Thematic Focus: Technologies and Teacher Education

Editorial

5 Technology and Teacher Education: Making the Connection
Wadi D. Haddad, Editor

ICTs for teacher education and teacher education for ICTs are two complementary endeavors. They hold significant potential, but like any innovation, success is not automatic. As with any ICT application, the learner (in this case the teacher) should continue to be the center of any strategy and the measure of any success.

Frontline

7 The Missing Link in Educational Technology: Trained Teachers
Sam Carlson, Executive Director, World Links

A well-planned, ongoing professional development program, based in a theoretical model, linked to curricular objectives, incorporating formative evaluation activities, and sustained by sufficient financial and staff support is essential if teachers are to use technology effectively to improve student learning.

10 E-training: the New Frontier of Teacher Professional Development
Cheick Kante, Chief Operating Officer, World Links

This article focuses on how technology makes teacher professional development possible anytime anywhere, without major disruptions to the job of teaching.

12 TechKnowNews

X3D Technologies to Unveil First Software that Turns PCs into 3D TV ♦ Communities in Nigeria Using ICTs to Document Traditional Healthcare Knowledge ♦ Online Guide to Free Computers, Software and Email ♦ Iowa College Going Paperless ♦ Claroline - Free eLearning Platform

This issue is co-sponsored by:
Academy for Educational Development

The contents of this Issue do not necessarily reflect the policies or the views of the co-sponsors or their affiliates
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>America's PT3 Initiative: Addressing the 21st Century Teacher Quality Challenge</td>
<td>Mary McNabb, EdD., Research Consultant, Learning Sciences Institute at Vanderbilt University, and Kirk Vandersall, Vice President for Assessment &amp; Accountability, The Metiri Group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The PT3 program is the first major initiative across American institutions of higher education targeting teacher candidates’ preparedness to effectively use technology to enhance students’ learning opportunities, experiences, and achievements.</td>
</tr>
<tr>
<td>19</td>
<td>Pedagogy of the Impressed: Introducing Teachers in Developing Countries to Educational Technology</td>
<td>R.W. Burniske, Ph.D., Assistant Professor, University of Hawaii</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This article summarizes a program of professional development of educators to introduce new forms of educational technology for pedagogical purposes.</td>
</tr>
<tr>
<td>24</td>
<td>The Aula Mentor Program: Making Connections and Building Capacities across Continents</td>
<td>Aimee Verdisco, Inter American Development Bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This article describes the Aula Mentor Program, which uses the Internet to bring together educators throughout Spain and beyond via a range of self-paced, self-study tele-tutoring courses.</td>
</tr>
<tr>
<td>27</td>
<td>Schools Around the World: A Hybrid Professional Development Model for Mathematics and Science Teachers</td>
<td>Marie-Françoise Baker, Former Co-Principal Investigator, SAW, and Erma Anderson, Principal Investigator, SAW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Schools Around the World Program offers professional development by bringing teachers together via the latest technologies to analyze and discuss student work, expectations, and achievement.</td>
</tr>
<tr>
<td>30</td>
<td>SHOMA: A Multimedia Approach to South Africa's Teacher Development</td>
<td>Joanne Capper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>By utilizing the latest digital satellite technology, Shoma relays both television and web-based learning material to remote learning sites across the country. This article summarizes Shoma’s professional development model.</td>
</tr>
<tr>
<td>34</td>
<td>Brazil: Rapid Experiential Learning Program: An Integrated Approach to Teacher Preparation</td>
<td>Eric Rusten, Academy for Educational Development, and Vera Seguri, LTNet-Brazil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This article outlines a nationwide approach for preparing teachers to integrate the use of computers and the Internet into routine teaching and learning. It also describes, in detail, one workshop that illustrates how the different characteristics of this approach are integrated.</td>
</tr>
<tr>
<td>38</td>
<td>ILCE: A Multi-Country Program in Educational Technology</td>
<td>Staff, Latin American Institute of Educational Communication (ILCE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The prosperity and well being of the Latin American region rests on the ability to teach and learn new ways to use ICTs for education.</td>
</tr>
</tbody>
</table>
# Table of Contents

## Under Observation

### 41 Technology Integration in the Classroom: Is There Only One Way to Make It Effective?
*Soledad MacKinnon, Inter American Development Bank*

This article revisits the literature about different approaches towards integrating technology into today's classrooms.

### 45 From Blackboard to Mouse Pad: A Case Study of the Effectiveness of E-learning and Technology in Teacher Education Programs
*Thierry Karsenti, University of Montréal*

This article describes the methodology and results of an experiment that studies the various effects of the implementation of different types of web-based courses and resources in a teacher education program.

### 49 Distance Technology Teaching: A View from the Trenches
*Gregg B. Jackson, Associate Professor of Education Policy, The George Washington University*

What are the challenges and satisfactions of college and university teaching by distance technologies? In late 1999, The American Federation of Teachers surveyed a large number of U.S. college and university faculty members who had done such teaching. This article summarizes the results from 200 respondents.

## Planning for Technologies

### 53 A Comprehensive Strategy for Internet-in-Education Teacher Professional Development
*Edward A. Friedman, Director, Center for Improved Engineering & Science Education, Stevens Institute of Technology*

The real question is, “What actions are needed for students to benefit from integration of technology into the teaching/learning process?” Teacher professional development only deals with one set of requirements for success.

### 58 Training Educators in Effective Technology-Integrated Instruction: A Model Course in Internet Instructional Design
*Joseph M. Baltrus, University at Albany, State University of New York*

Teaching about technology is progressing into teaching with technology. To make this transition, teacher training (whether teacher-educator courses or professional development) can and needs to address technology in the instructional design context.
68 Word Processing for the Digital Divide: The Merits of a Single Application Technology Solution
Anthony Bloome, Operations Analyst, World Links for Development Program, World Bank, and Ayub Kalema Golooba, Mengo Senior Secondary School, Uganda

What if rather than using most of our technology resources for a bundling of computer software and hardware applications that we may only infrequently use, we buy the just-what-we-need hardware and software components that support what we really do from day-to-day -- such as those used for word processing?

73 WorthWhileWebs
Sonia Jurich

This issue focuses on Web sites that are dedicated in two areas to teachers: training teachers in the use of information and communication technologies in teaching and administration, and using information technologies in teacher education/training. Also highlighted are few online Journals dedicated for the support of teachers.

76 Handheld Computing: Educational Savior or Fantasy?
Gregg B. Jackson, Associate Professor of Education Policy, The George Washington University

This article discusses the use of handheld computers by teachers and students and their present and future educational potential.

78 "Position Capturing" Technology: Turning Static Whiteboards and Flip Charts into Dynamic Teaching Tools
Editorial Staff

This article describes position capturing technology as it relates to whiteboards and flipcharts, the products using this capability and the implications this technology has for education and communication.

80 Insights into Training Teachers with Technologies: Not a Project Description from AED/Learnlink
Mary Fontaine, Academy for Educational Development

This article presents some insights and lessons derived from a number of teacher training endeavors.
Technology and Teacher Education: Making the Connection

Technology and teacher education is a two-way street. Information and communication technologies (ICTs) can be a powerful tool in teacher preparation, continuous upgrading, and support. Likewise, teacher education and training is an obvious and well-established prerequisite for effective integration of technologies into the education process.

Technology for Teacher Education

Technology for teacher professional development is not a panacea – it is only a tool. Professional development is a complicated and sophisticated process that involves training in content, pedagogy, and a broad range of skills. It also spans the life of the teacher. Its success requires a change in the school environment – the ecosystem. Bureaucratic walls, conventional methodologies, attitudes about innovations and reforms, and management of the teaching/learning process under the influence of examinations and timetables, represent powerful forces that tend to pull teachers back into pre-training modes.

In all of this, ICTs provide some concrete and unique opportunities:

Simulation and good practice. New technologies, both computer- and web-based, allow for simulation of specific skills through mini- and micro-lessons that can be watched, manipulated and tested. Also demonstrations of real teachers in real classroom settings, representing different subjects, approaches and methodologies, may be brought into the teacher education center without having to travel to schools. More fundamentally, these good practices can be dissected, analyzed, watched again, and assessed over-time without disrupting an actual class.

Savings in time and expenses. Through the application of ICTs, appropriate parts of teacher education can be provided at a distance or virtually – into the trainee’s location, thus saving travel time and cost. Here, we are not talking only about the Internet. Other technologies such as TV, radio, and correspondence have proven effective in this domain.

Training (and learning) on demand. ICTs allow teacher education to take place any time, any place. More importantly, teachers do not have to be supplied with a prescribed body of knowledge and skills irrespective of whether they feel the need for it or whether they are ready to learn it. ICTs (videos, CD-ROMS, Internet, and software) allow teachers to learn things on demand – when they feel the need for that.

Isn’t this how adults learn throughout their lives? Isn’t this what we are advocating for all learners?

Professional and peer support. Initial and specialized training cannot be sufficient for the entire professional life of teachers. There are unanticipated changes in knowledge, methodologies, pedagogical issues, students, school culture – all of which a teacher is bound to deal with ALONE. ICTs can break this professional isolation by permitting, among educators, communication, exchange of information, chat rooms, bulletin boards, discussion forums, and virtual conferences.

Teacher Education for Education Technology

The importance of training of teachers for successful integration of ICTs into education is finally recognized but not well financed and implemented. There are at least four prevailing issues that constrain the effectiveness of such teacher training.

- Many programs are limited to computer literacy and do not train teachers in the instructional use of technology.
- Most programs are supply driven – if we supply training we ensure classroom success. The demand side is equally important. We have to consider the demands of teachers, their needs, interests, attitudes, etc. Why don’t teachers make better use of instructional ICTs? Do they see a practical use of ICTs in their classrooms, or do they consider technology as a threat and a waste of time? Does the school environment (nature of the curriculum, role of teacher and student, allowance for innovation) demand or at least allow for the use ICTs to add value to the teaching/learning process?
- Some training sounds like a selling pitch, amplifying the great benefits of ICTs for the teacher, the students, the school and the world at large! This is a recipe for fanaticism and frustration. Training should be grounded in realism and educational context: ICTs’ potential, limitations, and conditions for success.
- No training, no matter how good, can be a one shot intervention. Training in the use of ICTs for instructional
and learning purposes takes time and individual hand-holding. The reasons are many: even the most knowledgeable and enthusiastic energetic teachers face time constraints and competing demands to learn new things; technologies are unreliable – the more sophisticated and promising they are the more they break down; both hardware, software and educational applications keep changing; and, teachers need time to figure out a comfortable and beneficial zone of use of ICTs in their classrooms.

It is usually assumed that training for educational technologies is an in-service or a specialized activity. What about integrating it into pre-service or initial teacher education? Can new teachers be prepared to teach in a digital age? A 1999 study – commissioned by the Milken Exchange and conducted by the International Society for Technology in Education (ISTE) – “found that teacher preparation programs, while well-intentioned, are not providing the kind of training and exposure teachers need if they are to be proficient and comfortable integrating technology with their teaching.”

(http://www.mff.org/publications/publications.taf?page=154)

In the UK, ICT is now an integral part of the initial teacher training National Curriculum. “The curriculum aims, in particular, to equip every newly qualified teacher with the knowledge, skills and understanding to make sound decisions about when, when not, and how to use ICT effectively in their subject teaching.” The Teacher Training Agency, a governmental body whose purpose is to raise standards in schools by attracting able and committed people to teaching and by improving the quality of teacher training, has also produced exemplification materials on the use of ICTs in subject teaching.

(http://www.canteach.gov.uk/community/ict/)

The Measure of Success

ICTs for teacher education and teacher education for ICTs are two complementary endeavors. They hold significant potential. But like any innovation that involves individuals and organizations, success does not happen through mere application. There are intricate, multi-faceted and uncertain conditions that must be provided, continuously assessed, and modified accordingly. As with any ICT application, the learner (in this case the teacher) should continue to be the center of any strategy and the measure of any success.

Wadi D. Haddad
The Missing Link in Educational Technology:

TRAINED TEACHERS

Sam Carlson
Executive Director, World Links

Introduction

Far too many of us have witnessed computers in classrooms collecting dust; computer labs locked because there is no one trained to run them; students playing non-educational games on computers for hours on end. Literally millions of dollars are being spent this year on providing computers to schools in developing countries, much of which will be wasted because teachers are not trained to use technology effectively.

Experience around the world in developing and industrialized countries has shown that teacher training in the use and application of technology is the key determining factor for improved student performance (in terms of both knowledge acquisition and skills development enabled by technology). Educational technology is not, and never will be, transformative on its own — it requires teachers who can integrate technology into the curriculum and use it to improve student learning. In other words, computers cannot replace teachers — teachers are the key to whether technology is used appropriately and effectively.

That said, designing and implementing successful teacher professional development programs in the application of technology is neither easy nor inexpensive. It is also woefully under-funded. There are more cases of inadequate and ineffective training programs than there are of success stories. Moreover, success stories are not automatically transferable to other situations and the total body of experience and knowledge in this field is in its infancy. This calls for humility, innovation, a willingness to fail, ongoing evaluation, sharing of both positive and negative experiences, and constant revision of teacher professional development programs related to technology.

Teachers remain the gatekeepers for students’ access to educational opportunities afforded by technology: they cannot and should not be ignored. Providing technical skills training to teachers in the use of technology is not enough. Teachers also need professional development in the pedagogical application of those skills to improve teaching and learning. Traditional one-time teacher training workshops have not been effective in helping teachers to feel comfortable using technology or to successfully integrate it into their teaching. Instead, a new paradigm is emerging that replaces training with lifelong professional preparedness and development of teachers. This approach includes pre-service and in-service training, as well as ongoing pedagogical and technical support and mentoring.

While technology increases teachers’ training and professional development needs, it also offers part of the solution. Information and communication technologies (ICTs) can improve pre-service teacher training, by providing access to more and better educational resources, offering multimedia simulations of good teaching practice, catalyzing teacher-to-trainee collaboration, and increasing productivity of non-instructional tasks. ICTs can also enable in-service teacher professional development at a distance, asynchronous learning, and individualized training opportunities. Finally, ICTs can overcome teachers’ isolation, breaking down their classroom walls and connecting them to colleagues, mentors, curriculum experts and the global teacher community on a continuous basis.

Principles and Methodology

Technology and teacher professional development in its use are best introduced in the context of broader educational reform, which embraces a shift away from teacher-centered, lecture-based instruction towards student-centered, interactive, constructivist learning. This has consequences for reform of curricula, examinations, provision of educational resources and teachers’ professional development. Indeed, one of the most exciting aspects of ICTs is their role as a catalyst for such educational reform.
Technology can promote effective instruction that is more student-centered, inter-disciplinary, more closely related to real-life events and processes, and adaptive to individual learning styles. Such instruction encourages development of higher-order thinking and information-reasoning skills among students, and socially constructed (collaborative) learning, all of which are increasingly required in today’s knowledge-based global economy. This potential of technology to improve instruction must be integrated into the design and delivery of teacher professional development programs in the use of technology.

Perhaps most importantly, technology implies a shift in the teachers’ role from being the sole source of knowledge and instruction to being a facilitator of students’ learning that is acquired from many sources. This is often referred to as a shift from being “the sage on the stage to the guide on the side.”

Teacher professional development in the use of technology should embody and model the forms of pedagogy that teachers can use themselves in their classrooms. For example, these training programs should

- Empower teachers to develop their knowledge and skills actively and experientially, in a variety of learning environments, both individual and collaborative.
- Include a variety of learning strategies, including direct instruction, deduction, discussion, drill and practice, induction and sharing.
- Aim at higher-order thinking skills.
- Provide an authentic learning environment so that teachers engage in concrete tasks within realistic scenarios.
- Emphasize ways that technology can facilitate and enhance teachers’ professional lives.
- Encourage teachers to be mentors, tutors and guides of the students’ learning process (rather than simple presenters of knowledge and information).
- Develop teachers’ skills in learning how to learn (define learning objectives, plan and evaluate learning strategies, monitor progress and adjust as needed).
- Promote cooperative and collaborative learning.
- Be sensitive to the culture and diversity of teachers as learners, using a multifaceted approach so as to respond to different learning styles, opportunities, environments and starting points.
- Enable learning independent of time and place (anytime, anywhere learning).

Such an approach implies a need to develop both synchronous and asynchronous modalities, so that teachers can take advantage of training opportunities when they have the time, which is not necessarily when the trainer is available.

A key for successful teacher professional development programs is a modular structure, corresponding to different levels of teacher expertise and experience using technology. Adapting materials to teachers’ comfort level and starting points is essential. In this way, teachers new to technology can be exposed to the full series of professional development modules, while teachers higher up the learning curve can enter where their knowledge and skills stop, and help their less technology-savvy colleagues along.

The basic principles of Adult Learning should be incorporated, meaning the training program is highly social and collaborative, with opportunities to share experiences and combine instruction with discussion, reflection, application and evaluation. In addition to these principles, technology enables an even more collaborative approach and maximizes peer-to-peer sharing of the challenges, frustrations, advantages and successes of using technology to teach and learn. Such an approach encourages the use of illuminating failures in the use of technology in the classroom, as well as examples of best practice.

Finally, these principles of teacher professional development for technology imply the need to build community and systems of on-going support, from peers, mentors and experts. Single training events that leave teachers alone afterwards should be avoided.

**Content of Teacher Professional Development Programs in the Use of Technology**

What should be learned? What skills and attitudes do teachers need to develop? What knowledge do they need to construct in order to effectively use technology to improve teaching and learning? This topic has been extensively discussed over the last ten years as information technology, and particularly the Internet, has been introduced to schools around the world.

To begin with, the designers of a teacher professional development program for use of technology need to determine current levels of teacher competency in this area. The International Society for Technology in Education (www.iste.org) has produced a set of standards for teacher skills and knowledge in the use of technology (“Recommended Foundations
in Technology for All Teachers”), which serves as a useful diagnostic tool to determine competency levels and basic content of teacher professional development programs. While no single set of standards “fits all” and differing economic, social, cultural, educational, and technological realities require different approaches, some minimum guidelines and suggestions for the content of teacher professional development in the use of technology are warranted.

Policymakers should assume as a bare minimum requirement at least twenty-four (24) hours (three full days) of teacher training in the use of technology. This would include basic operating systems, word processing and spreadsheets. Obviously, the more time allocated for this, particularly hands-on time, the greater the mastery of these basic skills. Teachers should finish this basic course with at least the fundamentals necessary for them to practice and further develop their skills on their own back in their schools.

Adding another sixteen (16) hours of training and Internet access would enable teachers to access information on the Internet, do some basic lesson planning integrating technology, and exchange e-mail messages and files with colleagues and experts. With this base of forty (40) hours of professional development, provided that the methodology of the course incorporates some of the key interactive learning principles described above, teachers should be able to begin using technology in the classroom.

Experience of the World Links program suggests that at least eighty (80) hours of professional development are required before teachers can really begin to integrate technology into their teaching. Additional content would include linking curricular objectives to technology-based activities, development of lesson plans and evaluation strategies that incorporate technology, construction of educational web sites, and discussion of ethical issues related to technology and education. Ideally, this would be provided in various stages, allowing time for teachers to experiment with and apply their new technological skills and knowledge in the classroom before moving on to more advanced applications. This approach also allows teachers to reflect upon and share their learning experience (both positive and negative) with their peers, promoting the social construction of knowledge.

World Links has been one of the pioneers in developing and delivering teacher professional development programs in the use of technology to improve teaching and learning in developing countries. It is by no means the “definitive” program nor the most easily replicated and scaled. However, for purposes of illustration, the complete World Links Teacher Professional Development program includes two hundred (200) hours of training, equivalent to five 40-hour weeks. This takes teachers with no prior contact with a computer to full competency, over a two- to three- year period.

Motivation and Incentives

A key issue that must be addressed is teacher motivation to participate in professional development workshops in the use of technology. While so-called “champion teachers” will request and seek out professional development opportunities in the use of technology, the vast majority of teachers will not. Teachers are generally reluctant to change their teaching styles and habits, are cautious of time-consuming activities that may take away from other high-priority obligations (economic, familial or educational), have difficulty in seeing the potential pay-off beforehand of this kind of training, and may feel genuinely threatened by technology such that they want to distance themselves from it rather than embrace it.

Incentives, both extrinsic and intrinsic, which have been used successfully in the past to motivate teachers to participate in professional development workshops, include the following:

- Certification of training by Ministry of Education, with grade and salary impacts
- Public Recognition and Time Allocation by Supervisors
- Reduced Isolation and Increased Professional Satisfaction
- Enhanced Productivity
- Opportunities to Become a Trainer

Training of other School Community Members

Administrators

School directors, finance officers and other administrative personnel also need professional development in the use of technology for non-instructional purposes. Technology can significantly improve the productivity of activities related to financial management, class scheduling, personnel management, student tracking, administrative reporting, communicating with parents, etc.

However, training of school directors should not be limited to non-instructional uses of technology. It is vital that school directors understand and support teachers’ efforts to integrate technology into the classroom. Far too often school directors minimize the time and effort required for teachers to develop the skills and knowledge required to use technology effectively, and in many cases they actively oppose teachers’ efforts to use technology in innovative ways. Administrators who understand the process and time required to tap the potential of technology as a catalyst for effective learning will be far more likely to encourage their teachers to participate in training workshops, to provide them the release time teachers need to do this, and to encourage their teachers to...
experiment with innovative teaching practices using technology.

**Students**

Parallel to, and in conjunction with, teacher professional development is the need to provide training for students in the use of technology. It is shared wisdom now that youth acquire technological skills far more quickly than adults, and are more likely to share their skills with their peers. Rather than seeing this as a threat to their authority, teachers should embrace this reality and use it to their advantage.

Technology training for students has a “viral” character to it, in that it tends to spontaneously replicate itself and spread among other students, many of whom have extremely strong intrinsic motivation to learn new skills. This motivation is related to youth’s natural affinity for new technologies, their desire to improve their academic performance for downstream educational and economic opportunities, and their understanding that these skills are increasingly demanded in the labor markets of their countries.

**Funding**

Traditionally, teacher professional development is woefully under-funded, at both pre-service and in-service levels. This is doubly true with training in the use of technology because education policymakers typically work within fixed technology budgets and heavily prioritize funding of hardware and software acquisition over teacher professional development (to spread technology access as broadly as possible, often for political and institutional reasons). In the political economy of education financing, teacher professional development is a low priority. It doesn’t excite parents, equipment vendors, or politicians who like ribbon-cutting ceremonies. Indeed, it is often viewed negatively because it is costly, time-consuming, pedagogically and logistically challenging, and often results in outcomes that are difficult to measure.

Actual funding requirements for teacher professional development in the use of technology will obviously depend on the scope (content, duration) and methodology of the program itself, and on the number of teachers who are targeted. But experience in both industrialized and developed countries suggests a guideline of professional development financing equivalent to 40% of hardware/software expenditures. As an illustration, if a school (or a ministry of education) spends US$15,000 to establish a computer lab (computers, server, printers, network architecture, software, furniture, etc.), at least US$6,000 additional should be budgeted for professional development of teachers, administrators and students in that school over a two- to three-year period. Assuming a training cost of US$25 per day per participant, and an average of 80 hours (or 10 days) hours of training per participant, a budget of US$6,000 would enable training of twenty-four (24) teachers, administrators and students at that school over several years. This should be enough to promote not only the introduction of technology into the school, but also its integration into the curriculum for improved teaching and learning.

As an illustration, the World Links program was operational in approximately twenty (20) developing countries during the 2000/2001 school year. More than 16,000 teacher-training-days were provided, through 400 local and international workshops, in five languages. Training costs varied from US$25 per teacher per day to US$400 per teacher per day. Taking into consideration the minimum training content guidelines discussed earlier, this translates into a minimum cost of US$75 per teacher. If the training goals of the ministry of education extend to integration of technology (not just use) into the curriculum, this minimum cost (for eighty hours) would be US$250 per teacher.

**Future Trends**

Future trends in teacher professional development in the use of technology will be shaped by two main factors: increasing demand for teacher training and new technologies/methodologies enabling that training.

**Increasing Demand for Teacher Professional Development in the Use of Technology**

The demand from ministries of education and teachers themselves for professional development in the use of technology is outpacing the capacity of conventional approaches, such as face-to-face training, to respond. There is a simple issue of scale as ministries of education implement nation-wide educational technology programs (in countries as diverse as Chile, Senegal, Turkey and Sri Lanka) and the sheer numbers of teachers who need to be trained exceeds financial, human and technical capabilities to handle teacher training requirements. There is an additional issue of increased complexity and content of the training required – as the Internet is introduced a whole new set of skills and knowledge is required among teachers far beyond simple computer literacy (word processing).

At the societal level, expectations of what teachers should know and be able to do are increasing every year. Teachers not only have to know their subject matter and basic pedagogy, they are also expected to model higher-order thinking processes, work in interdisciplinary teams, and inculcate leadership and communication skills. At the same time, they are supposed to deliver better student results on standardized tests, while addressing larger societal problems (HIV/AIDS, conflict resolution, disintegration of families, etc.). Traditional teacher training approaches are simply not equipped to deal with all these new expectations.
By contrast, ICTs can help teachers meet these expectations, by providing productivity tools, access to information and colleagues, and collaboration opportunities. As teachers experience these external pressures and realize the potential of technology to help them respond, their demand for training in the use of technology will grow.

As the need and demand for teacher professional development increases, the key challenges will be ensuring content quality, reliable and appropriate training delivery infrastructure, follow-up support, measurable outcomes, and all at acceptable cost.

**New Technologies and E-Learning**

As discussed earlier, e-learning is a way for teachers to learn new knowledge and skills using computer network technologies. The technologies provide not just text, but also sound, video, simulations, and collaboration with other learners who may be scattered around the country or the world. Currently, most e-learning is delivered using the World Wide Web. However, future e-learning could include delivery via mobile handheld devices, cell phones, and digital video devices.

The field of e-learning is rapidly developing because of the following four main factors:

- Gradual increased availability of higher-speed computer networks to deliver information and services;
- Recognition that teachers need to "work smarter" with constant updating of skills;
- Convenient just-in-time education for teachers (often "anytime, anywhere"); and
- Cost-effective alternative to traditional classroom-based education and training.

However, ensuring that genuine teacher professional development occurs as a result of e-learning requires more than just "putting things on the web." Once again, the key is understanding how most adults learn. Typically, this means involving teachers in real tasks, with frequent interactions with their peers and instructors, opportunities for application of new ideas and skills in the classroom, feedback on assignments and examinations, and time for self-reflection. Good online teacher professional development programs in the future will create knowledge-building communities among the participants.

Of course, it is essential to take into consideration all the costs associated with the e-learning approach. In addition to the costs of computers and Internet access, there are considerable costs in designing the online course itself and providing course coordination, participant registration, technical support, and assessment/certification. Over time these costs can be brought down through standardized templates and increased skills in using the technology and software among all participants. But initial investment costs are likely to be substantial.

**Conclusion**

Most teachers want to learn to use educational technology effectively, but they lack the conceptual framework, time, computer access and support necessary to do so. A well-planned, ongoing professional development program, based in a theoretical model, linked to curricular objectives, incorporating formative evaluation activities, and sustained by sufficient financial and staff support is essential if teachers are to use technology effectively to improve student learning.

While it is neither easy nor inexpensive to design and implement teacher professional development programs in the use of new technologies, it is an absolutely critical element of any initiative to introduce technology into schools to improve teaching and learning. Failure to invest sufficient resources in teacher training will result in failure of school-based technology initiatives. This would result in substantial wasted investment, which few if any developing countries can afford.

Success in ensuring that teachers acquire the skills and knowledge they need to use technology effectively opens the door to all kinds of new educational opportunities for both teachers and students, and downstream economic opportunities for graduating youth and their countries. It is the key to participation in the global knowledge-based economy. Accordingly, teacher professional development in the use and application of technology must be given the priority and resources it deserves, while still maintaining a constructively critical eye on its costs, methodologies and impact.

---

1 This new paradigm was articulated in detail by Wadi D. Haddad, in *TechKnowLogia*, November/December 2000, “Teachers...Training...and Technology.”


5 ibid.
Teachers’ preparation and professional development in skill and content areas constitute a major challenge for education systems around the world. Seldom are sufficient resources available to meet the career-long professional needs of teachers, and even when such resources are available, teachers are having a hard time getting out of their classes during the school year to attend traditional workshops. Though not a panacea, the emergence of technologies as powerful tools for learning and teacher empowerment is revolutionary. For once, the integration of technology into education can be used as a starting point for educators’ professional growth. E-training, or online professional development, offers a tremendous potential for teachers to stay in their classrooms while meeting the constant skills improvement needs inherent in the teaching profession.

The first part of this article focuses on how technology makes teacher professional development possible anytime and anywhere, without major disruptions to the job of teaching. We will discuss an example of how e-training is being used to meet teachers’ professional development needs. The second part of this paper focuses on the cost aspects of e-training.

New Skills for New Expectations

The demand from ministries of education, school districts and teachers themselves for professional development in the use of technology is outpacing the capacity of conventional approaches, such as face-to-face training, to respond. There is a simple issue of scale as educational authorities implement nation-wide educational technology programs (in countries as diverse as Chile, Senegal, Turkey and Sri Lanka) and the sheer numbers of teachers who need to be trained exceeds financial, human and technical capabilities to handle teacher training requirements. There is an additional issue of increased complexity and content of the training required as the Internet is introduced, a whole new set of skills and knowledge is required among teachers far beyond simple computer literacy (word processing), or web browsing.

At the societal level, expectations of what teachers should know and be able to do are increasing every year. Teachers not only have to know their subject matter and basic pedagogy, they are also expected to model higher-order thinking processes, work in interdisciplinary teams and demonstrate leadership and communication skills. At the same time, they are supposed to deliver better student results on standardized tests, while addressing larger societal problems (e.g., HIV/AIDS, conflict resolution, disintegration of families, etc.). Traditional teacher training approaches are simply not equipped to deal with all these new expectations.

E-Training and Professional Growth

Information and communication technologies (ICTs) can help teachers meet many of the expectations cited above, by providing productivity tools, access to information and colleagues, collaboration opportunities, and alternative ways to professional growth. Today, technology offers teachers the keys to unlock a vast world of opportunities available in meeting the goal of professional development. Once teachers have fulfilled the basic requirements of computer literacy and Internet skills, e-training can help them strike the difficult balance between pressure to deliver one’s ‘prescribed’ classroom curriculum on the one hand, and the obligation to maintain up-to-date qualifications on the other.

