Technology education and integration: A position paper on attitude, perspective and commitment

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Abstract: You cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to BE technology-users and classroom implementation will follow. This author suggests a relational link between (a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing. It is suggested that this relationship accounts for the 25 year failure of technology integration.

Introduction

Based on a recent survey of parents and children (National School Boards Foundation, 2000) by the time children are teenagers, nearly three out of four are online using the internet. Our society is clearly becoming a nation online, a technological world, especially among children. While computers have been in our schools for more than a generation (since before the middle 70's), educators are still concerned with how to integrate technology into instruction. Why has this issue or goal not been successfully addressed among educators over the past 25 years? This paper discusses problems with educators' perspectives and attitudes about how teachers learn to use technology and associated implications for integration issues.

Teachers in our society are expected to lead rather than follow children to mastery of the world in which they must live and work. If teachers are not leading, then children will inevitably learn on their own. As the rock-n-roll generation grew to adulthood, whose music was originally considered renegade, subversive or rebellious, that same music is now integrated into established adult society. Even elevators today play themes originally found on the 45 rpm records of adolescents. Young people from generations past, without guiding classroom leadership, brought with them elements of a culture exclusively their own and simply by virtue of growing to adulthood replaced established society with their own. The same is becoming true of the computer generation. Young people, learning technology without significant leadership from educators, are learning on their own. They have grown - are growing – to adulthood to establish a new cyber-society as a new standard. Unfortunately, educators are following instead of leading.

For a full generation educators have presumably been about the business of integrating technology. The tech-limitation of the novice teacher is as important today as 25 years ago. Being a total beginner to computing today is the same as 25 years ago. Certainly there is a kind of societal "tech-awareness" that is different today but not knowing is not knowing. Beginners are beginners. Society's cyber-development does little to provide an education for interested teachers who know nothing of technology. And, contrary to the mission of today's teacher trainers, you cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to be technology-users and classroom implementation will follow.

However, teachers' perspectives skew their expectations and attitudes about computing experiences and limit if not preclude the achievement and acquisition of computing knowledge and problem solving skills. This author suggests a relational link between (a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing. It is suggested that this relationship accounts for the 25 year failure of technology integration.

Recipes vs. Education: Do Teachers Want to Change?

Often today, teachers (preservice and inservice) as beginners with technology bring to the learning situation preconceived notions not only about computing but about how to learn. Berghoff (1997) suggests that learning situations are determined by and a consequence of a positional "stance," philosophical perspective and expectation. Berghoff's notion is that the "stance" creates a context of both bias and opportunity wherein experiences yield meaningful significance consistent with that context. One's approach determines the outcome. This suggests that students' expectations of computer training and point of view about what's necessary to learning computing can limit what, how and whether or not they learn it at all.

Quite common today, teachers expect recipes for using technology. Simply stated, they want to be shown how to do something with computers without actually learning to use them. Teachers invariably seek to be given procedures to follow, packaged lesson plans to implement, imaginative and representative applications of technology that they can carry back to the classroom and put into practice in teaching. This is a popular notion among many teacher and technology educators and seems on the surface to make sense. This idea as a goal for empowering teachers with technology for the benefit of school children seems quite appropriate at first glance and is thought to withstand any criticism as noble and obviously beneficial for the target group.

The problem of course is simply that this does not constitute learning anything. That is, the teacher (the technology user) never actually learns to be a competent user. This misconception about what it takes to successfully bring technology into teaching precludes experiencing concept-building and other valuable competence-building activities. That is, teachers resist those experiences that have no obvious classroom applications.

As an analogy, consider hiring a chef for an important banquet. Your chef is known to have gone through schooling designed to prepare the chef with the latest in cooking the finest meals. Two hours before your guests arrive you look in on your chef only to find a total dependence on recipes, step-by-step charts and other such aids. When you inquire about the chef's ability to intuitively manage the art of cooking with a flare of imagination, insight and mastery, your wizard for your evening of magic points to the recipe. The chef explains with confidence that their experience in school was state-of-the-art, equivalent to the finest schools around the world, and amounted to getting a recipe book and some classroom practice following the recipes. You of course reluctantly and apprehensively settle for the hope that the recipe will workout for your evening.

