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ABSTRACT

This document contains the fall 1999, fall 2000, and winter 2000 issues of "Technology and Teacher Preparation." The fall 1999 issue describes NCREL and its Higher Education Initiative; contains a faculty profile focusing on engaging science educators with technology; and describes tenth-grade students' efforts to measure the Coon River creekbed, Minnesota. The fall 2000 issue offers articles on the following topics: the University of Illinois Chicago's program to place preservice teachers in city classrooms following training on the integration and use of technology in the classroom; tools and resources for systemic redesign (the enGauge Web-based framework and tool set, which is designed to help schools, districts, colleges, and universities use technology effectively for teaching and learning); providing professional development via the Pathways to School Improvement Internet server to promote the effective use of technology in education; integrating information and communication technologies into teacher education programs in the Netherlands and the United States; and a variety of World Wide Web sites containing resources and information about technology and teacher preparation. The winter 2000 articles are: (1) "Get with the Program: Online Teaching Is Here To Stay" (Raymond Rose); and (2) "Reforming Teacher Preparation for Effective Use of Learning Technologies" (Kyle L. Peck). (SM)

Technology and Teacher Preparation, 1999-2000

Sabrina Laine, Editor

Fall 1999
Fall 2000
Winter 2000

NCREL
North Central Regional Educational Laboratory
"Applying Research and Technology to Learning"
Fall 1999

TECHNOLOGY AND TEACHER PREPARATION

IN THIS ISSUE

What Is NCREL?

North Central Regional Educational Laboratory (NCREL) is one of ten federally funded regional educational laboratories serving the needs of students and educators across the United States. NCREL specializes in technology integration and serves the upper-midwestern region of the country.

For over 10 years, NCREL has developed and delivered products and services for K-12 educators. For example, our *Pathways to School Improvement* Web site (www.ncrel.org/pathways.htm) receives over 1,200 visitors daily and our Learning With Technology course helps practicing teachers integrate technology into the curriculum in meaningful ways. We invite you to visit our Web site (www.ncrel.org) for more information on these and many other resources.

NCREL's Higher Education Initiative

Over the years, many preservice teacher educators have expressed interest in our efforts to help classroom teachers develop strategies for integrating technology into the curriculum. Spurred by this interest, NCREL has created a project called **Preparing Teachers for Tomorrow (PTT)**. The project's goal is to support education faculty as they explore new ways of preparing teachers for the 21st century.

Preparing Teachers for Tomorrow includes a Web site that highlights issues and best practices in the preparation of new teachers as well as this quarterly newsletter on technology applications in teacher preparation. Each issue of the newsletter will include the following features:

- **Faculty Profile**—a story about a preservice faculty member who has developed lessons that address technology integration
- **Technology in the Classroom: Sample Lessons**—interviews, sample lessons, and resources from K-12 classroom teachers who have enhanced a lesson or unit with technology
- **Web Sites**—reviews and abstracts of Web sites to help teacher educators locate resources, models, curricular ideas and materials, and sites for their students

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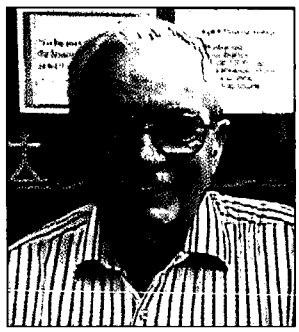
Visit the PTT Web site!
www.ncrel.org/ncrel/he/ptt/

Faculty Profile

Engaging Science Educators with Technology

Course: Methods of Teaching Middle/Senior High School Science

Featured Faculty: Professor Hans Andersen, Indiana University, ANDERSEN@indiana.edu



Can helping students learn to teach with technology bring new life to an experienced teacher educator? Hans Andersen would answer a resounding "yes" and go on to explain how his course has been "professionalized" by the addition of technology. "My goal is to see if I can prepare my student teachers to use technology well enough to teach and help their classroom teachers (during their professional semester) with technology."

