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Technology 2000: Using Electronic Portfolios for the Performance Assessment of Teaching and Learning

SUMMARY. This article describes a collaborative university-school district project for improving teaching and learning by using state-of-the-art educational technologies. The work resulted in the simultaneous improvement of P-12 education and teacher education. The article illustrates some of the important outcomes of a project known as Technology 2000, a collaborative effort between a university, a school district, and a business partner. Through using appropriate educational technologies, pre-service teachers, in cooperation with their supervising teachers in five classrooms at two school sites, engaged in the collaborative alignment of curriculum, instruction, and assessment to facilitate student achievement. The participants believe that the outcomes of this

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educational technology project have important implications for improving teaching and learning in other schools and teacher education settings.

KEYWORDS. Portfolio, electronic portfolio, electronic folder, performance assessment, pre-service teacher education, educational technology, collaboration

The demand for educational technology in our nation's schools has increased tremendously in the last five years. In an effort to meet the demands of parents, legislators, teachers, and others, school districts have spent millions of dollars to put "technology" into schools. In many cases the dollars spent on technology amount to funds for school wiring and computers, with little or no thought given to selecting appropriate software applications, educational technology programs, teacher training, or implementation and evaluation strategies. Today, accountability issues have surfaced and those same parents, legislators, teachers, and others have begun to question the academic results for the huge investment of funds. Following are some of the issues this search for accountability has brought to light:

1. Computer hardware and networks alone make no difference without software applications selected to address educational needs of students in a particular school.
2. Computer hardware, networks, and software alone make no difference if teachers and students are not using them.
3. Computer hardware, networks and software alone make no difference without teaching methods and strategies that give teachers concrete ways to integrate the technology into their existing methods of classroom instruction.

The authors believe that computers and networks are essential, but are simply the basics of an educational technology program. Considerable thought, research, and funds will be necessary to address and resolve the three issues cited, before fairly assessing what positive student learning gains can be achieved through using educational technology.

The Technology 2000 project described in this article was designed to address these issues. Participants in the project were provided with

appropriate hardware and grade-level instructional software resources, adequate software and hardware technology training, and methodology for using classroom-based instructional technology for teaching and learning activities. The performance assessment methods used involved the development of electronic portfolios and electronic folders, which in turn provided a means to evaluate the impact of the project on the accomplished practices of pre-service teachers and the academic achievement of their students.

PORTFOLIOS AT UNF

The teacher education program of the College of Education and Human Services at the University of North Florida (UNF) prepares professional teachers to effectively participate in diverse and evolving learning communities. The program emphasizes structured clinical experiences in school settings. The assessment of these experiences by UNF personnel is accomplished through a portfolio process carefully designed by the faculty (Boulware & Holt, 1998).

During the completion of two, two-semester-hour field laboratory courses, pre-service teachers prepare working portfolios through which they document their work with students in classroom settings. The working portfolios are collections of unabridged versions of carefully selected documents used to portray their professional growth (Campbell, Cignetti, Melenyzer, Nettles, & Wyman, 2001).

The culminating experience of the teacher education program is a 16-week internship during which the pre-service teachers produce their professional portfolios. These portfolios are a selective and streamlined collection of teaching and learning materials that reflect their mastery of Florida's 12 Pre-professional Accomplished Practices (Florida Education Standards Commission, 1996). Accomplished Practice 12 is centered on the pre-service teachers' effective use of computers in school classrooms. This article provides the details of an effective means for pre-service teachers and teacher educators to combine the uses of portfolio assessment with the appropriate uses of computers in school classrooms.

RESEARCH ON PORTFOLIOS

During the past five years the interest in portfolio development for teacher education has gained considerable momentum. There are sev-

eral excellent books and articles that provide comprehensive information on the current state-of-the-art of portfolio development.

