
GENERAL ARTICLES

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Why Do Teachers Need to Use Technology in Their Classrooms? Issues, Problems, and Solutions

ABSTRACT. Will computers repeat the failure that older technologies (e.g., film, radio, and television) experienced concerning educational applications of technology? A simple question seems to be helpful for us to gain more insight on this issue: "Why do teachers need to use technology in their classrooms?" To answer this question, first of all, the general expectations that people have for computers in education are examined. Then, a summary of the failures regarding educational uses of technologies are provided and analyzed. Next, the question of whether computers can escape the same fate as film, radio, and television is examined. Finally, a conclusion is presented that computers can bring great changes to classrooms in the next decade, but improper enthusiasm must be discouraged. To a great extent, the passion for computers can be managed by a more realistic research agenda. The paper

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Computers in the Schools, Vol. 20(4) 2003
<http://www.haworthpress.com/web/CITS>
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Digital Object Identifier: 10.1300/J025v20n04_05

concludes with recommendations for development research and design-based research. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2003 by The Haworth Press, Inc. All rights reserved.]

KEYWORDS. Technology integration, development research, design-based research

Education change depends on what teachers do and think—it's as simple and complex as that. . . . If educational change is to happen, it will require that teachers understand themselves and be understood by others.

—Michael Fullan, 1982, p. 107

INTRODUCTION

The successful integration of technology into classrooms has been a goal for generations of instructional technology researchers and practitioners (Cuban, 1986). Especially in the last 25 years, emerging “new technologies” such as computers and the Internet have attracted many people to research and practice focused on improving education with technology. The interactive multimedia “affordances” (Norman, 1990) of contemporary networked computers enable us to think of them not only as media for distributing information, but also as environments capable of fostering the adaptation of student-centered pedagogy (Jonassen, Peck, & Wilson, 1999; Sandholtz, Ringstaff, & Dwyer, 1997). Using the Internet for instructional purposes especially stirred the public’s imagination, and thus in the 1990s, there was a rush to wire virtually all schools (Becker, 2000). The sheer amount of technology in schools in the United States has greatly increased since 1995 (Becker, 2000; Reiser, 2001). According to the National Center for Educational Statistics (2002) report, in the year of 2001, 99% of public schools had Internet access. Additionally, the number of students per computer decreased from 10:1 during 1995-1996, to a little over 5:1 during the period of 1999-2000 (CEO Forum, 2001).

Unfortunately, history teaches us that the current passion for instructional uses of technologies such as computers and the Internet is not

unique. Similar enthusiasm appeared when older technologies (e.g., film, radio, and television) were introduced into education (Cuban, 1986). In those earlier times, technology proponents spent considerable time and money on educational research and evaluation aimed at demonstrating that the then “new” technologies could contribute to educational reform in a big way. Unfortunately, before substantial evidence of the actual integration of those older technologies into everyday practice could be found, most people lost interest, perhaps because the impact was not instantly obvious. At the same time, those who were interested in educational uses of the technologies became passionate about even newer technologies, believing that the latest innovations would finally “revolutionize” education if widely adopted (Perlman, 1992). As each new technology was promoted as the next possible panacea for educational problems, people rarely thought carefully about the previous failures involving older technologies.

Taking a long view, Cuban (1986) described a cycle that was repeated again and again in the applications of older technologies: “exhilaration/scientific credibility/disappointment/teacher-bashing” (p. 5). Cuban explained that whenever a new technology was introduced into educational contexts, some people advocated its widespread adoption to improve education to a broad and deep extent. Subsequently, numerous research studies were conducted to find credible evidence of the effectiveness of instructional applications of the innovation. After the technology was introduced in many schools but failed to do what had been promised, disappointment became rampant and the search for someone or something to blame began. Most often, teachers’ resistance to using it was identified as one of the major reasons for the failure of technology to transform education (Winn, 1989).

Teachers were easy targets of critics regarding the failure of technology integration in classrooms. People were much more prone to attribute implementation failure to the motives and self-interests of teachers rather than to contextual variables, poor leadership, or gaps in supportive infrastructure (Cuban, 1986). In the court of public opinion, teachers were viewed as free to utilize whatever technologies they thought appropriate in their classrooms, but they simply chose not to use them. These uninformed opinions failed to acknowledge or did not ever perceive factors that severely limited teachers’ choices concerning instructional use of technologies. Teachers’ hostility, reluctance, and fear of technological innovations were proclaimed as the major reasons for the failure of technology integration, while the real reasons were much more complex (Means, 1994). The conditions that limit teachers’ ca-

capacity to adopt technology and other innovations may have actually worsened over the past two decades partly due to the imposition of incoherent multiple reform initiatives (Cuban, 2001; Fullan, 2001).

