Chapter 9
Science Technology and Young Children

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ABSTRACT

Teachers of young children have access to an ever increasing diversity of technology tools. This chapter provides a framework for evaluating and applying tools for science in all classrooms. It includes a series of vignettes that illustrate the application of technology in the context of a tools-task-strategy approach.

INTRODUCTION: TEACHING TOOLS, OR TEACHING THINKING?

Early childhood and primary level science teachers, especially novice science teachers, are confronted with a number of challenges when they try to integrate technology into the classroom. Sometimes the tools that they have are not appropriate for young children. Sometimes the tools that they have are not appropriate for anyone - they are obsolete hand-me-downs, computers and software passed from upper grades to the earlier ones. Fortunately, partly due to the reduction of costs of computers, school districts are beginning to equip early grades with computers that are of recent vintage. Even when the computers or other technology tools available are modern and grade-level appropriate, how can they best be used? Where can a teacher turn for ideas, for training, and for high-quality, teacher-tested strategies, for curricula that incorporate technology effectively?

The sustainability and fidelity of high-quality curricula in the classroom is not a new problem. In 1994 George W. Tressel, former head of the National Science Foundation's (NSF) programs on public understanding of science and pre-college curriculum development wrote a bleak assessment of the impact of NSF educational program interventions on improving science education. He noted that the NSF and other agencies had

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spent billions in public expenditures and made little change in individual classrooms. Among the statements that he made in this key critique of science policy were: *"...after 30 years, there remains a wide gap between the massive scale of U.S. science education problems and the limited impact of most NSF projects*" (Tressel. 1994, p77). "*Three decades have seen little change in typical classroom practice and little overall impact on the average student*" (p84), and "*Teachers are still intimidated by the time, content and preparation demands of hands-on learning*" (p84).

A generation of students has started and finished school since Tressel wrote this bleak assessment of science reform in the United States. Despite the passage of years and the best efforts of well-meaning professional development programs, hands-on, inquiry-based instruction is still a pedagogical technique that is under-utilized. Tressel's quote that "*teachers are intimidated by the time...demands of hands-on learning*" is still a concern of educators today. The sad truth is there are wonderful inquiry-based curricula available, but that they too-often sit on the shelf because classroom teachers are not prepared to implement them effectively. The same can be said for technology tools in the classroom. One approach has been to purchase and implement a 'one-stop shop', a turn-key technology solution provided by a major provider, whether it is a textbook company, a computer products company, or a science supplies company. It simplifies the implementation for the school, but it includes a new set of hidden costs - it ties the teacher (and the school) into a single path, creating a form of 'product tunnel vision.' The school becomes increasingly connected to one product line, and it becomes less and less likely to explore diverse solutions that may present themselves in the fast-changing world of technology. Despite what the marketing representatives say - or even this author - there is no single product line or approach that has all the answers. A better solution is a well-developed campus or district committee that re-visits and renews the options available on a regular basis and involves the individual teachers in the use of tools and technology strategies. That is the most profitable answer to the question, "*where does a teacher turn to for high-quality curricula that effectively integrate technology*?" High quality curricula and training in their use are available from the NSF, from educational foundations such as the Concord Consortium, from private-public partnerships such as Thinkfinity or from educational development laboratories such as the Southwest Educational Development Laboratory (SEDL), but access to any curriculum is less important than the context in which it is used. Technology integration is most effective when the school collaborates internally to make the most of their technology resources, and when it works with the community to seek out training and support the needs of their teachers and students. George Tressel's concern about the lack of change in classroom practice is valid: although the resources for change can be provided from without, real educational transformation in science and technology must occur from within.

My belief that teachers are both the solution and the obstacle to implementing technology and science in the United States has influenced my decision to write this chapter. I have always had a strong sense of inquiry and interest in learning. I am currently a researcher but have teaching certificates in Composite Science, Life/Earth Science, Art, Dance, Theatre Arts and Geography and an endorsement in Gifted Education. I am currently a professor of technology and science education at the University of Texas. I strongly believe that our issues in science and technology are in part influenced by the environment of consumerism in the United States. We always seem to be looking for a quick fix to issues related to education and teacher training.

This chapter focuses on ways to assist that kind of engaged and active campus planning team - and provides advice and suggestions for the individual teacher who may or may not benefit from the resources that an effective support structure may