Barriers to Curriculum Technology Integration in Education

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Recommended Citation

Many barriers have been placed in the path of school curriculum reform involving technology. This article focuses on eleven of these barriers and provides workable recommendations for ameliorating them.

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Barriers to Curriculum-Technology Integration in Education—Are You Asking the Right Questions?

A survey 1988 of school districts across American highlighted numerous success stories about integrating technology into the fabric of teaching and learning (OTA). A follow up study by the Office of Technology Assessment reiterated the same heroic theme, but emphasized a growing concern about the lack of wide-scale adoption of technology into classrooms (1995). Numerous heroic efforts of teachers empowering students with the new technologies vital to human survival in the evolving global economy have been documented (*Business Week*, 1994). Yet it still takes heroic efforts. A central question remains. Why, after several years of heroic efforts and vast sums of money, is the integration of technology into curriculum still dependent on individual heroic efforts?

Individual success stories and heroic efforts of technology are not enough to meet the challenges of preparing students for the 21st century. National, state and local agencies, which govern public school systems throughout the fifty states, must

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make technology integration their top educational priority in the next decade. Failure to do so is to put our nation at risk of losing the economic, political, and social leadership position that it has held in the last century.

Why Are We in Technology-Integration Limbo?

American schools have not embraced technology as a major school transformation tool for a variety of reasons. Lack of leadership within their own ranks, lack of state and national government support, lack of staff development, and lack of money are a few reasons which can be attributed to our current state of "technology-integration limbo."

Fundamentally, lack of systematic technology-integration in American education can be attributed to educators' failure to understand the impact that technology has had on society over the last few decades. Educational leaders at all levels have failed to see the emerging technologies as a second order change referred to by Larry Cuban (1992). In essence, the emerging technologies in business, medicine, military, agriculture, entertainment, religion, etc. have changed the way we communicate, work, play, and make a living in society. Students swim like fish in a sea of technology until they pass through the school door where they become goldfish in a fishbowl. The school landscape is littered with unused technology which failed to be integrated into a meaningful curriculum (Borrell, 1992). One can safely argue that the last sector of society that remains "unwired and unchanged" is public education.

Where Are We?

The heroic efforts of curriculum-technology integration taking place today in schools throughout the United States could be described as "piece-meal" at best. In the last decade, we have argued that a number of leadership strategies must be undertaken to effectively integrate technology into teaching and learning. Strategies such as technology planning (Lumley & Bailey, 1993), technology staff development (Bailey and Lumley, 1994), and technology leadership (Bailey & Bailey, 1994) must become priorities before moving into major curriculum-technology integration efforts.

During this period of time, few materials have surfaced on curriculum-technology integration as a natural flow of the total process of technology planning. This is not to say that computers have not found their way into the curriculum or are nonexistent in the school curriculum. Millions of computers and computer-related devices have been purchased by elementary and secondary schools over the past ten years, but technology remains a curriculum "add on" to a curriculum already overloaded with public agendas.

What Are the Right Questions?

Curriculum-technology integration is complex. The complexity lies in asking the right questions—*not necessarily asking easy questions*. The greatest problem school integration of technology has been the inability to ask the right questions about comprehensive technology integration. To understand the nature of the problem and to ask the right questions, schools must understand the various barriers that block effective curriculum-technology integration.

Barrier #1: Failure to distinguish the computer from the emerging technologies or learning technologies. While computers occupy a central powerful technology position, emerging technologies encompass much more than just computers. They include a wide range of technologies: computer technology—microcomputer, laptop, mainframe, local area networks, wide areas networks; telecommunications technology—online databases, facsimile transmission, distance learning, satellite, cable TV, external networking, microwave, wireless,

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modems; optical disc technology—videodisc, CD-ROM; administrative technology—electronic card catalog, computerized circulation, voice mail, and learning technology—Electronic Teaming, Hypermedia, Multimedia, Electronic Simulation, and Integrated Learning Systems.