Campbell, Cignetti, Melenyzer, Nettles, and Wyman (2001) provide helpful details to pre-service teachers for developing their portfolios. They state that the creation of portfolios is an authentic and holistic way to illustrate the developing professional competence of pre-service teachers. They found that portfolio development enables pre-service teachers to chart their own professional growth while following step-by-step procedures. In another publication, Campbell, Melenyzer, Nettles, and Wyman (2000) provide information for teacher educators on the portfolio development process. The critical elements of a well-designed portfolio assessment system are defined and illustrated. The authors provide directions for teacher educators to tie performance assessment tasks to adopted state and national standards for success in professional education and make them faithful to real-life teaching. They provide specific help with the design and use of portfolio rubrics to assess the performance of pre-service teachers.

Farr and Tone (1998) provide a multitude of illustrations and helpful information on portfolio and performance assessment for improving teaching and learning in the classroom. These authors define portfolio assessment as "the practice of saving lots of things that a student creates so that the student and the teacher can look at the collection and see how the student is doing" (p. 11). Portfolios are viewed as collections "organized in such a way as to reflect, promote, and report a considerable amount of thinking that students have applied to the contents in them" (p. 11). Farr and Tone believe that portfolios should "inform the teacher about the student's progress as a thinker and language user, while indicating how effective the instruction has been and what additional instructional emphases are needed" (p. 11).

Cole, Ryan, Kick, and Mathies (2000) provide definitions, strategies, and details on the uses of portfolios and electronic portfolios across the teacher education curriculum. They define and describe a variety of useful tools for incorporating educational technology into college teaching and learning. They note that "bringing the learning process alive and using portfolios to document the products of this process requires various technologies" (p. 53). They suggest that teacher educators consider incorporating the following with their use of computers in education: local and wide area networks, servers, school networks, online databases, global educational networks, optical media, laser discs, Zip and Jaz car-

tridges, CD-ROM disks, scanners, digital still cameras and camcorders, and multimedia software.

Barrett (2000) defines several categories for the evolution of electronic portfolios and provides a conceptual framework for thinking about their development. She describes two bodies of professional literature that define the process for developing electronic teaching portfolios to support long-term professional growth: the multimedia development process and the portfolio development process. She illustrates five levels of technology for developing electronic portfolios that are appropriate at each stage of teacher professional development.

After extensive review of the portfolio literature, Read and Cafolla (1999) based their portfolio assessment work on a constructivist theory which "views the learner as actively engaged in the construction of his or her own representations of knowledge" (p. 98). They found that creating professional portfolios requires pre-service teachers to "engage in self-reflection as they select performance items for their portfolios" (p. 99) and is a means for them to provide evidence that they have met national and state professional education standards. Read and Cafolla also found that standardized and criterion-referenced tests fail to reflect the actual learning that takes place during instruction in teacher education. They describe the computer software and hardware used for successfully producing multimedia portfolios in pre-service teacher education programs.

Hartnell-Young and Morriss (1999) offer help to teacher educators interested in digital portfolio development. Their textbook is designed to help teachers "understand ways in which technology can assist them to record and communicate their professional achievements, and how they can share what they have learned with students to help them unlock the secrets of multimedia" (p. 3).

Holt and McAllister (1999) provide a research base for their work with electronic portfolios. They describe the implementation and evaluation of a five-year project with electronic portfolios for pre-service teachers linked to the electronic folders developed by students that feature the accomplishment of some of Florida's Sunshine State Standards (1996). They provide details on how computer software for language arts, mathematics, and science was successfully employed in school-based professional development classrooms through collaboration between a school district, university teacher education program, and business partners.

PROJECT OVERVIEW

The Technology 2000 project was collaboration between the University of North Florida, the Chets Creek and Lone Star elementary schools of the Duval County Public School District, and Logical Business Systems, an IBM business partner. The project was designed to improve teaching and learning through the use of educational technologies.

