely up to the teacher to make the classroom development program, in the required technology course; other students learned the program basics following the HyperStudio Workbook (Wagner, 1997-1998). Each SEM created a four-card HyperStudio stack that would introduce the SEM to an e-pal. The SEMs scanned a recent photo of themselves onto the first card (see Figure 1). The second card included a brief biographical description with a button linked to the third card which contained additional information about one area described on card two. For example, card three might describe the SEM's hometown, current job, or favorite hobby in more detail. The fourth card contained a favorite poetry selection appropriate for middle school. This simple application of HyperStudio demonstrated to SEMs the potential and the power of active, open reading, stretching the boundaries of traditional, linear text (Pope & Golub, 2000; Soetaert & Bonamie, 1999)."
“discussion friendly.” I plan on dedicating time in my classroom to explaining the importance of discussion and also chipping away at some of the fears of classroom discussion when I am a teacher.... I think that a successful discussion depends greatly on how the dynamics of the students play out. If there are tensions outside of the classroom, in the social setting, good discussions will be very hard to facilitate. The students really need to see themselves as a learning community and need to respect each other. How can a teacher prove in actions that each comment made in a discussion is valuable?

A classmate offered her reaction to the article as well as this response to Kerry’s question:

I think that the teacher can use different approaches when he or she responds to group discussion. I think that marking down each time someone volunteers to talk is a good method to get conversation started. I also think verbal recognition is very helpful too. If someone says something interesting it is very good to validate that and ask other students to add to [lit orb share what they think about what the person said. The classroom should be organized in a fashion that the students feel like their opinions are worth sharing.

**Use of subject-specific software.** Throughout the course, SEMs were challenged to reflect on integration of the following technology in English Language Arts classrooms: video and film recordings (Egenberger, 1997), video cameras (Urban, 1989), photography (Westcott, 1997), and hypermedia (Wilhelm, 1995). Ongoing emphasis was placed on reviewing secondary literacy software from the college software collection (see Table 2). Each SEM was assigned a software program to review, paying close attention to the content strengths and weaknesses, the interactive elements, and the ease of use. Written reviews were posted in the Main Forum of the class WebCT site, accessible to all students.

The instructor demonstrated salient features of software at appropriate times in the course. For example, during exploration and discussion of short story use, reviewers presented the software programs That Strange Mr. Poe and Poe’s Tales of Terror. During exploration of and discussion of poetry use, other reviewers presented the software selections How to Read and Understand Poetry, In My Own Voice, and the “Poetry Corner” of Writing Trek. Realistically, timing, pacing, and available equipment do not always permit this type of course activity.

### TABLE 2

<table>
<thead>
<tr>
<th>Title</th>
<th>Year</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammar for the Real World</td>
<td>1998</td>
<td>Knowledge Adventure, Inc.</td>
</tr>
<tr>
<td>Hollywood High</td>
<td>1996</td>
<td>Theatrix Interactive, Inc.</td>
</tr>
<tr>
<td>How to Read and Understand Poetry</td>
<td>1995</td>
<td>CLEARVUE/eav, Inc.</td>
</tr>
<tr>
<td>In My Own Voice</td>
<td>1996</td>
<td>Sunburst Communications, Inc.</td>
</tr>
<tr>
<td>Opening Night</td>
<td>1995</td>
<td>MECC</td>
</tr>
<tr>
<td>Opening Night Behind the Scenes</td>
<td>1995</td>
<td>MECC</td>
</tr>
<tr>
<td>Poe’s Tales of Terror</td>
<td>1993</td>
<td>Queue, Inc.</td>
</tr>
<tr>
<td>Reader’s Quest II</td>
<td>1999</td>
<td>Humanities Software, Sunburst</td>
</tr>
<tr>
<td>Read On! Plus Active Reading Strate</td>
<td>1998</td>
<td>Humanities Software, Sunburst</td>
</tr>
<tr>
<td>Reading Galaxy</td>
<td>1996</td>
<td>Broderbund Software Inc.</td>
</tr>
<tr>
<td>Romeo &amp; Juliet</td>
<td>1996</td>
<td>Sunburst Communication, Inc.</td>
</tr>
<tr>
<td>That Strange Mr. Poe</td>
<td>1997</td>
<td>Thomas S. Klise Co.</td>
</tr>
<tr>
<td>That’s a Fact, Jack</td>
<td>2000</td>
<td>Tom Snyder Productions</td>
</tr>
<tr>
<td>Write On! Plus Literature Studies</td>
<td>1989</td>
<td>Humanities Software, Sunburst</td>
</tr>
<tr>
<td>Write On! Responding to Great Literature</td>
<td>1997</td>
<td>Humanities Software, Sunburst</td>
</tr>
<tr>
<td>Writing Trek Grades 6–8</td>
<td>1999</td>
<td>ED-Vantage</td>
</tr>
</tbody>
</table>