Some words of caution:

- As is true with other forms of professional development (modern or traditional), it is imperative that e-training incorporate all the elements of adult learning, that is, allow adult learners to be self-directed. Teachers display
readiness to learn when they have a perceived need, and they desire immediate application of new skills and knowledge.3

- Effective e-training must be embedded in the reality of schools and teachers’ work. E-training modules should be designed with teacher input, and foster critical reflection and meaningful collaboration.

- E-training should motivate teachers, facilitate their day-to-day lives, and make their job more satisfying both professionally and personally. It should enable teachers to be part of a global teacher community and to work with mentors (or to mentor others); to access easily Ministry of Education policies and procedures; to develop, find and share on-line educational resources and lesson plans; and to upgrade teaching skills and knowledge. All these dimensions make teaching more rewarding, enriching their lives and increasing their effectiveness.4

When all those prerequisites are met, e-training can then broaden the range of teacher training opportunities and reduce the cost of providing retraining to teachers. World Links (http://www.world-links.org) a program focusing on promoting the use of technology as a teaching and learning tool in developing countries, is demonstrating the feasibility of an original teacher professional development program delivered via e-training. This World Links model focuses on “Curriculum and Technology Integration,” a course geared towards secondary school teachers who have had two previous face-to-face interactions. This professional development course is a 12-week online course that focuses on broadening and deepening teachers’ skills in teaching with technology. Through weekly activities facilitated by instructors and mentors, teachers build technology-integrated lessons and projects that fit the curriculum and technological considerations of the participants’ teaching environment. Central to these activities are regular online discussions and peer reflections on participant work. Participants are expected to work collaboratively to develop group activities and projects, and teach a technology-integrated lesson during the course.

At the center of the World Links’ model is the teacher, aided in the learning process by an instructor and a pool of mentors, all available online. More specifically, instructors are pedagogical experts that assume a leadership role in overseeing and guiding the pool of mentors and their respective course participants. Instructors engage teacher groups regularly through activity introductions, discussion forum dialog, activity reflections, and regular online office hours. In addition, instructors also provide a pedagogical context to the course. This can include suggesting tips for lesson development, helping participants identify and iterate student outcomes, suggesting scenarios for classroom and time management, and providing relevant online resources. Instructors are also responsible for teacher assessment and evaluation.

Aiding the teacher in his/her e-training is a pool of mentors who directly interact with the participant-teacher on a regular basis, through the course discussion forum and email. Mentors assume a peer-expert role, facilitating the development of ideas and strategies for accomplishing activity tasks, enabling creative and effective professional learning and technology integration practices. Mentors are responsible for answering questions, clarifying activities and assignments, and responding to participant postings with comments, suggestions and questions. Mentors make recommendations for activity assessments, assist instructors in identifying key issues, and submit regular reports to the course instructors.

### How Good Is E-Training

Just how good is e-training as opposed to face-to-face as a professional development delivery mechanism? Our contention is that e-training needs to and must be supported by face-to-face interaction, especially at the early stages of teachers’ encounter with technology. While e-training can take professional development to higher levels of achievement and efficiency, it can only build on face-to-face training. Equally important is the supporting virtual community of instructors, mentors, peers and even students. The World Links example illustrated above corroborates the Costa Rican experience in training teachers to use technology, and using technology to train teachers.5 Over 12 years, more than 15,000 teachers and administrators have been trained in Costa Rica, using both face-to-face and distance methodologies. Teachers engage in training on-line on their own, at their convenience, and can do so as often and for as long as they want. Ongoing, continuous pedagogical support and
teacher networking, key ingredients of effective in-service training, are facilitated by the technology. By infusing technology into the teaching and learning process, teachers’ career-long professional development has become a continuous and planned process. Technology extends training into and beyond the classroom, no longer bound by fixed schedules or physical spaces for instruction (anytime, anywhere learning). This dramatically increased Costa Rican teachers’ motivation for, and participation in, professional development in the use of technology to improve teaching and learning.

A study by the Korean Multimedia Center (KMEC – http://edunet.kmec.net) indicated that ‘teachers preferred online training since it provides a more flexible learning environment and allows them to be involved in more meaningful interaction without barriers of either time or space.” Their comment about traditional training was that such “…training programs are delivered in a large classroom environment, with little interaction between instructors and teachers, or among teachers.”

E-Training A Costly Undertaking?

In addition to the capital costs of deploying a technology infrastructure and the recurrent costs of Internet access (which can be prohibitively high in many developing countries), there are considerable costs in designing the online course itself and providing course coordination and moderation, participant registration, technical support, and assessment/certification. Over time, these costs can be brought down through standardized templates and increased skills in using the technology and software among all participants. But initial investment costs are likely to be substantial. Also, as Internet access and bandwidth improve in developing countries, additional web-based synchronous and asynchronous teacher professional development opportunities will arise.

Ultimately, even traditional face-to-face professional development turns out to be expensive. For example, compare the $8,000 cost of a 40-hour face-to-face World Links training workshop (in the use of technology as a teaching and learning tool) for 40 participants with Fundacion Chile’s $400,000 cost of providing a 60-hour online training workshop for 15,000 participants. The face-to-face workshop had a 100% completion rate, while only 50% of teachers completed the online workshop. This translates into a unit cost of $200 per teacher for the World Links program, versus approximately $50 per teacher completing the course for the Fundacion Chile program. Even with a very large dropout rate, the e-learning approach would appear to be far more successful in terms of reaching greater numbers of teachers at lower unit costs.

Conclusion

Effective technology use and its integration in education, especially as a means to deliver professional development, are less likely to replace face-to-face training. But the need to employ technology tools for learning will grow more and more, as education systems embrace technology. E-training and the web, its delivery media, provide real benefits for teachers – and students – when appropriately contextualized to the needs of teachers. The struggle to mainstream technology and its curriculum development models has yet to be won anywhere in the world. At the very least, the vast amounts of money invested in many educational systems can be leveraged by offering those teachers, who are ready, the option of balancing the endless need for professional growth, with their primary responsibility of delivering a curriculum. E-training allows that.

X3D Technologies to Unveil First Software that Turns PCs into 3D TV

X3D Technologies, a New York based company, unveils its X3D (eXtreme Three Dimensional) software on October 1, 2002 at the Internet World US Tradeshow held between September 30 and October 2, 2002. The software transforms TV broadcasts, videos, and games in real time from 2D to 3D, on any PC with a CRT monitor.

At the tradeshow, X3D Technologies demonstrates a number of the software's technologies including the following:

- Video games that totally immerse the user in a 3D fantasy world.
- TV signals that convert on the fly to true, stereoscopic 3D viewable on any CRT computer screen.
- Realtime DVD in X3D that delivers home theatre viewing excitement on your PC.
- eCommerce applications that combine X3D and IBM WebSphere technologies, presenting products as they are seen in the showroom.
- The world’s largest online educational eXtreme 3D library, including hundreds of hours of life-like educational courses over the Internet.
- Various applications for advertising and entertainment.

The X3D system includes everything required to convert 2D into eXtreme 3D - including wire and wireless glasses, receiver, connecting cords and infrared transmitter, install system software, TV & DVD conversion software.

X3D Technologies Corporation offers hardware and software imaging products that enhance education, entertainment and video game experiences on the Internet. Its Internet site, http://www.3dworld.com, is the Web’s first destination for viewing eXtreme Three Dimensional images and video.

For more information, go to http://www.3dworld.com.

Source: X3D Technologies
http://www.x3dworld.com/about/genAboutPressRelease.cfm?ObjectID=85F1C4E0-7218-4099-A1F0DCD7F8AC0DFF

Communities in Nigeria Using ICTs to Document Traditional Healthcare Knowledge

The Association for Progressive Communications (APC) reported on September 4, 2002, that the Fantsuam Foundation, an APC member in Nigeria, has prepared a study that is examining how communities in Nigeria are using ICTs to document traditional healthcare knowledge.

Given the role of traditional medicine, especially in communities where it is the only healthcare available, the Fantsuam Foundation has been working with rural women to understand traditional healthcare practices, and where appropriate, is introducing best practice and safer techniques.

The project/study is unique in that it is a first attempt at documenting knowledge that is traditionally passed on orally. Thus far, the information gathered has been grouped into clear and manageable categories and has been stored on CD-ROM and hard disk. All the information was obtained from the communities themselves, particularly the elders, and the CD-ROM and hard drive are kept with the village head.

Source: The Association for Progressive Communications
The Fantsuam Foundation: http://www.fantsuam.com

Online Guide to Free Computers, Software and Email

Bridges.org, a South African based NGO that helps communities in developing countries to span the digital divide, has created an online guide to finding information about free computers, software and email accounts.

Developed as a result of frequent inquiries to the NGO, the guide, the “Free IT Guide” can be found on the bridges.org website at: http://www.bridges.org/toolkit/freeIT.html.

Teresa Peters, executive director of bridges.org, said: "This is not about illegal or black market software. We want to
connect people with the large variety of legitimate, legal, free software, hardware and IT services that are available. Some services and computer resources are free because they are donated. Others are offered for free as a marketing strategy when the money is made on advertising, or support and services."

The guide is made up of two sections, the general resources section and the software section. The first tells people where to find donated computers and how to get technical support from volunteers. It also provides information on free web development and hosting, free email accounts, and free computer training. The second acts as a resource guide on software applications, explaining their function, pros and cons, as well as providing information on obtaining this software.

The guide's aim is to help NGOs and small businesses, though anyone can make use of it. It is not intended to be comprehensive, but rather serves as a first stop to get people started. Organizations that do not have Internet access can obtain a CD version of the guide from bridges.org.

The Free IT Guide is part of bridges.org's practical toolkit, which also includes resources on telecenters, e-readiness and e-literacy, and a detailed list of organizations working to span the international digital divide.

Bridges.org can be reached at freeIT@bridges.org.

Source: Bridges.org
http://www.bridges.org/media/pressrelease/02_August_1.html

Iowa College Going Paperless

The Des Moines Area Community College's West Des Moines campus opened last fall with the mission to collaborate with companies to beta test education technologies. Last year, about 75 telecommunications students participated in a pilot program to go paperless. Each student has a Compaq iPaq handheld to access e-textbooks, syllabi and class materials, as well as to take notes and exams. The school does not have a library, rather a resource center equipped with computer workstations that can access the Internet, e-books and online journals, but no books.

This fall, the school plans to expand its paperless program to include all technology courses and some business and liberal arts courses. It is expected that over half of the campus community will be paperless with this expansion. All students with concentrations in technical fields are required to have their own handhelds.

The campus has its own wireless infrastructure. Faculty use smartboards (similar to giant touchscreens) to take notes, which students can then download to their handhelds. All data, including faculty and student work, is stored on the school's storage area network and is Internet accessible. Also, the students' iPaqs hold memory cards that can then be synched with a PC or laptop.

Being paperless is not without its disadvantages, however. For example, teachers often have to create their own e-content when what is already available does not meet their needs. As well, the school's printing cost has increased as a result of students' printing materials to read. The school has instituted a printing limit per student per session and if students exceed the limit, they have to pay for the excess printouts.

West Des Moines College website is:
http://www.dmaccwest.org/.

Source: Wired Magazine
http://www.wired.com/news/school/0,1383,53747,00.html

Claroline - Free eLearning Platform

Via press release sent directly to TechKnowLogia:
Announcing “…the release of the new version of Claroline. (1.3).

Claroline (Classroom Online) is an eLearning platform developed at the University of Louvain (Belgium). It allows professors to create easily course websites through the web.

Claroline is a FREE software based on Open Source technologies.

This has already helped to build a community of volunteers around the world to adapt the platform for different countries. The Platform is now available in 12 languages: Chinese, English, Finnish, French, German, Italian, Japanese, Polish, Portuguese, Spanish, Swedish and Thai.

With Claroline, we want to prove that eLearning doesn't necessarily imply heavy investment. Some of our main goals are speed, ease of use and lightweight installation. The tool is based on PHP/MySQL and works both on Windows and Linux/Unix. All details can be found at http://www.claroline.net."
America’s PT3 Initiative: 
Addressing the 21st Century Teacher Quality Challenge

Mary McNabb, Ed.D. 
Research Consultant 
Learning Sciences Institute at Vanderbilt University 
mlmcnabb@msn.com

Kirk Vandersall 
Vice President for Assessment and Accountability 
The Metiri Group

Catalyzing Change in Teacher Education

Amidst the backdrop of a globally networked, interactive culture our American schools find themselves facing a digital dilemma. Today’s youth have different developmental needs than those of yesteryear. They need to acquire higher levels of functional literacy and life-long learning skills, demonstrate well-developed social-emotional intelligence useful for negotiating and collaborating within the global village, and be fluent in using information and communications technologies (ICT) for a variety of purposes. These are some of the personal attributes vital for success as 21st century citizens (Fukuda-Parr, & Birdsall, 2001; Goleman, 1995; McNabb & McCombs, 2001; Metiri Group, 2002; Murnane & Levy, 1996; Tapscott, 1998). Our teacher workforce, however, is not well-prepared to facilitate school improvement changes needed to meet the emerging needs of their students (Carroll, 2001; Darling-Hammond, 2000; Hiebert, Gallimore & Stigler, 2002).

In a two-year study conducted by the National Commission on Teaching and America’s Future, major flaws in teacher preparation were identified among the barriers to students’ acquiring the knowledge, skills and dispositions they will need in the 21st Century (NCTAF, 1996). There is substantial research evidence for the claim that teacher quality has a most important influence on students’ achievement (CEO Forum, 2000; Darling-Hammond, 1999, 2000; Haycock, 2001). Among the five recommendations for enhancing teacher quality advocated by the National Commission on Teaching and America’s Future is the goal to reinvent teacher preparation.

The Preparing Tomorrow’s Teachers to Use Technology (PT3) grant program, funded by the United States Department of Education, comes as a response to the widespread call for reinventing teacher preparation that has been heard from many voices in recent years. Teachers need life-long learning skills and the professional development opportunities to reach their goals. It starts with how they are prepared as professionals. Under the leadership of Dr. Thomas Carroll, the three-year grant program was launched in 1999. It constitutes a historic initiative to redesign teacher education to influence the preparation of new teachers. The PT3 grant program is vital to building the human resource capacity needed in America’s schools that, through the E-Rate, Technology Literacy Challenge Fund, Technology Innovation Challenge Grants and other federal and state programs, have acquired a robust technology infrastructure.

Access to the Internet is now widely available in American schools. According to the National Center for Education Statistics (2001), 98 percent of U.S. public schools and 77 percent of classrooms in those schools were connected to the Internet by Fall 2000. Despite the large increase in access to ICT, Becker found that teachers in the U.S., in general, are not engaging in the full range of information and communication activities that could benefit them and their students. In 1998, Becker (2000) surveyed more than two thousand fourth- through twelfth-grade teachers in U.S. public and private schools, and found that only 16 percent communicated by e-mail with colleagues in other schools as often as five times during the year. Further, only 18 percent of teachers posted information, suggestions, opinions, or student work on the World Wide Web during that time even though 68 percent of these teachers use the Internet to locate information resources to supplement their lesson plans. The data also showed a strong correlation between teachers’ technology skills and how teachers and students use technology in the classroom (Becker, 1999).

Preparing a critical mass of new teacher candidates in curriculum and assessment methods aligned with 21st Century standards and a strong foundational understanding of how people learn, ensures that needed reforms involving effective
uses of technology to enhance students’ learning will occur within our schools. This article describes how PT3 grantees are helping meet this 21st Century teacher quality challenge.

**The PT3 Program and its Partnership Approach**

Since its start in 1999, PT3 has awarded 441 grants (50 catalyst grants, 253 implementation grants and 138 capacity-building grants) totaling $337.5 million to education consortia focused on preparing new teachers for credentialing. Three-year grant awards were made in 1999, 2000, and 2001. The first round of projects is just completing its full cycle of activity. Funded projects seek to improve teacher development, course restructuring, expanded pre-service teacher preparation programs. Implementation grants were awarded to institutions of higher education and their sub-stantial grant partners that grantees were required to enlist in order to leverage local, regional and national support for re-designing teacher education. Funding for Implementation grants ranges from $200,000 to $1.5 million over three years; a typical Implementation grant is $400-500,000. Strategies employed by Implementation grants include faculty development, course restructuring, expanded pre-service teacher experiences related to technology or other specific elements of teacher education related to technology at their institutions of higher education. To the credit of the PT3 program, it is difficult to identify a “typical” grant project. Most implementation projects seek to expand the range of technology-supported teaching strategies used by their university faculty, provide training and support to faculty and preservice teachers, redesign curriculum, and partner with technology-rich schools in which to place their candidates for field experiences. Specific activities undertaken by Implementation grants have included the following:

- faculty development initiatives,
- course restructuring to align with the learning sciences,
- certification policy changes at the national, state and institutional levels,
- online teacher preparation course research and development,
- video case studies,
- electronic portfolio methods,
- faculty and student mentoring networks, and
- embedded assessments.

Grants were made in three different categories: Implementation, Catalyst and Capacity Building. Capacity building grants, only awarded for 1999, were designed to provide institutions with technology resources and time to plan for policy changes related to integrating technology into their teacher education programs. Implementation grants were awarded to institutions of higher education and their substantial grant partners that grantees were required to enlist in order to leverage local, regional and national support for redesigning teacher education. Funding for Implementation grants ranges from $200,000 to $1.5 million over three years; a typical Implementation grant is $400-500,000. Strategies employed by Implementation grants include faculty development, course restructuring, expanded pre-service teacher experiences related to technology or other specific elements of teacher education related to technology at their institutions of higher education. To the credit of the PT3 program, it is difficult to identify a “typical” grant project. Most implementation projects seek to expand the range of technology-supported teaching strategies used by their university faculty, provide training and support to faculty and preservice teachers, redesign curriculum, and partner with technology-rich schools in which to place their candidates for field experiences. Specific activities undertaken by Implementation grants have included the following:

- Consortia of universities within a state seeking to revise state-level requirements and support for technology in teaching,
- development of case-based teaching resources for helping preservice teachers learn how to integrate technology,
- development of performance assessments for preservice and inservice teachers to demonstrate proficiency with a variety of technology-supported teaching strategies,
- creating partnerships among state departments of education, institutions of higher education, and large urban school districts to support and develop teachers’ technology skills,
- gathering and disseminating tools, resources and examples of best practice in teaching with technology via the World Wide Web,
- digital video libraries of best practice using technology in K-12 teaching,
- digital video libraries of best practice using technology in university teaching, and
- repositories of lesson plans that incorporate technology effectively.

Some of the most innovative resources, strategies and practices with sustainable impact at the policy level of teacher...
The rapid cultural infusion of ICT and its converging technologies among grantees are cornerstones of the PT3 grant program's evaluation and support for collaborative exchange of equity and inclusion practices, and thorough attention to courses designed on the premise of research findings from credentialing standards, requiring methods and foundations of working at the policy level to make needed changes to strengthen teacher preparation: human development, career development, e-learning communities and cultures, change in living systems, ethics and governance, teaching and learning sciences, and evaluation and assessment.

The PT3 Vision Quest Group, 2001

The PT3 Vision Quest on Assessment in e-Learning Cultures Project was a one-year multidisciplinary initiative, spearheaded in 2001 by PT3’s director, Tom Carroll, to investigate the nature of networked e-learning cultures and to gain insight into developmentally appropriate uses of the Internet for learning and assessment purposes (McNabb & McCombs, 2001). The Vision Quest group consisted of 23 professionals with expertise spanning seven areas impacting teacher preparation: human development, career development, e-learning communities and cultures, change in living systems, ethics and governance, teaching and learning sciences, and evaluation and assessment.

The PT3 Vision Quest Group created a collection of reflection papers and a framework intended to provide guidance for transforming educational systems to support customized e-learning opportunities for all learners. Informing the framework are research findings discussed in the Vision Quest reflection papers, integrated within the larger scope of literature surrounding these issues. The PT3 Vision Quest Group concluded that while most of our current accountability systems at the state and federal levels are based solely on high-stakes scores pertaining to knowledge-transmission outcomes, the need is immense for new accountability policies and strategies and assessment methods that are dynamic measures of learning achievement and learner development in e-learning cultures. (For more details, see http://www.pt3.org/VQ/main.php3).

From this focus on redesigning assessment and accountability policies and methods appropriate to e-learning, Carroll aimed to focus the attention of grantees and others involved in teacher education on envisioning the future of schooling. Working at the policy level to make needed changes to credentialing standards, requiring methods and foundations of courses designed on the premise of research findings from the learning sciences, emphasizing preparation for digital equity and inclusion practices, and thorough attention to program evaluation and support for collaborative exchange among grantees are cornerstones of the PT3 grant program’s leadership.

The rapid cultural infusion of ICT and its converging technologies called for a new set of educational technology standards for teachers. In 1999, the International Society for Technology in Education (ISTE) was awarded a PT3 Catalyst grant to develop a national consensus on new technology standards for teachers through an extensive review and revision process. ISTE’s project resulted in the National Council for Accreditation of Teacher Education (NCATE) infusing the new National Educational Technology Standards for Teachers (NETS-T) into their professional standards (NCATE, 2000) and in wide-scale adoption of these standards by states, districts, schools, and universities across America. With the help of its consortia partners, ISTE is extending and expanding its role in sustaining and strengthening teachers’ preparation to use technology through a second catalyst grant project focused on development and dissemination of resources for assessing teacher candidates' progress toward attainment of NETS-T (see details online at http://www.iste.org/standards/index.html).

Electronic portfolio assessments have emerged as one widely used assessment method in teacher education. A primary goal of PT3’s assessment initiatives is to increase capacities across the teacher education community for assessing teacher candidates’ progress toward attainment of NETS-T. In addition to ISTE’s assessment resources, other PT3 catalyst and implementation projects are focusing on designing and implementing new assessments to measure candidate’s performance in relation to NCATE and NETS-T requirements. For example, the Technology for Reflection and Assessment Coalition initiative of the Watson School of Education at the University of North Carolina at Wilmington, and its regional partners, is training teacher candidates and faculty to use Palm-based technologies to develop effective classroom formative and summative assessment practices. Another catalyst project focused on electronic assessment is the IMMEX-Powered eTIPs Cases Project designed to assess preservice teachers’ problem-solving abilities in simulated school contexts. The PT3 group at Vanderbilt University formed a partnership with the eTIPs Catalyst grant consortium to infuse the findings from the National Research Council report titled How People Learn (Bransford, Brown & Cocking, 1999) into the development of the IMMEX-Powered eTIPs assessment methods.

Assessment-centered practices are one of the four essential dimensions of effective learning environments (Bransford, Brown & Cocking, 1999; Bransford & Schwartz, 1999; Bransford, 2001; Pellegrino, Chudowsky, & Glaser, 2001). Providing a 21st century foundation from developments in the learning sciences, the PT3 Group at Vanderbilt University and its partners are helping new teachers develop a strong understanding of how people learn, and how learning can be enhanced through innovative uses of new technologies. An inquiry-based curriculum design framework has been developed and serves as the basis for the redesign and development of teacher education courses at Vanderbilt’s partner
Providing technical assistance for the types of changes needed to redesign teacher education courses, graduation requirements, and institutional policy to meet NCATE’s new standards and align with findings about how people learn is the CATALISE Catalyst grant. The CATALISE PT3 Catalyst grant assists the Teacher Education Council of State Colleges and Universities (TECSCU) member institutions in preparing teacher candidates to effectively use technologies in their own learning, and in their developing teaching practices. Since its grant award in 1999, CATALISE staff has developed the Technology Planning System (TPS) to assist teacher educators in linking technology assessment to planning, planning to action, and action to results. The TPS and its related technical assistance services assist teacher educators in assessing where their programs are, to plan for where they want them to be, and to acquire the resources and assistance to move their programs in those directions (for more details see http://www.catalise.org).

Another group of PT3 grants focuses on state-wide initiatives. State policy governing the preparation and qualifications for teacher licensing, hiring and retention have a strong influence on teacher quality and subsequent student achievement (Darling-Hammond, 1999). In efforts to facilitate state-wide changes to improve teacher quality, state-wide PT3 grants established state level organizations of university leaders working on teacher preparation standards, state level support for technology in teacher training, and policy level changes designed to encourage, support, and require proficiency in using technology in teaching for licensing. Additional state level activities support partnership building between universities and local school districts and educational service agencies.

Through grants and contracts, the PT3 program has strongly emphasized program evaluation as a key to success. The PT3 program funded an outside consulting firm to provide technical support and training to project evaluators and grant directors. This support included assistance in designing project reporting, reviewing project reports, and providing direct evaluation assistance to projects through workshops and individual intervention. A core group of evaluation advisors and project directors was convened to help guide the grant program’s evaluation and to further support and highlight the work of evaluators within the projects. Support was also provided through grants to organizations that have col-

<table>
<thead>
<tr>
<th>HIGHLIGHTS OF PROGRAM SUPPORTS AND TECHNICAL ASSISTANCE</th>
</tr>
</thead>
</table>

The PT3 grant program provides leadership and support to teacher preparation programs and institutions through a variety of program supports and national and state initiatives.

Through a combination of contracts and grant-funded projects, the Department of Education provides a range of additional program supports for PT3 grantees. These are instrumental in providing sustainable momentum for technology-related reforms in post-secondary education, and include:

- **PT3.ORG.** In addition to the U.S. Education Department web site, the project also sponsors an in-depth web site dedicated to the PT3 project, that includes shared resources and strategies, an email list-serve, project profiles, a database of all projects searchable by project focus, resources, partners, year, type, etc., and a variety of stories and information of interest to university reformers. (For details see http://www.pt3.org).

- **PT3 Conference.** The Education Department has sponsored annual conferences that bring together all PT3 grantees and serves as a time for sharing strategies, resources, and accomplishments across projects. Sessions covering grant management, evaluation, faculty development, student assessment, and a range of strategies for effecting university change were part of these annual three-day gatherings of grantees.

- **Collaborative Exchange.** Unique to PT3, the collaborative exchange brings together groups of Implementation projects that have similar interests and are addressing similar needs, and provides funding for them to host and participate in two-day site visits to other campuses. Visitors function as “critical friends,” providing advice and insight into how best to further accomplish their goals.

- **Digital Equity Task Force Portal.** This task force provides online access to high-quality learning technology resources, digital content resources, and culturally relevant content, methods for effective use of these resources for teaching and learning, and links to opportunities and tools for generating equitable curriculum resources and methods. The task force envisions the portal, initially designed to provide resources to PT3 grantees as they address inequitable access to learning technology resources in their projects, to become a “librarian expert system” to facilitate the online work of digital equity experts responding to queries from teacher educators. (See http://digitalequity.edreform.net/home/).
lected and disseminated evaluation models, assessment instruments, rubrics, observation protocols and other evaluation tools.

Evaluators and grant directors helped guide the PT3 program in its development. They were enlisted to help design reporting forms, review program reports, run workshops and seminars at annual PT3 conferences. Many who assisted the PT3 grant office in reviewing annual reports commented that this was among the more meaningful learning experiences in which they had participated in years. For results of PT3 evaluation efforts, see http://www.ed.gov/offices/OUS/PES/higher.html#pt3.

Lessons Learned about Preparing Future Teachers

The PT3 program is the first major initiative across American institutions of higher education targeting teacher candidates’ preparedness to effectively use technology to enhance students’ learning opportunities, experiences, and achievements. Pioneering the way to change has produced some important “lessons learned.” Among these lessons is the realization that money is no substitute for leadership. Institutions that made the most substantial progress with reaching their PT3 grant goals had the support of Deans, Department Chairs, and other leaders in making policy changes that directly affected pre-service teachers’ educational experiences. For example, including a graduation requirement that preservice teachers demonstrate proficiency with a variety of technology supported teaching strategies requires school and department level changes that money cannot buy. Program funds can support that change and help make it feasible, but leadership and policy change is a required first step.

Getting university leaders to commit to change requires multiple points of pressure. Funding and programmatic efforts by the PT3 office have engaged a number of important post-secondary boards, interest groups, and policy-making bodies in the move to improve the technology related components of teacher education. These groups include NCATE, TECSCU, AACTE, and ISTE, among others.

Another important lesson learned is that good evaluation requires good program design. As the PT3 program progressed, its focus on evaluation continued and expanded to include program design. The PT3 program engaged evaluators and grant directors in a joint effort to promote logic mapping, a technique designed to both sharpen program design and improve evaluation design (McLaughlin & Jordan, 1999). Early efforts focused solely on program evaluation led to a more comprehensive approach including technical assistance that encompasses attention to evaluation design and findings, together with overall program design and grant performance.

Overall, the PT3 project has increased the capacity of the post-secondary sector to adequately address preparing teachers to enhance students’ learning opportunities through effective uses of technology. Through grants to universities and educational consortia, PT3 has created a powerhouse of new resources, tested institutional and program change strategies, fostered a commitment to modeling effective uses of technology among teacher preparation faculty, and raised the level of dialogue within and among the majority of university organizations across America.

Infusion of technology has been an integral part of recent school improvement efforts in America’s K-12 schools. Most of our states have adopted a form of the National Educational Technology Standards for Students (NETS-S), a goal which cannot be met without teachers well-prepared in effective uses of technology for their ongoing professional development and classroom practices. Universities, both by themselves, and through their standard setting and collaborative organizations, must seek to continue addressing institutional and other barriers to creating more sustainable changes. In some respects, PT3 only begins to set in motion the catalysts for making necessary changes in teacher education to improve teacher quality. These beginnings, however, are impressive and we await to reap the benefits of PT3 as new teacher candidates become teachers in the field.

References


Endnotes

1 Both authors have served the PT3 grant program in a variety of ways including as members of the national core group of evaluators. The views in this article are those of the authors and do not represent the position or policy of the Office of Post-secondary Education at the U.S. Department of Education. Writing of this article was supported, in part, by the Preparing Tomorrow’s Teachers to Use Technology Catalyst Grant, #P342A990348, awarded to Vanderbilt University.

2 Dr. Thomas Carroll was appointed the executive director of the National Commission on Teaching and America’s Future in December 2001.
Introducing Teachers in Developing Countries to Educational Technology

R.W. Burniske, Ph.D.