The term *emerging technologies* is preferred over the commonly used term computers or *technology*. The term emerging technologies denotes that there are several different types of technology and are evolving into something different, more powerful, more useful than the previous versions (Burrus, 1993).

Failure to embrace all of the emerging technologies has caused major problems for those school districts and sites who are working on technology integration. Many people do not see the computer as anything more than an electronic typewriter which only requires specialized skill training in word processing, spread sheets, and databases. As a consequence, technology is seen as an "add on" to the existing curriculum.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How do should **computers** be integrated into the **existing** curriculum?

Right Question: How should **emerging technologies** be integrated into an integrated, **authentic** curriculum?

Barrier #2: Failure to develop a vision of how technology should be used in all aspects of teaching and learning. Many educational leaders have failed to come to grips with the basic role of technology in teaching and in learning. Developing an understanding of the power and potential of technology in teaching and learning must precede all aspects of curriculum-technology integration (See Bailey & Lumley, 1994). Three interrelated, major questions need to be asked about using technology when developing a vision about technology as a teaching-learning tool:

1. *Should technology be used as an aid to teaching and learning?* By this question, we are asking or implying that technology can be used as enrichment or remediation to our existing curriculum? Viewed in this fashion, technology is a tool for enhancing the existing curriculum (i.e. only doing what we have been doing—only better or more efficiently with technology).

2. *Should technology be taught as a subject?* By this question, we are asking whether technology should be seen as a subject in itself (i.e technology as a part of the curriculum that exists along side the existing academic curriculum) as well as a tool used to learn the curriculum? The current Technology Preparation movements can be viewed as technology-as-subject which is offered with the regular academic curriculum.

3. *Should technology be used as empowerment tool in teaching and learning?* By asking this last question, we are implying that technology is a "tool that students use to learn" rather than a tool that "teachers use to place information in students' heads." Equally important, this question implies that technology can be used to transform the very nature of teaching and learning—*teacher-as-guide while student becomes primary consumer and creator of information.*

Failure to develop a clear vision for the use of technology in teaching and learning means avoiding the right question—what should technology be used for? The inability of educational leaders to ask the right question about the role of technology has led to wide spread retreat of using of technology-as-aid—a tool to enhance current practice.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How do we integrate **computers** into the existing curriculum?

Right Question: How do we develop a vision of maximizing the potential of technology before we focus on integrating technology into the curriculum?

Barrier #3: Failure to prepare and implement district and site technology plans as prerequisites to any curriculum-technology integration activities. A technology plan must be the foundation of curriculum technology integration efforts. The mission, policies, and priorities have to be in place before educators tinker with the "how and where" of curriculum integration (See Lumley & Bailey, 1993). If the school district and sites do not know where they are headed with technology, any kind of curriculum-technology integration effort will seem successful.

Failure to develop comprehensive technology plans leads to automation of past practices—at best. At worst, lack of technology planning leads to a perpetuation of past teaching and learning strategies without the use of technology.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How do we integrate technology into the current curriculum?

Right Question: What kind of technology plan do we need to have in place before we engage in serious curriculum-technology integration efforts?

Barrier #4: Failure to design and implement a technology staff development program as a prerequisite to curriculum-technology integration activities. Once a technology plan is established and monitored on a regular basis, the second major priority must be implementing a technology staff development program (See Bailey & Lumley, 1994). However, the technology staff development program must go beyond any existing staff development program(s) normally found in schools and school districts. A technology staff development program targets all players in the school district as participants—not just teachers. The technology staff development program provides the "big picture" to everyone who impacts student learning—teachers, administrators, board members, and support staff.