Modeling. Hans teaches his students "just the way I want them to teach in schools: everything gets modeled." Classes include demonstrations of Probeware, laserdisks, CD-ROMs, and spreadsheets. "We also e-mail all assignments or turn them in on a disk. I return all comments electronically and allow for lots of revisions, since the computer makes that so easy.

"To show them classifying, I dump the contents of my desk drawer on a table and ask groups to organize what they see, to consider the things that are alike and different, and to invent a classifying system. Then, we can use the classroom computers to create spreadsheets and databases of what we have invented."

Hans wants students to experience cooperative learning as an extension of his belief in modeling. He believes, as Piaget has expressed, that everything should be introduced only when it can be shown and practiced, not just presented and discussed.

World Wide Web. "The World Wide Web is loaded with both good and bad science materials. I show the bad as well as the good. Students take turns doing a Web site report each day. People have so much interest in this activity that they take extra turns and bring in Web sites we 'just have to' look at!"

Engaged Learning. Using technology regularly helps students see how science can be taught using the engaged learning model he introduces in class. "It used to be called 'inquiry teaching,' but I like the engaged learning principles better. Inquiry is often understood by my students as 'something scientists do,' rather than something they can model and teach. But the engaged learning model is meaningful. They can plan for student engagement and it is not intimidating to them." Students include levels of engagement, low to high, in the lesson plans they develop in class.

"I help them learn the engaged learning characteristics by using the 'Engaged Learning' essay from the Learning With Technology (LWT) course materials from NCREL. I also make extensive use of their videotapes and the CD-ROM materials. These provide the model of expected behavior that really visually explains what I am hoping for in my student teachers."

Constructive Friend. Hans also uses the LWT concept of the "constructive friend," in which colleagues review each other's lesson plans and support the integration of technology into teaching. "The materials help students learn that collaboration with other teachers—and serving as a constructive friend for a peer—is an important part of teaching."

Standards. The units students develop in Hans' class for their student teaching must be based upon the Indiana Proficiencies, the National Science Teachers Association's benchmarks, or the Science Research Council Education Standards. Hans finds that requiring students to be familiar with the standards is easier now that they are available on the Web.

Technology Projects. Hans also requires students to present their unit ideas in class using PowerPoint presentations. "In the future, I would like to get students involved in creating Web pages to support their teaching ideas. I may have them create Web pages that are sites for their students and the parents, to help them understand what is taught in science. Producing a product will become more important to my class assignments, as we include Web page design and production. But project-based education will still be the focus. Keeping science students engaged in their learning is vital."

Hans credits the Educational Technology Services unit at Indiana University with reenergizing him as a professor by encouraging and helping him integrate technology. "ETS reports that 'even the dinosaurs' are using technology effectively to model good teaching. I feel that this has revived my teaching career."

Technology in the Classroom

Minnesota Students Measure the Coon River Creekbed[1]

Welcome to Coon Rapids High School in Coon Rapids, Minnesota, where Skip Rumsch's tenth-grade biology class is investigating how the local creekbed affects the health and prosperity of the community. Skip believes that students should connect what they learn in the classroom to real-world problems. He also wants them to understand that local concerns may also be regional or even universal concerns. "I hope that the students ... get increased awareness of water quality issues, which are really serious in our country," explains Skip. He also wants them to have a better understanding of general ecology issues.

Luckily, Skip discovered the Rivers Project, designed and monitored by Southern Illinois University at Edwardsville. The River Project began in 1990 as a pilot program with eight schools along the Mississippi and lower Illinois Rivers. The project has now grown and includes schools in the United States and Canada.

Skip and his students work with students and teachers from other schools to analyze water quality from various test sites. Their river study includes the historical, social, and/or economic implications of river conditions.

Skip's students work in their own backyard—the Coon River watershed. They are investigating how river discharge, rate of flow, velocity of the current, and the contouring and meandering of the stream affect its habitat and the organisms that live in it. The students are dealing with issues such as the pH of the water, nitrogen, phosphorus, fecal coliform, invertebrate and plant life, dissolved oxygen, temperature, and total solvents.

