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National standards for preservice educators make technology preparation a critical component of education programs. But without guidance, technology integration into core courses remains problematic. Technological activities that promote reflection and observation during an early field experience course are described. The purpose of these activities is to provide opportunities for preservice teachers to reflect on and respond to the technology issues they encounter during their teacher preparation. These activities are facilitated using an online, interactive journal format.

Introduction

Technology supports teaching and learning. In recent years, standards in technology education shifted from a foundational knowledge of technology towards a focus on the effective integration of this technology into classroom learning. While the focus and standards in technology education have shifted, teachers' views and abilities concerning technology have not shifted accordingly. In order to effectively integrate technology into core subjects, teachers need structured support (Glazewski, Rutowski, Sutton, Berg, Krumwiede, Mansfield, Smith, Stromfors, Igoe, & Brush, 2003; Mize & Gibbons, 2000).

This article will present 11 separate activities designed for preservice education majors to facilitate their evolution from technology avoider to technology integrator within the K-12 classroom environment. The activities were developed and field-tested by the authors in junior level technology integration and subject matter methods courses at a pubic university in the intermountain west and at a private urban university in the southwestern United States. As activities were used, the authors engaged in an informal assessment of their effectiveness eliciting students' reflections. Activities were refined over time to further promote reflective practice. A corequisite for each class was an early field experience. Whenever possible, access to technology was considered when making the field placements. Nevertheless, instructors of other field experience courses, including those where technology is not the central focus, may find the activities useful in meeting local technology mandates.

Literature Review

Two organizations leading the change in technology education are the National Council for Accreditation of Teacher Education (NCATE) and the International Society for Technology in Education (ISTE). Their proposed standards call for preservice teacher education programs to emphasize technology as a critical component of the curriculum. NCATE requires college educators to teach students to use technology to facilitate learning for a diverse group of students and to integrate technology throughout the content areas (NCATE, 2001; NCATE, 2002). If teacher educators comply with these directives, it will no longer be enough to teach technology integration in isolation from other core education courses, nor will it be appropriate to teach technology integration without field-based experiences (Brush, Igoe, Brinkerhoff, Glazewski, Ku, & Smith, 2001; Dawson, Pringle, & Adams, 2003; Hoelscher, 1997).

Clinical and Field-Based Experiences

Clinical and field-based experiences are critical NCATE accreditation standards for teacher preparation programs (NCATE, 1997; NCATE, 2002). Several studies document the need for increased field experiences for preservice teachers (Goodlad, 1990; Pierce, 1996;

U.S. Department of Education, 1999). But, if early field experiences are critical to students' development as effective teachers, then field experiences focusing on effective technology integration are essential if preservice teachers are to develop complex technology integration skills (Larson & Clift, 1996; Northrup & Little, 1996; Norton & Sprague, 2002; Snider, 2002; Strudler & Grove, 2002). "[H]elping teachers use technology well may be the most important step in helping students" (U.S. Congress, Office of Technology Assessment, 1995, p. 95). However, many teacher education programs do not provide adequate experiences using technology for their students (Medcalf-Davenport, 1999; Moursund & Bielefeldt, 1999; Willis & Mehlinger, 1996). In a 1996 study, Willis and Mehlinger found that technology was minimally considered in student teaching placements. Although technology use is increasing in teacher training programs, Moursund and Bielefeldt (1999) asserted "preservice education could do more to help students learn to integrate [technology]" (p. 4).

Wang (2000) argued that preservice teachers should be provided models of effective technology integration during field experiences in order to insure their future success. Norton and Sprague (2002) along with Strudler and Grove (2002) expanded this idea, calling for a restructuring of existing practicum experiences to further focus on technology integration. Just as students must learn complex teaching skills by shadowing, observing, teaching, and reflecting on their experiences (NCATE, 1997; Reed & Bergemann, 2001), they must also apply these tasks to the development of technology integration skills (Jayroe, Ball, & Novinski, 2002; Roschelle, Pea, Hoadley, Gordin, & Means, 2000).

Gains in confidence among preservice teachers who participate in structured field experiences have been documented (Casey & Howson, 1993; U.S. Department of Education, 1999). Abbott and Faris (2000) reported that elementary preservice educators study learned technology integration strategies by working with and observing teachers during a technology-focused, site-based practicum. Roschelle et al. (2000) asserted that classroom instructional experiences assist in the development of technology integration skills. Preservice teachers can learn effective technology integration strategies by working with and observing teachers and students during field experiences that focus on technology integration and reflective practices (Dawson & Norris,

2000; Jayroe, Ball, & Novinski, 2002; Roschelle et al., 2000; Wang, 2000).

Reflective Experiences

Reflection is another critical skill that preservice teachers need to acquire (NCATE, 1997). Dewey (1921) defined reflection as the purposeful discovery of facts. The complexity of reflection ranges from simple to complex. Diverse questions such as "What just happened?" to "What would I do differently if I were to do this again?" demonstrate this reflective range. Preservice teachers who are able to reflect on their field experiences are more successful than those who do not engage in reflective activities (Reed & Bergemann, 2001). Consequently, field experiences should provide ample reflective opportunities if students are to fully develop as teachers and technology integrators (Henniger, 2003).