Undoubtedly, as the ultimate practitioners, teachers are one of the key contributors to the success of integrating new technologies into learning and instruction (Office of Technology Assessment, 1995). However, teacher's perspectives of classrooms, including their expectations and views of factors such as structure, discipline, and relevance, have usually been overlooked by educational researchers as well as instructional designers. Indeed, instructional innovations were seldom initiated by teachers *per se*, but usually by outsiders (Cuban, 1986, 2001; Neal, 1998). The failure of new technologies to be successfully integrated into classrooms may well lie in the inability or failure of their proponents to address the most important perceptions and needs of teachers (Kent & McNergney, 1999). Given this lack of focus on teachers' concerns, it is easy to understand why teachers have rarely used film, radio and television in classrooms more than once a week (Cuban, 1986), and why even newer media such as computers and the Internet have had minimal impact on instructional practice and educational outcomes thus far (Cuban, 2001; Reiser, 2001).

Now the cycle of failed innovations is underway again as educational technologists and commercial interests seek to support research and development focused on the educational uses of computers and the Internet as well as other new emerging technologies such as virtual reality (Dede, 2000), personal data assistants (PDAs) (Hudgins, 2001), and digital libraries (Landoni & Diaz, 2003). The sometimes feverish passion for networked computers has infiltrated nearly every corner of the globe; and, as a result, educational technologists as well as many members of the public appear convinced that computers will surely succeed in enabling (or forcing) teachers to integrate technology into their classrooms where so many previous innovations have failed. The remaining challenges, from the proponents' perspectives, are simply that teachers need more time to accept the new technologies and to change their beliefs, and that with proper support, technology integration will finally be accomplished. Of course, if that doesn't happen, it will be concluded that there must be something wrong with teachers, students, or others—anyone except the researchers and developers themselves who once again are not paying enough attention to teachers' perspectives and needs.

For the new technologies to escape the same fate of older technologies in schools, we need to pause and think more seriously. A simple

question could be helpful for us to gain a better insight on this issue: “Why do teachers need to use technology in their classrooms?” To answer this question, we need to take a fresh approach and throw away old assumptions. We must call into question the current ways we view the issues involved in school reform through technological innovation, especially what is taken for granted. This new attitude requires a fresh theoretical perspective such as phenomenology, through which it is possible that new meanings will emerge, or at least, that the former meanings will be validated (Crotty, 1998).

NEW TECHNOLOGIES, OLD PASSIONS

New technologies have often engendered great passion about their possible educational applications, especially among technophiles. In 1913, when film was first used in instruction, Thomas Edison proclaimed that “the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks” (Cuban, 1986, p. 9). Nearly a century later, however, films had still not replaced books, although instructional films did contribute a great deal in military training, especially during World War II (Noble, 1991). Forty years after Edison’s optimistic prediction, television, a “new” media that combined the major affordances of film and radio, attracted people to research and practice focused on its application in education. According to Reiser (2001), there was a great growth in the use of instructional television (ITV) in the 1950s. For example, at least 242 television channels were established for educational purposes. But by the mid-1960s, the interest in instructional television had greatly abated due in part to the mediocre quality of most programs, lack of interaction, inadequate curricular support, and to some degree, teachers’ perception that ITV threatened their classroom authority and created discipline problems (Kent & McNergney, 1999; Reiser, 2001).

Thomas Edison is hardly the only representative of people who have overestimated the educational advantages of technology. On the cusp of the introduction of the World Wide Web, Perlman (1992) predicted that new “hyperlearning” technologies spelled the end of schools as we know them. And yet schools remain largely similar to the ones both Edison and Perlman predicted would be transformed. With the wider and wider availability of computers and Internet access over the last decade, new prognosticators have come forward to predict the transformation of

education via technology. Jones (2000) proclaimed that it might soon be a feasible idea to replace teachers with holograms. It has even been predicted that artificial intelligence and bionic computers interfaced with our own ultimately inferior wetware will supersede our need for learning (Pearson & Neild, 2002).

