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ABSTRACT

This chapter is part of a book that recounts the year's work at the Early Childhood Development Center (ECDC) at Texas A & M University-Corpus Christi. Rather than an "elitist" laboratory school for the children of university faculty, the dual-language ECDC is a collaboration between the Corpus Christi Independent School District and the university, with an enrollment representative of Corpus Christi's population. The chapter describes a project at the ECDC to develop standards for the integration of technology into the school curriculum. The standards were synthesized from teacher concerns, examination of instructional materials, and review of national and Texas Essential Knowledge and Skills (TEKS) state standards. The project resulted in several products, including a set of tables describing each TEKS technology strand, corresponding performance objectives or tasks for each grade level, suggested student activities from thematic units, and required software. (EV)

Chapter 12

Developing a Curriculum Framework in Technology for Young Children

Stephen Rodriguez
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Technology in Early Childhood Education

Many educators believe that computers and other instructional technologies hold great potential for enhancing school learning. However, successful and appropriate uses of technology in the schools are often hampered by a number of factors. How prepared are teachers to use technology effectively? What technology skills should students acquire? How might those skills relate to the traditional curriculum? These questions were examined in a research project that focused on early childhood education. The context for the project was the Early Childhood Development Center (ECDC) at Texas A&M University-Corpus Christi (TAMUCC). The university's College of Education and the Corpus Christi Independent School District (CCISD) operate the school in partnership. Staffed by CCISD teachers, the school presently serves students at the prekindergarten through third grade levels.

Components of a Technology Framework

In initiating this project, the researchers first sought to identify the components of an effective technology framework. As a result of the research, three products were developed:

1. Scope and sequence documents that indicate computing competencies students are to acquire by grade-level
2. Tables organized in four technology strands that explain each strand and provide detailed descriptions of student tasks, related student activities, and germane software
3. A teacher handbook, which provides examples of curriculum-based, technology-oriented activities that a teacher can conduct with students.

As a follow-up to the project, the second author provided training to the ECDC teachers. This training focused on the development of the technology skills teachers required to follow through on implementation of the student technology standards established under the project.

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Criticality of Planning for Technology Use

Using instructional technologies (IT) to improve young children's learning in the schools is not a simple matter. Rather, like any major social innovation, adoption and use of IT by teachers is a complex, multifaceted, and lengthy evolutionary process.

One is also cautioned to remember that technology is a means—a tool that must be used thoughtfully and in planned ways. Providing hardware and using technology are not end results in and of themselves:

> Technology alone cannot improve teaching and learning . . . Technology use must be grounded firmly in curriculum goals, incorporated in sound instructional process, and deeply integrated with subject-matter content. Absent this grounding, which too often is neglected in the rush to glittery application, changes in student performance are unlikely (Baker, Herman, & Gearhart, 1996, p. 200).

Clearly, planning how to integrate uses of technology into the school curriculum has emerged as a critical issue. Growth of the Internet and the World Wide Web, advances in digital video technology, and the introduction of alternative, affordable storage media such as "write-able" CD-ROMs all add to the challenge of successfully integrating technology in today's school curricula.

The present project entailed development of student technology standards. These standards represent a major component of an evolving plan to bring about meaningful, sustained uses of technology by teachers and students in the ECDC School.

Constructivism and Technology Use

Constructivist conceptions about human learning have emerged in the literature and at professional conferences as a central theme associated with technology use in the schools. The constructivist view holds that learning and knowledge construction are grounded in meaningful experience and individual meaning-making. Jonassen (2000) asserts that students do not learn anything, per se, from computers. Instead, he argues that teachers should use computers to

engage students in thinking meaningfully and representing their knowledge. Under this view, "...the most effective uses of computers in classrooms are for accessing information and interpreting, organizing, and representing personal knowledge" (p.4) rather than for studying traditional instructional software. Constructivist approaches are also applicable in regard to instructing adults about technology (Rodriguez, 1997).

Whereas the constructivist view holds appeal for many, most educators recognize that constructivist approaches must be balanced with more traditional instructional strategies, including direct instruction. Educators should thus strive to balance use of commercially produced software with more constructive activities involving analysis and display of data, communication between people, and development of multimedia and web-based products, among others.

Method

In initiating this study, the researchers first obtained approval for the project from the individuals responsible for directing and administering the ECDC School. Subsequently, the researchers visited the ECDC School. At this early meeting, they met with teachers and reviewed the current school curriculum. The teachers were greatly concerned about how to match the use of technology in thematic units with the school district's local standards, which had a technology element.

The researchers also reviewed various instructional materials currently being used with students. The intent was to identify specific components of the curriculum that would lend themselves to the use of computing technology by students.

The researchers also obtained and reviewed various student technology standards, which are discussed in the next section of this chapter. Based upon these reviews, they developed a synthesis of standards based upon the unique needs, curriculum, and student and teacher characteristics of the ECDC School. These served as the basis for other project components.

Throughout the course of the project, the principal and teachers of the school were consulted. Teachers were given drafts of various project documents and provided feedback and suggestions. The

principal supported the need for a scope and sequence document; this support was critical to the successful completion of the project. Equally critical was the feedback that teachers provided, especially with regard to the overall question of how to integrate technology within the existing curriculum.