In 1998, a year after the inauguration of the World Links program, I was asked to lead a series of workshops for teachers and administrators in Uganda. My initiation included an enthusiastic group of educators, an unreliable Internet connection and no formal training materials. Over the next four years, however, I would witness remarkable improvements in the telecommunication infrastructure in places like Kampala, the technological skills of the teachers with whom I worked, and the articulation of the World Links’ professional development program. Overall, my experiences would teach me a great deal about the political struggles, social inequalities, and paucity of professional development opportunities in educational systems ranging from the USA to Uganda, South Africa to Palestine, and India to Brazil.

More than anything, I learned how difficult it is to create and implement a professional development program that introduces educators in developing countries to new technology. One reason for this is that we often neglect the “meta-level” narrative that should inform such programs, allowing a preoccupation with “how to” questions about educational technology to overwhelm the more critical “why” questions. I hope this article will help colleagues step back from technical questions to think about the rationale behind their efforts. We need more deliberate, sustained and self-conscious approaches to the professional development of educators learning how to introduce new forms of educational technology for pedagogical purposes. We can devise such approaches by thinking more carefully about our actions before, during, and after the facilitation of professional development workshops.

Part I – Before a Workshop: Thinking about What We Want to Do

The Narrative: Think of the Workshop as a Dialogue

To begin with, I’d argue that anyone involved with the introduction of educational technology should emphasize education more than technology. Toward that end, a program such as World Links needs to present a coherent narrative for its participants, one in which every activity builds upon its predecessor while anticipating its successor. By doing so, it enables participants to overcome impoverished forms of educational discourse, which have a debilitating effect upon classroom relationships:

A careful analysis of the teacher-student relationship at any level, inside or outside the school, reveals its fundamentally narrative character. This relationship involves a narrating Subject (the teacher) and patient, listening objects (the students). The contents, whether values or empirical dimensions of reality, tend in the process of being narrated to become lifeless and petrified. Education is suffering from narration sickness. (Freire, 1997, p. 52)

The World Links program was designed as an extended dialogue among participants, one that begins with an intensive Phase I workshop, typically five or six days of face-to-face and online activities dedicated to “Teaching and Learning with Technology.” Phase I workshops ask participants to create pilot email projects, which usually involve a small group of colleagues who participate in online discussions over a 3 – 6 month period, acquiring hands-on experience with the technology introduced during the workshop.

If they fulfill the requirements of a pilot email project, learning about the challenges of communicating via this medium, participants will be well prepared for what Phase II brings to the conversation: an “Introduction to Telecollabo-
rative Learning Activities.” Throughout the Phase II workshop, the facilitator draws upon activities and experiences from the Phase I workshop as well as the pilot email projects, establishing a common frame of reference while introducing the vocabulary of “activity structures” (Harris, 1998) and a far more sophisticated notion of telecollaborative learning.

During the Phase II workshop, participants design and implement an original, telecollaborative project that supports existing curricula. The project enables teachers to fulfill their curricular mandates rather than thinking of telecollaborative learning as an extracurricular activity. What’s more, the ensuing, curricular-based, telecollaborative projects anticipate discussions that will take place during Phase III of the World Links’ program, the “Integration of Technology and the Curriculum.”

In many ways, Phase III asks participants to take a step back from the technology to think more thoroughly about its place within their curricula. Phase I introduced a number of different tools, essentially asking three questions about each of them: (1) what is it? (2) how does it work? and (3) how can I use it for teaching and learning? Phase II assumes familiarity with these tools, concentrating upon activity structures for telecollaborative projects, while introducing new concepts for thinking about the forms that online learning activities might take. Phase III, therefore, presents an opportunity for teachers to concentrate upon a fundamental concern: how does this fit within my curriculum? Through a series of hands-on activities, participants create integrated learning units, online libraries, and a telecollaborative publication that will disseminate information about innovative projects and practices. Thus, Phase III draws upon prior knowledge and experience, while anticipating Phase IV of the program, “Innovations: Technology, Pedagogy and Professional Development,” which emphasizes lifelong learning and the diffusion of innovations.

In order to articulate the narrative structure of a program like this, the workshop facilitator needs to be aware of its existence and mindful of it at all times. What’s more, to overcome the “narration sickness” that Freire condemned, we must do everything we can to alter the classroom dynamics, providing opportunities for participants to express their ideas in both face-to-face and online forums. Otherwise, we perpetuate a patronizing model, employing a pedagogy that leaves participants feeling oppressed rather than favorably impressed.

Otherwise, we perpetuate a patronizing model, employing a pedagogy that leaves participants feeling oppressed rather than favorably impressed.

Build a Community: Think about Sustaining the Dialogue

While striving to create a coherent narrative out of a seemingly disparate set of learning activities, workshop facilitators must also transform a “group” of individuals from different parts of a country into a “community” of learners. In Phase I of the World Links’ program the workshop facilitator encounters a group of people who bring a wide range of experiences and expectations. Some may have elected to attend for their professional development, while others may have had it thrust upon them by administrative decree. Still others may have volunteered simply to get out of the classroom for a week. Regardless of participants’ motives, the workshop facilitator must establish a shared sense of purpose, forging a community through a series of face-to-face and online learning activities. If successful, the group will feel a commitment to the pilot email projects that they design with colleagues. This, in turn, will serve them well in Phase II, when the development of telecollaborative learning projects inspires the construction of an even stronger community.

Yet, how does one build such commitment and community? How do we turn what some educators construe as mere “release time” from instruction into a shared ambition? As always, this requires the cultivation of a good learning environment, preferably one in which the participants can dedicate themselves wholly to their professional development. In Brazil, I witnessed a startling contrast between a Phase I workshop held in Sao Paulo during May 2000, and subsequent workshops held at conference centers outside the city. Our physical re-location enabled the group to focus on its work without worrying about the daily trials of transit through Sao Paulo’s congested labyrinth. Our retreat to the countryside provided time for participants to work and play together, particularly in the evening when they could meet in the computer laboratory, to complete work that they could not finish during the day, or continue discussions in less formal settings. In general, four principal work sessions and an open lab and recreation session in the evening (9:00 p.m. – midnight), shaped our days.

This extraordinary immersion accelerated the learning process, supported collaborative work, and fostered a growing sense of community. However, building a community of learners requires far more than an escape from cities like Sao Paulo. We must also make time within workshop sessions to pull ourselves from the computer monitors and small group activities to engage in full group discussions. After all, if we’re true to constructivist principles -- embracing the notion that knowledge is socially constructed -- we must enable par-
participants to share their insights, test their ideas, and work in social settings. For this reason, workshop participants in Brazil grew accustomed to hearing their instructor say, “desliguem seus monitores” (turn off your monitors). Switching off monitors is a prerequisite for active listening. It also signals a break from the technology, enabling the introduction of “ice breaking” activities that nurture community and relaxation exercises that address the ergonomics of technology in education.

Unfortunately, technology has a way of complicating things, particularly when overzealous instructors think more about their curriculum than their students. In our haste to demonstrate the power and potential of new technologies, we may overwhelm individuals who come from a technology-poor environment. There’s nothing wrong with using poster paper for brainstorming sessions instead of an online discussion forum. It might give participants a much-needed respite from staring at iridescent monitors. More importantly, it might simplify an activity, shifting the focus to brainstorming and exchanging ideas rather than the concern of mastering new technology that can, at times, inhibit ideas because participants are too tangled up in the boxes and wires to think clearly.

In my experience, the most successful workshops transform a disparate collection of teachers from various schools and regions of a country into a community of educators with a shared sense of purpose. In Sao Paulo, three different groups have emerged from their respective workshops with a deeply shared experience, as indicated by their recollections of late nights spent creating telecollaborative projects, web pages, and more. Ultimately, their sense of community in face-to-face encounters has inspired a “virtual community” linked by electronic mailing lists, discussion forums, and digital archives that sustain their dialogues (http://www.enlaces.org.br).

**Part II – During a Workshop: Thinking about Doing What We Do**

*Show, Don’t Tell: Think about Teaching Someone How to Fish*

One seldom feels as though there’s sufficient time to “cover” everything in educational technology workshops. As a result, workshops of this kind are fraught with the temptation to cut corners and “tell” participants how to do something instead of “showing” them how to do it. As the Ugandan teachers would have it, this is the difference between handing their pupils a fish rather than teaching them how to fish. We’d do well to remember this when introducing educational technology to people who have little or no previous experience with it.

Although it takes time and patience, workshop participants benefit far more from a “show, don’t tell” philosophy. For this reason, I seldom hand out a list of recommended online resources; rather, I ask participants to conduct online scavenger hunts to find their own resources. This approach reinforces a belief in the social construction of knowledge, encouraging participants to learn by doing, while demonstrating a preference for resources that have cultural and curricular relevance. While it’s tempting to hand over a “Net of fish in the form of annotated URLs, such actions perpetuate the notion that teachers are omniscient authorities capable of pouring the magical elixir of knowledge into passive receptacles.

A “show, don’t tell” philosophy may prove more valuable than any technology in the classroom. Equipped with it, workshop facilitators can resist the temptation to find the resource, build the webpage, or revise a project description for those who are struggling with such challenges. Although participants may howl from time to time, the facilitator’s actions and rhetoric remain aligned, consistently emphasizing the importance of collaboration and sustainability. The “show, don’t tell” philosophy demands an activity-based pedagogy rather than a lecture-based one. Indeed, in the final day of a workshop – even a Phase I workshop – I often remove myself from the room in which participants are working and communicate only via mailing list, asking for work to be completed and submitted to an online archive. This, too, shows participants the shape of online work, rather than telling them about it. By employing such strategies, the facilitator’s actions reinforce his rhetoric, for they demonstrate the importance of dialogue, collaboration and sustainable learning communities.

**Plan B: Think About What Might Happen While You’re Making Other Plans**

Things will go wrong during a workshop. Whether we’re working in technology-rich or technology-poor environments, something will eventually run amok. Perhaps the electrical supply will falter, the Internet connectivity will fail, or the LCD projector’s bulb will go up in a plume of smoke. This is as it should be, however, because things will most definitely go wrong during the classes that participants will teach. Rather than avoid these challenges, however, workshop facilitators should use them as opportunities to demonstrate the importance of “Plan B” – an alternative activity that enables educators to overcome various challenges when introducing new technology to their classrooms.

While technological problems and local constraints are the most frequent reason for a change of plans, the needs and
desires of workshop participants may also compel deviations from the daily agenda. For example, in November 1999, during a Phase I workshop for Palestinian educators in Ramallah, one of the first questions asked was this: “How do we send email in Arabic?” I had no answer. Although the workshop was conducted in English, participants had a right – and a need – to communicate via email in their own language. However, the email software installed on the computers in the laboratory featured only the English language. While there were online email services in a number of other languages, we couldn’t find one in Arabic.

Finally, after conferring with the lab assistants at Birzeit University, where this workshop took place, we struck upon a solution. Participants could write their messages in Arabic using a word processing application, then send those messages as attached files. However, nowhere in the curriculum of a Phase I workshop was there an activity introducing participants to the process of sending file attachments. This had been a conscious decision, not only because of the complexity of the process, but also because it introduces as many problems as it solves (including the transmission of computer viruses). However, in this case I felt it necessary to deviate from the curriculum, jumping ahead to an activity that was far more difficult to explain than simply sending, receiving, and forwarding messages via email. In this instance, the needs of the group compelled a shift to Plan B: learning how to attach files to communicate in Arabic.

Collaborate: Think About Sharing the Labors of Learning

In any dialogue, one must be sensitive to language. At its core, dialogue is a form of collaboration, which literally means to “share the labors.” In order to share the labors of learning in a workshop dedicated to educational technology – particularly in developing nations where participants lack fundamental experience – facilitators must earn the group’s confidence and trust. Only by collaborating with the group, demonstrating respect for local customs and individual needs, can the instructor build a healthy, collegial environment. In my experience, this has meant respecting tea times in Kampala and New Delhi, prayer times in Ramallah, and extended lunch times in Sao Paulo.

However, this does not mean that the facilitator should capitulate at every turn. To co-labor, the participants need to understand that the integration of new technology and pedagogical innovations will require a significant amount of time and energy. In order to collaborate successfully they must be aware of the challenges from the outset, including time constraints and technological limitations. This compels the facilitator to share a vision for the week, reinforcing that vision with a disciplined (yet flexible) agenda on subsequent days. Invariably, it will take time to arrive at a rhythm that feels comfortable for both the workshop facilitator (who usually wants to move more quickly) and participants (who usually want more time for each activity). Once that rhythm is established, however, the symbiosis between facilitator and participants manifests itself in a most compelling way, revealing the need to erase traditional boundaries.

Education must begin with the solution of the teacher-student contradiction, by reconciling the poles of the contradiction so that both are simultaneously teachers and students.

(Freire, 1997, p. 53)

Without the facilitator’s disciplined approach, the participants can sabotage a workshop, turning it into a chaotic series of disparate activities that lack the urgency and continuity necessary to accomplish a meaningful objective. Without the participants’ cooperation, however, collaboration will give way to a battle of wills, turning what should have been a rich, human interaction into an unpleasant tug of war. Fortunately, I have not witnessed this on many occasions, but suffice it to say that the legacy of apartheid, which reared its ugly head in a workshop I facilitated in Johannesburg in March of 1999, taught me all I need to know about the importance of a collaborative spirit in workshops introducing educational technology to a diverse group of educators.

Telecollaborate: Think About Sharing the Labors at a Distance

If collaboration means “sharing the labors” then “telecollaborative learning” means “sharing the labors of learning at a distance.” To simulate this type of learning in a face-to-face workshop – initiating participants to discussions beyond the physical confines of a particular classroom – we need tools that facilitate dynamic, online learning activities while establishing a digital archive that preserves collective memory. It was this desire that prompted Michael Trucano, the World Links’ Director of Technology, to design an online Collaboration Centre for workshops: http://www.world-links.org/discuss/english/messages/8/8.html.

The importance of telecollaboration during a workshop cannot be overstated, for it enables participants to acquire greater comfort and experience with online tools and learning environments. We are creatures of habit, after all, and we learn to do what we do. Facilitators must be cognizant of this fundamental truth when introducing novices to new technology or they may unwittingly lead them toward frustration and failure. If, for example, a Phase I workshop relies exclusively upon a web-based email service – in a country where rural schools lack reliable access to the Web – participants will suffer myriad frustrations that might have been avoided by learning how to use email applications that enable offline work. Similarly, it does little good to offer presentations of
Professional development requires a careful balance of action and reflection, prompting continual learning on the part of classroom practitioners. With that in mind, I believe that programs like World Links need to stimulate the kind of learning that Freire called praxis, which is best described as a process of discovery.

*The discovery cannot be purely intellectual but must involve action; nor can it be limited to mere activism, but must include serious reflection: only then will it be a praxis.*

(Freire, 1997, p.47)

During individual workshops, so much learning is compressed into a short time period, and the learning curve is so steep, that we need to give participants time to reflect. I have employed “Process Journals” for this purpose, requiring individual or group reflections at the end of each day. Entries in the journal serve as meditations, encouraging participants to raise questions, express concerns or ponder the impact of new technology upon their teaching and professional development. These journals enable a facilitator to keep a “finger on the pulse” of the group, as well as select “journal gems” to share with the full group. More importantly, though, they help participants make sense of their experience.

By inculcating the habit of reflection during workshops, we can help participants come to grips with the impact that new technologies have upon them – personally and professionally. In several instances, participants have continued the practice after a workshop’s conclusion, keeping journals to capture their experiences with pilot email projects and telecollaborative learning activities. In addition to helping them through the process, these journals also serve as a rich source of material for professional publications and presentations.

Healthy praxis requires more than reflection, however. For this reason, I try to conclude each workshop by bringing participants back to the beginning. As a rule, small groups that will engage in telecollaborative activities are asked to devise an action plan that describes what their next steps will be -- individually and collectively -- to sustain the momentum generated during the week. ²

By helping participants come full circle, we also help them understand that the end of a workshop signals the beginning of the telecollaborative work that will sustain their discussions and learning process, renewing their community while forming a bridge from one phase of their professional development to the next.

**The Diffusion of Innovations: Think about the Future**

Without a strategy for the diffusion of innovations, a program such as World Links will fail to realize its full potential. Diffusion research has demonstrated that only 2.5% of a given population fulfills the role of “innovators,” while roughly 13% prove to be “early adopters” of new innovations (Rogers, 1995). This is especially significant when we consider how little is known about the efficacy of telecollaborative learning activities and what exactly “goes on” inside them. What do the students do? What do they learn? How can we measure that learning? What pedagogical practices ought to be encouraged? Which should be discouraged? Certainly, computer technology introduces new possibilities, but it also introduces new problems and responsibilities. It is incumbent upon all members of a social group, therefore, to test an innovation before embracing it. This underscores the importance of our historical moment, since the online learning practices that we endorse today will influence the diffusion of innovations tomorrow.

Unfortunately, few K-12 educators work in an environment that encourages innovative teaching methods or their diffusion. Consequently, a professional development program that teaches educators how to integrate new technology for pedagogical purposes must also encourage them to share their ideas and innovations. Because they lack precedent for this, most teachers have grown accustomed to thinking of their classroom as a self-contained chamber within a fortress, rather than as a conduit to the world. In many cases, they feel safer thinking of their classroom as a refuge from “administrivia,” faculty meetings, and daily chores. Rather than share what goes on inside the classroom, they often keep it to themselves, particularly when things aren’t going well. When things do go well, especially when they’ve “colored outside the lines” of The Curriculum, they prefer not to call attention to themselves because their innovations may threaten their colleagues and the status quo. They may lack the courage – or incentive – to share ideas with their department chair. They may erroneously believe that colleagues in
other disciplines, other schools, and other countries will have little interest in the web pages, online libraries or telecollaborative projects that they’ve initiated with their students.

Imagine, though, if innovative educators in developing countries felt empowered to share ideas for an integrated learning unit via discussion forums, electronic mailing lists and online archives? If you need help imagining such things, then have a look at Journal Info-Enlaces, an electronic publication initiated during a Phase III workshop in 2001: http://www.infoenlaces.com.br.

Meanwhile, imagine if educators in developing countries created a National Association of Innovative Educators that would support telecollaborative endeavors as well as an annual conference? If you can’t imagine this, then have a look at what resulted from Ugandan educators’ collaboration during a Phase IV workshop in January 2002: http://209.15.74.171/discus/english/messages/8/838.html?1011282960.

Ultimately, if we can imagine such things, we can do them. And if we do them, then we will help others initiate extraordinary changes in educational practices around the world. That process begins with a dialogical approach to educational matters, including the integration of educational technology to existing curricula. It continues, however, by transforming a pedagogy of the oppressed into a pedagogy of the impressed.

References


1 R.W. Burniske, the co-author of Breaking Down the Digital Walls: Learning to Teach in a Post-Modem World, is an assistant professor in the College of Education at the University of Hawaii.

2 To see examples of telecollaborative work that has taken place during particular workshops, please visit one of the following archives in the World Links’ Collaboration Centre:
   • Phase I – India (January 2002)
   • Phase II – West Bank/Gaza (May 2000)
   • Phase III – Brazil (March 2002)
   • Phase IV – Uganda (January 2002)
     http://209.15.74.171/discus/english/messages/8/744.html?1013070376

3 As demonstrated by the following reflections submitted by educators shortly before their graduation from the program:
   • Phase IV- Brazil (September 2001)
   • Phase IV - Uganda (January 2002)

4 For examples of action plans created by educators in the early phases of the program, take a look at the following archives:
   • Phase I - India (January 2002)
     http://209.15.74.171/discus/english/messages/8/976.html?1011956214
   • Phase II - West Bank/Gaza (May 2000)
Closing Distances between People. Distance between people, places and ideas is quite readily closed with the Internet. Witness the number of websites dedicated to teachers in North America. Teachers have been brought together from within and between schools, school districts, states and even countries to plan lessons, undertake collaborative projects, brainstorm, solve problems, and otherwise cultivate and maintain professional working relationships.

And between Areas. It thus is little wonder that similar sites have been launched elsewhere. The “Aula Mentor” (http://www.mentor.mec.es/) provides an interesting example. (“Aula” means classroom.) Created by National Center for Education Information and Communication of the New Technologies Program of the Ministry of Education in Spain, it uses the Internet to bring together educators throughout the country and beyond. It offers a range of courses and options for self-paced, self-study through tele-tutoring. A total of 61 courses are offered through the program. All are intended to last an average of four months. Given the self-paced nature of all coursework, however, actual study time may either be shorter or longer. In pacing themselves, students (enrolled in courses in Spain) must keep in mind that final exams are given five times a year and must be taken in person. Not all courses, however, are specifically targeted towards teachers. Such courses include administration of small and medium enterprises and accounting for small and medium enterprises. Also a fair number of courses aim at the basics – basic know-how of basic yet pervasive computer programs such as Microsoft Office and Internet Explorer – thus giving recipients the skills they would need to continue online study or, in the specific case of teachers, to be able to effectively utilize and maintain technology-based education packages in their classrooms. Access is open to any interested person independent of the degree, title or position he or she may hold. Enrollment is open and continuous (with the exception of the month of August, when many in Spain take vacation), and all successfully completed courses are certified.

In Spain, any non-profit institution, public or private, can create an “Aula Mentor.” To do so, it simply requires a formal agreement with the National Center for Education Information and Communication of the Ministry of Education and prior clearance from the Adult Training Service of the local council of education. Upon entering into such an agreement with the Ministry, the sponsoring institution agrees to provide and maintain the necessary hardware, including Internet connections, and the selection and payment of technical staff to maintain the machinery and address any technical problems encountered while the machines are in use. The National Center for Education Information and Communication, for its part, agrees to train this technical administrator; select, train and monitor the performance of the “mentors” (discussed ahead); create and update course materials; organize and evaluate all courses; and maintain the program’s server. In terms of costs and financing, the program more than pays for itself. Sponsoring organizations provide the space, and enrollment fees cover the cost of maintenance, including of technical support staff.

Connecting People and Places. Initiated in June of 1993, four phases of the Aula Mentor program and the technology it employs can be noted. The initial phase piloted the program in 10 locations in the (Spanish) provinces of Castilla and León. The technology used reflected the state of the art of the day: Ibertex. The second phase extended the program to Extremadura and penal institutions in Madrid, and updated the technology: to satellites for data transmission. The third phase entails further expansion, to Asturias and Soria, as well as to centers for adult education throughout the country. Technological improvements have also been made, as cutting-edge telecommunications have been incorporated into program platforms and delivery mechanisms. The fourth and most recent phase has been a virtual “internationalization” of the Aula Mentor Program with access to the program and delivery of its content and materials occurring over the Internet. Data for 2001 indicate that more than 30,000 students have taken courses through this program - the majority from Spain, but also from Honduras, Nicaragua and the Dominican Republic.

To make use of the services offered through the Aula Mentor program, participants simply need to have access to the Internet. That is, they can work from their homes, their offices, a cyber-café, a tele-center or any other location with appropriate infrastructure and wiring. It’s not the “aula” per se that matters, although many public-access centers are staffed by technical support personnel; the important activity takes place online, from coursework to evaluations. All learning activities are modular- and web-based, as are most evaluations. Final exams are offered five times a year and must be taken in person. A passing grade is a precondition for certification and for continuing to study at a higher level.
Virtual One-on-One Support and Instruction. Every student has his or her own online “mentor” who is responsible for keeping him or her on track and monitoring and evaluating progress made on all course work. Recruited, trained and selected by the (Spanish) Ministry of Education, the mentors are the key component of the program; they are responsible for ensuring that learning objectives are met online. Through daily email contact with each one of their students, mentors provide “one-on-one coaching” and individualized attention to students as well as facilitate “chats,” tele-conferences and/or tele-debates between students. All student inquiries are answered within 24 hours. In addition, mentors also are responsible for updating course materials, and evaluating student performance.

The mentoring component has seen a number of interesting innovations. For one, it has international reach and scope. With support from the Spanish International Cooperation Agency, the Organization of Iberian-American States, and the respective ministries of education, the “Aula Mentor” program recently has come to Nicaragua, Honduras and the Dominican Republic. An “aula” – or classroom – has been created by and is maintained at each of the ministries. In each instance, the “mentors” are in Spain. However, the idea is to use the mentoring process to build capacity at the local level. Officials in Nicaragua, for example, indicate that they fully expect to be able to extend the program to other sites in the country and to provide all services, including the mentoring component, with local staff.

Online delivery has placed a premium on the need for high quality teaching and learning materials. Realizing this need, the (Spanish) Ministry of Education put together an interdisciplinary team of experts (in content, pedagogy, program design and implementation) specifically charged with elaborating materials for online delivery and others to support content delivered online, such as CD-ROMs and study guides. These materials are intentionally sequenced and balanced between theory and practical applications, complementary activities and activities designed to reinforce key curricular concepts, and self-, peer- and mentored-evaluation. All materials are available online (yet in a secure location so that they can be accessed by students only) and in “hard” (e.g., CD-ROM, paper) format.

Connecting Continents. Outside of Spain, the program usually arrives as part of a technical assistance package for ministries of education. In general, this package includes the necessary hard and software, infrastructure, and training for maintaining all machines. The “mentoring” is done from Spain, although with the vision for all mentoring to be delivered locally (as noted above).

In Nicaragua, the only case outside of Spain for which information was made available at the time of this writing, the Aula Mentor program arrived as a 7-month long pilot experiment in November of 2001. It received support from the Spanish International Cooperation and the Organization of Iberian-American States, and operated under the auspices of the Adult Literacy and Basic Education Program (Programa de Alfabetización y Educación Básica de Adultos de Nicaragua, PAENANIC). The pilot offered a menu of 13 courses to employees of the Ministry of Education working in the area of adult literacy and education, the majority of whom had limited or no contact with computers prior to entering the program. In all, 94 people participated. Indeed, according to Ministry officials, the demand for the program far exceeded its capacity: it ran from 10 machines, accessible during business hours (three additional hours were added on Saturday mornings to accommodate demand).

The Ministry of Education, with support from the Spanish Agency for International Cooperation, is in the process of building from and expanding this pilot program. Plans include five additional machines, an increase in the number of courses offered (to 28), and making the program accessible to all employees of the Ministry of Education.

Closing the “Continental Divide:” Innovative Responses to Local Problems. In moving into this second phase, the program has put forth some innovative responses to technical problems identified in the first phase. For example, problems with Internet connections often compromised the quality of services delivered. To deal with this issue, program administrators are in the process of consultation and negotiation with Ministry officials for connections to their Intranet. Talks also are under way with IBW, an Internet Service Provider, for a cable-based connection. In this way, the program appears to be establishing a support network based on a local public-private partnership – a necessary step towards sustainability.

Other issues being dealt with as the program scales up include anti-virus shields for the network. During the first phase, virus shields were installed on the individual computers, not the network. Given the intensive use of the machines, including the email traffic generated by the students, network failures due to viruses were frequent.

The Aula Mentor is less sophisticated than the teacher-to-teacher sites found across North America. It is, however, a necessary precursor to such sites. The program gives teachers and other education administrators access to basic tools they need in order to make use of technology for their own professional development as well as for use in their classrooms. It also is likely to push forward externally financed technology-based programs for education. After all, if the basics of technology haven’t been mastered, the potential of technology to close gaps in and improve the quality of education is likely to be lost.
Does your professional development consist of sitting in a class full of other teachers and being lectured at by someone who has not been in the classroom for years, who does not engage you or value your opinion, and who has no clue what you do in YOUR classroom? If you answered yes to these questions and you yearn for something new and refreshing that

- focuses on the content of your students’ work with links to standards;
- offers online and in-person opportunities to participate in a guided two-year professional development process;
- introduces you to student work from other countries; and
- lets you engage yourself fully in the professional development experience,

have a look at the Council for Basic Education’s Schools Around the World program (http://www.c-b-e.org).  

In the last ten years, the use of student work as a vehicle for assisting teachers to improve instruction has become accepted as an important means of carrying out professional development. In the United States one might even say that a student work movement exists that emphasizes collaboration and dialogue.

Four years ago the Council for Basic Education began offering this unique style of professional development to K-12 science and mathematics teachers via its Schools Around the World (SAW) program. An Internet friendly program, SAW relies on the latest technology to bring together teachers from seven U.S. districts (Arlington and Alexandria, Virginia; Horry County, South Carolina; Tomahawk, Wisconsin; District 26, New York City; Bucks County Pennsylvania; Washington, DC) and eight partner nations (Australia, Czech Republic, France, Germany, Hong Kong, Japan, Portugal, and the United Kingdom) to analyze and discuss student work, expectations, and achievement.

**SAW Academy for Teaching Excellence**

Through SAW’s Academy for Teaching Excellence (ATE) (http://www.edc.org/CCT/saw2000/ATE/index.htm), the U.S. professional development arm of SAW, teachers can participate in a two year professional development program based on analyzing student work collected from the U.S. districts and SAW partner nations (http://www.edc.org/CCT/saw2000/ATE/ate_ov.htm). Each year consists of four face-to-face workshops and three accompanying four-week-long online seminars. The first year workshops and seminars cover the following topics: inquiry, assessment, knowledge vs. understanding, and the “meatiness” of assignments. In the second year, teachers discuss process skills, instructional strategies, intellectual quality of student work, and misconceptions. In addition, teachers can sign up to participate in an international online collaboration with SAW’s partner nations. Last year, the first two international collaborations looking at group work attracted teachers from six of the nine SAW countries.

**Online Seminars**

Originally consisting of four face-to-face workshops a year, SAW joined the ranks of online learning two years ago when it began offering its six-week Evidence-to-Excellence (E2E) seminar. (For excerpts from an online seminar go to http://www.edc.org/CCT/saw2000/annotated_seminar.htm). Last year SAW branched out to offer shorter seminars on inquiry, assessment, and knowledge vs. understanding to accompany the face-to-face workshops. Each seminar has its own requirements. Generally, teachers are required to complete weekly readings, analyze student work and consider questions posed by the online facilitator and by their participating colleagues. This means posting a message regarding
the central question of the week as well as responding to the other participants’ comments.