At first glance, multimedia computers and the Internet, with their powerful interactive capabilities and the merging of all the major functions of previous media—television, radio and film—may indeed seem to have the potential to overcome the failures that the earlier technologies suffered. Alas, the latest research reports and critical analyses have already shown us that the effects of these technologies are far more modest than their advocates expected (see Cuban, 2001; Kent & McNergney, 1999; Noble, 2001). Why have so many high expectations resulted in dismal results with respect to learning and the use of technology? It is not easy to answer this question, but we may gain some new insight if we try to consider whether our expectations are too high to be achieved with technology or if the capacities of current technologies are too limited to be used effectively.

PROBLEMATIC EXPECTATIONS

An important reason that many people think computers are integral to a school's success in the 21st century stems from the current e-culture. New Internet technologies have progressed more rapidly than most people imagined to transform banking, commerce, travel, communications, and other sectors of everyday life. As a result, many people believe that computers must be in schools if for no other reason than to prepare students for their e-future.

However, trying to keep schools up to date with the latest technologies may be a hopeless crusade. Just as soon as most of the schools were wired, the wireless "revolution" arrived. Desktop computers have been supplanted by laptops, and laptops are now being superceded by PDAs and tablet computers. A "new" computer with latest technologies is likely to become inadequate to utilize the latest software and operating systems after just a few years of use; whereas, a refrigerator can still be conveniently used even after a decade or more (which is often regarded as a generation). Rapidly changing technology will only accelerate in the future. To a greater extent than before, educational technology is viewed as a way for students to learn to deal with the rapidly changing e-society. But a visit to most schools will reveal closets full of technolo-

gies that were hardly used at all, much less utilized as the instruments of fundamental educational reform.

Education is also viewed as essential for the continuing development of our market economy. According to Cuban (2001), the primary economic purposes that public schools and higher education should serve first became explicit in the early 1900s, and a century later contemporary school activists are still focused on solving the nation's economic problems through education. With the wider integration of computers throughout many aspects of our society, having basic computer skills is considered by many to be a prerequisite for students to find a decent job. Thus, computers are also considered to be an ideal way to reform schools by many public officials and corporate leaders (CEO Forum, 2001; Jones, 2000). Of course, many of these same proponents represent corporations that realize enormous profits when technology is sold to schools.

In the conversation published in a recent issue of *Educational Technology*, Professor Michael Molenda of Indiana University suggested that K-12 teachers are more willing to adopt "hard technologies" over "soft technologies," as the former ones do not threaten their way of teaching and role in the classroom (Oswald, 2003). He also pointed out that it is the pedagogical issues rather than the technological changes that are essential to technology integration in classrooms (Oswald, 2003). Molenda's ideas reflect an important expectation that people have for computers in education, i.e., the shift from teacher-centered instruction to student-centered learning (Cuban, 2001). In the past decade, with the introduction of constructionism as a learning theory appropriate for most levels of education (Papert, 1993), many educational experts have come to view this change as an ultimate goal to be achieved with the aid of technology (Jonassen, Peck, & Wilson, 1999; Sandholtz, Ringstaff, & Dwyer, 1997). Educational technology proponents view computers as much more accommodating than their precedents to enable authentic learning environments and extend students' control of their learning processes (Means & Olsen, 1994; Reiser, 2001). Unfortunately, most teachers find the shift to constructionist pedagogy to be out of sync with other expectations placed upon them, such as the emphasis on improving achievement test scores and maintaining classroom discipline.

WHY OLDER TECHNOLOGIES FAILED

Before trying to answer questions about whether computers can overcome the barriers that have thwarted technological innovations in

the past, it's necessary to examine the reasons that older technologies failed to fulfill people's expectations. Cuban (1986), in his book titled *Teachers and Machines: The Classroom Use of Technology Since 1920*, explained that the failure of instructional film and television were inescapable and could be attributed to many reasons. First of all, the supply of equipment was limited. It was too expensive to have every classroom equipped with a film projector in earlier times, as it would be even today, and thus showing a film required adhering to a schedule. Teachers needed to order a machine to be sent to their classroom or reserve a special film classroom whenever they wanted to have their students view a film (Cuban, 1986; Kent & McNergney, 1999). Teachers find adhering too strictly to a "time and place" schedule to be confining because it limits the possibilities of taking advantage of the "teachable moment" when the opportunity to clarify or expand upon content comes at unpredictable times within the context of teacher and student interactions. In addition, few teachers have the planning time required to make best use of technology that must be scheduled well in advance; instead, the little planning time teachers have is spent struggling to figure out how they are going to teach successfully during the next day or two.

