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Professional Development and the Educational Technology Metamorphosis: Emerging Butterfly or Deleterious Root Worm?

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For more than three decades the educational community has debated the use of computers as an element in classroom learning. Spending our limited educational resources on these machines has been criticized in that the computer is not a value neutral tool, and to employ it ubiquitously in classrooms has negative social and educational ramifications (Alliance for Childhood, 2001; Apple, 1994; Brown, 2002, Cuban 2001; Healy 1998a; Healy 1998b; Oppenheimer, 1997; Stoll, 1999). In contrast, others have proposed that this is a wonderful new learning tool that would empower us to learn in new and better ways (Hillis, 1999, Papert, 1994). They suggest that the computer allows us finally to realize the dream that Dewey espoused close to a century ago, the dream of transforming our educational system into a student-centered bastion of collaborative, authentic, and project-based learning (Dede, 2000; Pappert, 1998; Stager, 2003).

The same type of criticism now leveled at computer use, was once voiced in the past regarding other educational innovations. Concerns over the use of the slate blackboard date back to its invention in the 1800’s. Not too long ago serious questions were also raised about the educational and social ramifications of moving from quills to ballpoint pens. The use of information and communication technologies (ICT) in our classrooms has sparked a similar debate about the effect of this new tool on learning and development. There has been a tendency in some technocentric circles to dismiss these concerns as coming from those who at best do not understand the new technologies, or at worst are Luddites simply averse to any technological evolution. This dismissal of legitimate educational concerns is a reactionary approach that suffers from the same form of dichotomous oversimplification that has polarized previous discussions of educational change.
The past few decades of educational research have made it clear that most questions regarding tools and teaching cannot be resolved by looking only at simple main effects; computers in classrooms are good vs. computers in classrooms are bad. These questions involve complex interactions of educational philosophy, specific pedagogical implementation, teacher preparation, administrative support, historical zeitgeist and other relevant mediators and moderators.

I believe that there is much to criticize in the current application of computers to classroom teaching and learning. However, I firmly believe that the problem does not lie with the tool itself, instead it is a manifestation of the manner in which we have employed them in classrooms and the expectations that people have held for their efficacy. Therefore I will begin by reviewing those factors that have led to many of the current problems of use in the classroom. Next I will focus on the process of information and communication technologies professional development (ICTPD) and propose five factors that would improve the quality of these experiences for teachers. In part two of this article, I will review these five factors in greater depth and in support of these ideas I will provide examples from my work with teachers in America and in New Zealand. Finally, I will propose the steps we might take to become confident in the utility of this tool to assist in the process of learning.

There is no question that the use of computers in classrooms from preschool through graduate school has in general been a prodigious disappointment to educators at all levels. We have spent billions of dollars on computers, a complex infrastructure, and on teacher training programs, and yet there seems to be few positive results to show for this incredible investment of time and money. In fact there are some who contend that this expenditure and the stress that it has placed on already burdened teachers is now cutting away at the very pith of our educational system (Oppenheimer, 2003). Yet even in these reports of great expenditure with minimal measurable success, I suggest that we can find the seeds for optimism and for change. I believe that including ICT in classrooms allows, even requires us to fundamentally reexamine our educational priorities and practices. From within these emerging technologies we may find the educational metamorphosis that we have been searching for since the proposals of Dewey over a century ago.

Three Transformational Educational Revolutions

It has long been said that Gutenberg’s invention of the printing press was the pivotal technology in the evolution of information dissemination, and I do believe it marked a significant transformation. From the first, word of mouth was the most common modality for sharing information. The printing press launched a literacy revolution where large numbers of individuals could access information and learn independently, temporally and spatially removed from the scholar.

Mass printing eventually led to a second educational revolution, that of the widely accessible university. The increased access to books allowed large numbers of scholars to work within organized university settings where they could be in contact with great numbers of students. Students could therefore have access to large numbers of books from which to learn, all under
the watchful eye and tutelage of the sage on his stage.

We are now poised on the cusp of the third educational revolution, the information revolution where the traditional structure of educational dissemination of the past 200 years is in the process of being transformed. No longer will universities and libraries be the sole repositories of all knowledge, and the faculty the font from which this knowledge flows[1]. Instead, information is readily available to everyone with access to computers and the Web.

So how is this third revolution going so far? The answer again depends on your perspective and value structure. However, while many schools are now wired and computers abound, a large number of educators (perhaps the majority) at all levels have not yet embraced these tools in their classrooms in a way that supports student learning and deep understanding. Furthermore, a visit to any campus or classroom will show that most educators continue to serve as the sagacious disseminators of knowledge. The chrysalis has formed, our classrooms and students are ready, but a metamorphosis of teaching and learning has yet to occur.