This scenario, as absurd as it is, is not unlike what today's teachers expect from their study of technology. The intuition, problem-solving and critical thinking abilities consistent with learning and mastery are not commonly recognized as vital for classroom integration of technology. Such elements of education require one to change. To risk over dramatizing, becoming a competent user of technology involves a transformation as one acquires an education – a mastery. Teachers don't want to change and prefer instead to merely pickup copies of their recipes and thus their mindset precludes being educated at all.

Training vs. Education

It is important to distinguish "training" from "education" - two distinct notions that are often used interchangeably. Unfortunately, the most popular notion in teacher education today when it comes to learning technology is that teachers are to be "trained," not "educated." That is, language tends to emphasize "showing teachers how to use" technology - rather than facilitating insight, understanding, and a sound conceptual base. Programs emphasize only what teachers are expected to use rather than what might develop good concepts. Teaching for conceptual understanding and to develop higher-order thinking skills is typical of programming (Tu & Falgout, 1995) but can also be a fundamental goal of instruction for beginners in more general computing. But, the notion that teachers will not do programming yields programs consisting exclusively commercial software. Teachers as end-users of software never see the construction process or design issues behind the experiences they are supposed to learn.

This regrettable trend in computer education today is toward skills and competencies. Ayersman (1996) accounts for skills in general tools use (word processing, spreadsheets, desktop publishing, graphics), the Internet, networking and on-line database access. While programming is included, an experience considered high-value in building strong concepts, the focus seems to be on performance in a variety of areas of applied technology. The point is that skills, competencies and even performance standards can still fail to account for important

understandings, perspectives, concepts - integrated knowledge - that all contribute a fundamental and critical basis for problem-solving and adaptability.

Naturally, a program focusing on conceptual development will involve procedures, tasks, keystrokes, software, projects, etc., just as a focus on mere training and the mastery of a discrete set of tasks will likely yield insightful understanding for many. But, the difference is in the goal and the means to that end. Experiences and tasks should be designed to yield a more complete, sound and fundamental understanding of computing. Most programs - indeed, most perspectives of teacher educators and technology development programs - fail to recognize this important viewpoint and instead pursue skills and competencies to the detriment of understanding. While a report several years ago indicated that US students have weak concepts of technology, it failed to really address the nature of technology education and its impact on concept development (Zuga, 1994). Little has changed.

This problem seems localized to the learning of technology for teachers. It is common in other discipline areas to speak of "education" rather than "training." Conceptual development is often the primary focus in the study of science (Trumper, 1997). Even when the preparation of teachers is described in terms of "training," programs emphasize the integration of science concepts, not skills (Thompson & Schumacher, 1995). In spite of the procedures and skills inherent in science experimentation and discovery and of course in the study of mathematics and related fields, students are nevertheless guided toward the development of a sound conceptual understanding as they are "educated" - not "trained" (Cannings & Stager, 1998).

An encouraging note, although several years old now, Blandow (1992) recognized the importance of conceptual development in learning technology. As technology education continues to develop, it can be systematized to include the laws, principles and concepts of technology. Blandow accounted for cognitive development and basic principles in teaching technology students to think. But, this is the exception rather than the rule as most programs focus on the limited procedural rituals of training on popular software over the broader notion of conceptual development.

Empower Teachers: A Prerequisite to Integration

Leading the call for a focus on computer integration is a recent study that accounts for the current status of teacher technology-training programs across the United States (Moursund & Bielefeldt, 1999). Available equipment and beginner-level courses are thought to be sufficient for the purpose they serve but teachers still need more. The report recommends that computing instruction for teachers be integrated throughout the curriculum rather than isolated classes. Also, that instruction should specifically focus on integration issues, methods and models. While this author supports the need for broadening instructional computing beyond the confined courses which have evolved from the early computer literacy courses (which can still be important for many populations today), there are other issues in the methodology of achieving integration.

Recent studies have shown that most teachers do not learn to use computers from courses, seminars or workshops, inservice programs or college courses (Galloway, 1997). It is interesting that one does not tend to find teachers using computers with students who do not also have a real commitment to using computers themselves in their personal and professional lives. The majority of teachers today use computers with their students to varying degrees but very few (less than 10 percent) do so without also having a significant personal involvement with computing. Educators learn to use computers primarily on their own and it is unlikely that teachers will integrate computer technology into classroom instruction without the inclusion of personal and professional usage. It seems that planning models and integration programs should consider these factors more heavily when addressing teacher training. Educators should emphasize the importance of a personal commitment from teachers who are learning to use computers or who intend to use computers in teaching. Integration has failed to the extent that teachers have failed to personally adopt the computer in their personal and professional lives. This must change for integration to succeed.