PROJECT PARTICIPANTS

Participants in the project included a University of North Florida professor who served as project supervisor, a business partner technology trainer; five University of North Florida pre-service teachers, five directing teachers from Chets Creek and Lone Star elementary schools, two school principals, a media specialist; and 110 students from three first-grades, a third-grade, and a fifth-grade classroom.

PROJECT FOCUS

The Technology 2000 project provided five participating pre-service teachers with the educational technology skills necessary to excel in a learning community. Through the project learning activities, they developed the ability to not only use computers and related technology for word processing and recordkeeping of student achievement, but also to use computers and multimedia tools to significantly enhance classroom instruction and student learning.

Participants in the project learned to use multimedia technology, including laptop and desktop computers, scanners, digital still cameras, and video cameras for creating presentations and for instructional activities. They learned to use software, courseware, and related technology-based materials available at the schools for classroom instruction, assessment, and evaluation, with an emphasis on IBM's Teaching and Learning with Computers (TLC) approach to instruction. They became knowledgeable about available technologies for use with a single computer to present whole-class instruction, while successfully conducting technology-infused lessons. They used PowerPoint to create instructional materials that incorporated text, video, sound, and graphics. They used instruction and assessment strategies to assist P-12 students with the creation of electronic folders using PowerPoint.

TECHNOLOGY TRAINING

Enhancing classroom teaching and learning through the use of technology encompassed the following ideas and concepts:

1. Using technology to present subject area curriculum to students in an innovative, dynamic manner.

The teaching interns learned to use multimedia computers along with projection devices to display images from their computers onto larger screen classroom televisions. They learned to review the existing software and resources in the school to find computer-based lessons that would enhance or supplement the lessons they were teaching. They learned to use PowerPoint to create their own supplementary lesson materials. They learned to integrate the technology with their traditional instruction by presenting the lessons to the class using the projection devices. They learned to use this method of instruction as a means of teaching their students as a group how to use PowerPoint and other curriculum-based software. This reduced the amount of time needed to work individually with the students to teach them computer basics, and allowed students more time to actually work and create products on the computers.

2. Using carefully chosen computer-based lessons to supplement and reinforce traditional instruction.

The interns learned to integrate the technology with traditional instructional methods by creating a variety of cooperative and independent learning centers in the classroom that included computer-based lessons and activities, as well as other "off-line" activities, all based around the goals and objectives for the lesson being taught. These learning/activity centers supported different student learning styles cross-curricular unit lesson planning, and encouraged alternative assessment methods, including the development of electronic student folders. Interns also learned how to organize student groups and manage the movement of these groups through the centers so that every student experienced the learning environment at each center. The technology became an integral part of the classroom instruction rather than a rewards-based, add-on for students who had finished all of their other work.

3. Using technology to document learning in electronic portfolios and electronic folders.

Interns learned the basics of PowerPoint so that they could teach their students to create simple electronic folders containing text, graphics, and sound that documented the learning that had taken place during the unit as a culminating activity. Each intern used his/her knowledge of PowerPoint to create an electronic portfolio that contained text, graphics, and sound; documented their experience with the project; and included selected samples of electronic products from their student's folders. They learned how to use technology resources, including scanners, digital cameras, the Internet, clip art, and video cameras, to highlight and bring to life their electronic portfolios.

4. Using technology as an alternative assessment method to assess and document student learning and progress.

Interns learned to use product-based assessment methods to evaluate student progress and learning during the learning center activities and through the production of electronic portfolio products.

5. Directions for interns in the classroom.

The interns identified an organizing theme for their unit lesson projects and the curriculum areas they chose to highlight. They identified the appropriate hardware and courseware/software resources that were available (such as computers, projection devices, scanners, digital cameras, curriculum-based software, and presentation software (to create unit lesson plans that encompassed whole-class computer presentations, computer, and off-line learning center activities. They divided their classes into student groups for participating in the learning centers and creating electronic folders. They presented their unit lessons. They had their students use the computer resources to create electronic folders to document their learning of subject matter and newly acquired technology skills in creative ways with text, graphics, and sound. The interns used the computer resources themselves to create electronic portfolios that documented their participation and experiences with the technology integration process and included examples of the products produced by their students as evidence of product-based assessment.