Reflective Technology Activities

Opportunities exist to promote reflective and observational practices among prospective teachers. What follows is an overview of activities appropriate to an early field experience course. The authors worked cooperatively, trying the activities in classes, discussing their successes, and revising them as appropriate. Students' comments have assisted the team in planning and adapting the activities as well. The activities promote reflection and observation about technology integration within K-12 educational settings. Because the act of writing is often reflective (Wells, 2000), many of the activities rely on the use of an online, interactive journal for written reflection, but more traditional journals are also appropriate. Several activities, such as the technology philosophy statement, are variations of activities suggested by the literature on technology observation and reflection (Abbott & Faris, 2000; Jayroe, Ball, & Novinski, 2002; Norton & Sprague, 2002; Roschelle et al., 2000).

Activity 1: "Prereflection" on Future Technology Use

In this activity students are asked to "pre" reflect on their future technology use by anticipating any issues or concerns they expect to face during the field experience. Students express their concerns in

writing as part of their online reflective journals. The excerpts below are illustrative of the range of student perceptions about this activity:

> ***Marcia:*** *Bring it on! I think that because I am open about all types of technology that I will continue to grow and learn new applications for the tools that continue to be developed. I prefer learning new technology by just diving in and figuring it out. However, when the software is not intuitive it is always nice to have a book or an instruction manual to work with.*

> ***Delaney:*** *How do we actually accomplish this? There are limited resources in all of the schools so how do we actually get the time in the computer labs, etc. so the students actually get the time to be able to learn and apply all of these objectives? It seems somewhat overwhelming right now.*

Instructors' reflection. The activity guided thoughtful, reflective, and honest discussions about how individual preservice teachers can begin the process of technology integration. Students were able to increase their awareness of technology issues in order to provide a useful framework for prioritizing these issues during the placement. Through the voicing of concerns and the discussion of those concerns, students were encouraged to share and build upon one another's ideas. They also began to understand that the placement was fundamentally different from anything they have done before.

Activity 2: Picturing Technology Integration

Pictures serve as mirrors for the images that exist in students' minds and reveal students' understanding of both concrete and abstract concepts (Wineburg, 2001). Students are asked to visualize technology integration by drawing a depiction (picture, chart, graph, concept map, etc.) illustrating how they perceive it. This exercise includes a diagram of what the student perceives as the "ideal" technology-infused classroom (i.e., will it be the typical one computer in the classroom, 2-6 student computers, etc.). The resulting drawing, then, serves as a "jumping point" for thoughtful discussion comparing the "ideal" to the "real" field experience classroom. Under the picture, students can

write a caption supporting or explaining their picture. Once completed, these visual metaphors serve as a basis for in-class and online discussion of what students drew and why they drew it. Discussion is intended to lead to a greater understanding of technology integration among the preservice teachers (Figure 1).

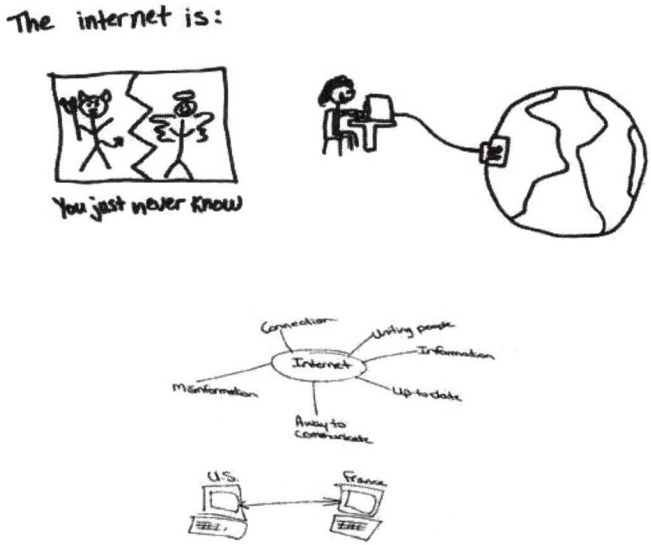

Figure 1. At the Beginning of a Semester Students' Understanding of Technology Integration May Be Narrowly Focused

A variation of this task would involve students formulating a metaphor using *PowerPoint*™ (Webb, Metha, & Jordan, 2002; Wright, Sundberg, Yarbrough, Wilson, & Stallworth, 2003) or a concept map (Jonassen, 2000) using *Inspiration!*™ software. Once the metaphor is developed in the software, students offer a written explanation of the reasoning in their online journals.