What did this unit look like?

Skip's students started with a shoebox model of the topography of a riverbed. They inserted a wooden dowel into holes in the top of the model, measured it, and entered the data into an electronic spreadsheet. They then entered the data into a public domain NIH* (National Institute of Health) program that created an electronic visual image of the riverbed. Once they understood what a riverbed might look like, they went to the field to do the imaging of the Coon River creekbed. The unit took approximately three weeks to complete with two days in the field measuring the creekbed and a smaller drainage ditch, and approximately three days' work with the technology. Students worked in groups of two to six, depending on the scope of the work, and shared respon-sibilities of gathering, reporting, and entering data. All students were responsible for data analysis.

How did technology support this unit in ways that traditional methods could not?

Traditional data-gathering methods, such as those used in testing oxygen or hydrogen, take a lot of class time. According to Skip, NIH imaging allows his students to measure the parameters of the creek more quickly and efficiently and to sample larger portions. And Skip would rather have his students spend their time on data analysis and on predicting the effects of Coon River's water quality on their community than on data collection.

What kinds of analysis did students do?

Since NIH imaging doesn't show output or discharge, students had to use mathematical formulas to calculate output based on velocity and average area of profile. From this data they had to predict the output and how it affects the creek.

How were students assessed?

Skip rated his students on the bases of collaboration, planning, and data accuracy. Each team submitted a written report and delivered an oral presentation. He also had his students submit reflective accounts of the experience.

Summary

This unit can be used by preservice teacher educators as a model of the types of lessons and technology integration being designed and developed by K-12 educators. College of Education faculty using NCREL materials can provide such model lessons as their students begin developing their own student teaching materials.

** NIH Image (http://rsb.info.nih.gov/nih-image) requires a color capable Macintosh and at least 4MB of available RAM. A free PC version of Image, called Scion Image for Windows, is available from Scion Corporation: http://www.scioncorp.com/*

Available for Macintosh, Windows 95, and Windows NT

[1]Part of NCREL's *Captured Wisdom* series

To find out more about this project, check out:

The Rivers Project
http://www.siue.edu/OSME/river/index.html#RiversProject

Coon Rapids High School Great Rivers Project
http://www.cards.anoka.k12.mn.us/projects/grp/mrp.html

Measuring the Creekbed *is part of the NCREL/NCRTEC* Captured Wisdom *videotape and CD-ROM series. For more information, contact NCREL's order department at 800-356-2735.*

Check Out These Web Sites

The following Web sites contain valuable information about technology and teacher education:

North Central Regional Technology in Education Consortium
www.ncrtec.org

This site provides a comprehensive look at technology integration in K-12 schools. It includes tips for teachers and resources for professional development and technology planning. For information about the Learning With Technology course, go to the Training and Professional Development section of this site.

NCATE News: Report Says Schools of Education Should Increase Emphasis on Technology
http://www.ncate.org/specfoc/techrpt.html

This report from The National Council for Accreditation of Teacher Education (NCATE) discusses technology's importance in defining accreditation standards for teacher candidates and the use of technology in schools of education.

Case Illustrations of Technology Use in Teacher Education
http://www.ncate.org/projects/tech/Caseintr.html

This site provides brief case illustrations that demonstrate innovative technology use in teacher education programs. These are based on NCATE's report, *Technology and the New Professional Teacher: Preparing for the 21st Century Classroom.*

Marcopolo
http://www.wcom.com/marcopolo/

Teaming with top educational organizations, Marcopolo has created standards-based Internet content for K-12 classrooms, and has provided online professional development resources to assist teachers in learning to integrate Internet-based resources.

Tell Us What You Think

We welcome your comments and suggestions for future issues of the newsletter. In particular, we are interested in information on technology integration, faculty profiles, K-12 classroom examples, technology and curriculum standards, and key issues in preservice teacher education.