The storage and distribution of films were also big problems. Most importantly, the quality of many film programs was mediocre. Though high-quality films could be produced, they were often too costly to be affordable (Cuban, 1986). In addition, teachers lacked training to know how to use films to their maximum advantage in their classrooms. For some teachers, films were threatening, as they "decentered" their authority. Teachers had to sit in the dark with their students while the screen flickered, and if the film was of poor quality, they had to spend most of their time keeping students from misbehaving or falling asleep.

Later, instructional television (ITV) was introduced as an advanced medium that combined all the basic advantages of film and radio. But ITV was susceptible to many of the same problems earlier media had: lack of teacher training, poor quality of programs, scheduling, the expenses of installation and maintenance, and so forth (Reiser, 2001). Most teachers perceived ITV as a single-direction medium with very limited if any interactive capacities. Another significant challenge was that teachers found it very difficult to integrate ITV into the normal flow of the curriculum as defined by textbooks and/or district or state level curriculum guides. It was not easy for teachers to adapt video materials to their instructional needs, and it was even more difficult to create their ITV own materials (Kent & McNergney, 1999).

Even more problematic was the fact that all those earlier technologies tended to foster a teacherless form of instruction whereby the centrality of the media would supersede teachers (Kent & McNergney, 1999). Teachers were seldom consulted when administrators and educational technologists tried to “push” those technologies into classrooms (Neal, 1998; Cuban, 2001). The efforts of technology advocates were doomed because it is the teacher, the ultimate authority in a classroom, who determines if a technology will be successfully integrated or not (Fullan, 1982, 2001; Bitner & Bitner, 2002). Most teachers resisted using older technologies because the media were perceived as increasing their workload while bringing only minimum benefits. Teachers recognized that the proponents of new technologies had little knowledge of or concern for their day-to-day instructional practices (Cuban, 1986). Failing to pay attention to teachers’ perspectives, administrators and technology experts assumed that the failure was caused by teachers’ resistance; they rarely tried to find why teachers didn’t want to use these technologies that seemed so powerful. After all, their effectiveness had been “proved” scientifically correct in quasi-experiments most often conducted in nonschool contexts (Collins, 1999). So the failures of the past were repeated again and again, and teachers were always blamed for the failure of instructional use of new technologies.

ARE COMPUTERS ANY DIFFERENT?

Is this failure repeating itself with respect to today’s application of computers in the classroom? Certainly, crass pundits such as Clifford Stoll (1999) think so, but pessimism is also echoed in the words of more thoughtful critics such as Neil Postman (2003) and researchers such as Larry Cuban (2001). There are many considerations to worry about, especially because there are many similarities between the classroom use of computers today and that of older technologies before. As in the past, too many people are overconfident that these new technologies will improve education greatly. Despite the lack of solid evidence, proponents appear to believe that “research” has proved their effectiveness. Politicians and corporate interests have worked hard to make computers and the Internet available in every classroom. States and school districts have invested heavily in computers, networks, and peripherals, but much less in teacher training and support.

The probability of repeating the previous failures looms large. Before long, technophiles will probably conclude again that these cur-

rently new technologies have become out of date, and then they will begin to embrace even newer technologies such as virtual reality systems and wireless portable devices, while education remains unchanged in any substantive way. Undoubtedly, it's time for us to think seriously about whether a computer can differentiate itself from those older technologies, and whether we have done or will do what is needed to give its application in classrooms a fair opportunity for success.

There are three key factors for a technology to accomplish widespread use and to be accepted by teachers: pedagogical flexibility, support for teacher control, and accessibility (Cuban, 1986, 2001; Kent & McNergney, 1999). The successes of chalkboards, textbooks, and overhead projectors in classrooms provide credible evidence of the importance of these three factors. These "innovations" can be flexibly integrated into teachers' curriculum plans and provide options for teachers to shape or shift their instruction whenever they think appropriate. Teachers also can utilize these without reducing their control over the classrooms and instructional processes. Their flexibility and low cost make them accessible and pervasive for teachers and students alike. There are few scheduling demands on schools and little teacher planning time needed to use these technologies.