While these beginning metaphors can reflect students' initial understanding of technology integration, their discernment may evolve during the early field placement (Knowles, 1994). For this reason, students are asked to re-examine their drawings (or metaphors) and then reflect, in writing, how their thoughts have evolved as a result of the field experience. Students are encouraged to write comments on their pictures or revise their original drawings and captions to demonstrate their improved understanding:

> ***Josh:*** *Ultimately, I hope to help students be prepared for future learning and for the fullest development of their gifts. I see technology as a way for students to have access to information and then organize it for their own good and for the benefit of others. Technology is a way for students to communicate their ideas and express themselves in a unique style. I want technology in my classroom to help students know that success is achievable, no matter what their interest and abilities. I hope to prepare them for practical situations; so they can be independent thinkers and responsible learners for all areas of their lives.*

> ***Abbey:*** *After much pondering, I have come to this simple conclusion: I like people. I like people face-to-face, even voice-to-voice—at least there is something human about the interaction. On the other hand, I am excited about the ways in which computer technology can enhance the lives of my family, my students, and me. I will try to instill in those whom I teach the awe I felt when I first sat mesmerized in front of a computer hooked up to the Internet. I believe that computer technology has its place, but I do not believe it should take the place of direct contact unless absolutely necessary.*

Instructors' reflection. Sometimes a picture can capture the essence of reflective thought in ways that written words cannot. Seeing their pictures and reading earlier comments provided students an increased sense of self-awareness about how their understanding of technology integration issues have developed as a result of their efforts over the course of the semester. It was also a positive experience in that many

students found showing and discussing the pictures to be an amusing ice breaker at the beginning of the semester.

Activity 3: Philosophy of Technology Integration

Writing thoughtful philosophy statements requires much reflection by preservice teachers. Creating philosophy statements assists students in thinking about and organizing their thoughts concerning what it means to be a teacher (Heslep, 1997; Jersild, 1955). Including technology integration within these statements causes students to incorporate technology into their personal view of what it means to be a teacher. Early integration of technology into philosophy statements can encourage students to see technology as integral to teaching. In this activity, students create or revise existing philosophy statements to include technology integration. Excerpts such as those that follow suggest an evolving understanding of technology's role in instruction:

> ***Amber:*** *I believe that it is essential for our students to be technology literate in order to be able to function in our ever increasingly technological society. I believe that technology can be a tool that enables students to be more actively involved in their learning. It is a tool that facilitates greater learning and retention on the part of the students. Technology cannot explain itself. Technology cannot encourage a student. Technology cannot analyze why a student may be having difficulty and come up with modifications and adaptations to help him be successful. Technology helps me create lessons and assignments more quickly with greater depth of information. It connects teachers and facilitates communication among educators. It connects people from distant locations so that collaboration is possible.*

The technology infused philosophy statements are then posted online where they serve as discussion prompts. As with more traditional philosophy statements, students are provided multiple opportunities to think about and revise their statements as they progress through core education classes and obtain greater exposure to technology (Tairab, 2001).

Instructors' reflection. This activity provided students the opportunity to use the lens of their past experiences in other academic settings to make links to their present circumstances. Making this connection to previous knowledge, coupled with their own personal insights, helped students to make the technology integration field experience a more meaningful experience.

Activity 4: Case Study Analysis

The more students understand the process of teaching and the more they observe effective teaching in the field placement and through the use of case studies, the greater success they will achieve in their own practice (Werman, Welty, & Lyon, 1992). Case studies, including those involving technology integration, can communicate the richness of human interaction (Maddux, 2000; Ertmer, Conklin, Lewandowski, Osika, Selo, & Wignall, 2003).[1] Students are assigned a video (or written) case study to help them think about what to expect as they practice technology integration in the field placement classroom. As students watch a video demonstrating a technology-infused classroom, they create a set of open-ended questions that become the focus of in-class and online discussion and reflection.

When conducted in person, students form small groups where each is given five minutes to discuss the case and identify major themes and events. Each group then works to develop one open-ended question that they will bring to the whole class discussion. In the whole class discussion, students form a large circle. The instructor asks each group to share its questions with the class. One of these questions is then used as a beginning point for the student-led discussion. The instructor's primary task is to facilitate (Zeiderman, 2001). After 15 minutes, students work individually to develop preliminary conclusions about the case in their online journals. Final conclusions can only come after students fully understand the case as it is applied to their teaching experience (Hoelscher, 1997).

Instructors' reflection. The case studies served a critical role in the initial steps of thinking about how to handle the issues that arose during the field placement. Students had to go beyond the descriptions in the cases to apply their academic knowledge and their emerging experiences

with technology integration to their discussion and resolution of the issues presented in the cases. The cases pushed them to articulate and understand how to handle the varied issues they will face as teachers.

Activity 5: Online Ethics and the Responsible Use of Technology and the Internet

Students are asked to discuss ethics with their cooperating teachers before reflecting on their own ethical viewpoints. Topics of discussion include the cooperating teachers' concerns about children's safety online, the role of filtering software, and the teachers' familiarity with the local district's Acceptable Use Policy (AUP). Once the dialogue has occurred, students respond to the following prompts in their online journals:

- How would you define online ethics?
- What concerns do you have about online ethics as a preservice teacher?
- What factors might interfere with your ability to model ethical behavior for your students?
- How might you assure students' responsible use of the internet while conducting an internet-based lesson?