Send your comments or suggestions to Debora Pitlik (dpitlik@ncrel.org) or Rhonda Robinson (rrobinson@niu.edu).

TECHNOLOGY AND TEACHER PREPARATION

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TECHNOLOGY AND TEACHER PREPARATION

Fall 2000

IN THIS ISSUE

UIC Launches New Teacher Preparation Program

by Phil Vincent

While researchers continue to mull over the most effective way to prepare preservice teachers to use technology, faculty at the University of Illinois Chicago (UIC) have come to a rather intuitive conclusion—there is no replacement for real-life experience.

Last spring, a core group of UIC College of Education teacher candidates were placed in public schools throughout the Chicago area. As one would expect, they jumped into their practicum year, eager to get their first real taste of teaching in a big city public school. These, however, were not your typical teacher candidates. This group had received training on the integration and use of technology in the classroom through an innovative UIC/Chicago Public Schools pilot program. They were placed in schools identified as having above-average technology infrastructures and encouraged to weave technology appropriately throughout their lesson plans.

"We really have made the decision at UIC that the university is extremely committed to preparing teachers to use technology, and one of the most effective ways to do this is to have the candidates experience technology within their practicum year," said Dr. Louanne Smolin, assistant professor at UIC and one of a team of new hires the university recently recruited to infuse technology training throughout the College of Education.

The university relies upon its partnership with the Chicago Board of Education to identify schools that "use technology as a tool, not as an end unto itself," said Smolin. "CPS [Chicago Public Schools] tries to point us to classrooms with teachers that are either considered experts at integrating technology into their curriculum or have a genuine desire to do more with technology."

UIC places about 80 student teachers throughout Chicago area schools each year. How and when the student teachers use technology is typically left to the discretion of the lead teacher. According to Smolin, the university often encourages both candidates and teachers to find ways to use the Internet in the classroom. "We're really trying to help teachers and students use various electronic telecommunication tools to communicate with and connect to other classes and experts. We want to give both classroom and student teachers the opportunity to do things like work on projects with teachers in other countries.

"Other public schools have really gotten into very specialized technologies based upon different content areas," she added. "One school I was in yesterday had a music lab that had a MIDI synthesizer connected to a number of keyboards. The students all had the ability to learn how to compose and develop their musical abilities."

continued on page 2

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continued from page 1

Yet, as technologies become more advanced and the uses more application specific, both universities and public schools face the problem of finding qualified, affordable support staff who can install, troubleshoot, and repair a variety of technologies. "For the most part," stressed Smolin, "once the student teachers plan something out and learn about the different ways that technology can be integrated into a curriculum, whether it be in a cooperative learning format or groupware type format—where a whole group of students might be interacting with one piece of software and doing some group activities around it...I think that they understand those structures. But, if there are problems in the school setting with loading different types of software or with computers that are freezing up, that's always a battle. The level of technical support the school has within the building is crucial. If that's not very fluid it makes it really hard for these students to do what they need to do. A support structure really helps."

A recent study released by the *Center for Research on Information Technology Organizations* reinforces Smolin's concerns, noting that two-thirds of American schools remain without a full-time technology coordinator. The study stresses the connection between the successful integration of technology into a school's curriculum and the availability of personnel who can provide everything from routine maintenance to individualized trainings.

While universities may have an easier time finding and funding technical support than public schools, both have inherently similar hurdles to leap. "For UIC it was a matter of bringing everything together and making the infrastructure a little more user-friendly. We've done faculty workshops over the course of this last year and the college has committed itself to upgrading computers on a cyclical basis. We've also just renovated our computer laboratory so that it's more conducive to being not just a drop-in facility where students can complete assignments, but can also be used as a teaching and learning facility where faculty can come in and model different uses of technology within their own content domains," boasted a proud Smolin.

