Using Anchored Instruction to Teach Preservice Teachers to Integrate Technology in the Curriculum

MUMBI KARIUKI  
*Nipissing University*  
*Ontario, Canada*  
mumbik@nipissingu.ca

MESUT DURAN  
*University of Michigan-Dearborn*  
*USA*  
mduran@umd.umich.edu

This case study addresses the use of the “anchored instruction approach” to restructure educational computing courses to enhance future teachers’ learning of technology applications in the classroom. A cohort group of 22 preservice teachers from a typical teacher education institution in Southeastern Ohio was involved in the study. The preservice teachers were enrolled in both a curriculum development class and an educational computing class in the winter 2000 academic quarter. The instructors for both courses collaborated their teaching efforts whereby the preservice teachers used the educational computing class to research, record, and document their experiences in the curriculum development class. The theme of the curriculum development class was therefore used as an “anchor” for the educational computing class. Data collection and analysis were conducted on a continuous basis throughout the academic quarter. The findings indicate the effectiveness of anchored instruction for preservice teachers to learn about, and teach with advanced technology tools in their future practice. The authors recommend increased efforts to apply anchored instruction approach in educational computing courses.
Preparing technology-proficient teachers to meet the needs of 21st century learners has emerged as a critical challenge facing teacher preparation programs. Although institutions of higher education vary in their specific responses to this challenge, most institutions require at least one educational computing course as a core component of their teacher preparation programs. The goal of such courses includes individual development of both confidence and competency in the use of information technology in various learning environments.

Even though the structure and content of educational computing courses vary from one institution to another (Leh, 1998) such courses have usually been taught in a “didactic” manner where the instructor demonstrates the technology tools and then ask students to replicate a product (Ferguson, 2001). While learning technology skills is necessary, it is crucial to model to preservice teachers the way technology integration can look like. One alternative approach to the design of educational computing courses involves using a theme or anchor around which various learning activities take place. This approach has been referred to as “anchored instruction” (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990). This model provides learners with an authentic, situated, and social learning environment which encourages problem solving (Shih, 1997).

The anchored instruction approach has been used in a variety of disciplines such as language arts, social studies, math, science, and special education. In recent years, there has been a growing interest among educational technology instructors to apply the anchored instruction approach in educational computing courses to more effectively prepare preservice teachers to use advanced-technology tools in their future practice (Bauer, Ellefsen, & Hall, 1994; Bauer & Summerville, 1996; Bauer, 1998; Baumbach, Brewer, & Bird, 1995; Ferguson, 2001; Miller, Morano, Smith, & Mayes, 2002; Williams, 2002).

This article reports a case study in which the anchored instruction approach was applied to restructure an existing educational computing course to enhance future teachers’ learning of technology applications in the classroom. First, the article discusses the pedagogical foundations of anchored instruction and its application in educational computing courses. Second, the article describes the experiences of a cohort group of 22 preservice teachers who used their curriculum development course activities as an anchor in their educational computing class. Third, the article reflects on the lessons learned by the preservice teachers and their educational computing course instructor from this collaborative experience. In the concluding section, the paper identifies and discusses ways in which the anchored instruction approach responds effectively to the need for technology-proficient future teachers.
Anchored instruction is a model that highlights the development of an anchor or theme around which various learning activities can take place. Bransford, Sherwood, Hasselbring, Kinzer, and Williams (1990) defined anchored instruction as “a focal point or problem situation that provides [a link] for students’ perceptions and comprehension” (p. 123). McLarty, Goodman, Risko, Kinzer, Vye, Rowe, and Carson (1990) expanded on this definition and added that anchored instruction is “a rich shared environment that generates interest and enables students to identify and define problems while they explore the content from many different perspectives” (p. 2).