Mia's entry is illustrative of the students' reflection on this topic:

> *I am still unsure exactly what is acceptable when using material from the internet and the threat of online predators worries me. But my responsibility is to protect students from being exploited and from participating in illegal activities while using the internet. As a teacher, I need to make sure the students are educated and I am educated about the ethics and what is acceptable and what is not. A student and a teacher could get into serious trouble and not even know it if they are not educated ... I might believe that using information on the web is not really wrong, but [I] need to be aware that my example teaches much more than my words. I need to be aware of the acceptable behavior in order to model it.*

Mia continues with the following example from her placement classroom:

> *I was talking to a student who was complaining about the internet restrictions at school. He thought it was perfectly acceptable to watch a cartoon of a hamster being blown up in a microwave. How can you teach ethics of any kind to students when they have already been taught at home that [the] things I find objectionable are okay?*

After examining a series of teen-authored blogs, Karen wrote:

> *Blogs definitely seem to have both benefits and dangers. While discussing Act One of Macbeth this week, we were brainstorming examples of the witches' paradoxical statement that "Fair is foul, and foul is fair." Blogs seem to fit that quote well. As an English teacher, I [will want] to encourage writing and expression ..., and blogs provide an audience. However, it concerns me that many teens with emotional and/or psychological problems are connecting and giving "advice" to others. I think this could be dangerous.*

Instructors' reflection. Discussion of topics such as those demonstrated above encouraged students to become proactive with regard to the ethical issues they will face as teachers. Rather than waiting for problems to arise, discussions of ethical issues in technology use and integration encouraged students to anticipate the issues they would face in their own placements and, hopefully, take steps to divert negative outcomes from occurring. The non-teacher centered discussion of these issues also allowed students to take issues that were occurring in their placements and seek resolution of them via discussion with their peers.

Activity 6: Assistive Technology

Addressing the requirements of students with special needs is a challenge most preservice teachers are ill prepared to meet (Bryant & Bryant, 2003; Provenzo, Brett, & McCloskey, 1999). Therefore, an early focus on assistive technology tools to meet the diverse requirements of students is important (Horejsi, 2003). Preservice learners participate in a workshop where a variety of assistive technologies are demonstrated. Next, students select one assistive

software or hardware for in-depth exploration using internet resources. The activity asks students to respond to a scenario such as:

> You have just learned that a child with a motor disability will be transferred into your field placement classroom in the near future. The child, Kara, has spinal bifida, which affects the spinal cord causing mild paralysis in her lower and upper body. Her fine motor skills are somewhat limited. Your cooperating teacher has asked you to assist in the student's successful transition into the classroom. Your job is to inform your cooperating teacher about one type of assistive technology that can be used by the child to insure her meaningful participation in the class. Consider the learning-teaching context of your field placement classroom when answering the following questions:
>
> - How might the selected software or hardware support the child's needs?
> - How would it support your instructional goals?
> - What would have to be done to assure that your assigned classroom would accommodate the student's need?
> - How would *you* alter your instruction to accommodate the child's use of the selected assistive technology?
> - How would you assess a lesson that included this software (see example in Appendix A)?

Instructors' reflection. This activity encouraged students to reflect upon previous knowledge and then apply that knowledge from the perspective of a teacher who must deal with the needs of diverse learners in her classroom. Like other activities, this one forced students to use their academic content knowledge and their emerging understanding of technology integration to solve an authentic challenge faced by a local teacher. This activity pushed students to shift their perspective from that of a student to that of a teacher who is required by law to not only deal with the needs of diverse learners, but to use technology to assist in solving the need.

Activity 7: Observation of a Technology-Infused Lesson

Next, students observe a teacher interacting with K-12 students using technology. For example, students observe a lesson that involves teacher-centered technology use such as a *PowerPoint*™ assisted lecture or one where students are interacting directly with technology (i.e., during an internet field trip activity). During the lesson, students observe and record their perception of the effectiveness of the lesson focusing on the appropriateness of the technology and its use in meeting stated instructional goals. Afterward, they write a brief overview of the experience reflecting on the strengths of the lesson before discussing how the use of technology during the lesson could be improved. The objective is to encourage students to put themselves into the situation they observed and to think about how they would handle situations such as those that arose during the observed lesson. Tia's comments are illustrative of this activity:

> *I like that [another preservice student] used Inspiration[™] as a final assessment, but I thought it would be good for students early in the novel to map characters and [the] initial setting. Also, I like the idea of having them complete a practice map on themselves; I think this will help students to learn by doing instead of having [name] lecture so long.*
>
> ***Shane:*** *All [name] did was read his PowerPoint™ slides to the class. I wondered if he knew anything more than was on each slide. It was a crutch. I hope I didn't look as bad when I taught [before]. But maybe I did too?*

Instructors' reflection. This activity assisted students in thinking about technology integration within the context of the reality of public school classrooms. Observing others integrate technology into instruction gave them an opportunity to see multiple perspectives on the same types of issues and concerns they must face in their own teaching. Observation also gave them the opportunity to infer what methods were particular effective and to consider whether their own choices support student learning.