The Search for Technology Standards

It is one thing to want to use technology with students. It is quite another to determine which body of skills and knowledge should be covered, and at what grade level. In order to derive a useful and appropriate set of standards for young children, the researchers reviewed accepted national, state, and local technology standards.

Those first reviewed were the International Society for Technology in Education (ISTE) National Educational Standards for Students, first published in 1998. These standards, representing a synthesis of responses from many groups and individuals across the country, are organized into six strands, with goals identified for each strand and performance indicators identified for each goal. The standards address the following areas:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communication tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

Once national standards had been identified, the authors turned to the Texas Essential Knowledge and Skills (TEKS) for technology, also known as the TEKS for Technology Applications (Texas Education Agency, 2001). They can be used by school districts to focus the attention on teaching and learning of technology skills. The overall purpose is to promote students' lifelong learning as citizens in a technological age. The immediate goal is to give teachers support for using technology in their curriculum by outlining clearly defined goals.

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promote students' lifelong learning as citizens in a technological age. The immediate goal is to give teachers support for using technology in their curriculum by outlining clearly defined goals.

The TEKS address the acquisition of technology application skills as a continuum, progressing from the elementary to twelfth-grade level. The technology TEKS are organized by benchmarks, not by grade level, thus giving some flexibility in the way school campuses can achieve the goals over a three-year period. Students are expected to demonstrate targeted proficiency levels before exiting second-, fifth-, and eighth-grade. Embedded within the grade clusters are four strands, or levels, with appropriate student expectations in skills and knowledge for each strand.

The first strand is the Foundation Level, which compares directly with the ISTE standards Basic Operations and Concepts level. At the Foundation Level of the Texas Technology TEKS, the students are expected to demonstrate knowledge of hardware components. Specific skills at this level include using the correct and appropriate input and output devices, demonstrating keyboarding skills, navigating successfully within the desktop, saving files, and using peripherals. Also in this strand, the Texas technology standards address social, ethical, and human issues related to technology use. Related examples include following the school district's Acceptable Use Policy and displaying respect for intellectual property.

The second strand, the Information Acquisition Level, requires students to gather varieties of information from electronic sources. This involves performing keyboard searches and navigating successfully to access information in text, audio, video, graphical, or combined modes. Students must gather the information; they must also evaluate the relative success of the search and the credibility and usefulness of the acquired information.

The third area targets Problem-Solving. Here the students are expected to create and modify problem solutions, using software to incorporate audio, video or graphic components. At this level, students also conduct research using electronic tools in order to justify the recommended solution. The students should generally be able to use word processing and multimedia software to explain ideas and to solve problems.

The fourth strand is the Communication Level. Students should be able to present audiovisual information using appropriate fonts,

graphics, and color, all of which are geared to enhance communication. Other communication skills and knowledge include suitable printed output, consideration of monitor displays, video presentations, and use of electronic mail. The expectation is that the student should select appropriate applications in order to facilitate and evaluate communication.

The teachers at the ECDC were aware of the Texas Technology TEKS, but were more concerned about meeting the standards that had been set by the school district. CCISD's standards are presented in *Real-World Academics Standards: Standards for the New Millennium Pre-K Grade 6* (2000). Once again, elements of the national standards and the requirements of the state standards can be detected in the district's standards.

The CCISD's standards did not give a specific scope and sequence of skills that should be taught at different grade levels. Such a tool could prove useful to teachers when integrating technology within the curriculum because it would reveal levels of expected skill accomplishment.

Products Resulting from the Project

Overall, national, state, and local standards are fairly consistent. So the authors synthesized them to derive a coherent set of technology standards for teachers and students of the ECDC school. These were captured in a scope and sequence document, which provides a specific skills list by grade level. Major skill areas include Computer Familiarity, Keyboarding, Word Processing, Draw Applications, Desktop Publishing, Database Environment, Spreadsheet Environment, Telecomputing, Multimedia, Computer Simulation, and Computer Ethics (Williams & Rodriguez, 2000).

A set of tables was produced to demonstrate how the curriculum, the Texas Technology TEKS, and the ECDC technology scope and sequence could be merged to produce learning activities for the ECDC students. Each Texas Technology TEKS strand was described and then a number of tasks, or performance objectives, were listed for each grade level within the strand. A variety of student activities from the grade level thematic units were matched with each task, and the required software was listed. Examples of these activities are shown in Table 1. This was done for each strand and grade level. The teachers

could see examples for their own grade level, They could also use the tables for ideas and look across grade levels to see the desired progression (Williams & Rodriguez, 2000).

