Principles to Guide the Integration and Implementation of Educational Technology

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INTRODUCTION

The Educational Technology Integration and Implementation Principles (eTIPs) are six statements that describe the K-12 classroom and school-level conditions under which the use of technology will be most effective. The eTIPs are an example of materials that can aid teachers in designing instruction and participating in creating supportive conditions for technology supported classroom instruction.

BACKGROUND

During the last decade, the call for teachers to be better prepared to teach with technology (CEO Forum, 1999, 2000; Office of Technology Assessment, 1995) has been repeated several times. In response, there are now standards in place to which new teachers are being held that explicitly describe the technology skills all teachers should have to be prepared to teach in a 21st Century school. These include the National Education Technology Standards for Teachers (ISTE, 2000), which were adopted by National Council for Accreditation of Teacher Education (NCATE) as a part of its accreditation requirements, and the Interstate New Teacher Assessment and Support Consortium standards (INTASC, 1992) used by many states as licensing requirements. In general, these standards call for teachers to be able to use technology in the classroom to plan and design learning environments and experiences, and support teaching, learning, and the curriculum. These standards, in turn, imply that teachers must make the consideration of technology use a routine part of their instructional decision making.

Teachers' decision making has been defined as the course of action during which teachers gather, organize, and interpret information, generate alternatives, select a specific course of action, and, after its implementation, consequently evaluate the effectiveness of the decision (Clark & Yinger, 1977; Lipham, 1974). The research literature emphasizes how critical teachers' planning and interactive decisions are in determining what they do, or do not do, in the classroom (e.g., Clark & Yinger, 1977; Jackson, 1968; Peterson & Clark, 1978; Shavelson, 1976). Shavelson and Stern (1981) posit that teachers' decision-making processes are influenced by schemata that are activated from memory.

MAIN THRUST OF CHAPTER

The Educational Technology Integration and Implementation Principles (or eTIPs) are one example of a set of statements that could serve as a schema, or the basis of a schema, for a teacher to organize his or her instructional decision making about the integration and implementation of technology. Principles can assist learners in recognizing and connecting ideas and in seeing how new and old ideas relate (Marzano, 2001), which are key tasks in developing the more elaborate schemas that are characteristic of expert teachers (Carter, 1990; Fogarty, Wang, & Creek, 1983; Kagan, 1992). The six eTIPs summarize what research suggests are the conditions that should be present in order for educational technology integration and implementation to be effective (Dexter, 2002), while offering the advantage of brevity over the 23 NETS-T standards and the five technology-specific statements in the INSTASC standards.

These eTIPs are organized into two dimensions: classroom and school-wide. The classroom principles expand upon the premise that effective technology integration requires the time and attention of teachers in the role of instructional designers, planning the use of the technology so it will support student learning. They assume that educational technology does not possess inherent instructional value but that a teacher must design into the instruction any value technology adds to the teaching and learning processes. Thus, the three classroom eTIPS prompt a teacher-designer to consider what he or she is teaching, what added value the technology might bring to the learning environment, and how technology can help to assess student learning.

Classroom-Level eTIPs

eTIP 1: Learning Outcomes Drive the Selection of Technology.

In order for learning outcomes to drive the selection of technology, teachers must first be clear about their lesson or unit's student-learning outcomes. This is an important first step in determining whether or not the educational technology available can be a support to teaching and learning. It will allow teachers to be more efficient as they search for available, appropriate technologies because they will quickly eliminate those that do not support their learning outcomes. Where technology does seem to support learning outcomes, teachers must also consider the cognitive demands made by the technology and if they are well-suited to the cognitive demands inherent in the learning outcomes. For example, if a learning outcome asks students to analyze or synthesize information, a drill and practice program or reference material on a CD-ROM probably isn't going to match as well as concept mapping or database software.

eTIP 2: Technology Use Provides Added Value to Teaching and Learning.

Using technology to add value—meaning to make possible something that otherwise would be impossible or less viable to do—might mean that it helps to individualize instruction or make it more responsive to a student's questions and interests or that it provides additional resources of information so instruction is more real-world, authentic, and current. Educational technology can also aid teachers in providing "scaffolds" that support learners as they move from what they already know and can do to what they are learning. Educational technology can also help teachers to create social arrangements that support collaborative as well as independent learning by facilitating communication and interaction patterns. Teachers can also use educational technology to support additional opportunities for learners to practice, get feedback, or allow for revision or reflection; thus, it supports knowledge acquisition and practice, so learners become more fluent in their knowledge.

Educational technology can aid students accessing information or representing it in new ways. It can increase access to people, perspectives, or resources and to more current information. Many times, software's interface design allows learner interaction or presents information in a multi-sensory format. Hyperlinks can allow learners to easily connect to related information. Built-in indexes and key word searching support learners by easing their search through a large amount of information to find what is relevant. These features all add value by increasing access to data or the users' control during that access. In terms of processing information, added value might mean that the educational technology supports students learning-by-doing or aids them in constructing mental models, or making meaning, by scaffolding their thinking. For example, a database can allow students to compare, contrast, and categorize information through query features. By asking students to create products with tool software, it requires them to think more deeply about the material in order to represent it with that tool (Jonassen, 2000). Educational technology can also add value to students' ability to show and articulate to others about what they have learned.

eTIP 3: Technology Assists in the Assessment of the Learning Outcomes.

At times, teachers will want to collect and return to students formative data, to let them know about their learning progress. Some software or hardware actually collects formative data during its use, and some technologies also provide help in the analysis of the information. Generally, these are software programs designed to assess student learning, such as tutorial or drill and practice software. Some of these programs, through screens or printouts of information, or other feedback mechanisms, support students' self-assessment of their learning.

Teachers will also want to collect summative information about students' achievement of the learning outcomes. Technology can assist teachers in collecting data that will help them understand how students are meeting or have met the learning outcomes for that lesson or unit. Products students produce through software, whether a database, "mind map," multimedia or word-processed report, or a Web site, demonstrate what they have learned about both the content of their product, the procedural knowledge required to produce it, and their ability to communicate. The capabilities a product might demonstrate include the skills of editing, analysis, group collaboration, or the operation of the software itself.

School-Level eTIPs

Part of what makes teachers' integration activities feasible or not is the level of technology support at a school. The three school-wide principles elaborate upon the premise that the school environment must support teachers in a role of instructional designer by providing adequate technology support. The presence of high-quality technology support programs are correlated to teachers' increased uses of educational technology (Dexter, Anderson & Ronnkvist, 2002). Thinking about the school-level