ASSESSMENT IN THE TECHNOLOGY AND LEARNING PROJECT

One of the primary premises behind the project was that networked computers should be an integral part of teaching and learning activities in the classroom. Students worked in pairs, small groups, or large groups in a variety of learning centers (including computers) whose content was based around a specific concept.

Teacher evaluation was integrated as well and included not only a graded assessment of the various product outcomes from the centers (electronic portfolio being one of them) but also assessment based on observation of the learning process. This included teacher observation of such things as teamwork, group cooperation, following of directions, behavioral habits, and so forth. The teacher's role in assessment was ongoing throughout the project and included process and product rather than focusing simply on the final product outcome. The teacher was a guide, facilitator, observer, and evaluator. The student was an active learner as an individual first but ultimately as part of a team of learners.

In this project the pre-service teachers' assessment rubrics were created in advance and included giving points/credit for reaching individual goals in regard to timeliness of completing tasks, individual behaviors in learning center activities, correctness and completeness of work, as well as points/credit for the timeliness, behavior, and final product outcomes of the whole group. All points throughout the work of the projects were totaled for the final grades. The pre-service teachers charted observations and comments regarding the performance of their students during the project. These were combined with the product outcome evaluation to produce the final assessment of student work.

ILLUSTRATIONS FROM A SAMPLE ELECTRONIC PORTFOLIO

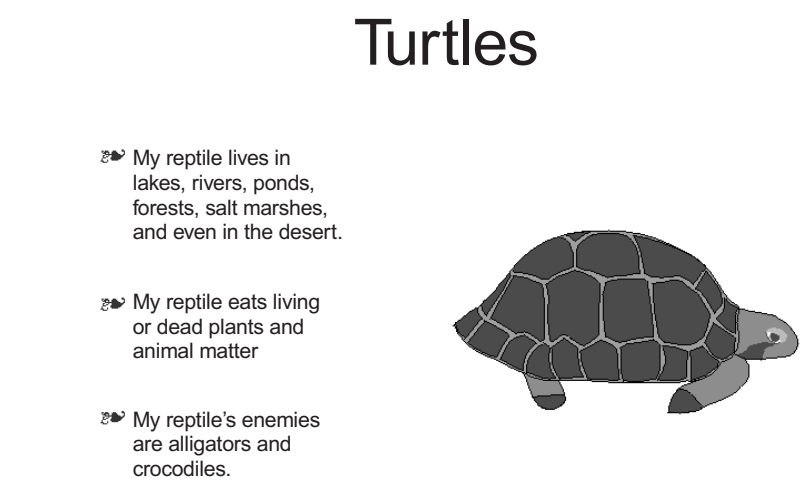
Illustrations from an electronic portfolio provide evidence that students learned the content they were taught and knew it well enough to organize the concepts into a main idea with supporting details using the computer and PowerPoint software. During the unit, the first-grade students learned about reptiles using books, lectures, PowerPoint presentations, Windows on Science lessons, and actual hands-on learning experiences. The students' last assignment during the unit was to write a report on a reptile of their choice. Once the reports were completed, the

students typed their reports into a PowerPoint slide. Finally, the students added a graphic to their slide. The students saved their slides to the school network, which then were imported into the electronic portfolio. The following is a slide illustration of student work:

Figure 1 provides the student's information on the habitat of turtles, their diet, and predators. The clip art added illustration for the information. Sound effects, including applause, were included in the electronic portfolio for interest and dramatic effect.