Table 1

Sample Scope-and-Sequence Activities Keyed to Texas Technology TEKS

Strand	Grade Level	Task	Student Activity	Application
Communications	PreK 3	Introduce concept of print and drawing as a form of communication.	Students draw and write on the screen and then explain their ideas to peers or other designated persons.	KidPix
	PreK 4	Show that graphics can tell meaning.	Put together a sequence of pictures showing firemen going to the fire and putting fire out.	
	Kindergarten	Understand that large, bold print is designed to attract attention.	Study newspapers and notice headlines.	Claris Works
	First	Send e-mail messages to known respondents.	Open Internet browser and send email message previously prepared	Netscape Navigator
	Second	Post message on an electronic bulletin board.	Subscribe to NASA and ask experts for information concerning class assignment.	Netscape Navigator
	Third	Determine when Internet search may be effective.	Use the download facility and then find the downloaded material for use. Discuss the concept that using a book or a CDROM, already available in the classroom may be more effective, and quicker than logging on to the Internet and then locating information.	Netscape Navigator Grolier Encyclopedia
	Fourth	Access and navigate web sites.	Integrate the thematic units with Internet searches and CDROM searches.	Netscape Navigator
Strand	Grade Level	Task	Student Activity	Application

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Foundations	Pre K3	Introduce basic terms: monitor, keyboard, mouse.	Obtain old computer that can be broken down and rebuilt.	Computer
	Pre K4	Identify technology uses at work and at play.	Tour school to locate computers and their use.	Local School
	Kindergarten	Demonstrate correct care and use of computers	Show touch fingering and controlled mouse clicking	KidPix Broder bound stories
	First	Key words and sentences using a word processor.	Participate in group writing of story; the story started by one group that leaves the computer after writing, then next group comes to read the story so far and continues.	KidPix Claris Works
	Second	Understand important issues in an information technology-based society.	Discuss any newsworthy issues regarding information technology e.g. hacking into networks.	Search Internet with Netscape and Internet search engines
	Third	Recognize that Copyright Law protects what a person, group or company has created.	Tell why it is against the law to make a copy of copyrighted software. Role-play situations that involve illegal copying of another person's computer work or software.	
	Fourth	Demonstrate proper keyboarding techniques for keying all letters.	Word process a paragraph using proper keyboarding techniques; edit the paragraph, save changes, print out.	ClarisWorks Children's Learning Center Storybook Weaver Deluxe

Strand	Grade Level	Task	Student Activity	Application
Problem Solving	Pre K3	Develop awareness that technology has a function and a place.	Students to be shown various forms of technology and to develop an understanding for their use. Hardware such as TV, digital camera, and computers can be studied. Students can offer their use.	ClarisWorks
	Pre K4	Discuss how technology helps people.	Teacher demonstrates use of computer to write a letter, or a newsletter, for home.	ClarisWorks
	Kindergarten	Collect data and graph the data to help with problem solving.	Collect information on number of students who ride the bus compared with those who ride in a car. Graph data to see if the school needs more parking spaces for buses or cars.	ClarisWorks KidPix Graph Club
	First	Data base library books in class.	Tracking class library books, a problem which can be addressed by building a database of books and then keeping record of borrowers. Simple two-field data base, which can grow as students become accomplished.	Claris Works
	Second	Use simulation software.	Model a town using boxes and other junk, then use SimTown to model the town and compare the differences and the similarities. Notice how the software can enhance the simulation.	SimTown
	Third	Use telecommunication for research into nature of problems and possible solutions.	Use newsrooms and BBS for support with ways to create more wildlife habitat within city e.g. Texas Parks and Wildlife website.	Netscape Navigator
	Fourth	Record and communicate information regarding a problem.	Work with groups to solve a problem. Post problem and solution for other groups to consider.	ClarisWorks
Strand	Grade Level	Task	Student Activity	Application

Information Acquisition	Pre K3	Tell a short story.	Teacher transcribes story to computer for possible email letter to electronic pen pals.	Netscape Navigator
	Pre K4	Group items by different attributes using manipulatives and/or software.	Students click on shapes and colors and put into sets by dragging shapes or drawing created by teacher.	ClarisWorks
	Kindergarten	Select software from the Launcher that will provide the information needed.	Select from the teacher-made multimedia profile student of choice. Click on sound clips telling more about the student.	HyperStudio
	First	Participate in the creation of a class multimedia sequential/ linear story.	Develop multimedia story from paper storyboard.	HyperStudio
	Second	Collect, sort and organize information to display as a graph or chart.	Collect birthdays, days, colors, favorite pets and record in database. Present information in the form of a chart or a graph.	ClarisWorks
	Third	Evaluate the success of strategies used to acquire information.	Evaluate the material found before printing or using. Download useful and appropriate graphic material.	
	Fourth	Describe examples of people using computers to access information in daily life.	Using email or postal service, write to a variety of previously contacted technology-using workers. Visit one nearby office and write up visit using slide show presentations with digital photographs.	Netscape Navigator ClarisWorks

Finally, the teacher handbook provides examples of curriculum-based, technology-oriented activities that teachers can conduct with students. Activities described in the teacher handbook are aligned with both the derived technology standards and the overall school curriculum.

Closing Thoughts

The present project represents an important step in the evolution of technology use in the ECDC School. Follow-through on the work accomplished under the present project will be critical. Regular contact with teachers of the ECDC School and the provision of related training will be essential in order to establish sustained use of the recommended student standards in technology.

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