The Cognition and Technology Group at Vanderbilt (CTGV, 1990) described anchored instruction as an approach that helps alleviate the problem of what Whitehead (1929) called “inert knowledge,” that is, the type of knowledge that people can recall when prompted, but cannot recall spontaneously during problem solving. The CTGV base their discussion on other early educators such as John Dewey. As CTGV described, Dewey addressed that when people learn new information in the context of meaningful activities, they are more likely to perceive the new information as a tool rather than as an arbitrary set of procedures or facts. Meaningful, problem-oriented approaches to learning are more likely than fact-oriented approaches to overcome inert knowledge problems.

Often in educational computing courses designed for preservice teachers, the knowledge and skills students acquire are inert (Bauer, Ellefsen, & Hall, 1994). These courses usually involve teaching the use of various software tools but there is often limited links to real life settings and hence the students have difficulty applying the knowledge acquired, to their own teaching activities. To overcome the problem of such inert knowledge, there has been a growing interest among educators in applying an anchored instruction approach in educational computing courses in the last decade (Bauer, Ellefsen, & Hall, 1994; Bauer & Summerville, 1996; Bauer, 1998; Baumbach, Brewer, & Bird, 1995; Ferguson, 2001; Miller, Smith, & Mayes, 2002; Williams, 2002).

In their early research, Bauer, Ellefsen, and Hall (1994) highlighted two major reasons for incorporating anchored instruction as a model for an educational computing course for preservice teachers: First, anchored instruction lends itself as a suitable forum for teaching the use of various technology tools using real life events, thus helping avoid the problem of inert knowledge. Second, the use of anchored instruction in such courses provides a model for the preservice teachers to apply anchored instruction in their own classrooms. According to Bauer, Ellefsen, and Hall (1994), anchored
instruction “is a model that can be applied to any grade level or content area, and could be used to integrate content areas. The anchor can serve as both a context within which they can practice what they have learned about a single technology, as well as a common thread with which a number of technologies can be sewn together” (p. 131).

Bauer, Ellefsen, and Hall (1994) highlighted six “key decision points” to help preservice teachers become actively engaged in learning by situating or anchoring instruction in interesting and realistic problem-solving environments in educational computing courses. These decision points include: (a) choosing an appropriate anchor; (b) developing shared expertise around the anchor; (c) expanding the anchor; (d) teaching with the anchor; (e) allowing student exploration; and (f) sharing what was learned from the anchored instruction. Later, Baumbach, Brewer, and Bird (1995) identified these six key decision points as “steps” or “phases” of anchored instruction. They indicated that when using an anchor, the key decision points or phases of instruction are “distinct and sequential, each contributing to the process” (p. 810). Baumbach, Brewer, and Bird described each phase as follows:

In phase one the anchor is introduced to the students. The anchor might be a video segment, a major event, a trip, or educational software, capable of maintaining the students’ interest and rich enough to support problem solving.

In phase two, students develop shared expertise around the anchor. In this phase, the instructor might lead a discussion of the anchor. However, as they learn more about the anchor, the students might assume more responsibility for their learning. Once the instructor and the students have developed expertise on the anchor, the links across the curriculum and to their prior experiences become a common occurrence within the classroom.

The students expand the anchor by conducting their own research in phase three. Gaps in information provided by the anchor might require students to research related materials.

In phase four, students use their knowledge as tools for problem solving. They might use this knowledge to solve problems posed in the anchor itself or relate the information to problems in other content areas. In this phase, instructors might provide scaffolds to help students solve the problems. For example, teachers who are using the Jasper Woodbury series to teach problem-solving and math skills might encourage the students to determine how to approach the problem and then provide them with the resources necessary to make progress.

In phase five, students work on projects related to the anchor. Students are given the opportunity to extend their knowledge and relate it to other
areas. Some examples of this phase might include reading in greater depth about the subject, writing a report or an essay, or creating a multimedia report. In phase six, students share what they learned from the project. The process of sharing not only creates pride in their own work, but also gives them valuable insight into how their classmates solved the problem.