Addressing the English Language Arts technology standard...
Use of desktop publishing. Throughout the course, SEMs had a number of experiences with desktop publishing software. During one class meeting, the software program Student Writing Center was reviewed by the entire class using a portable teaching station. Then SEMs used laptops from the portable computer lab to prepare a newsletter describing highlights of a curriculum unit each SEM was preparing. Students were required to use the following features of desktop publishing in their document: (a) headers, (b) text color, (c) different fonts and styles, and (d) graphics (see Figure 2).

Use of a database management system. Database management systems can be used to enter, store, update, access, and manipulate information. Most database management systems consist of three levels: a file or collection of information about a particular topic, a record that contains the information about one entry in a file, and a field that serves to organize the information on each record (Simonson & Thompson, 1994). A database management system is a valuable tool to help collect and analyze data and interpret the results, a performance indicator for the NETS+T "assessment and evaluation" technology standard.

In this course, FileMaker Pro was demonstrated to the entire class as a means of organizing one instructor's collection of adolescent literature. During course exploration of and discussions about using short stories, each SEM located two short stories that would complement his or her curriculum unit. Using a template created by the instructor in FileMaker Pro, SEMs first reviewed the short story records entered by previous SEMs in order to avoid record duplication. The SEMs then entered the information about their short story onto a blank record in the database file accessed in WebCT (see Figure 3). During a class session in the computer lab, the instructor reviewed the sorting feature of FileMaker Pro. Students manipulated the collection to find their entries and browse through entries contributed by colleagues. A follow-up discussion with the class focused on administrative and classroom teaching applications using this database and database management systems in general.

Use of a concept mapping program. A variety of conceptual mapping programs allow the user to create visuals that depict content links and concept relatedness (Anderson-Inman & Horney, 1997). In a modeling framework, the instructor used Inspiration, a concept mapping software program, to generate visuals for class application of the Discussion Web strategy (Alvermann, 1991), to explain course content, and to demonstrate the use of a graphic organizer as a prereading strategy for a factual selection.

SEM pairs used laptop computers with Inspiration software during part of one class session to review course content and to become familiar with various features of Inspiration, such as shapes, shadings, notemaking, and adding connector explanations. After this supervised practice,
SEMs used the diverse functions of Inspiration to map the contents of the curriculum unit they were preparing (see Figure 4).

**Use of the World Wide Web.** Most SEMs enter the class with Internet experience, although they have not extensively explored English Language Arts Web sites or carefully considered the implications of Internet use in the secondary literacy curriculum. Instructor-selected Web sites were posted (hotlinked) by categories at the course WebCT site (Knowles, 1997; Mike, 1996; Wilson, 1996), and at three points in the semester, SEMs were required to evaluate a Web site correlated to a course topic. SEMs were encouraged to use the Internet in planning their resource unit, and they were required to include at least one Web site for student use within the unit. This activity addresses the “planning and designing learning environments and experiences” technology standard, for SEMs were required to manage technology resources within the context of their unit activities.

**Suggestions for technology integration**

As the English Language Arts technology standard implies, K–12 students are expected to use a variety of technology tools “to gather and synthesize information and to create and communicate knowledge” (National Council of Teachers of English, 1996, p. 39). In addition, the National Educational Technology Standards for Teachers (NETS•T) (International Society for Technology in Education, 2000) provide guidelines for applying technology in educational settings and outline specific outcomes for teacher education candidates. Preservice teachers must be prepared to use these technologies to promote active student learning in classrooms. For this to occur, teacher education faculty need to integrate technology into methodology courses. Furthermore, the use of technology in these courses should exemplify how it can be used to support, expand, and enhance the English and Language Arts curricula.

Prior to 1991, faculty members in this department took little responsibility for providing preservice teachers with integrated technology experiences within the context of the various methodology courses (Schmidt, 1995). The departmental technology mentoring program provided structure, support, and encouragement for collaboration on self-selected, technology-enhanced curriculum activities. This process of curriculum review, discussion, and modification in light of technology integration was as valuable as the practices that resulted. Faculty became more confident and more independent in considering technology integration, in modifying the use of computer software, and in anticipating the adaptation of technology to specific curriculum situations (Schmidt, 1995). However, it has required faculty members to reconsider a number of teaching and learning factors.