**Framing the Issues**

I believe two fundamental conditions have impacted educators’ use of ICT to support powerful pedagogical practice in their classrooms. While there may have been some initial difficulty experienced by technological innovators or even the early adopters (as classified by Rogers, 1995), for the most part experimentation by these individuals was allowed and even supported. The real difficulties began to be experienced in the past decade by the early majority and later majority who constitute the largest number of classroom teachers.

First, the hype and therefore the external pressures to utilize ICT created an environment where many classrooms were provided with computers before the educators really fully understood how the hardware and software could contribute to the students’ learning experience. This meant that teachers needed to dedicate significant amounts of extra time first to learn how the tools functioned, and second to understand how they might enhance teaching.

Previous attempts at educational reforms have shown that when teachers are not actively involved in selecting and planning for the use of a new curriculum or tool, it is much less likely that it will get integrated in a meaningful fashion. Furthermore, along with the advent of classroom-based computers has come an increasingly burdensome addition of new content, standards and assessments, and curricular requirements that has crowded the time that teachers might have used to become technologically literate. Compounding the problem in our public schools has been diminishing funding and growing class sizes. Teachers are now expected to teach increasingly more content to increasingly larger classes using increasingly complex tools that they have not been adequately prepared to use.

The second problem is less a matter of time, but more pedagogical. Through workshops and “trainings” educators learned how to use these new computers and specific pieces of software, the question of when and how to use them to support learning began to emerge. Some
educators assimilated these tools into their existing models of classroom instruction and assessment and the computers became the deliverer of electronic worksheets or independent drill and practice machines. It did not help that much of the early software was based on this instructionist model. Other educators, however, began to recognize that computers could be used to access source materials and to support learning in a manner not previously possible (for example, the Valley of the Shadows). They recognized that the social interaction fostered by the use of ICT could stimulate wonderfully cooperative and collaborative projects (eg. WebQuests).

What is now needed is deep reflection on the vision that we have for how learning will take place in our classrooms and the role of ICT in that vision. It is time to reconceptualize the fundamental tenets of teaching and learning in view of the affordances offered by these new tools. Should we settle for technology enhanced-instruction and reproduction, or can we envision deep understanding constructed through technologically supported authentic projects? Given the present situation of temporal, financial and assessment pressures as well as the need for pedagogical reform, how can the field of education constructively move forward? The answer to this question really hinges on the vision that we have for the future of education in this country and the role of science and technology in that vision.

During the past few decades our insight into the mechanics of cognition has evolved significantly (Caine and Caine 1994; 1996; LeDoux, 1996; Sylwester, 1995; Sousa, 1998). We now have a much more detailed understanding of how individuals come to know, understand, and remember information (Caine and Caine 1998). Considerable research indicates that there are qualitative differences in the types of cognitive processing that occurs between different types of classroom practices (Bransford, Brown, & Cocking, 1999; Craik & Tulving, 1975; Marchese, 1998). We know the more we can situate new learning within the context of previous understanding; the more we can allow the students to be active participants in the process; the more we can engage them affectively; and the more we can provide authentic contexts for their learning, the more they will be able to learn, the longer they will remember, and the better they will be able to apply their understanding (Caine and Caine 1998). This constructivist vision of learning as a constructed and collaborative process, is based on research indicating that someone in the process of learning does not passively acquire or absorb a new understanding. Instead, new information is actively assimilated into existing cognitive structures while simultaneously altering these structures. Therefore, what individuals learn is always framed within the context of what they already know; each of us generates our own models and our own individual understanding of the world. This view of learning is antithetical to many of the elements of the school reform movement including standardized curricula, more teacher accountability for student progress, and segmented, decontextualized, standardized assessments of progress (Abbot and Ryan, 1999).

Given our deepening insights into the fundamental processes of learning and knowing, it is shocking how little of this understanding has been applied to the professional development work with teachers to prepare them to use ICT in classrooms. I have been reminded of this disconnect in recent years when asked to give professional development "lectures" to teachers on the
benefits of brain-based learning, or asked to engage in “training” teachers on the use of technology in the classroom. We know that lectures and trainings are an older model of professional development that is in many ways antithetical to the manner in which deep understanding and paradigmatic change are fostered. During this third revolution, it has been the continued implementation of a change model apropos to the second educational revolution that has led to a breakdown in the systemic metamorphosis of our educational system.