RESTRUCTURING THE EDUCATIONAL COMPUTING COURSE AROUND THE ANCHOR

In this section, the authors describe how an existing educational computing course was restructured around the curriculum development class (anchor). Restructuring the educational computing course around the anchor took place within the context of the six key decision points or phases of anchored instruction as described in the previous section. However, while phase one (choosing an appropriate anchor) was a clear and distinct first phase, the next 4 phases (2-5) namely; developing shared expertise, expanding the anchor, teaching with the anchor, and allowing student exploration occurred more in a cyclical version than in a distinct and sequential order as argued by Baumbach, Brewer, and Bird (1995). As the preservice teachers continued to engage in a variety of technology related activities based on the anchor, they developed shared expertise and continued to expand the anchor, were constantly involved in exploration, and were constantly sharing their learning. In the following two sections, the authors describe the process that led to the selection of the anchor and discuss how the instructional activities were organized around the anchor.

Choosing an Appropriate Anchor

Twenty-two preservice teachers were enrolled in both an educational computing class and a curriculum development class in the same academic quarter. In the curriculum development class the preservice teachers worked with a class of eighth-graders in a local middle school in Southeastern Ohio. The eighth-graders were involved in an “expeditionary learning” project in the local community. The expeditionary learning project was based on the principles of Expeditionary Learning Outward Bound (ELOB) model (ELOB, 2003). The ELOB model emphasizes learning by doing, with a particular focus on character growth, teamwork, reflection, and literacy. In this model, teachers connect high quality academic learning to adventure, service, and character development through a variety of student experiences.
including interdisciplinary, project-based learning expeditions. The learning expedition for the eighth-graders in this case involved conducting an inquiry whereby they researched the question of whether a local controversial coal mine should have been reopened. The students gathered different perspectives from the local community by visiting and interviewing different groups of individuals in the community. In the end, the students presented a Readers’ Theater depicting the different voices represented in the coal mining controversy.

The preservice teachers involved in this study accompanied the eighth-graders in this Coal Project expedition to learn with and from, the experiences of the eighth-graders, as part of their curriculum development class. The preservice teachers and eighth-graders worked together to plan the field trips involved, to prepare interview scripts, and to prepare scripts for the Readers’ Theater.

The researcher felt that the Coal Project expedition met the criteria for a good anchor because it could stimulate learning through a variety of disciplines including math, science, social studies, and language arts. Additionally, many projects could be designed around this anchor that would require preservice teachers to use various technology tools. The theme of the curriculum class was therefore chosen as an anchor for the educational computing class.

The following section describes how preservice teachers used the educational computing class to research, record, and document their experiences in the expeditionary-learning process.

Teaching with the Anchor

The preservice teachers spent some time learning the basic skills involved in using a variety of educational applications. This was followed by activities that gave the preservice teachers opportunities to practice the use of these applications within the setting of the anchor. The following section discusses the activities around each application used, and how the activities emerged from, or were based on the anchor.

Word processing and graphics. During the initial meeting of the educational computing class, each preservice teacher used word processing to write an introductory story to the eighth-grade partner that he or she would be working with. They also used a digital camera to take personal pictures. They inserted these pictures in their stories. The preservice teachers later shared these stories with the eighth-graders.
Web searching and bookmarking. The first meeting of the curriculum class involved a brainstorming lesson around the questions “what do we already know about coal mining, and would we like to know?” After listing several questions, the next task at hand was “how are we going to find out what we do not know.” This became an opportune time to introduce web searching. In the subsequent educational computing class the preservice teachers used different search engines to search the Internet for information about the topic of coal and coal mining. The preservice teachers created annotated bookmarks of resourceful sites, and saved them on floppy disks. They shared this bookmarked resources with the eighth-grader on the next meeting.

PowerPoint presentations. One curriculum class involved a discussion of the principles of expeditionary learning. The next technology class involved reviewing the expeditionary learning web site (http://www.elob.org) for further information. The preservice teachers then created a PowerPoint presentation around the topic of expeditionary learning based on materials covered in the curriculum development class and information gathered from the Internet.