Activity 8: Reflective Practitioner

Working in partnership with cooperating teachers and course instructors, students developed a technology infused lesson plan (or sequence of lesson plans). Once the lesson is approved and taught using the appropriate technologies, students reflect about the experience in their online journals. Reflection focuses on the following points:

- What went well with the lesson?
- How was the selected technology appropriate for the lesson's objectives?
- How did students respond to the technology?
- How was the lesson inclusive of all learners?
- What management issues arose as a result of using the technology?

Finally, students are asked to reflect on what they would change before reteaching the lesson, given the learning-teaching context of the field experience classroom. Regarding a secondary level algebra lesson, Bree wrote:

> *Three of my five targets were taught using technology in the lesson. I found that presentation of new information was much more effective for all students when compared to my direct instruction of algebra principles without technology. The use of PowerPoint™ allowed me to better pace the sharing of information, insuring that all students were up to speed with the concepts being presented. As I prepared to move through each slide, I solicit[ed] student input to solve each step of the solution. Class participation was excellent and much better than from lecture [alone]. Results from the post assessment [support this assertion] ... Student understanding improved; the use of PowerPoint™ improved the understanding of the concepts across the board. Not only was the concept presented but guided practice was also accomplished in the presentation ... The class was not set up for the use of technology, and for this reason, I avoided overdoing it. Clearly student learning was so much better, that in retrospect, I would have used technology in every lesson. I concluded that I am a better lecturer when provided some*

> *visuals and a method to control my pace, so for a large crowded classroom like I had, use of PowerPoint™ is the least intrusive technology but clearly [w]as also very effective.*

Instructors' reflection. Reflecting on the teaching process can be challenging for beginning teachers. Teaching requires a complex skill set that can be enhanced by answers to specific reflective questions. When asked to focus specifically on the technology used in the lesson, students were able to see how every aspect of a lesson can be impacted by the inclusion of technology.

Activity 9: Technology Assessment Plan

The ability to develop effective assessment strategies is another critical attribute of the successful teacher candidate (Smith, Smith, & Delisa, 2001; Stiggins, 2001). Integration without assessment is inappropriate; therefore, opportunities to develop assessment strategies for technology must be provided.

As students develop their technology lesson (or a larger unit), they create a draft assessment plan describing the assessment(s) they plan to use to monitor students' learning via technology. In writing their plans, students must consider technology access, adaptations for special needs, and other issues that may impact technology integration in the field placement classroom. Students' use of technology for assessment includes: (a) having their learners create technology products that can then be assessed using rubrics or other assessment instruments, or (b) using tool programs, such as spreadsheets, to collect assessment data. After designing their plan, students reflect on the following questions:

- How did you use technology to assess student learning of subject matter?
- How did you evaluate students' appropriate use of technology resources?
- How did you accommodate diverse learners in the appropriate use of the technology?
- How did you assure all students would have adequate time and access to the technology?
- How did you monitor students' use of the technology?

Instructors' reflection. Activities such as this allow students to make larger assessments of what they and their students accomplished during the field placement. Students were asked to assess and evaluate their accomplishments during the field placement. Doing this encouraged them to make summative conclusions about the experience. Activities such as this allowed students to go beyond simple description and reaction, to apply their academic knowledge about assessment as a means to better understand the experiences of the field placement.

Activity 10: Analysis of Student Learning

Once the technology assessment plan has been developed and the lesson taught, students collect assessment data (e.g., pre- and post-assessments), entering it into a spreadsheet program, and then begin the process of assessing student learning. Students use graphical displays (e.g., charts or graphs) to showcase student learning. This exercise includes a detailed analysis of all learners as well as specific individuals or small groups within the overall targeted classroom. Thus, the preservice student learns the process of analysis through a data-driven environment. Steps might include: (a) determination of the data to be monitored (assessment plan), (b) the purposeful gathering and recording of assessment data using a technological tool (spreadsheet), followed by (c) the logical examination of the resultant data through mathematical functions (e.g., summing, means, minimum and maximum scores, etc.), and (d) presentation of critical information in a graphical mode (charts and graphs). Once these steps are accomplished, the preservice teachers reflect on student achievement as well as their technology planning, delivery, and assessment processes (see the sample essay in Appendix B).

Instructors' reflection. Similar to activity nine, this one encouraged summative reflection on the successes and weakness of their teaching. But activity ten pushed students to make an honest assessment of the learning that occurred during the field placement based on evidence collected during the placement. Through the use of simple statistics, students had to draw conclusions based on their academic knowledge and evolving expertise with technology integration. In this activity they were pushed by the results of the data analysis to make an honest

assessment of student learning. This was a hard lesson for some students to face as they were forced to admit that the learning that occurred may have been marginal or nonexistent. However, this became a powerful learning opportunity for those students because they were then forced to reflect on the experience and to reassess their strengths and weaknesses as teachers. They had to think carefully about what happened while they were teaching and to make a plan for what they could do to improve as teachers. For some, the result was a shift from focusing on how they teach to focusing on how students learn.

Activity 11: Summative Reflection

As a cumulative activity, students are asked to describe, in detail, the technology integration efforts attempted during the field experience. Students use the following prompts to guide their reflection:

- How did the technology integration within the lesson support ALL learners?
- How did the technology integration promote higher order skills and/or creativity opportunities?
- How did you, as the teacher, manage student access to and use of technology resources?
- How did technology impact your evaluation procedures?