The technology staff development plan goes beyond computer skill training such as word processing, spreadsheets, and data bases. It focuses on all the emerging technologies and how they transform the teaching-learning process. In addition, the technology staff development plan must avoid the pitfalls of conventional staff development programs: (1) "one style fits all," (2) "one shot" efforts with no or limited follow-through, and (3) new information without demonstration, practice, feedback, and coaching (Joyce and Showers, 1988). Unfortunately, few comprehensive technology staff development programs are prerequisites to curriculum-technology integration efforts.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How do we integrate technology staff development to impact the current curriculum?

Right Question: What kind of technology staff development program should we develop and implement which will help us determine appropriate strategies for integrating technology into the curriculum?

Barrier #6: Seeing technology integration from "traditional" curriculum leadership perspective.

Traditional curriculum beliefs view computers or technology as new skills to be taught—"added on" to the existing curriculum. This curriculum leadership stance embraces the concept that student outcomes can be identified, isolated, and "plugged in" a scope and sequence chart. "Adding on" to the existing curriculum but not necessarily changing the curriculum becomes the leadership priority.

The emerging technologies allow schools to depart from traditional views of curriculum. If curriculum is a process rather than discrete outcomes, students will engage in authentic questions (i.e. meaningful, stimulating, relevant, worthwhile) which lead to new and exciting ways of learning. Emerging technologies allow educators to see students as entrepreneurs of learning—creating new information as opposed to simply digesting and storing information for later use in life. Emerging technologies allow teachers who become coaches and facilitators of entrepreneur-like learning. Failure to accept a radical transformation away from the traditional curriculum-evaluation paradigm means the end of schools as outlined by Lewis Perelman in *School's Out* (1992). Emerging technologies are wonderful tools for allowing students to move away from facts and memorization to higher order thinking, creativity, and creation (Ross & Bailey, 1995).

The emerging technologies allow us to view curriculum as new information "what could be" and "just-in-time" information when solving problems as opposed to collecting and storing information for obscure reasons. Conventional curriculum leadership focuses the known, not the new and the unknown.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How should we integrate technology into our current curriculum?

Right Question: How can the emerging technologies help us to create a new definition of curriculum?

Barrier #7: Failure to understand the basic differences between information literacy and basic literacy. Conventional curriculum beliefs stress basic skills. Basic literacy deals with core skills that all students need to function daily—reading, writing, and calculating math. Twenty-first century technology-based curriculum retains basic literacy but extends basic literacy to include information literacy. Information literacy is defined as identifying, accessing, applying, and creating information.

This new definition and understanding of literacy also underscores there is an abundance as well as an explosion of information. Advocates of information literacy recognize that information is doubling every two to three years. Finding, using and/or creating new information is and will be the norm; contrasting with memorizing and regurgitating information found in textbooks. The average student will encounter more information in their formal Pre-K–12 school experience than their grandparents were exposed to in a lifetime. It is no longer possible for a student to learn all they need to know in school. The exponential increase in information requires more than memorization—it requires the ability to sort and sift information to find solutions to complex questions. It requires students to be information literate. Information literacy will define successful, productive citizenship in the 21st century.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How should we integrate technology into our current curriculum?

Right Question: How can technology help us teach both basic literacy as well as information literacy in the school curriculum?

Barrier #8: Failure to understand that emerging technologies represent the most comprehensive, valuable set of curriculum materials ever available to humankind. Ironically, much of the vast curriculum reservoir remains untapped by teachers or students. More curriculum materials are available electronically outside school walls than will ever be found inside school walls. Textbooks are no longer the sole source or even major source of knowledge. Much of the entire Pre-K–12 curriculum is based on textbook materials which are out of date even as they are printed.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How should we integrate technology into our current curriculum?

Right Question: How do we use technology to redefine curriculum materials—both the information and the location of the information?

Barrier #9: Failure to empower students and teachers to engage in risk-taking and experimentation with the emerging technologies. Current curriculum and methods of transmitting curriculum are steeped in traditional ideas of minimizing student failure. Student success is translated into correct answers about known questions in the school curriculum. Based on the phenomenal amount of change that is occurring, few school curriculums are getting students ready for the challenges of the 21st century. Students need to be challenged to ask questions to which there are "no answers," and engage in experiments where failure is more the norm than success. Trial-and-error, risk-taking, failure, asking questions, perseverance are increasingly becoming prerequisites to success and knowledge (Ross & Bailey, 1995).