Spreadsheet. The eighth-grade class and the preservice teachers spent one session planning a field trip to the coal mining area in question. In this session the eighth-grade teacher involved the students in an activity aimed at figuring out what they needed for the trip, how much money they would need, and how to raise the funds. In the next educational computing class the preservice teachers were introduced to spreadsheets as a possible trip planning application.

HyperStudio. The eighth-graders and the preservice teachers engaged in several research-oriented activities aimed at providing information around the questions on coal mining. These activities involved interviewing different players, visiting coal-mining areas, and searching materials and information from the library. The preservice teachers used HyperStudio to document this entire experience. During the fieldtrips digital cameras were used to capture different scenes. These graphics were woven into the HyperStudio multimedia presentations.

Database. To help them keep track of the different components of the learning experience, the preservice teachers used a database. After each meeting with the eighth-graders the preservice teachers would document information
on a database template under such fields as: What was going on, what teaching was going on, how was learning taking place, what were the teachable moments, what learning was taking place, and what assessment methods were used? This database became a powerful tool for consolidation on learning for the preservice teachers. Later on, some of the preservice teachers were able to use the screen capture option of Macintosh computers to use these weekly database entries as part of their *HyperStudio* stacks.

**Inspiration.** One session of the curriculum class involved concept mapping. The eighth-grade class mapped out, on a chalkboard, the different aspects of coal mining that they would explore in the expedition. This became an opportune moment to introduce *Inspiration* as a concept mapping application. The preservice teachers later used these concept maps as part of their multimedia stacks.

**KidPix.** In the culminating project in the curriculum class, the eighth-graders worked with the preservice teachers to set up a Reader’s Theater. *KidPix* was introduced as a possible Readers Theater presentation application. Some of the preservice teachers used *KidPix* slide shows depicting some of the perspectives represented in the Readers’ Theater.

Before the anchored instruction approach was adopted in the educational computing course, all of the topics listed previously were taught as discreet workshops. The projects that accompanied the workshops were not necessarily related to each other. For example, preservice teachers would be given instructions on how to use spreadsheets and then asked to design a worksheet based on something that interested them. In contrast, as the instructor of the educational computing course indicated in her journal, teaching with the anchor was very natural and resulted in enhanced student performance on the required projects.

In the following section, the authors discuss the results and the lessons learned in relation to the use of anchored instruction with preservice teachers.

**SHARING WHAT WAS LEARNED FROM THE ANCHORED INSTRUCTION EXPERIENCE**

During the course of study, the preservice teachers and their educational computing course instructor journaled their experiences. At the end of the study, preservice teachers also wrote a reflection paper addressing their experience in the educational computing course. The researchers analyzed the
journals and the reflective papers to explore the experiences of the preservice teachers and their educational computing course instructor in the anchored instruction experience. The following section highlights the major themes that emerged from the data analysis.

**Preservice Teachers’ Perspective**

Most preservice teachers participated in the study indicated that anchored instruction increased their motivation to work on complete tasks, gave them a sense of pride and accomplishment in their work, enhanced their understanding of technology use in the curriculum, and helped them to develop a vision for technology integration in their future classrooms.

One preservice teacher illustrated the feeling of many others as she reflected on her experience:

I think it was a unique and once in a lifetime experience to be collaborated with the coal project while learning how to use technology in the classroom. I think it was a good experience for us to see how we could integrate technology with an integrated curriculum.

Another preservice teacher expressed her feeling in a similar way:

I think that linking the two classes, the technology class and the curriculum development class, was a brilliant idea and a great learning experience. This made the classes real and relevant to what we were studying. This made me more motivated in my work because I was creating and writing about what we were working on with the coal project….This has allowed me to familiarize myself and learn more about technology and apply it to a real life teaching situation.

One preservice teacher compared her learning experience in anchored instruction with the experience of other preservice teachers in other educational computing classes:

I found myself practically bragging to other technology student [not involved in the anchored instruction partnership] throughout the quarter about how our class made so much more sense because we were connecting our classes together.