For instance, in the E2E seminar, K-12 teachers from the U.S. and around the world learn the SAW process of analyzing student work. After taking the time to introduce themselves to one another in the first week and getting themselves acquainted with the online learning environment (in this case WebBoard), participants complete a series of assignments over the next five weeks. Each week, teachers have to review a different piece of a student work case taken from the SAW international database, complete designated readings and answer questions on both the work and the readings. Participants can log on at any time of day and have seven days to post their comments on each of the following weekly topics: identifying the standard and essential understanding of the lesson; explaining how the lesson fits into the unit addressing the standard; reviewing the assignment to identify the central teaching and learning goals; examining student work for evidence of essential understandings; and using colleagues’ reflections to improve the lesson and student achievement.

The four-week long asynchronous ATE seminars aim to build on the knowledge gained in the face-to-face workshops. They serve to bring together teachers from the various U.S. SAW districts to exchange ideas, concepts, thoughts, and experiences. Teachers not only discuss assignments, assessments, rubrics, and the like, but also learn what goes on beyond their school, district, and state. The international online collaborations have the same goal except that they provide a global outlook, thereby expanding horizons further.

In an effort to get teachers to “think globally and act locally,” the international collaboration seminars, which used a list-serv format rather than the WebBoard environment in order to accommodate our international partners’ needs, engaged six of the nine nations to consider what it meant to do “group work.” The October discussion raised issues on the best time to use group work, good examples of assignments that use group work, the role of assessment in group work, and professional development opportunities to learn how to employ cooperative strategies. The second seminar, held in March, talked about how well the students worked together, the type of skills reinforced through group work, different ways students present their findings, and the advantages and challenges presented in utilizing cooperative learning in the classroom.

Each seminar has a content facilitator who monitors the comments and helps keep the discussion flowing. Teachers are expected to post at least twice a week—once to answer the questions and a second time to respond to a colleague. Very often a passionate discussion erupts, leading to some teachers posting between ten and sometimes fifteen times in some weeks.

The international collaborations use the content facilitator to lead in-person discussions in their countries with their team of teachers; the facilitator then posts a summary of the discussion to the listserv. This format allows teachers who speak very little to no English to receive and read all the country postings without having to post a text in English themselves. Furthermore, it limits to a manageable amount the number of postings every teacher receives and has to read, since the facilitator summarizes the main points of the discussion and there are only six comments posted as opposed to dozens.

To participate in the online seminars, teachers need regular access to the Internet either through their school or at home. The SAW Academy for Teaching Excellence web page at http://www.a-t-e.org hosts the seminars in a password-protected area accessible only to registered participants. The Center for Children and Technology (CCT), a leader in education technology and part of the Education Development Center, Inc. that designs the SAW technology, archives the seminars once they have ended so that they continue to be available for future reference by its participants and SAW staff.

**International Student Work Database**

Most of the seminars focus on a case of student work collected in the international database housed at the SAW website (http://www.s-a-w.org). Only teachers whose school or district have signed on for the two-year academy and have participated in the first workshop will gain access to all the cases in the password-protected database. The online database currently holds about 150 cases of student work, most of them in science and from the U.S. This year SAW will upload more mathematics cases to the database, and partner nations have been increasing the number of cases they contribute so that the database will house many additional interesting cases by the end of the year.

A case consists of a template providing some background information on the assignment, three samples of student work from the assignment representing three levels of teacher expectations (going beyond expectations, meeting expectations and not yet meeting expectations), and another template accompanying each sample to explain the reasoning behind the teacher’s evaluation. Teachers can also upload rubrics, the original assignment as it was given to the students, or any other material pertinent to understanding the assigned task and subsequent evaluation. The partner nations submit the original student work along with an English translation, and complete the background informational templates in English. The cases teachers volunteer to the data-
base represent tasks on which the teachers would like to receive feedback. By no means do they reflect exemplary assignments or samples. A fourth grade U.S. (http://www.edc.org/CCT/saw2000/nations/usa.htm) science case on electricity illustrates the different components of a student work case that help point teachers toward designing a better assignment, lesson and/or unit. (See Appendix for case example.)

Every year CCT presses a CD-ROM of the online database of international student work for easier offline access. Participating nations, districts and schools can then request a CD-ROM of SAW student work, which can serve as a resource for further in-school professional development.

Participant Comments

Teachers who have participated in the Academy workshops and online seminars have had many positive things to say about the program. http://www.edc.org/CCT/saw2000/blubs.htm An unpublished article written by our colleagues, Janet Zydney Mannheimer (Professional Development Laboratory at New York University) and Rachael Holovach (District of Columbia Public Schools), entitled ‘What happens when teachers collaboratively look at student work in science?’ highlights two teachers’ experiences in SAW’s Academy program.” Teachers who participated in the make-up version of the online seminar on “Inquiry” at the end of this past school year had this to say about the experience:

_The dialogue has led to new and improved ways of thinking for me. I like the online discussions and feedback. Talking to others online was interesting and insightful. Plus it is nice to be able to do things [in] my own time frame._

_The dialogue has helped me to see different ways to approach my teaching. I have made copies of the postings so that I can refer back to them._

_I really got into the posting. It was great to be able to do it when I had the time to relax and put some thought into it. I could go and read postings or readings, think about them and then return to answer…. Thanks for putting on a really good class that helps us improve our teaching!!_

Conclusion

Schools Around the World (SAW), with its focus on science and math, is unique in pursuing the quality of academic content learning through student work. The SAW Academy for Teaching Excellence combines the process of analyzing student work with the drive toward an academic standards-driven classroom. It helps teachers to improve the way they teach particular content areas. Using the standards as the starting point, SAW provides teachers the opportunity to become reflective practitioners, using student work first from the international database and then from their own classrooms as a basis for analyzing the quality of teaching and learning.

The growing online component makes it possible for teachers from all over the country and around the world to develop an extensive peer network through which teachers can safely discuss issues that are true and dear to them. Most importantly, they can do it on their own terms at a time that is most convenient for them. The online component also makes it possible to get to know better colleagues with whom you work in your school and district, and to even discover sides of them you never knew. For more information on the Academy for Teaching Excellence and the SAW program visit, our web sites at http://www.a-t-e.org and http://www.s-a-w.org or contact us at sawinfo@c-b-e.org.
## Case Example - Student Work Samples

### SELECTED INFORMATION FROM TEMPLATE ONE

<table>
<thead>
<tr>
<th>Specific SAW topic</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment name or activity assigned</td>
<td>Conductors and Insulators</td>
</tr>
<tr>
<td>Knowledge and skills students needed prior to completing the assignment</td>
<td>They need to understand open and closed circuits</td>
</tr>
<tr>
<td>Describe the preparation of the lesson and instructional strategies used in delivering the lesson</td>
<td>Individual help was provided as work progressed. Before constructing the actual series and parallel circuits, the students were asked to first build a simple complete circuit. This was used to compare the brightness of the light bulb before adding another or adding another pathway.</td>
</tr>
<tr>
<td>Describe any collaboration you had, if any, in designing this assignment: (e.g. other teachers, parents, administrators, students, community members, etc.)</td>
<td>Fourth grade teachers worked together on four aspects of this unit: open and closed circuit, conductors and insulators, parallel and series circuits, and static electricity.</td>
</tr>
<tr>
<td>Describe the circumstances and/or conditions under which students completed the assignment</td>
<td>Students worked individually; Work was produced in class; All students in the class performed the assignment; Work was submitted in stages or could be re-submitted several times; Work was produced during the lesson; Students were given rubrics or scoring guides; Students worked in groups; Work was produced at the end of the lesson.</td>
</tr>
<tr>
<td>Time students had to complete this case</td>
<td>3 class periods</td>
</tr>
</tbody>
</table>
Conductors and Insulators

In this investigation we tested to see what are good conductors and good insulators. We tested 7 different materials. Some were conductors and some were insulators. We would make a prediction, if it made the light light up, it would be a conductor, if it didn’t light up it would be an insulator. Here is a diagram.

A conductor allows electricity to pass through the wire, and lights up a bulb. Good conductors we tested were a paper clip, nail, penny, and aluminum foil. The way all the conductors are alike is that they all are copper, metal, or steel. The reason it is good to have conductors is because we need conductors to light up a light bulb so we can have fun.

An insulator does not allow electricity to pass through the wires and DOES NOT light up a light bulb. Good insulators we tested were a balloon, crayon, and a pencil. The reason we have insulators is because we have to put any kind of insulator around a plug so we won’t get electrified. In my wire the insulator is the plastic covering around the metal wire. The conductor in my wire is the metal wire inside the plastic covering. I have seen several places where insulators have been used. One was at my house when my mom plugged in the vacuum and she did not get electrified. The last place is at my house. The Christmas lights have insulators.
### Rubric for Conductors and Insulators

<table>
<thead>
<tr>
<th>Student's Name</th>
<th>Points</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

#### Content and Development
- All information is related to the topic. ✓ - -
- Facts and details are accurate. ✓ - -
- Each paragraph contains all necessary information with relevant details. - ✓ -
- Lab sheet with predictions and observations is complete. - - ✓

#### Organization
- Follows the proper sequence. - ✓ -
- Information is organized by paragraphs. - - ✓
- Report is neat. ✓ - -
- Report was completed on time. ✓ - -

#### Diagram
- Diagram is neat. - ✓ -
- Information is correct. ✓ - -

#### Conventions
- There are few errors in capitalization. ✓ - -
- There are few errors in punctuation. - ✓ -
- There are few errors in spelling. - ✓ -
- There are few errors in grammar. ✓ - -
WHICH MATERIALS ARE GOOD CONDUCTORS OF ELECTRICITY?
WHICH MATERIALS ARE GOOD INSULATORS OF ELECTRICITY?

OBJECTIVES: Students will be able to: a.) Define conductor and insulator.
          b.) Demonstrate which materials are good conductors and which are good insulators.

MATERIALS NEEDED:
A.) FIRST BAG: a.) 3 wires (bare on the ends)
    b.) 1 light bulb and light bulb holder
B.) SECOND BAG: a.) balloon
    b.) paper clip
    c.) pencil
    d.) crayon
    e.) nail
    f.) penny
    g.) aluminum foil
C.) BATTERY (Dry Cell)
D.) TAPE

COPY THE CHART BELOW INTO YOUR NOTEBOOK

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>PREDICTIONS</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) balloon</td>
<td>Won’t light up</td>
<td>Didn’t light</td>
</tr>
<tr>
<td>2.) paper clip</td>
<td>It will light</td>
<td>It lighted</td>
</tr>
<tr>
<td>3.) crayon</td>
<td>Won’t light</td>
<td>Didn’t light</td>
</tr>
<tr>
<td>4.) pencil (wood)</td>
<td>Won’t light</td>
<td>Didn’t light</td>
</tr>
<tr>
<td>5.) nail</td>
<td>It will light</td>
<td>Did light</td>
</tr>
<tr>
<td>6.) penny</td>
<td>It will light</td>
<td>Did light</td>
</tr>
<tr>
<td>7.) aluminum foil</td>
<td>It will light</td>
<td>Did light</td>
</tr>
</tbody>
</table>

MAKE PREDICTIONS. After the teacher creates an open circuit using a battery, tape, 3 wires, a light bulb, and a light bulb holder (illustrated below), observe one test modeled by the teacher. Based on your observations, predict what will happen when the ends of two wires touch an object? Write your predictions on your chart in your notebook. Be ready to share predictions with the class.
Conductors and Insulators

We tested materials in the science lab to see which are conductors and which are insulators. Insulators don’t light up, but conductors light up. We used a paper clip, 3 wires, a dry cell, one light bulb, a dry cell holder, and a light bulb holder.

A conductor allows electricity to pass through the wires and lights up a light. The paper clip, nail, penny, and aluminum bulb made the bulb light. Most conductors are a type of metal. It is good to have conductors so you can get electricity.

An insulator does not allow electricity to pass through the wires and does not light up the light. Some insulators are a balloon, a crayon, and a pencil. I think insulators keep you from getting electrocuted. The outside of the wire is the insulator, and the inside of a wire is a conductor. I’ve seen insulators in houses, my phone, my room, stores, farms computers, and power lines.
<table>
<thead>
<tr>
<th>Rubric for Conductors and Insulators</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student's Name</td>
<td></td>
</tr>
<tr>
<td>Content and Development</td>
<td>3 2 1</td>
</tr>
<tr>
<td>- All information is related to the topic.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>- Facts and details are accurate.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>- Each paragraph contains all necessary information with relevant details.</td>
<td>- - ✓</td>
</tr>
<tr>
<td>- Lab sheet with predictions and observations is complete.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>Organization</td>
<td></td>
</tr>
<tr>
<td>- Follows the proper sequence.</td>
<td>- - ✓</td>
</tr>
<tr>
<td>- Information is organized by paragraphs.</td>
<td>- ✓ -</td>
</tr>
<tr>
<td>- Report is neat.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>- Report was completed on time.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>Diagram</td>
<td></td>
</tr>
<tr>
<td>- Diagram is neat.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>- Information is correct.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>Conventions</td>
<td></td>
</tr>
<tr>
<td>- There are few errors in capitalization.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>- There are few errors in punctuation.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>- There are few errors in spelling.</td>
<td>✓ - -</td>
</tr>
<tr>
<td>- There are few errors in grammar.</td>
<td>✓ - -</td>
</tr>
</tbody>
</table>

Total: 37
WHICH MATERIALS ARE GOOD CONDUCTORS OF ELECTRICITY? WHICH MATERIALS ARE GOOD INSULATORS OF ELECTRICITY?

OBJECTIVES: Students will be able to: a.) Define conductor and insulator. b.) Demonstrate which materials are good conductors and which are good insulators.

MATERIALS NEEDED:
A.) FIRST BAG: a.) 3 wires (bare on the ends)  
   b.) 1 light bulb and light bulb holder 
B.) SECOND BAG: a.) balloon  
   b.) paper clip  
   c.) pencil  
   d.) crayon  
   e.) nail  
   f.) penny  
   g.) aluminum foil  
C.) BATTERY (Dry Cell)  
D.) TAPE

COPY THE CHART BELOW INTO YOUR NOTEBOOK

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>PREDICTIONS</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) balloon</td>
<td>no-light</td>
<td>no-light</td>
</tr>
<tr>
<td>2.) paper clip</td>
<td>yes-light</td>
<td>yes-light</td>
</tr>
<tr>
<td>3.) crayon</td>
<td>no-light</td>
<td>no-light</td>
</tr>
<tr>
<td>4.) pencil (wood)</td>
<td>no-light</td>
<td>no-light</td>
</tr>
<tr>
<td>5.) nail</td>
<td>yes-light</td>
<td>no-light</td>
</tr>
<tr>
<td>6.) penny</td>
<td>yes-light</td>
<td>yes-light</td>
</tr>
<tr>
<td>7.) aluminum foil</td>
<td>yes-light</td>
<td>yes-light</td>
</tr>
</tbody>
</table>

MAKE PREDICTIONS. After the teacher creates an open circuit using a battery, 3 wires, a light bulb, and a light bulb holder (illustrated below), observe one test modeled by the teacher. Based on your observations, predict what will happen when the ends of two wires touch an object? Write your predictions on your chart in your notebook. Be ready to share predictions with the class.

![Diagram of wire and battery](image)
Conductors and Insulators

Did you know that a conductor is an item that lets electricity flow? An antonym of a conductor is an insulator. It stops electricity from flowing.

My class has just finished an experiment to see which of seven items are conductors or insulators. We used these materials: a balloon, a paper clip, a crayon, the wood of a pencil, a nail, a penny and some aluminum foil.

Those aren’t all that you need. You will also need: a dry cell, three wires, a dry cell holder, a light bulb, and a light bulb holder.

First you should put the wires into the slots in the dry cell holder. Next you would, of course, put the dry cell into its holder. Then, very lightly screw the bulb into its holder. Take one of the wires that you connected to the dry cell holder, and put it into one of the connections on the light bulb holder. Next take the extra wire and connect it to the light bulb holder. For each material predict whether the light bulb will light or not. Finally, take one of the materials and put it between the two loose wires like this.

A conductor allows electricity to pass through the wires and light up a light. According to my tests, these materials are examples of good conductors: a paper clip, a nail, a penny, and aluminum foil. Have you noticed that these materials are all alike in some way? They are all alike because they are all made out of some sort of metal. It is good to have conductors because without them, we would have no electricity.

An insulator does not allow electricity to pass through the wires and doesn’t light up a light. From my observations, I found out that these materials were good representatives of an insulator: a balloon, a crayon, and a pencil. We need insulators so we don’t get electrocuted. On a wire, the part that is an outer covering is the insulator, and the actual wire is the conductor. I have seen insulators being used on the plastic cover of a plug that is being plugged into the wall, and when you turn off a light.
### Rubric for Conductors and Insulators

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content and Development</strong></td>
<td></td>
</tr>
<tr>
<td>• All information is related to the topic.</td>
<td>3</td>
</tr>
<tr>
<td>• Facts and details are accurate.</td>
<td>2</td>
</tr>
<tr>
<td>• Each paragraph contains all necessary</td>
<td>1</td>
</tr>
<tr>
<td>information with relevant details.</td>
<td></td>
</tr>
<tr>
<td>• Lab sheet with predictions and</td>
<td></td>
</tr>
<tr>
<td>observations is complete.</td>
<td></td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td></td>
</tr>
<tr>
<td>• Follows the proper sequence.</td>
<td></td>
</tr>
<tr>
<td>• Information is organized by paragraphs.</td>
<td></td>
</tr>
<tr>
<td>• Report is neat.</td>
<td></td>
</tr>
<tr>
<td>• Report was completed on time.</td>
<td></td>
</tr>
<tr>
<td><strong>Diagram</strong></td>
<td></td>
</tr>
<tr>
<td>• Diagram is neat.</td>
<td></td>
</tr>
<tr>
<td>• Information is correct.</td>
<td></td>
</tr>
<tr>
<td><strong>Conventions</strong></td>
<td></td>
</tr>
<tr>
<td>• There are few errors in capitalization.</td>
<td></td>
</tr>
<tr>
<td>• There are few errors in punctuation.</td>
<td></td>
</tr>
<tr>
<td>• There are few errors in spelling.</td>
<td></td>
</tr>
<tr>
<td>• There are few errors in grammar.</td>
<td></td>
</tr>
</tbody>
</table>

**Total points:** 42
### SELECTED INFORMATION FROM TEMPLATE TWO

**Date Submitted:** 08/12/99

<table>
<thead>
<tr>
<th>Did students have a limit on the number of times they could submit the assignment? Please explain.</th>
<th>No, they could submit it several times before the deadline of December 8, 1999.</th>
</tr>
</thead>
</table>

**Sample A: Does not yet meet expectations**

<table>
<thead>
<tr>
<th>Please explain why you checked this designation. Be as specific as you can, referring directly to the piece of student work as much as possible.</th>
<th>This student did his lab work, but he did not turn in his lab sheet. He only indented one of his paragraphs. There are several run on sentences. He did not list materials and needs more information about the procedure. He only scored 32 points.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of times submitted</th>
<th>Once</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Age</td>
<td>9</td>
</tr>
<tr>
<td>Student Gender</td>
<td>Male</td>
</tr>
</tbody>
</table>

**Sample B: Meets expectations**

<table>
<thead>
<tr>
<th>Please explain why you checked this designation. Be as specific as you can, referring directly to the piece of student work as much as possible.</th>
<th>This student did not list all the materials or discuss the procedure. Even though he scored a 1 on paragraphs that include all the necessary information with relevant details and following the proper sequence, he still scored a 37 overall.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of times submitted</th>
<th>Twice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Age</td>
<td>9</td>
</tr>
<tr>
<td>Student Gender</td>
<td>Male</td>
</tr>
</tbody>
</table>

**Sample C: Goes beyond expectations**

<table>
<thead>
<tr>
<th>Please explain why you checked this designation. Be as specific as you can, referring directly to the piece of student work as much as possible.</th>
<th>Student completed all parts of the rubric and received 42 out of 42 possible points. Work is neat and shows the student has a good understanding of the concepts. She connected the ideas to what we had been working on in language (synonyms and antonyms), and she also asked me to assemble the open circuit as she read me her directions to see if she had included all the steps.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of times submitted</th>
<th>Twice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Age</td>
<td>9</td>
</tr>
<tr>
<td>Student Gender</td>
<td>Female</td>
</tr>
</tbody>
</table>
Introduction

The Shoma Education Foundation is a non-profit, social investment initiative aimed at supporting teacher professional development in South Africa. The Shoma teacher development model is based on contributions of multiple public and private partners.

- MultiChoice, a satellite digital television broadcast company, through Shoma, supports the development of video and computer-based content for teachers’ professional development and delivers the content through its satellite delivery technology.
- Provincial education departments establish and operate the teacher development centers and provide staff who serve as facilitators during the Shoma training sessions.
- The National Department of Education provides the curriculum and consultation upon which the Shoma materials are based.
- Several other private companies contribute a range of supports, including financing, hardware and software to establish additional teacher development centers throughout the country, primarily in rural areas and townships.

Shoma’s Professional Development Model

Shoma content is developed collaboratively with the national and provincial education departments. National-level specialists first determine the framework of the curriculum, after which the provincial representatives have an opportunity to consult, comment, refine and change what is produced. Once the framework has been agreed upon, National Ministry curriculum staff and Shoma specialists appoint service providers to develop the content. The service providers are highly-regarded experts in their field; for example, the mathematics content was developed by the University of Cape Town’s School Development Unit and their mathematics department, and the language content was developed by senior academics at the University of the Witwatersrand.

Shoma was designed, in part, to accommodate the greatest number of teachers possible during after-school hours, generally between 13:00 to 16:30. To do this, Shoma’s model consists of three “rooms,” each lasting a specific amount of time within a 2½-hour period. Each room is described briefly below.

In the first room, teachers watch a video, which lasts about 10-12 minutes and is focused on a particular theme, always supporting implementation of the Government’s new curriculum. Each video ends with a probing question that the teachers are to discuss for about 20 minutes, with guidance by one or more provincial department curricular specialists, who have been trained by Shoma to facilitate the lessons.

In the second room, teachers engage in computer-based learning designed to reinforce the content shown in the video. Teachers work individually for approximately 45 minutes on the computers, reading text, watching digitized video and audio clips, answering questions and completing exercises. The objectives of the computer-based program are:

- to develop teachers’ computer literacy,
- to enhance their English-language reading and writing skills, and
- to convey academic content knowledge and teaching strategies emphasized in the new curriculum.

In the third room teachers work in small groups for 45 minutes to discuss the weekly theme or topic and prepare lesson plans that they can use in their classrooms.

Initially, the timing of each room was tightly controlled, and to some extent still is, to be able to accommodate four groups of 24 teachers per day. After one group completes the video viewing and discussion and moves into the computer room, a second group moves into the video room, etc.

All teachers receive about 4-5 hours of very basic computer literacy training prior to initiating the content-based training that Shoma offers. Teachers currently have little opportunity...
to use their new computer skills, other than in the Shoma training sessions, since few schools have computers. However, this is changing rapidly throughout South Africa and it is expected that this familiarity with computers during their training will serve the teachers well when the computers do arrive in their schools. In 1999, Microsoft South Africa offered the computer-literacy training, but it is now offered by the provincial department facilitators that work on the Shoma program at the local centers.

**Professional Development Centers**

Currently Shoma is working in 14 centers in eight of the nation’s nine provinces (with the exception of the Western Cape). The centers are operated by the provincial education departments and are based at various governmental institutions, ranging from teacher training colleges, provincial department of education offices, and schools.

Each center is supplied with one television monitor, a video server and satellite dish, a decoder, a Windows NT server, 24 Pentium workstations and recently Diginet Internet connectivity. Although the number of professional development sessions varies across centers, most host three to four sessions per day, four days per week, serving approximately 320 teachers per year, over 5,000 across all centers in 2001, and approximately 13,500 since 1998. In centers based at schools, some have made arrangements that allow students at that and surrounding schools to access the computers on a weekly basis.

**Training for Workshop Facilitators**

Shoma facilitators are professional staff employed by provincial departments of education, and the number of facilitators varies considerably across centers. Shoma is responsible for providing training to the facilitators to support and conduct the Shoma training sessions. The current core-training program for the facilitators is a one-week workshop followed by three additional four-day sessions per year. The initial training topics include the following:

- Self evaluation
- Presentation skills
- Learning styles
- Placement of equipment
- Seating arrangement
- Gestures
- Maintaining audience interest
- Use of visual aids
- Use of voice
- Planning
- Common errors of facilitators
- Ice breakers
- Use of worksheets
- Sample assessment forms
- Workshop evaluation

The training sessions are held at the MultiChoice headquarters in Johannesburg. While their hotel expenses are paid by Shoma, the government is responsible for facilitators’ transport costs. The most recent agenda for the tri-annual workshop included the following topics:

- How to use the Internet
- Basic Internet troubleshooting
- Time management
- Communication skills
- Adult learning
- An operational review whereby each center provides a quarterly update on teacher attendance, technical problems encountered, support needed by Shoma or provincial departments, and a time to engage in collaborative problem-solving with their facilitator peers and Shoma staff.

Videos were made of the most recent four-day session and made available to the facilitators on their local center servers. Training videos based on principles of adult learning also were developed and made available to all of the provincial departments’ facilitators (curriculum subject specialists), some of whom facilitate the Shoma sessions. When the videos were first developed, they were downloaded to each center’s server once a week, with the expectation that all department facilitators would come together to view and discuss the videos. After the initial 12 weeks of downloads, the complete package of videos now resides on the center servers where they can be viewed anytime.

**Governance and Staffing**

Shoma’s policy and strategic framework is guided by a Board of Directors of ten members consisting of two senior MultiChoice executives and representatives of various other governmental, educational and community organizations.

Shoma has three full-time staff and a full-time consultant: an operations manager works closely with government agencies and donors, establishing and supporting partnerships; a content manager oversees the development of all training videos and computer-based lessons; a production manager oversees the technology, both at the headquarters and at the centers, and is responsible for communications, including annual reports, publicity, new center launches, and finances; and an administrative staff handles all administrative matters. All
Shoma professional staff have educational experience, including teaching, principalship, and teacher training.

**Technology and Costs**

Shoma training content is delivered to centers via the Siyanda Satellite Services used by MultiChoice. The satellite footprint (i.e. area of coverage) has recently been expanded through access to PanAmSat 7, which covers all of Africa. The MultiChoice technology is unidirectional – that is, the television programming is downloaded to local sites with no accommodation for uploading from those sites, which has limited Internet connectivity.

In 2000, the centers’ technology was upgraded to include online connectivity and e-mail using the Diginet DSL network, which links all centers to a central server in Johannesburg. This offers the opportunity for remote network management and support of file servers, thus reducing technical downtime, creating a database facility, and providing access to e-mail communication among the centers. Shoma negotiated the rental of a dedicated 64K Diginet Internet line for each center at a monthly rate of R3,000 (approximately US$375), and 56K access at cost of R200 (approximately US$25) per month for the new mini-sites described later. Each site will be provided with software to ensure protection from Internet sites deemed unsuitable for children. The technology “nerve center” is now able to “interrogate” the server and networked computers at each of the centers to troubleshoot and repair the technology at a distance, thus reducing downtime and costs of travel to the centers by technicians.

Software for the centers includes: a Web server and exchange server software for e-mail, sequel server software for database administration, broadcast software, and operating system software for PCs. In centers based at schools, some have made arrangements that allow students at that and surrounding schools to access the computers on a weekly basis.

The cost to set up a center, including the 24 Pentium computers, a decoder, server, television monitor and software is around SAR300,000 (US$37,500). To date, all hardware has been donated by MultiChoice or other private, corporate partners. The goal is that centers will become self-sustainable by renting the facilities to schools or community organizations.

**Budget and Expenditures**

Shoma’s total annual budget for each of 2000 and 2001 was R8 million, approximately US$1 million. Of the R8 million, approximately one-third, or R2.75 million is allocated for content development and production, including video and computer-based lessons; about R350,000 to technical support; about R2 million for salaries for three professional and one support staff; R480,000 for satellite transmissions; and the remainder for administrative expenses, including meetings, workshops, publicity, travel, etc.. In 1999, the budget was 12 million, which included additional funds to establish 10 of the 14 centers. The total Shoma budget from 1998 through the end of 2001 was R32 million.

**Content Development**. Table 1 shows that the average cost to produce one video and computer-based lesson is US$2,425 per video, US$3,593 per computer lesson, and US$6,018 per lesson (video and computer lesson combined). Costs include a content manager and contracts with subject specialists and Web and TV production specialists.

<table>
<thead>
<tr>
<th>Product</th>
<th>South African Rand</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video per minute</td>
<td>R2,037</td>
<td>US$242</td>
</tr>
<tr>
<td>Video per lesson (avg. 10 min.)</td>
<td>R20,370</td>
<td>US$2,425</td>
</tr>
<tr>
<td>Computer lesson</td>
<td>R30,189</td>
<td>US$3,593</td>
</tr>
<tr>
<td>Total for one weekly video and computer lesson. Current total lessons per training program = 24 per phase</td>
<td>R50,559</td>
<td>US$6,018</td>
</tr>
</tbody>
</table>

About 5,383 teachers participated in the Shoma training in 2001, at a content-development cost of about US$1.12 per teacher per week, or US$26.88 per teacher for a complete 24-week course. This does not include the administrative costs involved in establishing partnerships or setting up centers. The cost per teacher will decrease as the number of centers
increase and the number of teachers who complete the training increases, although the number of weeks of training that teachers may participate in is likely to increase as Shoma continues to develop additional content.

A total of 140 ten-minute videos and computer-based lessons have been developed over the past four years – an average of about 35 lessons per year. Nine videos and accompanying computer-based content were developed for the pilot phase in 1998, 16 in 1999, 48 in 2000, and 67 in 2001.

**Total Costs.** Total costs to date are R$32 million to train 13,500 teachers, at a per-teacher cost of R2,370, or approximately US$198.00 for 24 lessons. This figure includes all costs, including those associated with the establishment of 12 centers, each with 24 computers, server, software, facilitators; satellite distribution; technical assistance; other staffing, etc.

Dropout rates for Shoma courses average about 30%, with the reported reason being transportation difficulties. This is one of the reasons that Shoma is beginning to look at the concept of mini-centers that have only 3-4 computers, but could be located closer to the more remote rural schools.