The excerpt below comes from an essay written by a preservice teacher who taught a unit on Egyptian history:

> *Technology helped with creativity when I had the students create a concept map using Inspiration software. They were familiar with computers; however, many students were not familiar with concept mapping. They enjoyed scanning through the different clip art choices as they searched for the Egyptian pyramids. The concept mapping activity also encouraged higher order skills. Students need to use reasoning and include logical for this activity, they could easily change elements, move concepts, and add or delete those that did not "fit." The students rarely have had the opportunity to create on the computer, since it is usually used for testing.*

I provided clear instructions on how to create the maps on the computer, then I watched closely as the students created their maps. The rules for computer use were given prior to the lesson and there was no need to repeat them.

For the students in my classroom, the use of technology to teach instead of for testing was a new experience for them. Because of this newness, students remained engaged in the activity and really focused on their learning. I noticed that they seemed less interested when I did not use any technology. (The virtual tour [in another lesson] gave the students another tour of Ancient Egyptian culture they may not have otherwise experienced.)

When teaching this lesson again, I will have the students practice more on how to create concept maps on the computer, and build on that skill to allow them to create a map of the concepts relating to Ancient Egypt. Also, if time had allowed, I would have the students make their own presentations in PowerPoint™. This would help some students on IEPs have more control over their own learning. It would have kept them engaged in the subject too.

Instructors' reflection. Activities such as this promote an increased understanding and sense of self-awareness about what was learned during the technology-infused field placement. And, like the previous activity, it pushed students to see how the placement had broadened and deepened their thinking about technology integration. It also encouraged them to assess and evaluate the accomplishments made over the course of the semester and to begin thinking about the issues they need to address as they move forward as teachers. And putting all of this into writing was a great way for them to deepen their understanding of the field placement. This and other documents can later be re-examined and integrated into their written assignments in other classes and other placement settings.

Conclusions

Each of the activities discussed above is intended to promote observation and reflection on the part of preservice teachers. Evidence of this occurring was obtained by instructor observation and through

the reading of individual students' entries. Whenever students struggled with their reflective writing, instructors would pose questions or ask follow-up questions in class to get at the intent of each activity. The activities were successful for the authors because they assisted students in internalizing the process of reflective writing. While activities rely on the use of an online journal or discussion forum, alternative methods, such as electronic portfolio entries or in-class discussion, can be used instead. Formal portfolio entries would be particularly effective for the longer entries. And, while the use of technology in instruction is the central focus, these activities also encourage preservice teachers to think about their future teaching.

The activities are proposed to address critical NCATE technology standards, specifically, standards requiring reflective practices and standards that promote technology integration. They also address a majority of the ISTE Nets for Teachers (NET•T), which "focus on preservice teacher education, define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings" (ISTE, 2002-2004, ¶ 1). Not only do the activities allow preservice teachers to demonstrate their emerging understanding of the role technology plays in instruction, but they also provide a forum for them to document their growth as reflective technology practitioners within the context of an existing early field experience course.

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Endnote

[1] http://ali.apple.com/ali_sites/deli/nav1.shtml is one source for technology integration case studies.

Appendix A

Assistive Technology

Dear Principal,

Kara has just entered my class. She is a child who has spinal[sic] bifida, which impairs her ability to use her hands and legs. The following information will give you an idea of the types of accommodations that would be appropriate for her in my classroom.

Recommended Hardware

Graphics Tablet: A graphics tablet would enable the student to utilize the computer but not have to type and use fine motor skills needed to manipulate a mouse. Whatever is written on the tablet would be input into the computer. This would help with problems with legibility of writing.

Head Pointing Device: Depending upon how severe the mobility limitations are, the student could be fitted with a head-pointing device so that she could manipulate the curser and thus data on the computer screen with limited physical movement.

Touch Screen: The student could use a touch screen to manipulate information on the computer. This would be easier than using the keyboard. She also has the option of having a keyboard available on the screen. This might be better for the student because the keys could be larger and easier to select. However, this would be a very cumbersome process for writing. I would encourage the child to use the speech recognition software for any kind of narrative information needed.

Tape Recorder: The tape recorders could be used by the student to record class lectures and instructions. The student could also record answers to questions on the recorder and submit the tape for the assignment.

Software Recommendations

Speech Recognition Software: I would use voice recognition software. This would enable the student to compose essays, or information for papers and work without needing to be able to use the fine motor skills needed for writing or typing. I would have to allow for time for the student to train the software so that it would work properly for her. If the student had difficulty with the paragraphs needed to train the software I would have her practice with an inclusion aide and then record and train. I would hope that background noise would not impact the software. However, we would try to make a headset with microphone available so that the microphone is close to the student.

Physical Accommodations

The area where the computer is set up must be checked to make sure that the wheelchair is able to fit under the table. Special compensation must be made so that the speech recognition microphone is readily available. It might be kept on the

side of the monitor–hanging on a hook. If the student is going to use a graphics tablet then there must be a computer in the room with a USB key. The student would need to be able to hold the stylus or she would have to have a special hand harness that could hook it to her hand.