By contrast, none of the older technologies could fulfill all three of these requirements. Film was not appropriate for any of them. Radio and television were accessible, but were not qualified for pedagogical flexibility or support for teacher control. How about computers?

Needless to say, the computer is far more powerful than the older technologies. All the functions that film, radio, and television have can be integrated into a multimedia computer, especially one with Internet access. Also, the accessibility of computers is widespread in most areas of the United States today (NCES, 2002). With computers, it would seem to be much easier for teachers to create their own course materials or to find low-cost materials created by other teachers or other developers. Now that the Internet has become an integral part of daily life for so many people, it would seem that asynchronous and synchronous interactions among students and teachers as well as with course content can become feasible. It would appear that teachers, with a little training, can easily adapt computer materials to correspond with their instructional purposes. Moreover, with the computer becoming more and more prevalent in our lives, the ability to use a computer has become for many a basic literacy ability as important as reading and writing. On the surface of things, it seems that using computers for instruction should become an ordinary behavior for most teachers just as they have used chalk-

boards, textbooks, and overhead projectors. After all, if teachers can integrate technology within their personal lives, effectively integrating technology with instruction should happen as well (Nisan-Nelson, 2001).

However, the current situation of the classroom use of computers remains disappointing. According to Cuban (2001), a technological revolution in teaching and learning has not occurred in the vast majority of American classrooms thus far. The few teachers who use computers regularly in the classroom usually deploy them in ways that reinforce traditional pedagogical practices rather than learner-centered approaches (Cuban, 2001). Mandinach and Cline (2000), among others, maintain that "it will be many years before such innovations (technology-based constructivist approaches) are widely implemented" (p. 377). Meta-analyses of the research literature have shown that there is no direct link between broader access to computer-based technologies and the enhancement of learning (Dillon & Gabbard, 1998; Fabos & Young, 1999).

Hence, even if we claim that the computer can differentiate itself from those older technologies, there are also many uncertainties that limit its imminent success in classrooms. First of all, teachers face many obstacles when they try to adapt themselves to these changes. Some of the obstacles are external to teachers, including time, funding, training, modeling instruction, hardware and software access, organization culture, and support from parents (Bitner & Bitner, 2002; Mandinach & Cline, 2000; Norum, Grabinger, & Duffield, 1999). There are also important obstacles that are intrinsic to teachers, such as overreliance on traditional teaching pedagogies, fears about loss of control, and underlying beliefs about the relative roles of teachers and students in classrooms (Ditzhazy & Poolsup, 2002; Ertmer, 1999). Both external and intrinsic obstacles can impede teachers as they try to adjust themselves to any change in classroom routines. It is extremely difficult to address any one challenge prior to others, as new difficulties always emerge in the process (Ertmer, 1999).

Moreover, the expectation that computers can easily foster a transition to student-centered learning pedagogy remains dubious (Mandinach & Cline, 2000). This expectation stems from the promotion of constructionism in educational learning theory, especially as taught in teacher preparation programs and continuing professional development seminars. Constructionists proclaim that knowledge and meaningful reality are constructed in and out of interaction between human beings and the social world (Crotty, 1998; Jonassen, Peck, & Wilson, 1999). From the

constructivist perspective, the teacher's role is to enable the construction process for their students as a facilitator and resources provider. Based upon constructivist epistemology, student-centered learning is viewed as more appropriate than teacher-centered instruction. By contrast, objectivism, the epistemology held onto by a great number of teachers despite their training, warrants that learning is the process of acquiring external truth, and that the teacher's role is to transmit knowledge to learners through direct instruction (Hannafin & Hill, 2002).

The change from one theoretical mindset to another is not easy, especially when there are such extensive differences between the two epistemologies. It is very difficult for teachers to adjust their teaching philosophy because the psychological mental models they have of teaching and learning processes has been formulated over years and consistently reinforced by the existing infrastructure. The provision of technology, no matter how widespread, does little to initiate teachers' movement toward constructivist methods. At best, it can be a catalyst for the transformation process of a teacher who already has become dissatisfied with teacher-centered instruction (Windschitl & Sahl, 2002). The pedagogical adaptation process is excruciatingly slow compared with the process of purchasing and deploying computers in classrooms (Cuban, 2001), and what teachers do and think has changed little over the past 25 years (Fullan, 2001). This shift becomes even more improbable in light of the emphasis on high-stakes testing that is pervasive in recent federal government directives to educators (Dede, 2002).