**Descriptions of Video and Computer Content**

All content is organized by level, i.e., foundation phase (grades 1-3), intermediate phase (grades 4-6), and senior phase (grades 7-12). There are nine lesson topics that apply to teaching and learning at all phases, and include the following (Box 1):

<table>
<thead>
<tr>
<th>Box 1- Lesson Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1: Understanding OBE principles, including integration across the curriculum</td>
</tr>
<tr>
<td>Week 2: Learner-centered teaching, including experiential learning</td>
</tr>
<tr>
<td>Week 3: Assessment</td>
</tr>
<tr>
<td>Week 4: Assessment</td>
</tr>
<tr>
<td>Week 5: Class management including planning &amp; leading</td>
</tr>
<tr>
<td>Week 6: Class management including organizing &amp; controlling</td>
</tr>
<tr>
<td>Week 7: Large classes &amp; multi-grade teaching</td>
</tr>
<tr>
<td>Week 8: Resources</td>
</tr>
<tr>
<td>Week 9: Diversity, multi-lingualism, multi-culturalism &amp; inclusion</td>
</tr>
</tbody>
</table>

Lessons for each phase continue from week 10 through week 24 or 25, and focus primarily on language, mathematics and science, with some lessons devoted to other subject areas.

**Videos.** All videos involve a combination of explanation by one or more experts, interwoven with classroom demonstrations, each ending with a probing question that the teacher audience is to discuss. The production quality is similar to what one would see on broadcast TV. The pace is lively and dynamic, and grounded in the real-life experiences of South African teachers and students. They all reflect current, research-based thinking about teaching and learning. Here are two examples in Boxes 2 and 3.

**Box 2. Description of Senior Phase Video (Grades 7-9)**

**Teaching Language across the Curriculum**

The video emphasized the following topics:

- the importance of developing students’ language abilities in all subject areas,
- the need to plan lessons in advance, and
- the importance of identifying in advance vocabulary that may be difficult for students.

The teaching strategies illustrated include

- games – putting pieces of words and sentences together,
- students working in small groups to study the meanings of words related to various curricular themes,
- students explaining the meaning of the words to others, and
- students comparing what they’ve learned, as displayed on their posters, with what other groups have represented on their posters.

The video ended with the question for discussion: “How can using the language-across-the-curriculum approach free up some of your curricular time?”

**Computer-based Lessons.** The computer-based lessons are designed to reinforce, deepen and expand teachers’ understanding of the concepts, knowledge and skills introduced in the videos. Teachers have 45 minutes to work through the lessons individually on the computer, reading text, viewing video clips and writing responses to questions or completing exercises.

All of the computer-based lessons are designed so that teachers are required to enter their responses to the exercises or questions before moving on to the next page. Once they enter their responses and click on the “next page” button, their
**Box 3. Description of Senior Phase Video Listening and Questioning Skills**

The video began by showing a doctor and lawyer, both from previously-disadvantaged groups, discussing how effective questioning and listening skills are important in their work. It then lists the various purposes for asking questions and illustrates each with an example. The purposes include:
- to gather administrative information
- to encourage learning
- to establish personal relationships
- to establish discipline

An expert then explains the difference between closed and open questions and describes the value of open questions in developing students’ thinking abilities. The video then explains what a probing question is and shows students working in small groups, while the teacher circulates among the groups asking probing questions. It then goes on to illustrate and explain prompting, as well as the importance of pausing or wait time in questioning – to give students more time to think about what they want to say and to increase deeper thinking.

The video ends with the question for discussion: “Which method of questioning is more effective – traditional or those shown in the video?”

Responses are automatically entered into a master database managed by the Shoma head office. This feature was designed into the system for three purposes: one is in anticipation of the time when Shoma courses become accredited and some form of teacher assessment will be needed for the accreditation process; the second is to use teachers’ responses to determine if the lesson needs refinement; and the third is to reinforce teachers’ learning and connect the lesson content to their own personal teaching experiences. In 2002, teachers’ responses will be available at the local centers and facilitators will be trained to analyze their responses to determine if teachers need further support to understand the lesson.

At present, teachers are not involved in communicating with one another or the facilitators through the Internet, nor do they access resources on the World Wide Web.

**Room 3 – Discussion.** After having viewed the video, briefly discussed the question stated at the end of the video, and gone through the computer-based lesson, the teachers then go to a third room to discuss and make lesson plans based on what they had learned in rooms 1 and 2.

**Evaluation**

The study revealed a very high quality of videos and computer-based lessons, but variable quality in the training facilitation. The teachers involved in Shoma were unanimous in their praise of it. All credited the Shoma training for helping them to understand and be able to implement the teaching strategies and philosophy intended by the designers of the new national curriculum, and all claimed that each of the training components (videos, computer-based lessons, discussion rooms and facilitators) played an important role in their increased understanding. Observations revealed that these teachers were more likely to be implementing the instructional strategies advocated in the new curriculum than were teachers who had not participated in Shoma training, but in general neither group of teachers was implementing the more complex, subtle teaching strategies, such as asking probing questions and stimulating analytical thinking.

Shortcomings included variable attendance at the training sessions, ranging from 20% to 100%; inadequate follow-up and classroom-based support for teachers; variable quality in the training facilitators; too little time allocated for the Shoma training sessions; a lack of focus on school-based learning and development; and an inability to take copies of the learning materials with them back to their schools.

The approach could be strengthened by giving teachers access to the Internet and facilitating online discussions among teacher participants, training facilitators and other instructional resource supports. In addition, it is likely that a more significant impact would accrue from a school-based training approach, as transportation to the centers was a major barrier in many rural areas. Teachers also would benefit by having the opportunity to practice the new behaviors in the training setting and receive feedback from their peers and facilitators.

The videos and computer-based lessons produced by Shoma are excellent and would be useful tools for any educational system concerned with increasing teaching quality. This public-private partnership has resulted in a significant contribution to increasing the quality of classroom teaching and learning, a contribution that would be unlikely given South Africa’s limited resources and numerous social demands.

---

1 Diginet lines are standard wired telephone lines, but are used primarily for transmitting data and are not suitable for voice transmission.
An Integrated Approach to Teacher Preparation

Eric Rusten¹ and Vera Suguri²

The Challenge

Countries, states, provinces, cities, schools and donors are investing millions of dollars in projects that seek to improve education by providing schools with computers and Internet connectivity. Even though the process of purchasing and installing computers and Internet access at schools is complex and expensive it is only a small part of the challenge facing education planners and principals regarding the enabling and empowering of teachers to integrate these technologies into their routine classroom teaching and learning.

The harsh truth about school computer programs is that if teachers are not effectively prepared and given the confidence, time and resources to make routine use of these expensive tools in effective learning activities, then these investments in technology will have little if any impact on education.

Unfortunately, it is all too common for education technology projects to spend most of their budgets on purchasing and installing equipment, software and connectivity, and building the supporting infrastructure. Once this work is complete, teachers may receive a few days worth of in-service training through workshops and lectures. Rarely are teachers provided with essential ongoing support and learning opportunities to help them learn how to use these tools and, more importantly, to integrate them into the curriculum and to use them to enrich and accelerate learning. The reasons often cited for not providing teachers with adequate and quality professional development in the educational use of technology are usually linked to a lack of funds and time.

Taking teachers from their classrooms for long professional development workshops, even those lasting only one week, is often not possible. School systems, especially poorer ones, usually cannot afford substitute teachers, the cost of transporting teachers to workshops, or to cover their hotel and meal expenses. This typically deprives most schools in developing countries from providing teachers with the skills and experience needed to effectively use computer and Internet technologies. Furthermore, planners and principals also commonly assume that, since the teachers are trained and experienced educators they will be able to figure out how to effectively integrate computers into routine teaching and learning once they are trained in the basic “how to” skills of using a computer and the Internet. The combination of a lack of funds and this flawed assumption consistently results in a failure of school technology projects to meet expectations and make a significant difference in the quality of teaching and learning.

These challenges are made even more difficult in many programs that are seeking to not only introduce computer and Internet technologies into education but also to bring about reforms in basic approaches to education and teaching practices. Under such situations, teachers are not just being asked to integrate the use of technology into routine teaching but to learn to teach in a new way while trying to figure out how to integrate technology into these new approaches as they are learning them. This combination can cause teachers to fail at both reform activities. Achieving success requires the use of highly effective approaches to professional development that enable educators to make use of computer and Internet technologies as an integral means of learning new educational approaches.

Along with the problems of insufficient training and the near absence of on-going support and supplemental learning opportunities, there are also often problems surrounding the training curriculum and the approach taken to prepare teachers to effectively use computer and Internet technologies in classroom teaching. Technology training programs for teachers are often divided into two broad categories. One common style of training that teachers often receive first focuses on building “how to” skills with using computers, software applications and the Internet. Such training is often composed of a linear series of mind numbing modules on how to use the computer, how to use Windows or Apple OS, how to use Paint, how to use Microsoft Word or WordPerfect, how to use a spreadsheet, how to use PowerPoint, how to use the Internet, etc. etc. etc. Under such training pro-
grams, learning to use the Internet is often the last step because it is considered more difficult to learn or that it requires the previous how to skills.

Then, if teachers are lucky they may receive the second category of training, which seeks to focus on pedagogical aspects of using computers and the Internet in education. This second category often starts with lectures on the potential of computer and Internet technologies to improve education and includes workshops where generic strategies for using these technologies in the classroom are presented. Then teachers are sent back to their schools where they are expected to change how they have been teaching and figure out how to creatively integrate a set of tools that they just learned how to use as independent applications into the different grade levels and subjects and to create collaborative project based learning activities. It is not surprising that few teachers ever do more with computers than have students carry out “research” online, type their papers, play “educational games” and do homework assignments. These are important uses; however, they are a woefully inadequate educational return on the costly investment of bringing these technologies to the school.

An Alternative Approach to Teacher Preparation

The following describes an approach for helping prepare teachers to integrate the use of computers and the Internet into routine teaching and learning. It is called Rapid Experiential Learning (REL), and was developed in Brazil within the ProInfo program. ProInfo is a national school computerization and change program developed and sponsored by the Federal Ministry of Education in partnership with state and municipal secretaries of education. Under this program, a network of more than 240 teacher training and technology resource centers, called NTEs, have been established around the country that are staffed with five to ten computer and education specialists, called Multipliers, who received about 360 hours of training. At the same time, several thousand schools have received computer labs with about 20 to 25 networked computers. ProInfo has three main objectives.

1. Address the severe logistical and financial constraints, faced by local school systems, in carrying out teacher professional development workshops.
2. Provide teachers with experience-based learning opportunities during which they learn to use computer and Internet technologies, often for the first time, in ways that are directly useful in their teaching.
3. Provide teachers with new skills, strategies and techniques for using computers and the Internet that support the transition from conventional teacher centered teaching to more student centered project based learning.
4. Provide ways for teachers to become active participants in a national and international learning network and become members of a virtual community of educators.
5. Provide participants with their own virtual learning environment that they can use to support continued professional development and to train others.

The last objective is proving to be one of the most important. Unlike many other training approaches, in the REL approach when the training is over, participants can return to their schools and continue using the on-line learning environment to reinforce new skills and to replicate the training experience with colleagues. The environment also allows participants to immediately start developing collaborative projects and to share with others their achievements.

This approach to teacher preparation was developed organically through a gradual process of trying to figure out how best to respond to the educational needs of teachers with re-
spects to using technology in teaching and learning within the harsh logistical and financial constraints of Brazilian schools. Time after time the authors observed that teachers would often not change their approach to teaching or integrate computer and Internet technologies into routine teaching after participating in conventional training workshops. It was becoming increasingly clear that conventional “how to” workshops were not meeting teachers’ needs. At the same time, most municipal and state programs could not afford to allow teachers to leave their classrooms to participate in training programs for more than one or two days. Furthermore, school systems could rarely afford the logistical expenses of training activities that lasted more than three days.

Elements of Brazil’s REL Approach

The REL workshop approach was developed within the context of Brazilian education and the ProInfo program. It was also developed to leverage existing resources created by local and national ProInfo programs especially the teacher trainers, or Multipliers, working NTEs or technology training centers. The REL approach has the following four integrated characteristics:

1. REL workshops are rapid, usually lasting only one to three days depending on objectives and available time and resources. These rapid workshops are often very intense events starting at 8:00 in the morning and ending at 10:00 at night with a few, short breaks for coffee and lunch. If the number of participants is large and time and resources are available, REL workshops can be organized to train a core team of trainers that can then replicate the training with a larger number of participants under the support and guidance of coordinators. This strategy not only helps give new trainers confidence in their skills but also allows training to be provided quickly and effectively to thousands of participants.

2. REL workshops provide educators, both principals and teachers, with customized practical experience with using computer and Internet technologies within the context of their real world educational needs. During REL workshops, educators are usually not directly trained how to use specific computer or Internet applications. Rather, they learn to use these tools in an educational context, often quite indirectly, while carrying out classroom relevant learning activities.

3. REL workshops use web-based collaborative learning environments that are customized to meet the needs of each group of educators. Each collaborative learning environment is comprised of an integrated set of collaborative and communication tools and resources that enable participants to experience first-hand how complementary sets of tools can be used to achieve specific learning objectives. Learning activities are made as concrete as possible and little time is spent on memorizing abstract step-wise processes to use a specific software application. Also, as participants progress through the learning process, each new skill and tool reinforces skills learned earlier. Supplemental resources are available on paper, on the web and via the Multipliers at the NTE to make it possible for the teachers to re- fine their skills through self-managed learning.

4. REL workshops provide teachers with opportunities, resources and mechanisms for on-going support and project-based activities to enable participants to continue using their new skills and their school computer labs in collaborative learning projects. It is unrealistic to expect teachers to transform the way they teach and start using computer and Internet resources in a routine way after only one learning experience with using and integrating computer and Internet technology into education. Achieving this transformation and enabling the routine and effective use of technology in education requires much more than one workshop no matter how well organized, long or intense. A mix of resources, services and organized activities are used to encourage and enable teachers to continue using their new skills in integrated learning projects. These include the web-based collaborative learning environments, national and local listservs, local multipliers at NTEs, and a national pedagogical coordinator to organize special projects and to provide on-going advice and support.

The REL Approach in Action

Over the last three years (since 1999) one or both of the authors have carried out numerous professional development workshops using the REL approach. Even though these workshops all had the broad goal of helping educators gain practical experience-based skills with using technology to enhance education, none of these workshops are the same. One example, the REL Workshop for Principals, Campo Grande, will be described to illustrate how the different characteristics of the REL approach are integrated.

The secretary of education in the municipality of Campo Grande manages 83 (81 attended the workshop) primary schools and has one NTE with about 8 Multipliers. Both André Puccinelli, the Mayor of Campo Grande and Maria Nilene Badeca da Costa, his education secretary, are promoting the use of computer and Internet technologies in education. They have built on the investments made by ProInfo by establishing computer labs for each primary school in the municipality and providing Internet connectivity to most of these labs. The Campo Grande NTE and Secretary of Education requested that ProInfo and LTNet organize and carry out an REL workshop for all 81 principals of the Municipality. They wanted this workshop because they recognized that the effective integration of technology into routine teaching and learning is enhanced when principals learn to use these
Technologies in their work and understand what is needed to enable and empower their teachers to use them in their teaching. They were specifically interested in having the principals learn to use the Internet for communication and to enhance classroom teaching. Unfortunately, because schools were in session, the principals could not be away from school for more than one day.

Two-Part Workshop
The workshop was divided into two parts. The first part involved taking eight Multipliers from the NTE and two computer lab coordinators from two of the schools through a one-day intense training session on the REL approach. During this session they used all the tools in the collaborative learning environment in the same way that the principals would use these tools. The trainers were also asked to prepare experiential learning exercises and support materials for the principals to use over the next two days. During workshop activities, the principals were asked to adapt and expand these learning exercises to be more appropriate to their situations. The goal of this part of the workshop was to build the capacity of local trainers by having them go through the same rapid experiential learning process that the principals would go through and to customize the workshop to meet the specific needs of their fellow educators.

Campo Grande’s web-based learning environment that was created for this workshop included the following seven collaborative and communication tools:

1. Access to free web-based e-mail accounts that participants subscribe to and practice using.
2. Access to two listservs, one a national list for Brazilian principals and the other set up just for the Campo Grande principals.
3. A private chat room within the environment customized for Campo Grande principals.
4. A web folio tool within their environment that allows the principals to instantly publish information, images, perspectives, experiences, challenges and questions on a web page in their environment for their colleagues and others across Brazil to read and comment on.
5. Access to an interactive “bank of links” specific to the needs of educators in Brazil.
6. Access to a selection of publications on using technology to enhance school management.
7. A gallery of photos from the training activity and for their activities later on.

In addition to these tools, their environment provided space to describe the training program in Campo Grande and efforts in Campo Grande to enhance the use of computer and Internet technologies in elementary education.

Training of Trainers
The training-of-trainers (TOT) workshop took place in one of the two labs of the NTE. The two authors were the trainers and used an LCD projector to display the web site and other materials as participants viewed the same on the screens of their computers. The lab had a DSL Internet connection so connectivity was fairly rapid. Some materials were provided on paper with copies on a diskette for easy and fast viewing and editing by the participants to enable them to customize these resources for their needs. The TOT participants had different levels of technical skills and teacher training experience, and most had only limited experience with using different Internet communication technologies.

The ten TOT participants were divided into two groups with each being responsible for preparing to lead the next day’s REL workshop with the principals. As they completed each experiential module, the trainers would work in their small group to prepare customized learning scenarios that would provide a real-world context through which the principals would practice using the tool. The teams of TOT participants worked late into the night finalizing their materials and practicing their new skills.

Training of Principals – Day 1
The next day the 81 principals arrived and were divided into two groups and ushered into their respective computer labs. A buzz of anxious excitement and anticipation filled the air as the principals, nearly all of whom were women between 30 and 50 years of age, sat in pairs before the computers. The Secretary of Education and other officials made brief speeches as members of the TV press recorded the start of the event. After the dignitaries left the five-member training teams dove into action.

Since most of the participants had little or no experience with computers, the first few hours of the workshop were chaotic and stressful for the participants. The authors found that this period of chaotic stress is an important part of the REL approach and we feel that it actually accelerates and solidifies the learning of new skills. The exercises start off with the pairs of participants learning and figuring out how to move their mouse, launch the Internet browser and then navigate to their web-based learning environment. In doing this, the principals were forced to quickly learn, much through experimentation, observation, and peer-based collaborative learning, the basics of MS Windows, how to use a mouse, find specific keys on the keyboard, and start learning a whole new vocabulary. One of the trainers was assigned to lead each module while the other four moved around the room providing encouragement, assistance, suggesting different approaches and solving problems. Once each member had succeeded in navigating to their web-based learning environment they were asked to visit a variety of other web sites.
and explore different features of the browser. They downloaded and printed a file, copied a picture from one site to their floppy diskette, viewed a PDF file and saved a site’s URL as a favorite for later use. By lunch, the tone in the room had changed from chaotic stress and fear to one of excited confidence as the principals actively demonstrated their new skills and vocabulary to each other and the trainers. Small, animated group discussions could be heard as the principals talked about how they could see this resource being useful to their work and to improving teaching and learning.

In REL, participants are introduced to using the computer by learning to use the Internet: navigation, minimizing and maximizing windows, using icons, scrolling up and down, etc. are all quickly learned as educators explore the Internet. Starting training by learning about the Internet has proven to be a good approach because educators can feel that if it was possible and easy to learn to use the Internet, there is no reason to fear learning other computer skills.

After lunch, the trainers had the principals navigate back to their web-based environment and then they launched into a new challenge, registering for a free web-based e-mail account. Each principal, even those few with existing e-mail accounts were asked to register for an e-mail account. As this task was completed, the principals recorded their new address on the board and then started writing messages to each other. The trainers suggested specific school management and education topics for the principals to write about. They were then instructed to send replies and add an attachment to their messages. Many of the participants struggled to find the letters on the keyboard and learn how to add the correct accents. Much of the learning of these new skills was carried out as self-managed and peer-based collaborative learning activities. The trainers focused on orchestrating the learning rather than dictating it and on solving periodic problems and difficulties. After the afternoon coffee break the principals were again directed to navigate to their environment and register for one or both of the listservs. They were given a brief explanation of what a listserv is. But instead of describing this tool, they were given directions to experience the power and facility of a listserv for themselves.

Before sending their first message, the principals were asked to compose a brief thoughtful message using MS-Word (a tool most had never used). Very little instruction was given on how to use MS-Word. Rather, the principals were simply pointed in the right direction and through intense experimentation, observation of what others and the instructors were doing and help from their peers, each principal eventually composed the first listserv message. None of the principals understood what would happen when they e-mailed this message to the list, but they soon discovered the result as a buzz of excitement and personal achievement filled the room. Before the training event, the authors had asked a handful of other educators across Brazil to be prepared to be online during this part of the training so that they would be able to quickly respond to the messages being sent by the principals. As the participants realized that they were sending messages to over a thousand educators around Brazil and were receiving replies to their messages from educators they had never met, an understanding of what a listserv is and how it can be used emerged organically and concretely—not abstractly.

Before leaving the labs the trainers quickly reviewed what the principals had learned and took an oral assessment of how the principals felt about their achievements. There was a unanimous feeling that they could never have guessed that they would have learned and accomplished so much in just one day. Some principals were nearly overwhelmed with emotion as they explained how they had come to the training program with a great deal of fear and trepidation because they had never had any experience with computers or the Internet and had only come because they were forced to be here. And now, after only one day, they had navigated the Internet, created an e-mail account, sent messages to their friends and colleagues, composed a message on MS-Word, subscribed to a listserv and communicated with educators from across Brazil whom they had never met. They were leaving their first day with a strong feeling of achievement and ability to learn new skills and an organic understanding of computers and the Internet based on personal experience.

**Training of Principals – Day 2**

The next day’s training activity was divided into two sessions. The first half was used to quickly review the previous day’s activities, check and respond to e-mail messages received, reply to new listserv messages and explore new web resources. After the morning coffee break, the principals were taken through the process of registering a user name and password for their environment’s chat room. As more and more of the principals entered their chat rooms, they started exploring the different features with little or no instruction. Creating an environment and a positive attitude toward exploration and experimentation is a critical feature and result of the REL approach. Participants who become comfortable with exploratory learning and start developing skills that improve this style of learning can be expected to quickly learn new skills with little or no formal instruction. Developing this self-managed learning skill within the field of education, computers and the Internet are essential for ongoing leaning and integration of skills into routine work. It simply isn’t possible to provide formal instruction to all teachers and principals in a country in the vast number of software applications and Internet tools.

Periodically during the workshop, participants were asked to stop what they were doing so that the group could have a
brief discussion on how the new skill or tool could be used in their work and what they could do as principals to help their teachers make better use of these tools to improve teaching and learning. These reflective moments are seen as critical to the ultimate success of the REL approach. Some of the participants were then asked to type up their ideas and distribute them via the listserv. This feature reinforces the importance of sharing ideas among the community of educators.

After lunch, the principals were introduced to their environment’s webfolio, the most complex collaborative tool of the training program. Learning to use this tool can be as simple as just registering a user name and password and then typing a message that appears on a web page in their environment. If participants are interested, they can also upload images to illustrate their message, and use simple HTML to format their text by adding color, or making some items bold or italics. Participants were asked to again use MS-Word to carefully compose a message about their training experience and how they plan to use their new skills in their work. By the end of this session, the environment’s webfolio was filled with messages, comments and images. Principals were seen moving from computer to computer to see their messages on the Internet. Mobile phones appeared from purses as principals called friends and colleagues to tell them how to reach the environment to read what they have just published on the Internet. Conversations exposed a newfound confidence and pride in what they had achieved, as the fear they felt the day before became a distant memory.

As with the day before, the trainers ended this session by quickly reviewing what was covered and asked the participants about their satisfaction with the workshop. It was clear that the principals were leaving the workshop with a sold set of practiced skills and a strong feeling of achievement and ability to use what they learned and to keep learning. The trainers were also left with a new set of skills and abilities and a confidence in a new approach to organizing and carrying out training workshops. They were both left with a web-based learning environment, owned by the municipal schools of Campo Grande, with tools that they could continue using without fear. They were all members of an active listserv and could participate in on-line chats and publish their ideas on the Internet.

How Applicable?

Even though the REL approach for helping prepare teachers to integrate the use of computer and Internet technologies into routine teaching and learning was developed within the context of Brazil and the ProInfo program and benefits from the resources of this program, the authors believe that the underlying principles of the REL approach are adaptable and applicable to any national or project situation. At the same time, it is important to note that there is no single type of REL workshop. It is simply an approach that needs to be customized to meet the condition of different environments, address local constraints, and meet the specific needs of the educators being trained.

1 Eric Rusten is a Senior Program Officer at the Academy for Educational Development where he serves as the Deputy Director of the USAID-Funded dot-ORG project.

2 Vera Suguri is a pedagogical consultant to Brazil’s Ministry of Education’s ProInfo program and the Executive Director of LTNet-Brazil a national NGO.

3 The REL approach to teacher professional development was developed by the authors through a collaborative initiative between Brazil’s ProInfo program (http://www.proinfo.mec.gov.br/) and the Learning Technologies Network (LTNet) project funded by USAID and administered by the Academy for Educational Development (AED) of Washington, DC.

4 In Brazil, these customized collaborative learning environments are called Ambiente de Aprendizagem Colaborativa (AAC). They are part of the LTNet-Brasil web site (http://www.ltnet.org/) which was initially developed under the USAID-funded Learning Technologies Network project administered by AED.

5 Campo Grande received computers and other equipment for labs in 5 schools from ProInfo. Based on the success of the ProInfo effort, the Municipal Government then provided funding for computer labs for the remaining 78 schools.

6 Nearly all of the principals did not have e-mail accounts and had never used e-mail before the workshop. Also, over 50% of the principals had no previous experience with computers or typing.
What is ILCE?
In Latin America there is a new generation that live in the technological era, with satellites, television, computers, and Internet but have little or no access to them. Recognizing the importance of educational technologies and communications to satisfy the needs of the Latin American Region, in 1954, during the first General Conference of UNESCO, several Latin American countries founded a non-profit international organization to meet this challenge. Subsequently, Instituto Latinoamericano de Comunicación Educativa (ILCE) was established in Mexico in 1956, with thirteen member countries: Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay and Venezuela.

ILCE emphasizes the implementation of technical availability to provide educational content and programs through cooperation agreements and through the use of media and audiovisual resources, such as technologies and educational communication and training human resources in technologies, and fostering regional cooperation in research, experimentation, production and distribution of audiovisual materials and information communication technologies (ICTs).

ICT Programs
Through cooperation agreements with the Mexican Public Education Ministry (SEP), ILCE has planned and implemented the Distance Education Program that includes projects such as

- EDUSAT, the Mexican Government’s Educational Television Satellite Network that broadcasts about 30,000 hours of programming each year, through 12 channels via satellite directly to about 35,000 schools in Mexico and by open air television on channel 22 in the mornings. Its footprint covers the whole Continent and the Caribbean;
- RedEscolar, an Internet-based computer network for schools that offers teachers and students pedagogical and information resources directed at improving the teaching-learning process. Since it began operating, 9,245 educational sites have been equipped with 185,000 computers, and receive an average of 1 million weekly hits;
- SEA, a TV-assisted Program based on competencies and tailored to the conditions of adults that have not concluded basic education.

ILCE also offers consultancy services on the set-up of virtual study centers using the most advanced media available (satellite, Internet, etc). The program was launched in March 2000, and there are now 173 service centers, including three in the USA (Illinois, Missouri and Michigan), in which 6,940 students have been enrolled and 500 tutors specially trained. During the next five years, this program intends to enroll over 600,000 students.

In addition, ILCE offers consultancy services on the design, implementation and management of distance learning projects using the most avant-garde communication technologies; as well as distance learning and media training; design of interactive and multimedia projects that can be available either on CD or through the web; design and production of training and educational television programs; TV production; teleconference and videoconferences simultaneously connected to diverse locations; TV and home video rights of educational programs; and educational materials on video and CD among others.

An important part of ILCE’s consultancy projects and services are the creation, implementation and monitoring of domestic governmental projects, with a clear objective of fostering and transmitting the quality and capacity of educational technologies products and services offered by ILCE. Some of the most recent projects have targeted improvements in the performance of the public servers through training, videoconference programs, leasing SATMEX space...
Training of Human Resources

Among ILCE’s aims are the production of specialists of a high academic level and the training of human resources able to develop new methodologies and systems, contributing to the improvement of education and adequately applying the instruments from educational ICTs. Through the Center for Educational Communication and Technology Studies (CECTE), ILCE offers courses of specialization, 39 on-site, distance learning or mixed format continuing studies courses, training workshops, training diplomas and the post-graduate degree in Communication and Educational Technologies. Until now, there is an average of 2000 students enrolled in the post-graduate degree, diplomas and workshops, backed up by the strong academic support of the research carried out by the Institute itself and by the exchange and cooperation with other institutions specialized in the field.

CECTE prepares teachers and professionals in the fields of Educational and Communications Technologies, emphasizing

• specific psycho/pedagogic, communication and didactic needs;
• design, development, innovation and evaluation of educational systems; and
• educational sciences and communication and technologies.

The scholars involved in these programs are highly qualified and strongly committed to pass on their knowledge, abilities and experiences in the education, management and communication technologies, contributing to the development of the students and allowing the teaching/learning process to be an intense experience. In addition, the scholars participate in activities and research projects that help developing Mexican and Latin American institutions by introducing avant-garde technologies, ethical reasoning and human values issues.

The Public Education Ministry (SEP), in 1997, began a summer television programming that aims to bring up to date teachers of basic education, provide guiding personnel and pedagogy advice, and offer better access to knowledge, learning processes for children, information and diffusion of printed materials and audiovisuals produced by SEP. The series and programs produced have begun their sixth consecutive year of transmissions with six weeks of programming from Monday to Saturday, four hours daily. From 1997 to date, there have been a total of 714,319 primary and secondary teachers subscribed to the SEP Centers and benefited from these programs.

This past summer, the program offered a number of series, programs and movies that have as a key element the diffusion and actualization of preschool, primary and secondary assignments; information about the contents of textbooks for students and teachers; suggestions on how to do workshops for within and outside classrooms; programs to stimulate and strengthen reading habits; information on educative integration of students with special needs; information on the use of audiovisual media and education; programs on important topics such as history, values, health, sexuality, etc; and interviews with specialist investigators, writers, artists and Scientists who, from their experience, can enrich our cultural wealth.