1. The pacing of instruction must be modified in order to include technology experiences in a methodology course. It simply takes more preparation time and often more time to implement. In addition, the instructor needs to be ready for the unexpected: hardware that fails, software that won’t open, servers that crash, computer labs that are double-booked, and so forth. The instructor

**FIGURE 3**
FileMaker Pro: Short story record

<table>
<thead>
<tr>
<th>Story title: “All Summer in a Day”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author: Ray Bradbury</td>
</tr>
<tr>
<td>Grade range: 7th–12th</td>
</tr>
<tr>
<td>Number of pages: 4</td>
</tr>
<tr>
<td>Three-sentence summary: In a futuristic community, nine-year-old Margot hopes to see the sun for the first time since her family left earth 5 years earlier. The other children in the community, who have never seen the sun or felt its warmth, become jealous of her and her memories. The story builds as Margot is forced to miss the sun she has longed to see.</td>
</tr>
<tr>
<td>Major concepts: jealousy, utopian community, equality, sameness</td>
</tr>
<tr>
<td>“Smashing” literary elements: dialogue, scenery, plot</td>
</tr>
<tr>
<td>Name of student: Nathan E.</td>
</tr>
</tbody>
</table>

Addressing the English Language Arts technology standard
TABLE 3
Sample course Web sites

<table>
<thead>
<tr>
<th>Sample course Web sites</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art and Technology Mining Co.</td>
<td><a href="http://www.arttech.miningco.com/library/weekly/aa031397.htm">http://www.arttech.miningco.com/library/weekly/aa031397.htm</a></td>
</tr>
<tr>
<td>Booktalks</td>
<td><a href="http://www.concord.k12.nh.us/schools/rundlett/booktalks">http://www.concord.k12.nh.us/schools/rundlett/booktalks</a></td>
</tr>
<tr>
<td>Carol Hurst's Children's Literature Web Site</td>
<td><a href="http://www.crocker.com/~rebotis/index/index/html">http://www.crocker.com/~rebotis/index/index/html</a></td>
</tr>
<tr>
<td>Electric Library</td>
<td><a href="http://www.elibrary.com">http://www.elibrary.com</a></td>
</tr>
<tr>
<td>Lyrics</td>
<td><a href="http://www.lyrics.ch/">http://www.lyrics.ch/</a></td>
</tr>
<tr>
<td>Maya Angelou: Teacher Resource File</td>
<td><a href="http://falcon.jmu.edu/~ramseyil/angelou.htm">http://falcon.jmu.edu/~ramseyil/angelou.htm</a></td>
</tr>
<tr>
<td>The Book Review Forum</td>
<td><a href="http://falce.atmos.uiuc.edu/BOOKREVlew">http://falce.atmos.uiuc.edu/BOOKREVlew</a></td>
</tr>
<tr>
<td>Young Adult Literature: Middle and Secondary English Language Arts</td>
<td><a href="http://falcon.jmu.edu/~ramseyil/yalit.htm">http://falcon.jmu.edu/~ramseyil/yalit.htm</a></td>
</tr>
</tbody>
</table>

needs to be comfortable with modeling flexibility, troubleshooting, and problem-solving approaches when technology difficulties arise.

2. The instructor must be very sensitive to the concept of accommodating for individual differences and must continually monitor instructional pace, explanation, and feedback when implementing and requiring technology use. Many preservice teachers remain wary of, and uncomfortable with, technology. Inequitable access needs to be con-

sidered when technology use is embedded in an assignment.

3. The instructor must be prepared for added emphasis on the concept of student and teacher learning together. Students frequently suggest technology options, modifications, or shortcuts, and there is typically at least one student in the class who is more skilled and confident with technology than the instructor.

4. Technology integration is ongoing and fluid. For example, enhanced faculty access to WebCT has recently modified a number of course activities. E-mail communication among class members takes place through the course WebCT site, suggested Internet addresses are hotlinked at the site, and the threaded discussion feature of WebCT recently replaced Discourse, an earlier technology used to promote student participation in a discussion topic. Copies of SEM-created curriculum units are available at the course WebCT site, and the FileMaker Pro short story database is continually accessible there.

Preservice teachers enrolled in this secondary reading methodology course have technology-enhanced opportunities for active learning that provide models for them to use and improve upon when they teach. For example, the preservice teachers experienced the power and possibilities of distance education when they communicated their ideas and interacted with middle school students. This experience provided a risk-free environment for preservice teachers and middle school students to explore and learn together. Without using these technologies, this collaborative learning experience would not have been possible because of scheduling and logistical problems.

Several activities during the semester encouraged SEMs to use what they learned about technology in curriculum unit projects. SEMs developed confidence and competence in using technology and expected it to be part of their teaching and learning.

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