Working for Change

For more than a decade, I have been working with colleagues to reconceptualize the manner in which ICT is used by practicing teachers at every educational level. Throughout the course of this work with teachers, I have taken care to note specific elements of professional development projects that seemed to be more effective in fostering conceptual and pedagogical change in classroom practice.

Professional development has become big business for many elements of educational practice, including ICT. The needs of schools and the money professional development can generate has led to the development of a wide range of ideas, methods, and scripted programs. While educational research examining effective professional development has pointed to multiple factors that appear related to teacher change (see NCREL), a further examination of the literature indicates a lack of agreement across these projects regarding which elements are truly effective in supporting this change (Guskey, 2003).

My studies, derived from a range of projects working to support conceptual and practical change in applications of ICT to public school and university classrooms has provided me with the opportunity to design, implement and assess the effectiveness of several elements of professional development. Let me briefly describe three of these projects.

In late 1999 a collection of faculty in private universities and colleges in Oregon began to discuss ICT integration in current education programs. Six of these schools (Concordia University, George Fox University, Pacific University, University of Portland, Western Baptist College, and Willamette University) came together to form the Oregon Technology in Education Network (OTEN). The purpose of the network is to collaborate on a means for transforming the manner in which educational technologies might be employed to support learning in each of our schools. The OTEN has received two grants to date: the first was a GTE grant that funded faculty development in our schools of education in 2000, the second a large federal PT3 grant designed to transform teacher education in the six participating schools. We are now in the fourth year of this grant, and it has provided four major benefits to our teacher education programs:

1) Funded over a dozen technology conferences for faculty and students.
2) Provided the funds to support the professional development of Arts & Sciences faculty who work closely with the schools of education to improve undergraduate use of technology.
3) Developed a program of offering mini grants to faculty across campus and student teachers in the schools of education to support innovative uses of technology in K-12 classrooms. These
grants have amounted to over one hundred thousand dollars.

4) Developed a library of hardware and software tools that is changing the manner in which the use of educational technologies can be learned by aspiring and practicing teachers.

The second project is the Murdock Technology Initiative (http://celt.cu-portland.edu/murdock/), a one-year project that began in 2001. It was designed to help nine participating institutions understand the role of educational technologies in the 21st century, and to help each “create and implement a unique plan of improvement and enhancement in the use of technology for teaching and learning consistent with their own institutional goals”. Nine northwest colleges and universities located in Oregon, Washington and Alaska participated in this project. I served as the lead consultant on this initiative and assisted in the planning, implementation, and assessment of this effort.

Through my involvement with these two projects, as well as work on faculty development projects at my university (sponsored by a Hewlett Grant), and frequent contact with a number of public school districts throughout the northwestern United States, I began to document a convergence of factors related to successful integration of ICT. While many of the elements of successful general professional development apply to educational technology as well, I began to see a pattern of effective practices that were specific to ICT.

While still reflecting on the patterns that I was witnessing, I had the opportunity to spend 3 months of my sabbatical in Christchurch, New Zealand early in 2003 in a unique and technologically-rich discovery-based elementary charter school, “Discovery 1”. In New Zealand I studied a national program of professional development called the “School Clusters program of professional development for teachers in ICT”. Beginning in 1999 the Ministry of Education competitively funded professional development programs in ICT for clusters of schools across the country. I was able to interview teachers participating in this program when they came to observe at Discovery 1. I was also able to visit a number of the participating schools, observe in classrooms and interview teachers. Furthermore I had the opportunity to interview the author of the Ministry’s evaluation of the first three years of this project, Dr. Vince Ham. His evaluation of this project is one of the most comprehensive analyses of any professional development program in educational technologies and it provides an important look into effective practice (Hamm, Gilmore, Kachelhoffer, Morrow, Moeau, & Wenmoth, 2002).

From my close-up work with university faculty and public school teachers, and the judgements provided by Dr. Hamm’s evaluations, I began to document the constellation of factors emerging as critical elements of ICT professional development. While there can be no absolute and definitive set of elements, I want to highlight what I have found to be the five more critical factors. Let me first label these factors and provide a brief description of each. In part two of this article in the next edition of the Berglund Journal I will describe these factors more precisely and discuss evidence of their utility.

**Five Effective Elements of ICTPD**
ICTPD is most effective when the project leaders:

1. **Design a process that respects teachers’ professionalism.** The single most important element in any ICTPD program is the manner in which the participants in the process are treated. When the professionalism of educators is recognized and they are treated as respected partners in the process, then long-term change is more likely. Paramount is the need to compensate educators for the extra time and resources they will invest in this process. Secondly, educational institutions need to divest themselves of the business model of ICT infrastructural control. Treating educators as professionals means empowering them to make informed educational decisions for their classrooms and schools, even with regards to technology implementation. A third related form of professional respect is institutional support and encouragement of technological innovators and those early adopters who seek to explore the ICT horizons. Providing resources for educators who implement creative new applications for technological tools has a positive impact on student learning as well as peer development.