The electronic portfolio provided evidence that students could reproduce their learning at the application level and present it in a totally different format on the computer, using original words and illustrations to document their knowledge. The electronic portfolio proved that students could use the technology (computer, keyboard, and mouse) effectively to complete a task. It also showed that they learned the software sufficiently to be able to produce, format, and edit text on the computer and select and manipulate graphics to illustrate their work. The electronic portfolio was also a valuable learning experience for pre-service teachers, who learned how to create and share instructional presentations using PowerPoint. They also learned how to import graphics and other slides into their electronic portfolios.

FIGURE 1. Example of Electronic Portfolio for Use in Student Assessment



OUTCOMES

Each intern involved in the project presented lessons to his/her respective students, using educational technology resources within the framework of Teaching and Learning with Computers. They created a personal electronic portfolio with PowerPoint, providing information on their intern experiences and displaying examples of technology-based products that their students produced. They facilitated the creation of student electronic folders that displayed knowledge of language arts, mathematics, and science subject matter, and evidence of newly acquired educational technology skills. They developed diagnostic and prescriptive lessons that included educational technologies as instructional and assessment tools. They also created digitized photographs and video clips of their teaching and learning activities using a variety of educational technologies.

ASSESSMENT, REFINEMENTS, AND CONCLUSION

Participants in the project completed an assessment by answering four questions: How did the project work? What worked well? What went wrong? What were the surprises?

1. How did the project work?

The pre-service teachers responded that the technology project worked very well. They learned a lot about using PowerPoint to enhance their teaching and to master technology skills. They suggested more time for doing the project would be helpful, perhaps by beginning the training earlier in the semester. They found that their directing teachers were very supportive and helpful as they knew PowerPoint and could help facilitate the development of the student's electronic folders.

2. What worked well?

The projects worked well because the pre-service teachers carefully organized their units of instruction to achieve goals for mastering the technology they were learning. The organization of students into small groups helped develop a team approach completing the learning tasks. They were able to share information and computer skills with one an-

other. Working on the computer motivated the students to learn the subject matter in a highly engaging manner.

3. What went wrong?

The biggest problem was that the pre-service teachers could not fit enough information on their floppy disks. It was determined that Zip, Jaz, or CD-ROM disks should be employed in the future. It was difficult to decide what to eliminate from the projects as all participants had worked so hard to produce them. Spring term testing of students consumed a lot of instructional time. Another problem developed when one piece of software used in the instruction phase would not easily import into PowerPoint.

4. What were the surprises?

First grade students who were reluctant writers with a pencil readily expressed themselves via the computer. Some exceptional education students initially perceived to be unable to successfully complete the project did as well or better than the regular education students. The novelty, creativity, and variety of learning styles incorporated into the project were believed to contribute to this outcome.

Elementary school students were capable of completing the project with a minimum of actual computer skills being taught. Participants were pleasantly surprised at how readily students acquired the ability to use the educational technology, leaving more instructional time to concentrate on the acquisition of subject matter content. Floppy disks would not hold a lot of multimedia. It was a pleasant surprise for participants to learn how user friendly PowerPoint could be as a tool for creating electronic portfolios and student folders.

REFINEMENTS

The participants believed that there would be value in refining the assessment checklists and rubrics for use in the evaluation of learning-centered projects, electronic portfolios, and folders. The assessments could then be adapted as needed to fit particular grade-level and subject matter needs.

It was agreed that the necessary computer equipment and software for the development of the project should also be provided at the university. The participants believed that the resources available at various schools will vary and that, while some are adequately equipped, others were less so. Having the resources for the project at the university would equalize the opportunity for all participants regardless of their individual school circumstances.

CONCLUSIONS

The professional portfolio is an excellent tool for assessing pre-service teachers understanding and skill to reflect on their own teaching and for providing evidence of their ability to facilitate student learning through the appropriate uses of the computer. The electronic portfolio is an effective means by which educators at all levels can demonstrate that educational technology can improve the quality of education for all students. The creation of electronic folders provides an effective means through which students can display their understanding of subject matter and their skillful uses of the computer to apply what they have learned.

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