WHAT CAN BE DONE?

Considering all the aforementioned challenges, is it rational for us to conclude that computers and the Internet can bring great changes to classrooms in the next few years? We think not. At the very least, improper enthusiasm must be discouraged. Educational innovation, as with any fundamental social improvement process, takes more time and effort than most people imagine. Poverty and homelessness are persistent in even a nation as wealthy as the United States, disease and unhealthy practices such as obesity are rampant despite advances in medical research and health indicators, and war remains a viable option for even self-professed democracies.

Most teachers remain reluctant to use computer technologies in their classrooms because they have perfectly reasonable doubts and questions about them. Cuban (2001) lists some of these questions:

- Is the machine or software program simple enough for me to learn quickly?
 - Is it versatile, that is, can it be used in more than one situation?
 - Will the program motivate my students?
 - Does the program contain skills that are connected to what I am expecting to teach?
 - Are the machine and software reliable?
 - If the system breaks down, is there someone else who will fix it?
 - Will the amount of time I have to invest in learning to use the system yield a comparable return in student learning?
 - Will student use of computers weaken my classroom authority?
- (p. 168)

If any significant progress is going to be made, educational researchers and instructional developers must seriously consider teachers' perspectives as essential to the success of integrating computers into classrooms. Cuban (2001) emphasized this point when he wrote: "Without attention to the workplace conditions in which teachers labor and without respect for the expertise they bring to the task, there is little hope that new technologies will have more than a minimal impact on teaching and learning" (p. 197).

Educational research has not been a great success in supporting the implementation of instructional innovations; in fact, it has had little influence on educational practice in general (Lagemann, 2000). Obviously, educational researchers and developers alike must change their ways if they are to influence practitioners. The technology integration process in classrooms could be accelerated if more educational technology researchers adapted a development research method (van den Akker, 1999). The history of educational technology research has been disappointing for decades (Clark, 1983). In an article titled "Socially Responsible Educational Technology Research," Reeves (2000) described three major problems with educational technology research: (a) generally poor quality with respect to design, implementation, analysis, and reporting; (b) disappointing research syntheses; and (c) major misunderstandings about the differences between basic and applied research. He proposed that educational technologists should pursue development goals if they want to be more socially responsible, especially considering the poor history and restricted return-on-investment of previous research approaches.

The overall goal of development research is to "solve real problems while at the same time constructing design principles that can inform future decisions" (Reeves, 2000, p. 25). Development research requires a prag-

matic epistemology that is in sharp contrast to the objectivist epistemology of traditional experimental research approaches. Recently emerging design-based research approaches, currently at the forefront of educational research, share basic characteristics with it. In a special issue of *Educational Researcher* (Kelly, 2003), The Design-Based Research Collective (2003) proposed that “design-based research . . . can provide a lens for understanding how theoretical claims about teaching and learning can be transformed into effective learning in educational settings.” (p. 8).

Both development research and design-based research emphasize that research should produce plausible solutions to practical problems while, at the same time, it should look beyond a specific context or problem and generate theories that can be shared in a comparatively broad context. These forms of research should have clear implications for both practitioners and other researchers. Secondly, in these approaches, research and practice are intertwined. Development research should be conducted in real contexts that allow theories to be tested and refined through cyclical studies. Over time, new theories and principles are refined *in situ*. Finally, both development and design-based research require intensive collaborations between the researchers and practitioners, so much so that their roles become blurred in the research process through continuous interactions and multiple feedback cycles (Bannan-Ritland, 2003).

CONCLUSION

Although it won't be easy and it certainly isn't guaranteed, the danger of entering another tragic circle of technology failure in classrooms should decrease if more development research or design-based research is used in education. Much closer collaboration between researchers and teachers will help to assure that teachers' perspectives will not be overlooked anymore. The practical problems related with the process of technology integration in classrooms may be solved through these approaches. The intertwined relationship between research and practice also can help researchers and practitioners deal with new problems that inevitably emerge in classrooms whenever innovations are introduced. Moreover, theories and principles that are tested in real contexts with rigorous studies will be informative to teachers, administrators, other researchers, and any other people who are concerned with these issues. It is our belief that the development research approach is the only socially responsible way to address the fundamental question: “Why do teachers need to use technology in their classrooms?”

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