Support for Individual Needs

The speech recognition software as well as the other devices to help them record information would allow the student to be able to create some sort of product with the information that she has learned. The technologies would alleviate the struggle with fine motor skills and she could create professional looking products she can be proud of.

Student Training Needs: The student would need to train the voice recognition software. She would have to learn how to use the touch pad. It would take some practice to get used to using the hands-free mouse. In genera[l], the student would need to be taught how to run normal word processing software in addition to the adaptive technology hardware and related software.

Teacher Training Needs: I would need to be trained to use all of the same software that the student is using in addition to all of [the] hardware. Troubleshooting would also be a good thing to work on as well.

Supporting Instructional Goals: The students in History classes must process information. The use of the touch screen, the graphics tablet, and speech recognition software would enable the student to write her ideas down.

Classroom Accommodation: In my classroom I would definitely have to work on the furniture. There are no tables in the class that would accommodate a wheelchair. Also, the actual technology would have to be purchased and incorporated into one of the computers that is in my room.

Changes in Instruction: I would need to make sure that I allowed adequate time for the student to complete the tasks. I would have to make sure that the assignments were adapted so that they could be completed on the computer. For example, a crossword puzzle would need to be just answered by number rather than trying to fill in the letters on the grid.

Assessment: I would assess the student the same as any other. In History the issue is ["H]as the student mastered the content[?"]. If the student was able to record on a tape or use voice recognition software to record her thoughts about an issue accurately then she will have accomplished the task. I might have to be more lenient with spelling issues and take into consideration common mistakes that voice recognition software might make.

Please consider the hardware and software that would make including her in the class more meaningful.

Thank you, Ms. X

Appendix B

Analysis of Student Learning

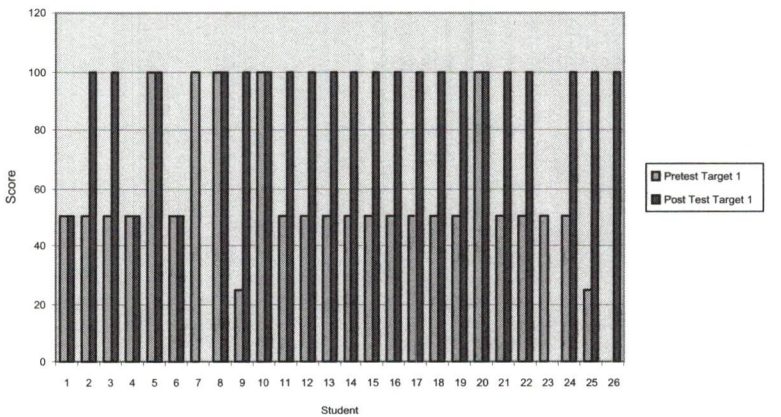
The following essay was written by a preservice teacher who taught a science unit in an elementary classroom:

During my sequential unit I observed growth in several different areas. The two main areas that presented significant growth was on Target One, *the learner will know and be able to put in order the flow of energy consumption from the sun to living things* and Target Four, *the learner will know and explain key elements about different environmental habitats.*

Whole Class–Target One

A more in-depth analysis of how the whole class performed on Target One showed that five students or 20% of the students scored 100% on the initial pre-test (see Table 1). This provided me with a challenge to insure continued growth on this target with these students. The rest of the class, or 80% of the students tested, scored 50% or less on the pre-test for Target One. One student, number 26, shows no pre-test score, but actually this student scored a zero on the pre-test and will not show up on the graph. The majority of low scores on the pre-test provided evidence needed to proceed with the target.

Table 1: Pre- and Post-Test for Target One

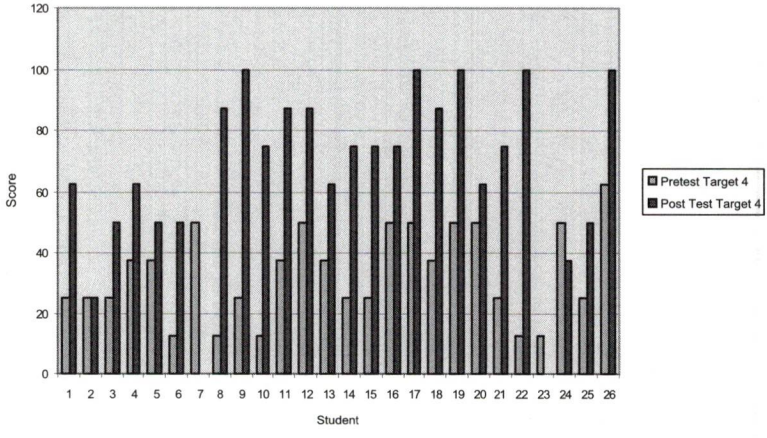


After my instructional sequence was completed I administered a post-test to verify if my lesson on energy flow helped the students gained knowledge on the subject. The post-test scores revealed that 80% of the class scored an outstanding 100% on Target One. Only three students or 14% did not score above 50%, and two students were unavailable for the post-test. The data indicates that all but three students met and excelled beyond the 80% criteria score set for this target. The target proved to be a challenge to the majority of the students, and challenge for me to continue growth with some students. Nonetheless, I am pleased with the results of my teaching methods on this target.