Another preservice teacher commented on the relevance of the assignments:
The fact that we were doing assignments that we could actually use and not just busy work was very important. We weren’t just displaying that we knew how to use computers; we were showing what we had learned this quarter. Students do not realize how much more interesting it is to do work related to their lives until the actually get. Everything is suddenly more interesting.

Some other preservice teachers also indicated that the experiences they gained in the anchored instruction approach provided them an authentic and rich environment in which they were able to reflect on their own learning. One preservice teacher described her experience:

Using [the computer class] as a compliment to the [Coal] project I feel that we were able to take reflection to the next level. Using programs such as HyperStudio and database, I was encouraged to synthesize the information I was acquiring about the coal as well as information I was acquiring about teaching eighth-graders. The integration of these two classes really helped me to be a reflective educator.

Another preservice teacher shared the feeling of her classmate:

Documenting work about the expedition through various technological applications really allowed one to reflect on what had been learned. I cannot imagine going through the motions to learn everything that we have in [the computer class]. Instead, because of the integration everything has learned and created can be used to show our professional development in the areas of technology and expeditionary learning. This connection mirrors the democratic philosophy of making all experiences authentic and rich. Furthermore it is because I was involved in this unique integrated curriculum that makes it easy for me to envision technology in my own classroom.

It was evident in the preservice teachers’ reflections that restructuring the educational computing course around the anchor worked well for them. They responded positively to this approach and learned essential technology skills and the application of these skills in an educational setting, in the process.

Instructor Perspective

Alongside teaching this particular class, the technology instructor was also involved in teaching another “regular” technology class. Most of the instructor’s reflections revolved around what was different about teaching the
anchor-based class than teaching the regular class. Teaching the anchored instruction-based class called for more flexibility on the part of the instructor and provided unique opportunities to provide just in time learning. The following section discusses the lessons learned from the anchored instruction experience, from the instructor's perspective.

**Flexibility.** In this study, the content for the anchor was open-ended and evolutionary in nature in the sense that no one could determine ahead of time either what the eighth-grade class was going to find out during the expedition or the sequence of activities they would need to take to complete their task. As the learners (eighth-graders) explored the task ahead of them, they identified their own questions and these questions became the basis for formulating goals and designing the activities that would lead to the realization of these goals. One of the goals of immersing the preservice teachers in this collaborative teaching/learning experience was to emphasize the relevance of technology in teaching and learning by allowing the preservice teachers to use technology in a real life setting. To achieve this goal, it was important for the activities of the technology class to relate closely to those of the anchor.

One of the challenges of anchored instruction is for the instructor to know how and where to fit anchored instruction into the existing curricula (Baumbach, Brewer, & Bird, 1995). The existing curriculum in this case was for the preservice teachers to learn the use and application of various technology applications for teaching/learning environments. Relating the activities of the technology class to the anchor, and fitting these activities within the curriculum of the technology course necessitated planning the technology activities as the content of the curriculum class evolved. It therefore became necessary for the technology instructor to attend the curriculum course class sessions. This created a great demand on her time, but as she reflected, “this was the only way I could make the assignments and class activities meaningful. I had to know what they are doing in the other class in order for me to create corresponding and complementary activities for them.” This suggests the need for flexibility on the part of the instructors involved in anchored instruction and confirms the suggestion by Baumbach, Brewer, and Bird, (1995), that when using anchored instruction, the teacher can no longer follow a fully scripted lesson plan.