Education’s greatest challenge is to take advantage of all ICT applications offered, in order to increase and improve the quality and range of services we provide. Yet, another challenge that educators face today, is to learn the use of these applications to accelerate the learning process and to evenly distribute the educational opportunities in our society. INTEL “Educar para el futuro” is a training initiative, which aims to prepare teachers in the development of constructive and meaningful learning environments, using ICT’s as a user-friendly learning resource and not as a resource on its own, strengthening both students’ and teachers’ acquired knowledge.

The program intends to train teachers to apply the use of computers in the current curricula as an instrument of production and to design and create specific learning environments through practical learning workshops. Participants develop a unit plan to include the use of internet inside the classroom, learn to design web pages, and use multimedia programs to structure their class content. They design, as well, evaluation strategies for their students’ technological projects while achieving abilities to provide technology know-how as part of the teaching-learning process.

Conclusion

Without a doubt, the prosperity and well being of the Latin American region rests on the ability to teach and learn new ways to use ICTs for education. In that context, ILCE is preparing itself with a human and technological infrastructure to face up and respond efficiently to the challenges of the near future.
Technology Integration in the Classroom
Is There Only One Way to Make It Effective?

Soledad MacKinnon
Inter-American Development Bank

Technology Integration for What?
Technology can and does help students develop all kinds of skills—from the basic to the higher-order critical thinking ones. However, for technology to be successful, teachers need to make informed choices relating to pedagogical approach, students’ needs, and learning objectives. Just as important as what technology is used, is how learning can be enhanced through technology (Strommen and Lincoln, 1992, p. 473). Moreover, a teacher’s philosophy of education and pedagogical praxis must play a vital role in forming one’s theoretical framework for technology integration.

“Teachers are being asked to learn new methods of teaching, while at the same time they are facing even greater challenges of rapidly increasing technological changes and greater diversity in the classroom…but relatively few teachers (20%) report feeling well prepared to integrate educational technology into classroom instruction.” U.S. Department of Education, 1999.

Technology integration means a lot of things to different people. When teachers are asked if and how they integrate technology into their curricula, many answers appear. For example:

- “I use the computer in my class as a reinforcement of topics we have covered.”
- “Students use the Internet to find information for their reports.”
- “My students must turn in their homework in word-processed form.”
- “I use PowerPoint to make all presentations to my class.”

Are these examples of technology integration? One might reasonably argue that each of these examples integrates technology. But the real issue is not if technology is used in the classroom, it is whether or not technology is enhancing the learning process.

Technologies do not guarantee effective learning. Yet inappropriate uses of technology can make learning more difficult. This is the case, for example, when students spend most of their time selecting fonts and colors for reports instead of planning, writing, and revising their ideas. Although technology integration is talked about a lot in education, very few educators have a clear vision or philosophy of what technology integration is all about. Moreover, if you ask educators how to integrate technology into the curriculum, very few will know how to go about doing it in a meaningful and purposeful way.

Pedagogical Approaches for Technology Integration

Most of the recent studies and recommendations put emphasis on only one approach: constructivism. In this sense, there is an ideological fervor that borders on evangelism, practically rejecting all other perspectives as heresy (Perkins, 1991). It is as if the constructivist approach were the only way to resolve educational problems. What is the place and role of other more direct approaches to teaching and learning? This article seeks to revisit the literature about different approaches towards integrating technology in today’s classrooms.

Educational goals change according to new social needs, and so do strategies for integrating technology into teaching and learning. Lately, there have been disagreements among learning theorists about which strategies will prove most effective in achieving today’s educational goals. This dispute has served as a catalyst for two very different models of teaching and learning: directed instruction and constructivism (Roblyer et al., 1997). Directed instruction is grounded primarily in behaviorist learning theory and the information-processing branch of the cognitive learning theories. The constructivist view, on the other hand, evolved from other aspects of the cognitive learning theory. A few technology applications (e.g., drill and practice, tutorials) are associated only with directed instruction; most others (e.g., problem solving, multimedia applications, and telecommunications) can enhance either directed instruction or constructivist environments, depending on how teachers integrate them into classroom instruction.
Directed Instruction
The earliest uses of computers to aid instruction based their instructional models on the work of behaviorists such as B.F. Skinner, whose followers considered that computers were able to provide drill and practice on previously learned skills. The stimulus-response interaction between student and technology was the dominant paradigm. Skinner and other behaviorists viewed the teacher’s job as modifying the behavior of students through positive reinforcement. These behavioral principles underlay the following two well-known trends in education:

- behavior modification techniques in classroom management, and
- programmed instruction.

Although current use of programmed instruction itself is limited, its principles form much of the basis of effective drill and practice and tutorial software.

Information-processing theories emerged from a branch of cognitive psychology that focused on the memory and storage processes that enable learning. A theorist in this area explored how a person receives information and stores it in memory, the structure of memory that allows the learning of something new to relate to and build on something learned previously, and how a learner retrieves information from short-term and long-term memory and applies it to new situations. One well-known information-processing theorist was David Ausubel, who proposed that the way a learner receives and stores information affects the usefulness of the information, for example, by transferring current learning to learning other skills.

Roblyer et al., 1997 identified four major needs addressed by computerized directed instruction. They are

- individual pacing and remediation, especially when teacher time is limited;
- making learning paths more efficient, especially for instruction in skills that are prerequisite to higher-level skills;
- performing time-consuming and labor-intensive task, freeing teaching time for other, more complex student needs; and
- supplying self-instructional sequences, especially when human teachers are not available, teacher time for structured review is limited, and/or students are already highly motivated to learn skills.

The behaviorist and information-processing theories have not only helped establish key concepts such as types of learning and instructional conditions required to bring about each type; they also laid the groundwork for more efficient methods of creating directed instruction. The directed method approaches, however, have faced some problems. For example, students cannot do problem solving and they find directed instruction activities unmotivating and irrelevant.

Constructivist Instruction
Constructivism is a theory of learning that describes how our minds create knowledge or how a student’s knowledge structures and “…deeper conceptual understanding” come about (Fosnot, 1996, p.30). A constructivist perspective views learners as actively engaged in making meaning, and teaching with that approach looks for what students can analyze, investigate, collaborate, share, build and generate based on what they already know, rather than what facts, skills, and processes they can parrot. To do this effectively, teachers need to be learners and researchers, to strive for greater awareness of the environments and the participants in a given teaching situation in order to continually adjust their actions to engage students in learning, using constructivism as a referent. Constructivist activities ask students to intentionally bring forth their own relevant mental models and attempt to integrate external information within these personal frameworks (Glynn & Duit, 1995; Novak, 1995). To help the learner integrate new ideas with his or her own familiar model, constructivists recommend grounding activities in everyday contexts such as realistic cases, expressing topics to be learned. Piaget, Papert, and Vygotsky are representatives of different types of constructivism.

Cognitive Constructivism is based on the work of Jean Piaget. Piaget’s theory has two major parts: one component that predicts what children can and cannot understand at different ages, and a theory of development that describes how children develop cognitive abilities. There are two key Piagetian implications for teaching and learning. First, learning is an active process where direct experience, making errors, and looking for solutions is vital for the assimilation and accommodation of information. How information is presented is important. When information is introduced as an aid to problem solving, it functions as a tool rather than an isolated arbitrary fact. Second, learning should be whole, authentic, and “real.” In a Piagetian classroom there is less emphasis on directly teaching specific skills and more emphasis on learning in a meaningful context. Technology, particularly multimedia, offers a vast array of such opportunities (Chen, 2000). With technology support such as videodisks and CD-ROMs, teachers can provide a learning environment that helps expand the conceptual and experiential background of the reader. Although much of the educational software created in the 1970s and 1980s was based on behavioral principles, much of the new multimedia educational software is based on constructivist theories.

Within the field of educational computing, the best-known cognitive constructivist theoretician is Papert (Chen, 2000). Unlike Piaget, Papert (1993) uses the term “constructionism”
to brand his favored approach to learning. "Constructionism is built on the assumption that children will do best by finding ("fishing") for themselves the specific knowledge they need. Organized or informal education can help most by making sure they are supported morally, psychologically, materially, and intellectually in their efforts" (Papert, p.139). As such, "the goal is to teach in such a way as to produce the most learning for the least teaching."

As examples of constructionist learning activities, Papert refers, amongst others, to measuring quantities while making a cake, building with Lego or working with the computer programming language LOGO developed specifically by Papert and colleagues for educational use. Papert's philosophy of learning and his constructionist approach rely on the computer for realization. He postulates that the computer, and particularly, its future development, will change children's relationship with knowledge, producing a revolution comparable to that of the advent of printing and writing. While the computer offers "new opportunities to craft alternatives, moving from the present epistemology and approach in schools will, in Papert's view, require "mega-change." Little schools, involvement of community, encouragement of educational diversity, decentralization, fostering of personal teaching styles, and the involvement of parents, teachers and students: these are to be the prime ingredients of change to embark on the revolution necessary to move into "the age of learning."

Vygotsky's constructivist theory, which is often called social constructivism, has much more room for an active, involved teacher than cognitive constructivism. The central point of our psychology, Vygotsky claimed, is mediation. Through mediation - both material and semiotic - human cognition engages in relationships with the material and social environment that are fundamentally different from non-mediated relationships. In Vygotsky's view, the use of technology to connect rather than separate students from one another would be appropriate. Teachers, thus, can facilitate cognitive growth and learning as can peers and other members of the child's community.

At present, interest in constructivist methods is on the rise. Robin and Harris (1998) found that technology-using teacher educators are generally learner-centered in their teaching styles, have higher levels of formal schooling, are more often female than male, and prefer to learn by concrete experience. Most frequently, proponents of information technologies in education speak of assisting student-centered learning through technology's ability to access, store, manipulate and analyze information, thereby enabling learners to spend less time gathering information and more time reflecting on its meaning (Robin & Harris, 1998).

Roblyer et al. (1997) identified four major instructional needs met by the constructivist model. They are:

- making skills more relevant to students’ backgrounds and experiences by anchoring learning tasks in meaningful, authentic, highly visual situations;
- addressing motivation problems through interactive activities in which students must play active rather than passive roles;
- teaching students how to work together to solve problems through group-based, cooperative learning activities; and
- emphasizing engaging, motivational activities that require higher-level skills and prerequisite lower-level skills at the same time.

Despite the current popularity of constructivism, its principles and practices have also stimulated a variety of criticisms. For example, under the constructivist approach, it is difficult to certify skill learning and to determine the amount of prior knowledge needed. Additionally, there has been little evidence that indicates that problem-solving skills taught in authentic situations in school will transfer more easily to problems that students must solve in real life (Roblyer, et al., 1997).

Which Approach is Best Suited for Technology Integration?

There is no right or wrong answer, yet there is one more question to bear in mind: Who is going to decide this? The software package producer, the computer, or the educator?

First of all, believing that acquiring the hardware and the software packages will resolve the problem is denying the importance of the human mind and capacity to choose. Secondly, the computer can be used as a tool to facilitate teaching and learning. However, the machine cannot make the choice of pedagogical approach. Whether to use one approach or the other is up to the teacher, who knows the lesson objectives, the expected results, and the students. Both approaches presented above, the directed instruction and constructivism could be used alternatively as long as educators have in mind why they chose them.

Three questions¹ could help educators determine technology's worthiness in a given lesson or situation. These questions are:

1. Is the lesson content worthwhile? (Are there clear objectives, connected to standards or significant questions, etc?)
2. Do the lesson activities engage students?
3. How does technology enhance the lesson in ways that would not be possible without it?

Educational practitioners, who are looking for the best means to facilitate a diversity of learning styles, can’t afford the luxury of being so ideological, dogmatic, and exclusionary in their view of education. Educational technologists need to be more pragmatic and eclectic, drawing from diverse theoretical perspectives as each proves useful in facilitating different kinds of learning. Educators need to be competent observers of the social milieu in which learners interact as well as knowledgeable about the content to which they wish to expose learners.

References


1 Source: Technology & Learning Center @aces http://edtechinct.org/integrate/index.asp
FROM BLACKBOARD TO MOUSE PAD:  
A Case Study of the Effectiveness of E-Learning and Technology In Teacher Education Programs

Thierry Karsenti  
Université de Montréal

INTRODUCTION

At the dawn of the new millennium, teacher education programs face numerous challenges: the growing diversity of student profiles, the arrival of new technologies, the reform of the curriculum, and the students’ lack of motivation. According to Gadbois (1989), “Of all things that ail society […] the most important is the lack of interest for any activity that doesn’t offer short-term personal profit. This attitude is manifested by a great number of young people in their lack of motivation for schooling and for their no-preparation for an eventual social role.” (Gadbois, 1989: 32)

Our changing society, now more and more centered upon information and communications technologies (ICTs), is giving rise to new educational needs as well as to new teaching methods. The arrival of Web-based courses and other Web-based resources presently appears to be one of the great focuses of pedagogical innovation at the university level. Furthermore, as these types of innovations greatly augment the possibilities of network implementation and of individual or group learning, the most basic teaching theories and principles such as those of Thorndike (law of effect and law of exercise), of Dewey (learning through action), of Piaget (construction of knowledge), and of Vygotsky (learning as a socio-interactive process) can be applied more readily and especially more frequently (see Grégoire, Bracewell and Laferrière, 1996).

TRAINING TEACHERS FOR THE NEW MILLENNIUM

Universities and education faculties play an essential social role and are often perceived as a model or source of innovation. However, in terms of the integration of technologies, the opposite is often the case. Bibeau actually asserts that ICTs are present in every area of society except education. Several studies highlight that, while new teachers do have a certain degree of knowledge with regard to ICTs, they have little know-how or technopedagogical ability with which to integrate those technologies into their teaching practice. This assertion is not limited to Canada; it applies equally to future teachers in the United States and Europe. The international nature of the problem reinforces the relevance of studies or pilot-projects dealing with this particular aspect of teacher training.

Elementary and high schools are also victims of the gap between teacher-training and a society immersed in technology, as they are subject to the influence of newly trained teachers and graduates of teacher-training programs. According to many, the difficulties encountered when ICTs are introduced into schools could be due in part to the absence of models for future teachers. Duchâteau, on the other hand, contends that the failure of technologies in schools results from the disparity between reality and the promises of over-enthusiastic promoters who often launch technologies in schools while the school system and teaching practices remain unchanged and therefore unprepared for this transition.

In a world where the explosion of numeric technologies is outpacing the means of accessing knowledge, the integration of ICTs in university pedagogy has a major impact. It leads to a modified task for the teacher-trainer, an altered teaching organization, and a change in the framework for learning and the student’s approach to knowledge acquisition. Until recently, education has dealt mostly with learning about technologies instead of working with them in the context of learning experiences. However, we argue that ICTs should not be considered an extension of the traditional classroom, but rather a tool promoting the use of learning strategies, notably within epistemological perspectives such as those brought forth in the context of constructivism.

INTEGRATING ICTS INTO TEACHER EDUCATION PROGRAMS: PROMISING PILOT-PROJECTS

Aware of the challenges stemming from university teaching, particularly those pertaining to the students’ motivation to
learn and to the development of richer technological environments, it was decided to implement four types of Web-based courses as well as develop other Web-based resources in a teacher education program in a Quebec (Canada) university:

- a 100 % Web-based course (the only compulsory, “totally” Web-based course in teacher education programs in Canada);
- a 50 % Web-based course in which a Web-based approach or Web-based modules were combined with “regular” in-class teaching;
- a regular-classroom course with Web-based resources and compulsory activities and assignments; and
- a Web-based resource for students during their field experiences in schools (practicum) within the teacher training program.

GOAL
The goal of this experiment was to study and better understand the various effects of the implementation of various types of Web-based courses and resources in a teacher education program. Our starting hypothesis was that Web-based courses and other Web-based resources, with their nature promoting self-determination, feelings of competence and affiliation (Deci and Ryan, 2000), would have a positive impact on the motivation of student teachers and on their learning. As well, we expected this Web-based course to have a positive impact on the student teachers’ willingness to use new technologies during their practicum (field experience in the schools).

METHOD

Subjects
All students enrolled in the various types of Web-based courses developed, as well as all students in their third or fourth year of a four-year teaching program were selected to participate (n = 429). They had a mean age of 21.

Quantitative measures and analyses
An adapted version of a motivation scale developed and validated in Canada, the Motivation in Education Scale by Vallerand, Blais, Brière and Pelletier (1989), was administered three times to all students who were participating in the Web-based courses. The first measure of motivation took place at the beginning of the first class. The second measure was taken after the third week of the course, when students were fully informed of the particular nature of their learning environment. The third measure was taken in the twelfth week of the course.

Qualitative measures and analyses
Interviews were conducted with students (n = 46). The results are also a product of the analysis of electronic mail received (n > 5300), messages posted on an electronic (Web-based) billboard (n > 1200) and transcripts of conversations held in “chat” (synchronous) mode (n = 52). It appears important to mention here that the qualitative analysis of such data would seem to be an increasingly promising means for dealing with qualitative data in education, especially in light of the teaching methods and the learning environment offered to the students taking “virtual” courses held on the internet (Winiecki, 1999).

RESULTS OF ONE PROMISING PROJECT
The results presented are based on the analysis of data collected during the 18 months of one pilot project (Project #1, a “100 %” Web-based course).

- analysis of more than 5300 e-mails received;
- analysis of synchronous conversations (chat); and
- analysis of interviews conducted with student teachers who participated in the project.

A total of 12 groups of 35-55 students took part in this one-semester course offered several times between January 1999 and December 2000. The analyses conducted highlight that students in the course were faced with two important challenges, while also benefiting from several significant advantages.

While it is easy to presume that the technological aspects of the course would represent the most serious obstacles for the student teachers, the results of our analysis demonstrate that this was not the case: problems related to information technologies came in second. The main difficulty encountered by students seemed to be their lack of autonomy or the trouble they had in learning by themselves, in managing their own learning. In other words, as noted by Lamontagne, the students had the most trouble in learning anew to learn.

Despite these obstacles, analysis of the transcribed chat conversations and of the e-mails received exposes the advantage of integrating ICTs into teacher education programs. The pilot-project experienced in Quebec (Canada) has enabled us to note the change that occurs among future teachers when they are confronted with ICTs in their practical training: a change in their motivation to learn using ICTs, as well as in their attitude towards learning to use ICTs -- learning with ICTs and learning about ICTs. The experience they undergo as learners, when faced with the integration of technologies in the context of a compulsory university course, is likely to shed a positive light on the integration of ICTs in general. It may also create favorable conditions and incentives for further integration of ICTs in their own teaching, either during a practicum or during their professional teaching endeavors.
Technologies are then perceived as learning tools with which the learners become more autonomous and more analytical in the face of dilemmas; they must find credible and relevant sources of information in order to answer their own questions. Other advantages have also been identified.

- Elimination of physical limits traditionally imposed by the classroom, leading to new, more open access to learning.
- Greater access to information and knowledge.
- Increased motivation to learn for future teachers.
- Better learning, which in turn is more likely to sustain the cognitive development of learners.
- More effective and custom-made teaching.
- More efficient teaching management (for educators).
- Improved and more frequent communication (among educators and learners, among the learners themselves, and also among the educators).
- Enhanced development of critical thought, thanks to increased communication.
- Greater autonomy for future teachers.

CONCLUSION

As Gutenberg redefined access to knowledge with the invention of the printing press, today's society has the potential to make a giant leap forward. In this study, student teachers confronted with the integration of technologies in their learning were required to view their relation to time and space differently; they had to acquire a new way of learning that seemingly provided them with increased motivation. However, integrating new information technologies in university pedagogy represents an enormous challenge, and the disturbances that will inevitably follow must be met with both enthusiasm and wariness. The pilot-projects implemented in Quebec have allowed us to ascertain that there are substantial advantages in integrating ICTs in teacher education programs, although there remains a large and considerable gap between the "real" university classroom and the virtual, technology-enhanced university classroom.

Distance Technology Teaching: A View from the Trenches

Gregg B. Jackson
Associate Professor of Education Policy
The George Washington University

What are the challenges and satisfactions of college and university teaching by distance technologies? In late 1999, The American Federation of Teachers surveyed a large number of U.S. college and university faculty members who had done such teaching. The following summarizes the results from 200 respondents.*

Technologies Used

Most of the respondents had used e-mail and/or the Web for the distance instruction, but 41 percent had some experience with interactive television and 15 percent had some experience with one-way television (telecourses). About 40 percent had used two or more types of technology, either simultaneously or at different points in time.

Support Mechanisms

Various forms of support were provided to the faculty members to help them with developing and teaching distance courses. These included technical support, seminars or classes, a help line, and other means. Seventy percent thought the support was sufficient and 30 percent thought it was not. The latter most often cited inadequate help with malfunctioning equipment.

Courses and Students

The subjects taught by distance were well distributed among math and science, humanities, social sciences, technology, writing, and career courses. The courses were mostly at the freshman and sophomore levels, but 17 percent of the respondents had taught graduate-level courses by distance. About half of the faculty members had 20-50 students in their distance course, and 10 percent had more than that number of students. Most respondents had taught the equivalent courses in on-campus classrooms.

Preparation Time

Almost everyone reported that the distance courses required more preparation time than did the traditional classroom delivery. The additional time is due partly to learning to use the technology, partly to putting exiting materials in new modes (such as in html format for posting on the web), and partly because much information that is normally provided verbally in classroom instruction must be recorded in writing or on video tape. Several respondents indicated that much of this additional preparation is a one-time investment that does not have to be repeated. But whenever a course needs to be revised, it appears that preparation of the revisions may also take more time. Half of the faculty members reported receiving release time or additional pay to compensate them for the additional preparation.

Interaction

The faculty members were asked how they fostered interaction between themselves and the students, and among the students. Sixty-six percent used e-mail, 35 percent used Web based discussions (bulletin boards), 32 percent used telephones, and 15 percent used student visits to the campus. Several mentioned giving small-group assignments that required students to collaborate electronically. One noted that he/she knew more about the individual students from extensive e-mail exchanges than he/she knew about the on-campus students. Many faculty members thought the frequency and quality of interaction was comparable to that of their traditional classrooms, varying among students. Some indicated that the distance interaction was more time-consuming for them.
Drop-out Rates

Forty percent reported differences in dropout rates between their distance and on-campus classes. The question, however, was asked without specifying “greater” or “fewer” dropouts, so the responses are ambiguous. Judging from comments following this question and some others, most of the differences were with higher dropout in the distance courses, but one comment specifically indicated there was less drop-out in the distance course and another comment indicated there was only a small increase in drop-out. Given that 60 percent reported no differences in dropout, it appears that increased dropout is a problem for a moderate portion of the courses.

When there were higher drop-out rates, the faculty members often attributed it to students who initially expected the distance courses to be easy and then learned the courses would be as demanding as regular courses. The faculty suggested that community-building among the students and optional weekend workshops for those needing extra help might reduce drop-out. One suggested allowing flexibility on deadlines, but another felt it helped to notify students that three late submissions would result in removal from the course.

Student Assessment

Sixty-seven percent indicated that they graded students in distance courses by the same criteria as used in classroom courses. Some indicated that they put more emphasis on multiple choice testing, but others indicated just the opposite, saying they put less emphasis on testing because it is difficult to proctor exams in distance courses, because the technology has forced them to become more creative in their assessment, and because the written discussions give them more basis for grading the students’ discussions.

The respondents reported several strategies for minimizing cheating on papers and tests. Of the 73 percent who gave final examinations, more than half did so with proctors, sometimes sending proctors to remote sites. Some assign papers unique to the class, minimizing the opportunities for plagiarism. Some require many short assignments, making it difficult for a student to find help with a large portion of his or her grade. These assignments also allow the instructor to become familiar with the student’s voice and style and thus allow them to recognize writing that is not the student’s own. Some also use video conferencing for student presentations that are graded.

Slightly more than half the responding faculty members thought that students in their distance courses learned as much as those in their traditional classroom courses. Twenty-seven percent thought they learned more and 13 percent thought they learned less. The comments about the better learning suggest that it is due to the drop-out of the poorly motivated and organized students leaving mostly strong ones, to distance courses needing to be better organized, to less negative peer pressure on susceptible students, and to more time being available to reflect before responding to electronic discussions. Most faculty members had observed that some kinds of students do better in distance courses than other kinds. Student motivation was most often mentioned as important for success in distance courses.

Finally

The faculty members were asked whether they wanted to again teach by distance. Eighty-five percent said yes.

* This article is based on a survey conducted by the American Federation of Teachers and reported in the following publication: American Federation of Teachers. (May, 2000). Distance Education: Guidelines for Good Practice. Washington, DC. Retrieved August 9, 2002, from http://www.aft.org/higher_ed/downloadable/distance.pdf
A Comprehensive Strategy
For
Internet-in-Education Teacher Professional Development

Edward A. Friedman
Director, Center for Improved Engineering and Science Education
Stevens Institute of Technology

Introduction

Users of the World Wide Web have proliferated with incredible speed. Within less than three years from its origin in 1994, Netscape software was installed on more than 40 million computers! In 2002, everyone has heard of the Internet and the Web, many have experienced it, and schools around the world are seeking connectivity.

School connections are increasing at a rapid pace. However, teacher professional development on subject matter classroom applications of this technology is not keeping pace. Too often, unrealistic expectations prevail. Many, including leaders of educational organizations and of high tech companies, hold the mistaken belief that a teacher with classroom Internet connectivity, who is capable of engaging in web search, will implement improved instructional practices. In reality, the Web can be a confusing domain. Searches can yield a bewildering array of possibilities. Untutored teachers can easily engage in counter productive Internet-based initiatives. Teachers are also vulnerable to the use of incorrect information in their web-based lessons.

The thought that teachers with connectivity, whose training has only dealt with web related tools, are likely to generate exciting new curriculum materials is naїve. It is akin to an expectation that a teacher with a computer and word processing skills is likely to generate a great new textbook. Some will, but the percentage is small. The fact that “early adopters” of new technologies often have succeeded in creating wonderful educational materials obscures the fact that the vast majority of teachers need guidance and ongoing assistance as they venture into new technology-supported territory.

The Challenges

In order for the Internet to have a significant impact on classroom practice and on student learning, a teacher must engage in many thoughtful and informed decisions. Effective Internet resources must be identified; strategic matches with prescribed curricula must be made; applications that support cognitive development must be organized and nurtured, and student learning must be guided by thoughtful lesson plans.

Teacher professional development for this panoply of competencies often requires understanding in several new areas of professional ability. One is the need for expanded subject matter knowledge. The Internet, especially in science education, facilitates exploration of valuable content that was never before accessible to pre-University students. For example, students of all ages can explore Genome databases that are expanding in scope and content on a daily basis. However, few teachers have had modern topics in molecular biology as part of their pre-service education.

A second is experience with pedagogical strategies that are unfamiliar to even experienced teachers. Internet technology facilitates discovery learning and communities of collaborative learners. Teacher expertise in these areas of pedagogy is often limited.

A third area of understanding is that of the culture and mores of the emerging “wired” society. Protocols and etiquette of email, appropriate use of Internet by students, familiarity with acceptable use policies, privacy, copyright practices and other legal and ethical concerns in the online world all need to be mastered.

These myriad needs for individual teachers present a formidable array of challenges that must be met in an effective teacher professional development program, but they still only deal with part of the process. It should be realized that we are biasing the discussion by categorizing the issue as “teacher professional development.” A more comprehensive and inclusive context should be taken into account. The real question is, “What actions are needed for students to benefit from integration of technology into the teaching/learning process?” Teacher professional development only deals with one set of requirements for success.
The educational system in which teachers function needs attention. Teachers cannot implement technology in their mainline teaching practice by themselves. Administrators and colleagues must be involved and supportive. Issues of scheduling, school Internet policies, utilization of alternative curriculum materials, support for team teaching that exploits new multidisciplinary learning opportunities, the introduction and use of alternative assessment strategies all require support within an informed and congenial school environment.

Teachers who are constrained to doggedly adhere to school prescribed textbooks or testing methods that do not allow for authentic assessment or student portfolio development can easily be thwarted in their quest to utilize Internet technology in a creative manner.

Teacher professional development programs therefore require simultaneous attention to programs that provide orientation and understanding among principals, curriculum coordinators, department heads, and other governmental or bureaucratic personnel. Workshops and seminars are needed for these other key individuals. Teachers need to be assured that those who control the organization of school programs and policies will support new initiatives – even when it is not fully understood what some of those new initiatives might be!

Hence, so-called teacher professional development programs should really be called technology implementation programs. Implementation programs require orientation and training of administrators, supervisors and the enforcers of school system policies. Not only must that transfer of information and knowledge be pursued, but agreements need to be reached that ensure that everyone will support teachers as they attempt to implement new methods and materials.

In addition to programs for teachers and administrators, a comprehensive strategy for teacher professional development should also be tied to a school system’s technology plans. Too often, technology acquisitions and plans exert an unreasonable pull on educational policies and programs. However, while protecting against technological determinism it is important that curriculum planning take into account technological obsolescence. Teacher professional development and coordinated continuing education for administrators needs to take place in a context in which there is an appreciation for technological change.

The time between the introduction of a new technological tool or process and its use in classroom instruction can easily be three to five years. Such time periods are exactly the same as those for technological innovation and change! Just as a new use of technology is ready for classroom use, a more effective technology may appear on the scene. Society has been coping with rapid changes in information and communications technologies for three decades. It is likely that equally rapid change will prevail for another three decades.

Educators need to become familiar with the capabilities of newly emerging devices and systems. Time is required for the exploration of how these new devices and processes can be integrated into classroom practice. The continuing education of teachers and of administrators should help them prepare for the future. Unfortunately, this preparation is rarely addressed.

As the corporate world trains personnel to utilize new technologies in its current practices, it also engages in planning and exploration of how it might deal with the next generation of those technologies. In the field of education one rarely finds individuals who are prepared to explore the consequences of emerging technologies.

The CIESE Local Experience

During the past eight years, our group at the Center for Improved Engineering and Science Education (CIESE) at Stevens Institute of Technology has been engaged in efforts to provide teacher professional development programs that deal with all of the challenges that have been described (http://www.k12science.org). CIESE has been developing and implementing programs whose goal is to bring implementation of state-of-the-art Internet technology into Kindergarten through 12th grade classrooms that enhance the learning of science while engaging competencies in mathematics, social studies and language arts.