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How should we integrate technology into our current curriculum (to ensure student success)?

Right Question: How do we use technology to create information—take risks and experiment to find new answers to existing and future problems.

Barrier #10: Failure to see the curriculum as something more than the written word or text. For many, a technology-infused curriculum means making computers accessible to text-based (written material). The computer is seen as a "word cruncher" or electronic typewriter. Curriculum means much more than the written word. In addition to text, the new curriculum involves sound, video, graphics. Seen in this light, literacy is much more than print information or concept understandings—it becomes visual literacy. In Marshall McLuhan-like words, "Gutenberg made us readers but the emerging technologies have made us authors, producers, directors, actors, and artists." We must facilitate visual literacy as well as text literacy in student learning.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: How should we integrate technology into our current curriculum?

Right Question: How can we redefine our curriculum by including all sources of information including audio, video, graphics—not just print materials.

Barrier #11: Failure to integrate technology into basic learning process—both outside and inside the classroom. For many educators, the computer lab has been the answer to integrating technology into the curriculum. The physical placement of computer labs in schools has been the solution to the problem of technology (computer) access as well as how to impart computer knowledge. The answer of computer lab or technology lab is an answer to a well-meaning but wrong question: Where do we place computers?

Technology is more than word processing, spreadsheet, database skills. Technology is both the tools for learning the curriculum **plus** the source of curriculum materials themselves. Could you imagine trying to teach a child any subject without providing paper or pencils? Could you imagine telling a child,

now it is time to go to Pencil and Paper Lab 101 because we can not provide them to you here—where you are? Technology must be integrated into every aspect of learning—not a location where technology is studied and used. As early as 1984 Seymour Papert was articulating a vision of schools where technology was as much a part of curriculum as pencils are in traditional schools.

Compare the frequently heard question to the right question that technology leaders should be asking:

Frequently Heard Question: Where do we put computers (which will facilitate curriculum-technology integration)?

Right Question: How do we get all of the emerging technologies into the hands of students which allows them to learn anything, anytime, anywhere—as a total process of curriculum-technology integration?

Four Suggested Steps to Initiate Curriculum-Technology Integration Strategies

The importance of integrating technology into the school curriculum can not be overstated. However, several preliminary steps must be taken to ensure that the curriculum-technology integration strategies will have the intended and appropriate impact on student learning. Consider the following sequence of curriculum-technology integration steps:

Step 1. Empower people to become technology leaders in your school district. Administrators as well as teachers must surface as technology leaders. In every school district and building, there must be a champion or champions of technology who work in teams on the problems and issues of technology integration (Bailey, Ross, & Bailey, 1995).

Step 2: Develop comprehensive technology plans and allow the empowered technology leaders to facilitate the plan both at the district and building level.

Step 3: Create technology staff development programs which support the technology plan—both at the district and building level.

Step 4: Devise action plans which address specific activities to integrate technology into the curriculum which are based on the technology plans as well as technology staff development plans.

Summary

Imagine a young girl, in the not too distant future, who has a device inside a pair of sunglasses that can tap into a global library of books, mail, speeches, movies, and limitless video and data sources. Critical thinking, complex problem solving, and knowledge creation characterize her curriculum whereas her mother's and father's curriculum carried the hallmark of memorization and regurgitation. She is a goldfish released from its fishbowl into a ocean of unlimited learning. Anything she can conceive, she can achieve because she has mastered information literacy. All the world's curriculum treasures are hers for the taking. This is not a dream but reality within our grasp.

What is our challenge? We can create and shape our children's and grandchildren's educational future or we can let the future create and shape their education. We have a choice about our future. The first step begins by having the ability to ask the right questions.

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