Most commonly today, efforts at integration focus on helping teachers to use computers with and for classroom children. This might be fine for non-beginners and teachers well established in using technology but does not work for limited users or beginners. Empower teachers with technical skills, computing knowledge and intuition, and critical thinking skills in using computer technology. This is a prerequisite to focusing on technology integration into classroom teaching.

While most administrators seem to think in terms of supporting technology directly for the classroom children, some do call for empowering teachers themselves. “Teachers should acquire technical skills and explore examples of compelling Internet-based lessons through a yearlong workshop series prior to developing their own Internet-based curriculum projects.” (McKay & McGrath, 2000, p. 120). Although in the minority among educators

today, some do seem to prioritize competencies for teachers as actual users of technology for themselves. The following outlines a number of these.

Warner and Maureen (1999) report the International Society for Technology in Education (ISTE)'s standards for preparing teachers. They call for teachers' ability to use computer technology in problem-solving, decision making, data management , to design and develop activities for technology, with skills in using a variety of presentation, applications and utility software. Clearly, this prioritizes computing competencies for teachers. And, while the title of the article fails to distinguish education from mere training, the discussion strongly attests to the importance of teachers' computing skill and knowledge as an antecedent to classroom integration. In fact, Warner and Maureen (1999) specifically describe how teachers were inspired to bring their experiences to their own classrooms. They suggest that by developing electronic portfolio's, teachers will learn important computing skills and knowledge that can directly impact integration into the classroom. "Teachers become frustrated with the process of teaching and assessing students with concepts they have not experienced themselves" (p. 87). Of course, this makes perfect sense and is quite insightful in understanding the importance of teachers' knowledge and experience as a prerequisite to classroom computing integration.

Sherry, Billig, Tavalin, & Gibson (2000) outline strategies for successful adoption of technology and integration into teaching. There is a strong focus on empowering the teacher as a learner and user of technology. Mentoring, specialists, online resources and more are suggested to effect development and progress in the teachers' skills and understanding of technology. Wilson (1997) maintains that if teachers fail to understand the value and relevance of information skills for themselves as learners, they'll be unable to develop those skills in their pupils.

Niederhauser, Salmen, and Fields (1998) outlines introductory technology coursework for preservice teachers taking into account the importance of empowering teachers with understanding and technical learning experiences. Technological competency through constructivist methods is the goal for teachers. Ramey, Tomlin, Basista, and Slattery (1998) explain that differences in philosophy and approaches to teaching and learning between colleges of education and sciences contributes to difficulties in teacher training programs. By sharing faculty between colleges their programs seem to overcome such obstacles to reach the more conceptual realm of understanding and education over procedures and mere training.

However, Farenga and Joyce (1996) have problematic approach in that, while they do focus on the importance of teacher competencies, they do so through training with procedural rituals. Without broader experiences and experimentation, such training is not likely to yield intuition, problem-solving skills or any understanding sufficient to move beyond initial introduction.

Summary

The goal is integration. The ultimate end is of course providing a state-of-the-art technological presence (instruction, resources, guidance, support, etc.) for school children. That's the purpose of education and why teachers exist. There are funds available for staff development, equipment, education or training programs. Although in some areas, there are more resources available today than years past, other areas have less. In any event, those resources are typically directed to using computers with or for classroom children to the detriment of the teachers. This approach has failed for over 25 years. The point is simply that you cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to become technology-users and classroom implementation will follow.

Training and education are not the same thing. Other disciplines find a more appropriate balance of skills, knowledge, understanding, and intuition. Science, for example, clearly involves training and skill development in order to successfully conduct experiments of various sorts. Yet, in Science such skills and training are clearly a means to a different end. Such skills are not the end in themselves. They support and make possible the development of a conceptual understanding, critical thinking and problem-solving skills. This must be true in educational computing and instructional technology as well if teachers are to continue to adapt to the quickly changing world.

Finally, teachers must be encouraged to accept their responsibilities as both users and learners of technology. Teachers must be encouraged and empowered to seek learning on their own and to accept the notion that successful computing involves more than merely following procedural rituals. There are no quick recipes, no shortcuts and no ways to effectively guide computer use for others without a more in depth variety of experiences that amount to a complete education for the facilitator/teacher.

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