2. **Construct coalitions empowered to contribute to project design.** The second element is the construction of educator coalitions empowered to contribute to the design of their ICTPD opportunities. Ideally, affiliations such as these should be viewed as learning communities whose participants are educators with similar interests. These are groups formed at the department level, school level or even more broadly, and they can be organized into teams or coalitions that help plan and implement appropriate learning activities.

3. **Foster philosophical and pedagogical reflection on the learning process.** With the introduction of any new educational tool comes the need to determine its impact on learning environments, activities and outcomes. Therefore, the third element of effective ICTPD must be a directed focus on the learning process. Throughout their exploration of new tools, educators need thoughtfully to reflect on the manner in which these tools will be modifying student learning in and out of their classrooms. The need is to carefully examine the pedagogical foundations of these technological tools and to consider the educational ramifications of their use.

4. **Develop projects with an extended focus.** Effective professional development involves designing projects with a long-range vision. Fundamental change does not take place rapidly in most educational institutions and with most individuals. While there must be short-term outcomes that can tangibly mark the transitional process, the focus of projects must be on institutionally-supported, long-term systemic change.

5. **Create support structures of essential resources.** Finally, effective ICTPD is facilitated by the development of institutional structures that can provide essential resources to support the project throughout its duration. There is great diversity in the ways that this support can be manifest, ranging from personal technology assistance to the development of online resources. The essence is support, both timely and matching the needs of the participants.

If we believe that there is a beneficial role for ICT in our classrooms, then we must transform the manner in which we employ these tools to stimulate and support student learning. I believe a
critical component of this task will be the future professional development work which teachers willingly accept. The five elements I have described could play a fundamental role in guiding us through needed changes. In the next issue of the Berglund Journal I will thoroughly explicate each of these factors and will provide multiple examples of their implementation.

The use of ICT in classrooms is still a work in process where it is too early to tell whether it will evolve into a deleterious diversion, or whether the work we are involved in will result in the metamorphosis of our educational system that will finally allow it the opportunity to spread its wings and take flight. There is work yet to be done.

Notes

[1] Idea adapted from a presentation by Francis A. Waldvogel President, Board of Swiss Federal Institutes of Technology, Zürich/Lausanne (Switzerland) Presented as a key-note lecture at the 19th ICDE World Conference in Vienna, Austria, June 20-24, 1999 as well as work done by Stephen C. Ehrmann. Retrieved 6/25/02 http://www.tltgroup.org/resources/or%20quality.htm

References


**Webbased Resources**

ACOT Research Library

An Educator’s Guide to Evaluating the Use of Technology in Schools and Classrooms

Apple Professional Development

Bailey: Learning, Technology and Educational Transformation
http://education.ed.pacificu.edu/bcis/workshop/

Becoming a Technologically Savvy Administrator

EDC: Successful Online Professional Development for Educators. EdTech Leaders Online: Documents Programs that Work
http://main.edc.org/newsroom/features/ETLO_ISTE.asp

ISTE: Computer Technology and Professional Development: Suggestions for Schools
http://www.iste.org/Content/NavigationMenu/Research/Reports/
The_Road_Ahead_Background_Papers_1997_/Suggestions_for_Schools.htm

NCREL: enGauge: Professional Development resources
NCREL: Critical issue: Finding Time for Professional Development
http://www.ncrel.org/sdrs/areas/issues/educatrs/profdevl/pd300.htm

NCREL: Critical issue: Providing Professional Development for Effective Technology Use
http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te1000.htm

NCREL: Involving Others in Organizing Professional Development
http://www.ncrel.org/pd/involve.htm

NCREL: Technology Professional Development
http://www.ncrel.org/tech/tpd/

NCRTEC: Professional Development
http://www.ncrtec.org/pd/lwlt/prof.htm

NREL: Classrooms@Work: Models of effective technology integration
http://www.netc.org/classrooms@work/

Planet Papert – the writing of Seymour Papert:
http://www.stager.org/planetpapert.html

Professional Development that Works
http://staffdevelop.org/secrets.html

Ten Steps to Effective Technology Staff Development
http://www.compstrategies.com/staffdevelopment/tensteps.html

The Milken Exchange on Education Technology
http://www.mff.org/edtech/

U.S. Department of Education: Seeds of Innovation
http://www.iaete.org/challenge/

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