**Providing just-in-time learning.** The Cognition and Technology Group at Vanderbilt (CTGV, 1993) in their discussion of anchored instruction suggested the notion of the potential of anchored instruction to provide opportunities for just in time learning. In this study the technology instructor provided
just in time learning on several occasions. An example was in the case of the use of *Inspiration* software as described previously. At the beginning of the course, the technology instructor had not planned to teach the use of *Inspiration* software to the preservice teachers. However, upon attending the curriculum class sessions and watching the concept mapping session (using a chalkboard), she quickly recognized this as a very timely opportunity to introduce *Inspiration* as a concept mapping software. The preservice teachers then used *Inspiration* to create an electronic version of the concept map which they had tried to create on the chalkboard earlier on in that day. *Inspiration* became the exact topic they needed to learn at this particular moment. Providing this on-demand learning helped the preservice teachers appreciate the use of *Inspiration*. As the ease of forming concept maps using *Inspiration* unfolded to them, the class was full of “aahhs” and “oohs” in appreciation.

One of the advantages of providing individuals with on-demand learning is that it allows them to immediately apply their newly gained knowledge. Immediate application cements the knowledge gain and makes it far more likely that the knowledge will be retained and used in future. A number of preservice teachers in this study reported that they started using some of the applications such as *Inspiration*, *PowerPoint*, and *KidPix* for other courses as well.

**Recognizing teachable moments.** Closely related to the concept of providing on-demand and just in time learning is the need for instructors to recognize and seize teachable moments. Teachable moments refer to a time when individuals are ready to learn. In using this approach the teacher may appropriately decide that the current discussion or situation may offer a prime opportunity to meet current or anticipated learning goals better than the planned instructional activities. In this study, some time the technology instructor had to change a planned course of action to seize a teachable moment. The case of the previously mentioned scenario involving *Inspiration* was one example. The prior plan for that particular class session was for the preservice teachers to work on completing previous assignments. The introduction of spreadsheet as a possible trip planning software, as described earlier, was yet another example. Suitable recognition and capitalization of teachable moments can increase instructional efficiency, despite deviation from planned activities (MentorNet domain, 2000).

**Cohort groups.** Cohort instructional programs, where students are required to take all or nearly all courses together toward a degree, have been associated with some benefits. An example of these benefits includes higher levels
of cohesiveness and group interaction among the students (Reynolds, 1993). These interactions in turn result in, enhanced professional confidence and life long learning relationships. This study reveals an additional advantage of cohort instructional programs, namely that cohort instructional programs present an excellent setting for educators to implement anchored instruction. The collaborative teaching experience in this study was made possible by the fact that the preservice teachers were involved in a cohort instructional program based on a partnership between the university and the local Junior high school.

**Motivation.** One major difference between this class and the “regular” class (based on same technological applications) was the level of enthusiasm and motivation in the participants. As the instructor indicated, “on average, for example, I spend considerable time just trying to get the students to think of a topic of interest to use when practicing web searching. In contrast, it seemed like this class could hardly wait to lay their hands on the WWW, because they were very eager to see how much information about coal and coal mining was available on the web.”

**DISCUSSION AND IMPLICATIONS**

In reviewing the structure of educational computing courses at a major teacher preparation institution in Southeastern Ohio, the authors discovered that many of the learning activities in such courses are designed in a didactic manner in which the course instructors demonstrate advanced-technology tools as discreet workshops and then require students to replicate a product. Importantly, the authors of the study also discovered that the status quo at this institution patterns the practice of typical teacher preparation programs across the country. The Teacher Education Community has argued that such didactic practice creates the problem of inert knowledge—the type of knowledge that people can recall when prompted, but cannot recall spontaneously during problem solving.

Data suggest that the anchored instruction approach addresses the shortcomings of existing structure in educational computing courses by providing a venue that fosters a rich shared environment that generates interest and motivation, and enables students to alleviate the problem of inert knowledge. In so doing, anchored instruction meets the needs of preservice teachers to learn about various technology tools in educational settings and apply them in their future practice. Data also suggest that anchored instruction
calls for the establishment of constructive activities on the part of the instructor by recognizing and seizing teachable moments throughout the process, rather than by creating preplanned curricular activities.

The study reported here suggests that anchored instruction enables an effective response to the need for restructuring educational computing courses to prepare technology-proficient K-12 teaching force.

References