Stevens Institute of Technology (http://www.stevens-tech.edu) is a private technological university that was founded in 1870 and which provides undergraduate and graduate education in the various fields of engineering, science and technology management. There are about 1600 undergraduate students and approximately 2600 graduate students pursuing bachelor’s, master’s and Ph.D. degrees. Located in New Jersey on the left bank of the Hudson River across from mid-Manhattan in New York City, Stevens is heavily oriented toward research that deals with the pressing issues of world society.

While Stevens does not have teacher education programs, it has been an innovator in applications of computers and information technology in the education of scientists, engineers and managers for a quarter of a century. For example, in 1982, Stevens required all of its engineering and science degree candidates to own personal computers that were used in the undergraduate instructional programs. In 1985, all of the undergraduate residence rooms were wired for Ethernet connections for student use. Stevens established CIESE in 1988 to bring this Internet-in-education expertise to pre-college teachers and school systems.
CIESE has been providing training programs for teachers and outreach assistance to school systems on applications of computers and network capabilities for teaching and learning in mathematics and science for elementary, middle and high school programs. Though its being embedded in a technological research environment that has strong links to industry, CIESE is cognizant of state-of-the art technology and of new technological developments that are just over the horizon. CIESE is thereby enabled to hone its programs to minimize risks of technological obsolescence.

In 1994, CIESE received a $2.9 million grant from the U.S. National Science Foundation to assist schools throughout the state of New Jersey on applications of Internet in science classrooms from kindergarten (5 and 6 year olds) through 12th grade (17 and 18 year olds). In that four year project CIESE had opportunities to provide training to approximately 3,000 teachers from more than 700 school buildings in New Jersey. Programs were developed that provided orientation and understanding of this technology for school administrators as well as teachers. Techniques were also developed to support and liaison with teachers after they completed training to help facilitate implementation of innovative materials and methods.

Unlike many Internet training programs that are limited to providing teachers with mastery of Internet tools and searching techniques, CIESE promoted the concept that the Internet resources should be utilized for unique and compelling educational applications. This point of view has led CIESE to emphasize student access to real-time data from the Internet that enable them to “do” science, rather than read about it as a static endeavor.

For example, students can engage in analysis of seismic data from the same day to study the global distribution of earthquakes and thereby discover the boundaries of prominent tectonic plates. Or students can exchange data about local river or pond water quality with students from other regions in the world and thereby gain insights into the dynamics of ecosystems. CIESE maintains a web site in which such real-time data and collaborative projects are freely accessible to teachers. These applications have the intrinsic capability of fostering student-centered project oriented learning. Students are enabled to prove and discover concepts rather than accepting new knowledge that is delivered to them by authority figures or textbooks. For many teachers, the hurdle of engaging in this type of instruction is as great as or greater than that of incorporating a new technology into classroom practice.

CIESE training programs are organized to stimulate and encourage teachers to follow their training experience with incorporation of these resources into their ongoing lesson plans. The availability of these materials greatly expedites the transition of teachers from learners to users of the new technology.

Through its experience with large numbers of teachers and school systems, CIESE has determined that the vast majority of teachers must be introduced to Internet technology as a tool for teaching in face-to-face training programs. While there is a great deal of interest in on-line education and training for teachers, the need to deal with multiple facets of teacher understanding and behavior call for training environments that are mediated through human interactions.

The CIESE National Experience

CIESE has grappled with the need to transfer training methods and experience that have been developed through local and regional experience to teachers and schools systems at distant locations. Since 1988, CIESE has been implementing a program on Internet in science education for teachers and school systems in Cleveland, Ohio, Miami, Florida and Phoenix, Arizona (http://www.k12science.org/alliance). This has been done through partnerships with local post-secondary institutions. Faculty and staff from community colleges in these three locations have been trained by CIESE and provided with highly detailed training materials. They are enabled and supported in the implementation of local train-the-trainer or cascade programs. Through this program more than 6,000 teachers in these three cities have completed 30 hours of hands-on training on the use of Internet in K-12 classrooms.

This program, known as Alliance+, is entering its fifth year of activity with the support of a $9.3 million grant from the U. S. Department of Education. CIESE has been able to organize and coordinate this effort through a partnership with the League for Innovation in the Community College and the participation of Cuyahoga Community College in Cleveland, Maricopa Community Colleges in Phoenix and Miami-Dade
Community College in Florida. These community colleges have, in turn, entered into partnerships with their local school systems in pursuit of enhanced classroom learning utilizing Internet technology resources.

Not only do the community colleges facilitate the training of teachers, but there are programs for school administrators, follow-up visits to classrooms and maintenance of an online network of teachers who are engaged in these efforts. CIESE provides web-based feedback tools for the workshops that are held locally to monitor the effectiveness of the training and provide opportunities for local trainers to be certain that they meet the needs of participants. CIESE also has staff that visit the sites and, together with community college and school system staff, hold meetings and discussions to focus attention on program needs. Listservs and Frequently Asked Questions and other web-based resources also serve to support the program.

The CIESE International Experience

Building upon the experience gained in the Alliance+ program, CIESE has embarked upon an international effort in Costa Rica, Ecuador and Peru. With support from the Inter American Development Bank and in partnership with Miami-Dade Community College, Internet training is being provided to two high schools in each of the three countries. One of the schools is a public school and one a private institution. This program, known as Proyecto Ciber@prendiz, is intended to provide a model for government officials and other decision makers in each country, as they engage in planning for Internet use in their nation’s schools. There is an added objective of encouraging the private and public schools to collaborate and help narrow differences in education that exist between these sectors in most countries of Central and South America.

The grant from the Inter American Development Bank is being administered by the Omar Dengo Foundation which is located in San Jose, Costa Rica. The Omar Dengo Foundation is a nonprofit organization that has been active in promoting technology use in the schools of Costa Rica. A web site for this project contains substantial information about its organizational characteristics and the curriculum materials that are being used. The site is at http://www.k12science.org/ciberaprendiz/index.html.

An important factor in the structuring of Proyecto Ciber@prendiz is the participation of SchoolsOnline (http://www.schoolsonline.org), which is a nonprofit organization based in San Jose, California dedicated to enabling schools around the world that have limited resources to have Internet connectivity. SchoolsOnline is providing computers for use in classrooms and wireless networking equipment to ensure that teachers who are trained in this project will be able to utilize Internet resources in their classrooms.

Proyecto Ciber@prendiz utilizes lesson learned and organizational experience that has been gained in the Alliance+ program. Educational materials developed by CIESE are being translated into Spanish for use in this project. Also, the strategy of having local partner organizations who are expert in the use of technology and in the delivery of advanced training programs is being employed. While the Alliance+ program had three community colleges as local partners, Proyecto Ciber@prendiz includes three highly competent, but diverse organizations, as partners. They are the Omar Dengo Foundation in Costa Rica, the Escuela Superior Politécnica de Litoral in Guayaquil, Ecuador and the San Pablo University in Arequipa, Peru.

These partners will also engage in local training and facilitation of project implementation in their local schools. The partners also will act as intermediaries between local schools, educational leaders and government officials and the educational project managers at Stevens, the organizational project managers at the Omar Dengo Foundation and the technology facilitators at SchoolsOnline.

Through Proyecto Ciber@prendiz, insights and understanding are being sought on strategies for a comprehensive approach to technology integration that can enhance student learning. Through the collaboration of seven organizations located in four countries and activities at six schools, a complex program is being developed. Proyecto Ciber@prendiz has the potential of providing a model that engages the special strengths of diverse institutions from multiple countries. All who are participating look forward to the events of the next year as students become engaged with applications of Internet resources in their study of science.

1 Edward A. Friedman is Professor of Technology Management and founding director of the Center for Improved Engineering and Science Education (CIESE) at Stevens Institute of Technology. He has been an award winning research physicist, director of a program to create a college of engineering in Afghanistan and Dean of the College at Stevens. He received the New Jersey Einstein Award in Education and an Honorary Doctorate in Mathematics from Sofia University in Bulgaria. His degrees are in physics from MIT (S.B.) and from Columbia University (Ph. D.) He can be reached at friedman@stevens-tech.edu.
2 http://www.k12science.org/curriculum/musicalplates/
3 http://www.k12science.org/curriculum/waterproj/
Technology is not new to education - but rather contemporary computer technologies, such as the Internet, allow new types of teaching and learning experiences to flourish. In their "new science of learning," Bransford, Brown, and Cocking (1999) propose that many new technologies are interactive, making it now easier to create environments in which students can learn by doing, receive feedback, and continually refine their understanding and build new knowledge. This constructivist approach is transforming the typical K-12 classroom, as opposed to students spending most of their time learning facts from a lecture or text and doing the problems at the end of the chapter (Bransford et al., 1999). Students in technology integrated environments find themselves immersed in learning activities that require computer use which in turn individualizes the educational process to accommodate the needs, interests, proclivities, current knowledge, and learning styles of students (Schacter & Fagnano, 1999). It has been argued that technology-integrated learning activities adhering to such constructivist assertions (Schacter & Fagnano, 1999) are an effective vehicle for promulgating a host of new instructional practices as well.

These new technology-integrated instructional practices offer a variety of different mediums and student products. The bulk of educational technology being used in American classrooms is more common to “everyday” computer software, e.g. word-processing, presentation, and spreadsheet software as well as the Internet (including research, graphical and web page design) (Becker, Ravitz, & Wong, 1999). These aspects of technology are where true instructional innovation is taking place, as these generic software types were not designed with true educational intent. As teaching colleges and universities are responsible to instruct pre-service and in-service teachers on the basics of instructional design and delivery, they are now filling technology’s motivational gap by offering a variety of courses geared towards the effective use of technology in the classroom. The term use is being qualified here by effective due to the reality that the mere presence of computers or high access to computers does not imply high use, let alone educational use. For example, using the computer for word-processing or simply as a delivery method does not ensure that the computer is being utilized such that curricular objectives are being addressed. Rather, effective use is referring to how technology (e.g.: the Internet) is translated into the instructional design context. More specifically, the effective use of computers really implies that the computer is being employed as
Planing for Technologies

a tool to facilitate the learner’s effort and resulting achievement aligned with explicit learning objectives and standards. Adopting the perspective that technology is not a replacement to the teacher but rather a supplemental aide, guides the framework of many technology-based teacher-education courses.

A Course Example

Clearly the Internet has changed our lives and getting teachers to believe that it can improve their instruction is a task paramount to teacher-educators. Following is a description of a model course entitled Internet for Educators, led by the author. The course is offered through the Department of Educational Theory and Practice at the University at Albany, SUNY. Typically, this course (and other technology-based courses) is offered during the summer months to master’s-level graduate students. A unique weeklong, 8-hour day structure to this course allows teachers to become deeply immersed in the course’s activities. The course is developed within an inquiry-based framework and is designed such that students are to become comfortable with the course’s content and technical features through extensive exploratory activities. Being heavily project-based as well, the concepts of ownership and intrinsic value are an integral component to the course’s success. While it is not within the confines of this article to discuss the course in its entirety, the basic principles and strategies inculcated are described.

The primary learning objective for the course is simply to increase teachers’ motivation to utilize the Internet in their instructional practice. This motivation can come in the form of course management and delivery but most importantly it is Internet-based lesson plan design they are learning. To achieve this latter component, the following two key reflective concepts are emphasized to teachers:

- keeping your learning objectives intact; and
- using the Internet as your first reference tool to attain these objectives.

The premise here is that once they grasp the basic technology, potential and impact of the Internet, teachers are reminded that curriculum comes first and technology comes a close second. To exemplify this, teachers are asked to take an existing lesson plan that they have used in the past and convert it to an Internet-based lesson. To accomplish this task, teachers need to reflect on the concepts above in addition to being given models of how this transition can occur.

Consider the following fictitious example of two teachers who both wish to have their students learn about poetry. The learning objectives are that each student will learn about the different genres of poetry, and write their own poem based on one of these genres. Technology is not needed. For example, Mr. Dawdler gives a direct lecture on poetry genres, and sends students to the library to research a genre, say haiku. Afterwards, Mr. Dawdler’s students can handwrite examples of haiku in notebooks or even present them orally. The learning objectives are met in this situation. But now consider Miss Swift who has a penchant for integrating technology into her curriculum. Miss Swift gives a brief but direct lecture on poetry genres as well, but rather than sending her kids to the library, scurrying through card catalogs and six foot tall book shelves, she goes to the computer lab with her students where they search the Internet for different types of poetry.

On the Internet, Swift’s students can instantly find multiple sources of poetry information to peruse and learn about. The instant access saves time in filtering through a wider range of useful sources so the students can find what really interests them. The writing product is composed on word processor software where students can receive automatic feedback on spelling, grammar and writing style with visual clarity. Miss Swift’s students can print out a self-edited copy of the newly created poem to hand in and recite; or electronic copies of each student’s poem can even be exchanged with other members of the class (and across the globe) by having the poems published on the Internet via individual or class websites. Multimedia presentations of student poems are an easy alternative for the standard oral report. In Miss Swift’s class the same learning objectives were met but her students were able to capitalize on their time and self interests through Internet searches and word-processing. They are able to use their time more efficiently in order to find what really intrigues them—the heart of student constructivism.

Theoretical Foundations

There is a general consensus in education that student-centered instruction elicits personal meaning and increases a student’s desire to learn. Desire manifests itself in increased effort ultimately leading to improved achievement. It doesn’t require a computer to attain this linear chain of events, but computer technologies are a tool that can make the instructional and learning process more efficient and albeit a little more fun.

For the most part, the learning activities in this course are student-centered with the instructor acting as the facilitator. The actual activities and instructor’s role are serving as a model to understand that effective technology use falls under this instructional modality. For instance, teachers were given
the task to answer ten questions relating to the history of the Internet, and they were supplied with several hypertext links as reference points in which their responses then had to be entered into the word processor software for completion. Their responses were then emailed to the instructor for quick submission. These “hands-on” activities that they performed are underlined as the very same methods that they are going to have to employ inside their own classrooms. While many teachers are aware of and understand constructivist or student-centered instruction, many don’t capitalize on this type of instructional design. Effective technology-integrated instruction mandates this approach.

One particular type of inquiry-based technology-integrated instructional strategy these teachers learned about is the Webquest (Dodge, 2000). Webquest is an easy activity to develop for basically any content area in which most or all information used by learners is drawn from the World Wide Web. It is designed to: “use the learners’ time well, focus on using information rather than finding it, and support learners’ thinking at the levels of analysis, synthesis, and evaluation” (Dodge, 2000). To illustrate this rather new instructional technique to teachers, they had to do a webquest about webquests whereby they are given a variety a webquests to peruse as models and then had to evaluate which ones they thought were effective for their purpose. As required for the course, teachers then had to design their own webquest, a lesson that they would actually use with their students. Again, the two key concepts mentioned above guided their development.

It was not required for teachers to develop their own web pages. However, they were given a primer on hypertext markup language (html) and shown a number of free commercial sites in which they could host their websites. To the surprise of the instructor, every single student opted to develop his or her own website. See examples at: http://www.albany.edu/faculty/jb6321/521studweb.htm.

These pages are either their webquests that they published on the Internet, general sites that they constructed for their classes, or a combination of both.

Ultimately, if the technological revolution is taking flight and our students and future leaders are to be equipped, then the field of education needn’t sit by and wait. Teaching about technology is progressing into teaching with technology. To make this transition, teacher training (whether teacher-educator courses or professional development) can and needs to address technology in the instructional design context. Educating teachers in this respect to effectively integrate technology into their instruction is not a difficult task provided they are made aware of what strategies are available to them. To this end, the advent of computers and the Internet really allows the function of a teacher to move from the sage on the stage to the guide on the side (Glavac, 1998).

References


1 Joseph M. Baltrus is an adjunct professor at the University at Albany, State University of New York. He is currently a Research Associate at RMC Research Corporation in Arlington, VA. Correspondence can be made via e-mail: baltrusj@rmcarl.com.
Word Processing for the Digital Divide:

The Merits of a Single Application Technology Solution

Anthony Bloome and Ayub Kalema Golooba

Scientists have conjectured that we use approximately 10% of gray matter in our brains. For some this may be a disconcerting estimate: on the one hand, there is a lot of leftover capacity that we can be doing something with; on the other, a more comfortable interpretation might be “hey, we’re doing alright with just 10%!”

Think about this when it comes to all the incredible capabilities of a computer’s software brain vis-à-vis our standard uses of it. We suspect that most average users, like ourselves, use significantly less than 10% of all the software and hardware options available on the average computer – and that a few applications (e.g., Internet, Word Processing and Presentation software) constitute the majority of our total computing time.

In a report on *How Are Teachers Using Computers in Instruction*, conducted with 4000 teachers in the U.S., researchers indicated that the primary application of computer usage was word-processing. In fact, word processing was used nearly twice as much as the next-most common types of software (i.e., CD-ROM reference materials and games for practicing skills). This is consistent with our own experiences in Africa, which we would suspect is indicative of usage in other developing countries as well.

Word Processing by the Masses: Merits of a Single Application Hardware

If word processing is the primary application of teaching usage, how might a technology solution that directly answers this need of classroom teachers be useful? Or put another way: what might be the advantages or disadvantages of a relatively straight-forward, low-cost, single application hardware product compared to a stand-alone computer with many largely underutilized features.

This issue came to mind with a recent contribution to World Links by AlphaSmart, Inc., a private Silicon-Valley based education technology developer. As part of a technology upgrading program in the U.S. to a newer generation of products, AlphaSmart collected and donated 1000 of its earlier model AlphaSmart 2000 and AlphaSmart Pro keyboards for use by schools in Africa involved in a World Links program.

While a donation of this kind might raise academic questions of new vs. refurbished machines and cries of technology dumping (although the contribution was certainly appreciated by the school recipients – as evidenced below), we’d prefer not to dwell on these issues as they are discussed with greater knowledge and depth in other journals, including earlier *TechKnowLogia* articles. Instead, we are intrigued by the issues raised by this donation – namely, of appropriate technology use driven by what users really need – or actually use – rather than by technology providers or perhaps misplaced expectations that the more sophisticated the technology, the better it is.

The following is also not intended as a flat-out endorsement of a particular product. An Internet search reveals other portable word processing or electronic keyboards on the market – e.g., Dreamweaver, Co:Writer, Perfect Solutions PC6, and QuickPad. Also there are the Personal Digital Assistants (PDAs) with those increasingly popular folding keyboards that technophiles love to show off. Yet feedback from recipients of the AlphaSmart donation in Uganda is useful as a starting point to raise some reflective issues of appropriate technology use both there and in other classrooms around the world.

Electronic Keyboards Described

A writer from The New York Times referred to electronic keyboards, such as the AlphaSmarts, as “glorified keyboards.” The AlphaSmart 2000 keyboards weigh about two pounds, have a full-size QWERTY keyboard, a 4-line 40-character LCD display, and run on AC adaptor or three “AA” batteries (including rechargeable ones). The keyboard’s software, which can be activated within 2 seconds after pressing the on/off button, allows users to enter and edit up to 64 pages of text in eight separate files, which via cable can then be printed directly or transferred to a PC or Macintosh computer for formatting. Files are saved automatically, even preserved
when the batteries are removed, and in the newer model, the AlphaSmart 3000, can also be transferred back from these computers to the AlphaSmart keyboard. (For more features of the AlphaSmart 3000 keyboard, visit the website www.alphasmart.com.)

**Donation to Uganda**

Uganda received 200 AlphaSmart 2000 keyboards in late 2001, which were distributed to headmasters in 27 schools participating in the SchoolNet-Uganda project, World Links’ national implementing partner. As a significant contribution, the Ministry of Education also paid for the duty tariffs and clearance of the donated equipment.

**Feedback from Users**

**As Teaching Aids**

The IT coordinator at Gayaza High, (a girls’ school in central Uganda) reports that the keyboards have been very useful to their school. “Teachers use these keyboards to set examinations and then download their questions to the computers. Teachers feel good when they type their own examinations. The AlphaSmart keyboards have enabled them to do this without any difficulty,” he says,” and adds “Other teachers are now able to give ‘handouts’ to students because they are able to prepare their notes directly in electronic form.”

Similar feedback has come from teachers at Mukono Bishop School where the keyboards are used for typing notes and handouts. “We are striving to integrate technology in our subjects,” says one teacher. “In the languages, for example, students are able to type their stories on the keyboards and later transfer them to the computer.”

**Maximizing Scarce Resources -- Typing and Keyboard Skills Development**

Similar to vocational education in the U.S., learning typing and word processing in Uganda are useful employable skills and important stepping stones for more expedient computer usage. Recognizing this, many of the schools involved in the World Links’ program in Uganda have received or purchased typing software. The keyboards themselves come with typing tutorials and automatic spell-check features.

Another advantage of classroom teachers focusing on these areas of skill development is alleviating pressure from limited resource computer laboratories. For a school fortunate enough to have a lab, the number of computers is usually quite limited. Maximizing access to these scarce resources requires creative usage of the technology and the labs’ physical space. For example, a student or teacher using an electronic keyboard to learn typing, do word processing or simple mathematical calculations frees up the computer for more sophisticated applications usage. Additionally, while some students are sitting in front of the computers, others could be working with printouts, workbooks or electronic keyboards in other parts of the lab or a different classroom. Written or electronic data can then be transferred later to the computers for printing or as e-mail attachments.

“We participate in the Global Teenager Project Learning Circles,” says Mr. Walugere from Kubuli Senior Secondary. “There comes a time when the pressure of the project is too much. That is when the keyboards prove very useful. I allow the students to type their responses on the keyboard while they discuss and then come to upload their work. Somehow, I have discovered that the students are keener to write when I give them the keyboard than when I ask them to write their answers on paper and then come to type them out in the computer laboratory late.”

**Portability**

In Mengo Senior Secondary, a school near downtown Kampala, the AlphaSmarts are kept in the head teacher’s office where a register is maintained for those who borrow them. This was done to ensure the safety of the keyboards -- as the computer laboratory has quite a number of users -- and it was also thought unadvisable to keep such portable technology equipment in it without supervision. Teachers and school administrators have the option of borrowing them overnight.

In Ndejje Secondary School, about 45 minutes east of Kampala, a different approach is used. The keyboards are entrusted to the coordinator of the computer center who has the authority to decide how the school community uses them.

These two lending models are possible with portable technology -- an obvious advantage of electronic keyboards, laptops, PDAs, e-books, etc. As with a laptop, these lightweight keyboards -- which weigh under two pounds -- can be used within or outside the classroom, or possibly checked out from the school library and during or after standard school hours.

This portability addresses a common complaint of teachers involved in the World Links program of not having access to the technology in more comfortable settings other than the computer lab. “In my job as IT coordinator, I write a number of reports to the school administration,” says Mr. Richard Walugere, a teacher at Kubuli Secondary School. “I am now able to write my reports more quickly in the comfort of my home.”

For example, Mr. Patrick Bbosa, the chief nutritionist at Mengo SS, no longer has to worry about working in the computer laboratory while supervising his staff 300 meters
away. Instead, he regularly uses the keyboard in his office to write messages that he can then send later via e-mail to the American School Food Service Association.

Another AlphaSmart user, Ms. Mary Mukasa, a literature teacher at Mengo, had just completed her master's degree from Makerere University. She typed her research dissertation using the electronic keyboard and told us, "I don’t know how I would have handled it [the research] without this keyboard. I really needed to work late in the night but I have no computer. I was thinking about buying a laptop but the cost is way too high. The AlphaSmart is a very handy device that helped me get on with my work."

Obviously, the flip side of portability is that it makes it easier for theft. In most African countries, there is nothing quite like it available. A question then: will a single application hardware product, such as the electronic keyboard, have more or less “street” value than a standalone or laptop computer?

**Price**

Certainly the retail and resale price of electronic keyboards factor into their “street” value. The retail price of a new AlphaSmart 3000 in the United States is just under US$200. While acknowledging that this is a significant financial outlay for most schools in Africa, the electronic keyboards are still considerably less expensive than laptop computers (you could have ten electronic keyboards for the price of one laptop) and more portable than desktop PCs.

Another advantage of the AlphaSmart keyboards is their incredibly long battery life. With three AA batteries, the AlphaSmart keyboards in Uganda have lasted anywhere from 300 to 500 hours of usage – some keyboards are still operating with the same batteries with which they were donated! With the average cost of a pair of Dura/Energizer batteries in Uganda at 3000 Uganda Shillings or roughly US$1.67, a long battery life is a big advantage, particularly for schools with unreliable electricity or where one has to travel distances for purchasing replacements.

**Durability**

With a rugged exterior shell and no moving parts, electronic keyboards are less fragile than either desktop or laptop computers. School administrators concerned with the potential mishandling of sensitive computer equipment might feel more inclined to allow teachers and motivated student users to check this technology out from the computer laboratories. This is a form of student empowerment that is important in the learning process. For example, at a recent exhibition at Mengo SS, students who had been taught how to use the keyboards were the lead presenters in explaining to their parents how these tools have been used.

**Not for Every User**

An electronic keyboard will obviously not suit every user. Those fortunate to be in school systems or schools with adequate financial resources will have access to a wide range of technology solutions to suit their teaching and learning needs. Many teachers might even find electronic keyboards limiting for professional development pursuits or maximizing student-centered learning. However, for every teacher that insists on using the latest and greatest computer gizmo, there are probably an equal number that principally do just word processing. If so, is there a complementary role that single application technologies, like electronic keyboards, can add to the teaching and learning process, particularly in less resource-equipped schools? Comments such as those above from Uganda and our own experiences suggest that there is indeed a useful role for products such as electronic keyboards.

This finding also raises another provocative question though: what might happen if as individuals, professionals or school administrators, we were also encouraged to purchase single-application technology solutions at far lower costs than the traditional desktop computer? What if rather than using most of our technology resources for a bundling of computer software and hardware applications that we may only infrequently use, we buy the just-what-we-need hardware and software components that support what we really do from day-to-day -- such as those used for word processing? As we are only using 10% of our own mental software, perhaps we will save discussion of this topic for another time.

---

1. Anthoney Bloome is an Operations Analyst at the World Bank’s World Links for Development Program focusing on ICT for Development issues. From 2000-2002, he was the Eastern and Southern Africa Regional Coordinator for the World Links program. Ayub Kalema Golooba, a teacher at Mengo Senior Secondary School in Uganda, was one of the lead online project facilitators for the World Bank’s World Education for Development online course on education for sustainable development.
3. World Links is a Washington-D.C. non-profit organization focusing on issues of digital divide in developing countries. For more information, see http://www.world-links.org
In this issue we focus on Web sites that are dedicated in two areas to teachers: training teachers in the use of information and communication technologies in teaching and administration, and using information technologies in teacher education/training. As well, we highlight a few online Journals dedicated for the support of teachers.

Selected by Sonia Jurich

**Society for Information Technology and Teacher Education (SITE)**
http://www.aace.org/site/default.htm

SITE is an international association of educators and affiliated organizations with the purpose of creating and disseminating knowledge about the use of information and communication technologies for teacher education and faculty/staff development. The site includes two online publications - *Journal of Technology* (paid subscription) and *Teacher Education and Contemporary Issues in Technology and Teacher Education* (free subscription) – in addition to documents and conference announcements.

**Association for the Advancement of Assistive Technology in Europe (AAATE)**
http://www.fernuni-hagen.de/FTB/AAATE.html

This organization tries to stimulate advancements in assistive technologies. It includes researchers, developers, and private companies within its membership.

**International Society for Technology in Education (ISTE)**
http://www.iste.org

ISTE is an international organization dedicated to promoting appropriate uses of information and communication technologies to support learning, teaching and administration for K-12 schools. The organization is also dedicated to improving teacher education through technology. The site is home to the National Educational Technology Standards (NETS) Project and the National Center for Preparing Tomorrow’s Teachers to Use Technology (NCPT). The site also includes an online bookstore, software reviews, information on workshops and conferences, and other resources.
The International Technology Education Association (ITEA)
http://www.iteawww.org

ITEA is the professional organization of technology teachers. In addition to services reserved for members, the site includes information on conferences, documents about the teaching of technology, and lists of workshops from the Center to Advance the Teaching of Technology & Science (CATTS). The site has also a digital library with journals and magazines on the teaching of technology.

Canadian Association for Distance Education/
Association Canadienne de L’Éducation à Distance
http://www.cade-aced.ca

Although CADE is an association of distance educators in Canada, it publishes an international journal with the objective of promoting and disseminating research on distance education, the Journal of Distance Education (La Revue de L’Éducation à Distance). The site also includes announcements about conferences, documents and a “communiqué” section with information about research and development of new technologies for distance education.

IASinitiative.org
http://www.iasinitiative.org/EDUteach.htm

This page is part of the Intra-Americas Sea Initiative (IAS), which aims to promote international understanding about the societal impacts of climate variability, oceanography, geology, and ecology in the Intra-Americas Sea (Caribbean Sea and Gulf of Mexico) and adjacent regions. In addition to news and information about the project, IAS has a site on information about technology and science training for teachers and links to technology projects that enhance science education. In English and Spanish.

El Aula Virtual
http://www.eygm.org/aulavir/aulavir.htm

This site, part of the Asociación Educación y Gestión de la Comunidad de Madrid web site, has links to tutorials and courses on technology and science. The teacher site has links to web sites of international organizations that offer support and educational resources in subjects such as physics, mathematics, music and others. The student site has links to sites with games, experiments and the Iberoamerican Olympiad of Mathematics.

TEAMS Electronic Classrooms
http://teams.lacoe.edu/documentation/classrooms/classrooms.html

Part of the Los Angeles Department of Education (LACOE), this site offers resources for elementary school teachers, including lesson plans, guided activities for teachers, student interactive activities, parent resources, and varied information. Teachers can join TEAMS to publish their own projects.
PBS Teacher Source  
http://www.pbs.org/teachersource

This site of the Public Broadcast Station offers resources for teachers, from Kindergarten to high school, in different subject matters. The site states having more than 3,000 lesson plans and activities on arts and literature, health and fitness, social studies, mathematics, science, technology and early childhood, in addition to a guide for educational television programs.

The Teacher Training & Technology Center  
http://www.the3tconnection.org/

This site was initially developed to host the case studies of innovative approaches to using technology to train teachers and is being expanded to share other reports, links and information relevant to this topic. Site visitors are invited to contribute or suggest additional resources. The case studies were supported by a grant from the Information for Development Program (infoDev), a global program managed by the World Bank to help developing economies fully benefit from modern information systems.