Whole Class–Target Four

The second essential target of my sequential unit was Target Four, knowledge of the key element of an environmental habitat. On the pre-test (Table 2) the average score was 33%. Out of the entire class, only 30% of the class was able to score 50% or better on the test, of which one high score was a 62.5. The information from the pre-test offered an indication that I could continue my plan to teach Target Four.

Table 2: Pre- and Post-Test for Target Four



The post-test revealed that substantial learning was gain after my sequential unit on habitats. The average score increased from 33% on the pre-test to a 72% on the post-test. The post-test results showed that 88% of the entire class increased their score from the pre-test. Only exceptions were one student that

showed no growth, one student decreased by one test question, and two students that were unavailable to post-test. Four students scored 100% on the post-test and three of those four more than doubled their score from the pre-test. Overall, the data shows that only eight students did not meet the 75% criteria goal for this target, and six students displayed learning growth between the pre and post testing with these students. The data also provided insight that my instructional methods for this unit and this target were successful with a large majority of the class. However, more adaptation or various teaching methods may have work with the students that did not meet the criteria goal.

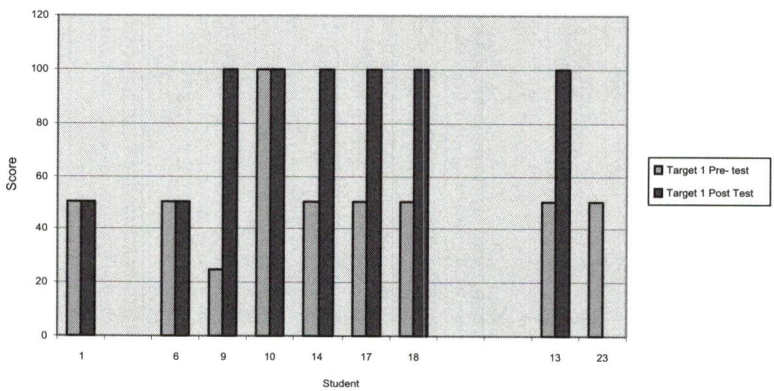
Subgroup Assessments

The subgroup consisted of the Title One students that were identified in the Learning-Teaching Context and the adaptations section of my Learning Activity Plan.

Assessment of Subgroup–Target One

My subgroup for Target One consists of the Title One students (see Table 3). These students scored 50% or less on the pre-test with the exception of one student, that student scored 100% on the pre-test. The pre-test was a strong indicator that I could proceed as planned with the lessons on Target One, *The learner will know and be able to put in order the flow of energy consumption from the sun to living things*. I will need monitor the student that scored 100% on the pre-test to make sure this student continues to growth on this concept.

Table 3: Pre- and Post-Test for Subgroup

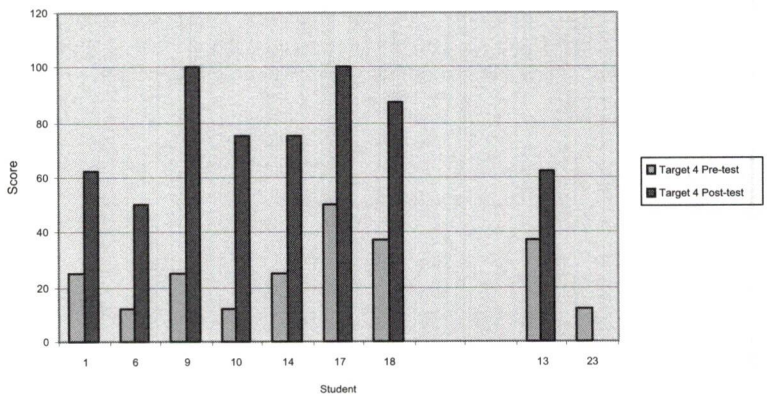


The post-test results for subgroup on Target One showed five students displayed significant growth, three students maintained their pre-test score, and one student was unavailable for post-testing. The criterion for this target was 80%, and all but two students surpassed this goal. The two students did seem to understand the concept on energy flow during the Interim assessment, however did not show exhibit this in the post-test. Perhaps my instructional method for these two students was not adapted to their special needs. I will adapt new methods for instruction in future lessons for these two students, as well as monitor their comprehension more closely.

Assessment of Subgroup–Target Four

The subgroup for Target Four is the same Title One group use for Target One. However, with this target all students exhibited low scores on the pre-test (Table 4). The results from the pre-test indicated that it was important to monitor comprehension on Target Four with this group.

Table 4: Pre- and Post-Test for Subgroup on Target 4



Overall, there was growth presented in the data from the pre-test to the post-test on these two targets with the whole class or the subgroup. The data also represents that my teaching method were successful with a majority of the students in both groups. Regardless, the data does indicate that I was not completely successful with all of the students and modification to the lessons will be necessary to achieve this in the future.