Online Publications:

Journal of Information Technology for Teacher Education  
http://www.triangle.co.uk/jit/index.htm

This is a fully refereed international journal that focuses on the implications of information and communication technologies for teacher education and training. The site includes full text of articles appearing in issues from 1992 through 2001 (as PDF files). Note: The Journal is changing its name to Technology, Pedagogy and Education.

Journal of Asynchronous Learning Network (JALN)  
http://www.aln.org/alnweb/journal/jaln.htm

This online journal publishes original work in asynchronous learning networks (ALN), defined as “people networks for anytime - anywhere learning.” The journal is peer-reviewed and includes experimental work in addition to reviews and theoretical papers. Full text articles can be accessed with no subscription.

Electronic School  
http://www.electronic-school.com/

This online journal caters to Kindergarten to high school teachers, providing commentaries, advice, and news related to the use of information and communication technology by teachers within or outside the classroom.
Handheld computers are partway on the evolutionary scale from electronic address books to notebook computers. Currently, the most popular are known as PDAs (Personal Digital Assistants) and are sold under brand names such as “Palm,” “Visor,” “iPAQ,” “Blackberry,” and others. While some are intended to operate independently, the newer models often have networking capabilities either through modems that must be connected to telephone lines or through wireless network systems. Most of the devices measure about 3 inches by 5 inches, by 3/4 inch thick, although some are even smaller. A recent list indicated there are 23 manufacturers of PDAs, including several established computer manufacturers, many start-up firms, and several phone manufacturers. Devices that combine PDA and cell-phone features are now hitting the market.

Most handhelds were designed primarily for the business world. Their software provides an address book, calendar and appointment manager, calculator, and memo pad. Those applications are not likely to attract many teachers. What has excited some teachers is that educational software has been developed for these devices. There is instructional software for students. There is scientific software designed to be used with various probes attached to the PDA that allow for the collection and analysis of data. There also is instructional management software that allows teachers to keep records on student progress, and with special software and a wireless network, to observe each student’s PDA screen as they work on assignments.

Handheld computers are partway on the evolutionary scale from electronic address books to notebook computers. Currently, the most popular are known as PDAs (Personal Digital Assistants) and are sold under brand names such as “Palm,” “Visor,” “iPAQ,” “Blackberry,” and others. While some are intended to operate independently, the newer models often have networking capabilities either through modems that must be connected to telephone lines or through wireless network systems. Most of the devices measure about 3 inches by 5 inches, by 3/4 inch thick, although some are even smaller. A recent list indicated there are 23 manufacturers of PDAs, including several established computer manufacturers, many start-up firms, and several phone manufacturers. Devices that combine PDA and cell-phone features are now hitting the market.

Most handhelds were designed primarily for the business world. Their software provides an address book, calendar and appointment manager, calculator, and memo pad. Those applications are not likely to attract many teachers. What has excited some teachers is that educational software has been developed for these devices. There is instructional software for students. There is scientific software designed to be used with various probes attached to the PDA that allow for the collection and analysis of data. There also is instructional management software that allows teachers to keep records on student progress, and with special software and a wireless network, to observe each student’s PDA screen as they work on assignments.

THE VISION

Lawrence Goldberg has suggested that for technology to transform education it “must become ubiquitous. It must be always available, mobile, and flexible. It must be intuitive, reliable, and user-friendly to the point of being no more difficult to operate than a chalkboard, textbook, or overhead projector. It must be seamless and nearly invisible. In a ubiquitous model, student must become adept at information retrieval, management, and synthesis, from a variety of sources.” 1 Many other advocates of handheld computers hold similar visions.

The Palm website has many reports of Palm use in schools and colleges. Financially strapped Green Middle School (Ohio) uses them in place of desktops and notebooks. It has six mobile Palm “labs” that it checks out for various uses in the classrooms and outdoor assignments. The students use the probes in scientific studies, the plotting calculator in math class, additional keyboards and word processing software to write essays, and wireless access to the Internet. In Centennial Junior High School (Colorado), Palms are used in a gifted and talented program to support inquiry-based learning. Students use them to help identify constellations in the sky, study problematic levels of Selenium in the local water supply, and participate in NASA sponsored scientific investigations. New York Law School has created a database of selected key legal documents that can be downloaded into the student’s Palms for easy reference.2
The Concord Consortium, a non-profit educational organization, has been exploring the potential of handhelds and small portable computers in education since 1995. This organization likes the low cost of the devices, their mobility, and the recent wireless connectivity among students, teachers, and the Internet. The following are some of the assignments that the Concord Consortium suggests be given to students using these devices: “Create a daily log and calculate percent of time per activity. . . . Organize the bibliography for a research paper by scanning the ISBN bar codes. . . . Compare and analyze topographical maps of your region. . . . Research web pages that pertain to the solar system or the Civil War or . . . Collect your pulse rate while bicycling up and down hills. . . . Use a document reader and editor to create a report.”

THE REALITY

Goldberg’s vision of ubiquitous computing in education is appealing, but PDAs won’t fulfill it, and he acknowledges that. The largest display screens on PDAs are about 2 by 3 inches--too small to read lengthy text efficiently and comfortably. PDAs display graphics within that small perimeter, sometimes even in color, but with less resolution than most desktops or notebook computers. Imagine reading your favorite newspaper or magazine from a two-inch wide roll of cash register paper.

Most PDAs are so small that input is done with a stylus, pressing small icons on the screen or tiny keys below the screen. One-finger typists may not mind this, but anyone who has mastered touch-typing and a modern mouse, will find it limiting and frustratingly slow for substantial data entry, writing, or graphic design. Handwritten note taking is possible on some, but again the notes must be written and displayed within a 2-by-3-inch rectangle. Most PDAs have ways of “synchronizing” (communicating) with desktop or notebook computers, which can facilitate input of data into the PDA, but this requires the expense of both a PDA and a larger computer.

Contrary to popular opinion, PDAs are not inexpensive. The prices in the United States currently range from about $150 for very limited devices to $550 (USD) for the most able ones, but add-on keyboards, add-in cards, and special software can boost the prices by several hundred dollars. A top-end PDA with a keyboard costs about as much as a low-end desktop computer, but the latter has far faster processing, a hundred times the data storage, and a display that is about 18 times as large. Low-end full-fledged notebook computers cost about fifty percent more. A wireless local area network suitable for a school costs thousands of dollars. Wireless connection to the Internet costs about $30-50 a month per user, although a local network can connect a substantial number of users to the Internet for less. In addition, PDAs occasionally malfunction, they get dropped and break, they are easy to misplace, and they are a juvenile thief’s dream come true. Unless backed up regularly to another device, all data in a dropped or stolen PDA is usually lost. In the hands of children and adolescents, carried about daily both at school and to home, it would be prudent to budget for repair or replacement of one-third of the devices each year.

Another downside of PDAs is that they can distract students from their studies. Students can play games or e-mail on them when appearing to be studying, although that can now be monitored with special software and wireless local networks which permit teachers to observe each student’s PDA display. Students have downloaded software into PDAs to play pranks at school, such as turning the school’s television on and off. The batteries of PDAs sometimes run out in the middle of classroom or laboratory use. Of course, some of these problems will be present whenever students have individual computing devices linked to the Internet.

A recent review of the literature on PDA use suggests that teachers participating in demonstration programs using the devices are enthusiastic about them. Some of the cited advantages are that teachers can access relevant information and record data anywhere and anytime as they move around the classroom and out on field visits, they can share proposed lesson plans with each other, and students can immediately analyze data collected in experiments. Some of the other cited advantages seem to be technology overkill, such as “on-the-fly note taking” and “as field journals,” which still can be done with a 79-cent notepad and pencil. Most of the research to date appears to be based on teachers’ impressions, and, to a lesser extent, students’ impressions. This review presents no evidence addressing the most common criticisms of PDAs—that the use of a stylus for input and the small displays impede the transfer of information between the user and the device. The review also cites no evidence that students are actually learning faster or better when using PDAs.

THE PROBABLE FUTURE

Four trends will probably create new small computers better suited to use in schools than PDAs. One trend is toward ever-smaller computer processing components that simultaneously require less power, and often become less expensive. The second is the rapid expansion of wireless networks—both local wireless, with a range of a few hundred feet, and re-
h local wireless, with a range of a few hundred feet, and re-
gional and national networks, such as those for cell phone
service. Wireless network prices will eventually fall, al-
though the foolish hopes that abounded in the late 1990s for
free services will not be realized. The third is that some
software development has provided powerful learning tools,
and further advances on that front can be expected. The
fourth trend is the steady progress in voice recognition tech-
nologies.

Two opposite paths could lead to devices that are better
suited to ubiquitous computing in education. One would
result in larger devices that are feasible with
today’s technologies, and the other to devices
that will operate hands-free, but will require
further advances in technology.

Most educational applications do not require
“hand-held” devices because they are done
seated at desks or standing beside laboratory
counters. “Notebook” devices that live up to
the name, not exceeding the dimensions and
weight of a mid-sized book, with a flip-up
screen, would allow displays large enough
for the easy reading of text and mid-sized
graphics, and permit a keyboard suitable for
touch-typing. Such devices could also be
used rested on one’s lap. Wireless network-
ing capabilities could easily be included.

Some have suggested that the next generation of e-books will
fill the bill, but for that to be the case, the devices must per-
mit a far wider range of user interactions than commonly
associated with books.

While “handheld” gives an impression of freedom, it requires
the use of one or two hands that cannot simultaneously be
used for other purposes. Far more freedom would come
from hip or wrist mounted computers that use voice recogni-
tion for commands and data input. Perhaps the display will
be built into an eyeglass lens, or in an 8” by 10” sheet of thin
plastic, or projected by a headband device that creates holo-
graphs. Such devices are no longer fantasies,
but they are still in the laboratories and not
likely to be commercialized for several years.
Eventually, however, "hands-free" computers
will probably replace "handheld" computers
in education.

Computers that mainly digitalize student ac-
tivities that have been conducted for centuries
with paper and pencil are not going to
transform education. To transform education they
must create notably more efficient and effec-
tive ways of facilitating student learning, and
do that at life-cycle costs that can be afforded
year after year by most schools.

1 Goldberg, L. (March 20, 2002). Our technology future. Education Week, 21(27), 32-34.
4 Based on prices in the June, 2002, issue of PC World.
5 Ray, B. B., McFadden, A., Patterson, S. & Wright, V. (Summer, 2001). Personal digital assistants in the middle school class-
"Position Capturing" Technology: 

Turning Static Whiteboards and Flip Charts into Dynamic Teaching Tools

Whiteboard technology seems to be constantly evolving. For many years, teachers, lecturers, speechmakers, etc. had only the use of the static blackboard, which then evolved to the whiteboard, and perhaps also the flipchart. In fact, to use the words whiteboard and technology in the same sentence would have been an unlikely scenario only a few years ago. Who would have thought it? But whiteboard technology HAS indeed evolved. In November 1999, TechKnowLogia staff wrote an article describing the then new electronic whiteboard technology, and then in May 2000, TechKnowLogia again wrote about the use of whiteboards in webcasting. Now, seeming to have come full circle is the emergence of the "position capturing" technology.

Whereas electronic whiteboards are boards "fitted" with electric nodes that capture what has been written, and then allow for that information to be printed, downloaded, shared, etc., position capturing technology allows for the same functionality but from a plain vanilla whiteboard or flipchart. How, you ask, is this possible?

The Technology

At the most basic level, this is achieved through the use of a capture bar, positioned somewhere on the board, which is connected to a PC or Mac via either a serial or a USB connection. Additionally, standard markers are slipped into electronic marker sleeves that transmit an ultrasonic signal or radio wave to the capture bar. There are generally four sleeves available (for four different color pens), and each sends a slightly different signal to the capture bar. This way the system knows which color is being used. Included, as well, is an "electronic" eraser, which must be used in order for the system to know that information is being deleted. Put simply, that is it!

The Product

Currently there are two products on the market that provide this capability - Virtual Ink Corporation's mimio product and Electronics for Imaging eBeam product. Both products are very similar in functionality and price point. mimio uses ultrasonic signals to capture movement, while eBeam uses radio waves.

Virtual Ink provides products for Windows and Mac, a portable product called mimio Xi, which is its most recent development, and mimio Flipchart. mimio for Windows attaches to a whiteboard and then to a PC via a serial or a USB connection. It saves information and reads it for printing or sharing, or whatever the imagination can come up with.

One can turn a whiteboard into an interactive touch screen with mimioMouse. Attach mimio to a whiteboard, then attach your PC to a projector and then project your desktop onto the whiteboard. Place the plastic mimioMouse insert into a stylus, activate the mimioMouse feature and use the stylus like a cordless mouse to control your desktop from the whiteboard to deliver presentations, edit and annotate slides, browse the Internet, etc.

Virtual Ink also has what is called boardCast software that will turn an existing mimio-equipped whiteboard into an Internet presentation center. The software allows one to stream "ink" and audio over the Internet live or archived for on-demand viewing.

"Stroke over time" technology allows previously recorded data to be rewound, replayed, and fast-forwarded, in sequence, similar to a VCR or tape-deck machine.

mimio for Mac functions in much the same way as Mimio for Windows. In addition, one can drag and drop notes, diagrams, and drawings into Office or Mac applications as well as export notes to HTML, PICT, JPEG or event to QuickTime and iMovie formats.
mimio Xi is the ultra-portable version of mimio for Windows. What differentiates it is its built-in memory, which means that it does not have to be connected to a PC while it is being used, while also being battery powered. It can record up to 10 hours of whiteboard notes, mimio Xi is 60% smaller than mimio, and weighs a little less than 2 lbs. with batteries included. It is also unique in that it is upgradeable through pop-out interchangeable link modules. A USB module comes standard. Additional connectivity modules, including wireless are in development right now.

mimio flipChart, as the name implies, is the product specific to flipcharts, and does not include the "erase" capability. mimio flipChart is portable - 8 inches long, weighing in at only 5.4 ounces. It slides easily onto any standard easel pad, sets up in just a few minutes, and requires no separate power source.

While all the mimio products are designed to attach to the left of either a whiteboard or flipchart, eBeam’s product is more compact in size and attaches to the corner. The same product can be used for both whiteboard and flipchart. The System 1 product compares to the mimio product while the System 3 product compares to the mimio Xi product in that it is portable. eBeam's Presenter product is similar to mimio's boardCast product and provides for streaming audio along with the interactive whiteboard achieved via its “System” products. Similarly, eBeam's product has a remote mouse to allow for remote control of one's desktop.

The Applications

This position capture technology has implications for practically anyone who uses a whiteboard or flipchart: teachers, consultants, presenters, trainers, lawyers, meeting planners and facilitators, and the list goes on.

Its applications can also be innumerable and can include the following:

- Teach and create curriculum materials from notes and post them online easily.
- Facilitate a meeting and share notes in real-time over the Internet with remote participants.
- Develop and replay client solutions in legal and financial activities.
- Draft charts and diagrams, then save and drop them into other applications for presentation later.
- Brainstorm about new product concepts without having to take notes.
- Capture, save and email notes to absent colleagues (or students), keeping them on the same page.

In summary, who best to explain the use of this technology than those already using it. Here is what some teachers had to say:

"This has been a great tool for our students to be able to record the steps to arrive at the answers to problems and drawings for later use. It also allows us to set it up on more computers for as many students to interact with the instructor."

"I can't tell you how much we are enjoying [this product]. The children especially liked using it . . . four children's families have requested the software so that they can receive their children's work, 'in action,' at home. Thanks for your confidence in letting an elementary teacher and her students try this technology."

"The… technology allows me to do highly interactive presentations for large groups while using 'small group' techniques such as a flip chart. It allows me to project my notes and brainstorming activities to virtually any size group...[and] the students are allowed to be more involved and not worry about 'getting the notes'. Its size and portability make it an invaluable part of my presentation tools."

Sources:
http://www.mimio.com/index.shtml
http://www.e-beam.com
http://www.pcmag.com/article2/0,4149,54078,00.asp

1 http://www.mimio.com/meet/flipchart/
2 http://www.mimio.com/testimonial/index.html
INSIGHTS INTO TRAINING TEACHERS WITH TECHNOLOGIES:
NOT A PROJECT DESCRIPTION FROM AED/LEARNLINK

Mary Fontaine
Academy for Educational Development

A recent article by Richard Heeks looks at the explosion of writing on information and communication technologies (ICTs) and development with a critical eye. Entitled “Theory, research and writings on ICTs and development,” the article begins by noting that a “major strand of writing has been the individual project or country case study,” which has been “largely descriptive, rooted in the practical realities of ICT implementation, and hard to generalize.” Heeks goes on to caution that “such work runs a growing risk of producing a sense of déjà vu—of re-treading the same old ground without making much progress in either a practical or theoretical way.” In his conclusion, Heeks calls for “writing more focused on analysis and less on description, to create new and generalizable knowledge.”

To those who have sat through hours of descriptive narrative and somewhat predictable PowerPoint presentations at seminars and conferences—and who receive daily emails explaining the implementation details of individual projects—Heeks’ critique resonates. Initially, sharing such details enabled the development community to understand the variety of ways in which ICTs could be applied to support our work. Several years later, however, many of us are hoping that more authors and presenters will take the next step: synthesizing the information collected from projects to produce lessons and insights with universal application that can inform future work.

The following presentation of some of the insights derived from AED/LearnLink’s teacher training activities endeavors to do just that.

A quick overview

Over the last six years, AED/LearnLink worked with USAID Missions in Namibia, Morocco, Uganda, Egypt, Brazil, and Guatemala to design and implement ICT activities that support and enhance professional development (PD) opportunities for teachers. The scope, scale, and focus of each activity varied depending on need, context, and budget. On one level, LearnLink worked with local partners to design pilot projects to solve specific problems or achieve specific objectives related to teacher training in particular settings, such as strengthening multilingual, multicultural education in Guatemala or improving instruction in one-room schools in Egypt. On a broader level, however, most of the activities sought to achieve greater goals linked to nation-wide educational reform efforts, such as applying ICTs to facilitate networking opportunities and access to resources or to promote a shift to learner-centered approaches to teaching. In all cases, the activities also generated information about the process and prospects for the widespread use of ICTs to improve the quality and effectiveness of professional development for educators and to meet the need for more widespread and ongoing PD opportunities. AED/LearnLink has collected, synthesized, and is disseminating these lessons and insights to inform future work in this area. The following presents some of the salient lessons learned from its field experiences.

Access

In general, ICT activities for teacher training have involved establishing computer laboratories in existing teacher training centers. Given the large initial investment required for procurement, installation, configuration, connectivity, and training—plus necessary construction, renovation, and security—these activities have been limited in scale, often focusing on outlying areas where infrastructure is sufficient but the PD opportunities and resources for pre- or in-service teachers inadequate. Not surprisingly, the lessons emerging from these experiences confirm that teachers need easy access if they are expected to become comfortable with using ICTs. Expecting teachers to travel long distances to use the computers either for training or classroom use is unreasonable. Even where the computer centers are conveniently located, restrictive security measures or limited operating hours will prevent daily usage by all but the most dedicated professionals. Indeed, while establishing computer centers in existing teacher training institutes makes good sense, this approach likely will not meet the needs of teachers in rural areas, many of whom most need the support that ICTs can bring. Universal teacher access will not be achieved through pilot projects unless sustainability and scaling up approaches are integrated into them.
Cost

Access is perhaps the greatest obstacle to the widespread diffusion of computer-assisted teacher training. If pilot projects are to be taken to scale, however, long-term financing plans must be developed not only to establish but sustain computer centers over time.

One approach to financial sustainability is charging educational officials for the training of Ministry and district level staff. In some cases, such officials have been the primary users of the centers, sometimes booking the venues for months straight for training staff. If regions are not charged for this use—if they are not required to include such costs in their budgets—then their use cuts into the time the centers can be used by teachers—or by other paying customers.

That the centers are being used extensively for training is positive, but it serves to underscore the point that their primary purpose is to serve the education community. As such, the education community must show greater willingness to support the centers. If donors choose to continue supporting such centers, perhaps they should consider doing so with explicit agreement from national counterparts to assume these costs at some pre-determined date.

A variety of other cost-sharing arrangements have been explored that show promise for contributing to the ongoing costs of computer centers for teachers. These include charging fees for ad hoc use of the centers by individuals and non-educational groups to connect to the Internet using the centers’ networks, charging these same groups for using the centers for training, and allowing educators living near the centers to connect to the networks from home using wireless technology. In some cases, the centers open their doors on evenings and weekends to the public, who pay to use the equipment for personal or professional purposes. While helpful, these revenue sources, if not fully exploited, tend not to approach a level that will allow them to support the centers on their own—and fully exploiting them often means launching into a “telecenter” type business that teacher training institutes generally are unprepared to operate without expert business planning. In some places, this effort is underway and shows promise. The experiences of telecenters, however, indicate that approximately two years are required for such enterprises to start covering their costs, which suggests that interim financing schemes—whether in the form of donor support or through other approaches—must be developed. In the meantime, these ad hoc revenues represent potentially lucrative sources of income that should continue to be developed.

Hopefully, connectivity costs will fall with time, and the concern about financial sustainability will be less problematic. Nevertheless, donors and projects must remember that these types of centers are being developed, at least in part, to address digital divide issues. If high fees from non-educators are needed to make these centers sustainable, then it is fairly certain that the people who can afford these fees do not come from the disadvantaged groups that are generally considered to be on the wrong side of the digital divide.

In short, attempts to launch widespread ICT-for-education programs must very seriously consider the costs and benefits of such tools, which are expensive to develop, deploy, and use. Taking such programs to scale will require substantial reallocations of the education budget, resulting in a sustained commitment to support the ICT effort—both philosophically and financially. To date, it appears that many governments are delaying such decisions, waiting for longer-term results from pilot projects to produce cost/benefit analyses confirming sufficient advantages from the ICT route to warrant such an investment.

Time

Introducing ICTs for such critical purposes is a process that takes time—time for new ideas and approaches to be fully developed and adopted, to determine how they may be effectively utilized, to design and convert content into electronic formats, to expand access to the technologies, to train the target groups in usage, to train mentors, facilitators and tutors, to pilot test the materials and programs, etc. While a two-year pilot project is a good start, it cannot be expected to be more than that. Critical to the pilot effort is careful monitoring and evaluation to assess short-term gains, focusing on such issues as costs/benefits, trends in usage, changes in classroom practice and teacher performance, and, ultimately, improvement in student learning. Monitoring similar efforts in other parts of the world also is useful to supplement the results of in-country experiences.

Human resources

The scarcity of human resources with ICT skills is a problem. While tying significant technical expertise to outlying computer labs may not be an efficient use of scarce technical skills, there is great concern about how the computer centers
will receive intermediate and advanced technical support. It may make sense to hire a traveling ICT expert based out of a regional office to provide this support to various centers. Establishing an online Help Desk or an ongoing support system, located at a central site, also can help. While it is not overly complicated to train educators to develop simple online and CD-ROM-based teacher training materials, being able to train people is insufficient to ensure the development of effective computer-assisted teacher training programs. To develop a program that more fully incorporates the use of ICTs requires a permanent team dedicated to the task. Further, the team must see this work as its primary responsibility, will need significant knowledge of its country’s professional development goals for education, must understand how technologies can be used to support these goals, and must be technologically competent.

Training out-of-work youth to operate computer centers appears to be a valuable approach. In Namibia, the National Institute for Educational Development (NIED) asked the AED/LearnLink project to attempt something different when hiring people to work in the computer centers. While other projects had hired staff away from their host Ministry to work in the centers, NIED let the project know early on that it would not appreciate such an approach. From NIED’s perspective, the Ministry had invested significant time and resources into training its teachers to teach. Taking teachers from classrooms, therefore, would be considered a loss of the Ministry’s investment. Further, NIED was concerned about the project hiring highly qualified professionals at salaries that could not be assumed by the Ministry after the project ended. In response, NIED and the project decided to hire otherwise out-of-work youth to run the centers. As these youth had only Grade 12 educations, the Ministry could more easily assume their salaries. Further, again from NIED’s perspective, the project would be training and developing new human resource capacity rather than “poaching” already developed capacity. Although this approach meant that the project started more slowly, it worked out well in the end. The young people working at the centers continue to gain both technical competence and professional confidence, the government was able to hire them at affordable salaries when the project ended, and they seem likely to continue in these positions rather than moving on to other jobs inside or outside the Ministry.

Does it work?
Perhaps the most critical questions regarding the use of ICTs for professional development for educators concern the effectiveness, reach, desirability, and durability of such programs. Clearly, the required inputs are considerable. Therefore, making the decision to invest scarce resources into a wholesale adoption of ICT-based teacher training programs will not be taken lightly.

Assuming issues related to access, cost, time, human resources, and appropriate use, as outlined above, are not unduly problematic, do such programs improve the professional skills and knowledge of educators? Do teachers actually use the technologies that are made available? Do ICT-based programs result in more effective classroom practice? Can ICT programs reach teachers whom traditional PD efforts have bypassed, such as those in remote and isolated places? Are such programs cost effective—do they result in a lower unit cost over time, with no loss in learning outcomes?

Appropriate use
Converting text-based materials to digital formats is not a terribly difficult or time-consuming task. However, the real concern is how to apply the technologies to support significant educational reform efforts. If educators do not believe that traditional texts are sufficiently effective for teacher training, for example, then merely digitizing those same materials will not be sufficient, either. If education is to be learner-centered, constructivist, and democratic, then teacher training programs also must be learner-centered, constructivist, and democratic. In addition, the programs must provide models and examples of the pedagogical approaches encouraged by the desired reforms. While the technology certainly can be used to provide demonstrations of such practices, simple demonstrations are not sufficient to encourage the reflective and critical perspectives needed to understand the theory and incorporate it into daily practice. In short, technology alone cannot ensure such reforms. Humans are needed to do that. Fortunately, because technology can enable access to instructors, facilitators, and Master Teachers at a distance, these humans are not required to be physically present. The technology can encourage ongoing communication between teachers and mentors and facilitate discussion between groups of teachers in training, interactions that can move the reform process forward.

Out-of-work youth from local NGO are trained to operate computer centers for Namibian educators.
Short-term returns from AED/LearnLink’s experience are exciting. We find that where enabling conditions have been created, educators are quickly gaining confidence and competence with ICTs, producing extraordinarily creative learning materials—in print, on CD-ROMs, and online—employing learner-centered approaches in curriculum content both for subject matter and pedagogical training, participating enthusiastically in online networks and virtual communities, enrolling in voluntary training courses in record numbers, applying software programs to track student progress, and sharing newly acquired skills with colleagues and students. Indeed, LearnLink’s experience suggests that educators introduced to ICTs are using them with increasing flair to stimulate pedagogical change and improve pedagogical practices, enhance subject matter expertise, enable the production of teaching aids and learning materials, and engage in professional networking and virtual educational communities.

Both through anecdotal and more scientifically designed tracking and assessment methods, such as monitoring numbers of “hits” on web sites, numbers of visitors to computer centers, and the quantity and quality of teacher training and student learning materials produced, we can confirm that participants in AED/LearnLink projects are benefiting from the introduction of ICTs both in accordance with planned outcomes as well as in unexpected ways. Who would have thought, for example, that female student teachers in Morocco would be training senior, male professors in Word or PowerPoint on weekends, or that teachers in Brazil would establish an NGO to continue the LearnLink project there after it ended, or that unemployed youth in Namibia could staff computer centers so expertly? While scientific study is needed to measure and assess specific, longer-term outcomes of its pilots, short-term results clearly confirm that ICTs warrant further exploration, experimentation, and implementation.

In countries where technology-based PD for teachers is more widespread and mature, such as the United States, both usage and impact increasingly are being evaluated. This teasing out of the computer-assisted PD input from all others is tricky, but results suggest that even the ultimate question—can teacher training with technology improve student learning—may be answered one day, most likely in the affirmative.

Experience suggests that ICTs present considerable promise for solving some of the enduring problems plaguing PD for educators around the world. Clearly, traditional approaches are not working. While conventional wisdom suggests they should not be discarded altogether—indeed, combining computer mediation with occasional face-to-face training has proven highly effective in a variety of settings—new approaches are urgently needed. ICTs are neither quick nor inexpensive fixes. However, compelling evidence indicates their potential not only to reach many more teachers on a more ongoing basis but also to improve the quality of both pre- and in-service training, enable incorporation of a host of new topics and issues into the educational curriculum, and encourage more fundamental pedagogical reforms. The concern is no longer whether ICTs can work but how the access, time, training, and cost issues complicating their adoption can be solved.

______________________________

1 LearnLink is a six-year Global Communications and Learning Systems program implemented by the Academy for Education Development (AED). An Indefinite Quantities Contract (No. HNE-1-00-96-00018-00), the program is funded by the USAID Bureau for Economic Growth, Agriculture & Trade, the USAID Women in Development Office, and other USAID Bureaus, Offices, and Missions.

2 Theory, research and writings on ICTs and development, by Richard Heeks (richard.heeks@man.ac.uk), published in “iConnect Online” (http://www.iconnect-online.org/base/ic_show_news?id=1903), August 17, 2002.

3 In January, 2003, AED/LearnLink will release a book containing the results of its six years of work, including practical models-of-use and guidelines for applying ICTs to support development in all sectors. Accompanied by case studies illustrating and illuminating useful lessons and insights, several sections will focus on using ICTs to improve education and strengthen learning systems. Known internally (and humorously) as “The Wit and Wisdom of LearnLink,” the book is designed to widely disseminate “generalizable” knowledge and inform future ICT-for-development efforts.

4 Many of the lessons presented here were written by AED/LearnLink’s core staff in Namibia, including Jeffrey Coup in Washington, DC, and Jeffrey Goveia in Namibia. They have been edited for TechKnowLogia by Mary Fontaine of the AED/LearnLink staff in Washington.

5 For a more complete review of ICT-based PD for educators, see “Computer-mediated Professional Development: A Model of Use for Developing Countries,” in AED/LearnLink’s upcoming book, described in Endnote #3.

6http://www.unesco.org/education/features_en/271101_dista
nec.shtml

Not whether but how

Many countries need to train large numbers of new teachers and upgrade the skills of the existing 60 million, many of whom are unqualified. In some sub-Saharan nations, student enrolments are outpacing the number of teachers available and, worldwide, teachers are facing demands to educate for democracy, HIV/AIDS prevention and for inclusive learn-