With the infrastructure in place and ongoing improvements in the works, starting in 2001 UIC College of Education students will be required to take a 1.5 credit technology course that supplements the information they receive in their individual methods courses. In other words, students preparing to become math teachers will be required to take a course on integrating technology into public school math curricula. These courses, combined with the experience they gain as student teachers in their practicum year, do more than simply expose the candidates to the possibilities various technologies present. What they learn is that using technology is not, as Smolin reminds us, "an end unto itself." The students are taught how and where to include technology and its relationship to a district's existing standards and assessment system. Most important, the students are taught that integrating technology is by no means simple.

"There's each of the content standards and also the Chicago standards that the students have to pay attention to as they're planning," notes Smolin. "We've also been using the NCATE [National Council for Accreditation of Teacher Education] approved ISTE [International Society for Technology in Education] technology standards as we're developing our coursework. That's been a wonderful guide for us. What we try to teach the candidates is that you have an easier time with technology integration when you stop thinking in terms of content-specific types of software. It's better to look at applications that students can appropriate in a number of different ways. When you start with the standard, as opposed to the technology, it gets easier to integrate, and I think it takes a lot of the pressure off of how the students are feeling."

Not surprisingly, the courses offered through UIC's pilot program have gained in popularity as teacher candidates find themselves being asked about their experiences with technology in the classroom during job interviews for permanent positions in public schools. "They kind of really didn't believe it, but when they started going out on interviews and talking to principals and the principals were asking them about their technology experience, they realized how important it was to develop their ability to effectively integrate technology into the curriculum," laughed Smolin.

UIC intends to extend the program's planning team and will possibly seek additional funding through a PT3 grant. "Our goal is to move away from the stand-alone course model and really infuse technologies throughout the student experience," said Smolin. "We obviously have to do some of that through coursework, but we're really trying to look at it experientially and make it more dynamic throughout the life of our students while they're in our program."

Tools and Resources for Systemic Redesign

EnGauge: A Framework for Effective Technology Use in Schools

EnGauge is a new Web-based framework and tool set designed to help schools, districts, colleges, and universities use technology effectively for teaching and learning.

Developed by NCREL with the Metiri Group, enGauge provides a comprehensive view of critical factors in educational systems that strongly influence the effectiveness of educational technology.

The enGauge Web site will help educational stakeholders:

- See how the effective use of technology can advance student learning.
- Learn about the educational system conditions required to use technology effectively.
- Complete online assessments to gauge school or district progress with learning technology.
- Compare school or district technology profiles to national data.
- Develop an informed plan of action for learning technology based on this knowledge.
- Track and report progress to policymakers.

Each aspect of the enGauge model is designed to show how educational technology can promote high-performance learning, including the development of:

- Basic literacy competencies
- Higher-order thinking skills
- Real-world problem-solving abilities
- Intrinsic motivation
- Communication skills
- Collaboration skills

The enGauge Web site will be formally introduced in December 2000. For a sneak preview of this exceptional tool, visit http://engauge.ncrel.org. Contact info@ncrel.org to let us know what you think and how you can envision the expansion and effective use of enGauge.

Providing Professional Development for Effective Technology Use

Critical Issue:

The *Pathways to School Improvement* Internet server (http://www.ncrel.org/pathways.htm) helps education communities use research and stories from the shared experience of other educators to support sound decisions affecting the classroom, school, and learning community. By focusing on meaningful learning for all students, *Pathways* encourages improvement in leadership and professional development, math and science instruction, assessment, technology integration, parent involvement, school-to-work transition, early childhood education, drug-free schools, the education of "at risk" youth, and more.

A recent addition to *Pathways* is the *Critical Issue* document "Providing Professional Development for Effective Technology Use." This document discusses the need for professional development to help teachers effectively integrate digital and other interactive technologies into curriculum and learning environments. Professional development for meaningful technology integration should empower teachers to enhance student achievement, reinforce established curriculum goals and objectives, and provide both teachers and students with the ability to use powerful new tools to support teaching and learning. This new *Critical Issue*, which provides the latest research on technology professional development, is intended to help educators establish and implement professional development strategies that will have a positive impact on how technology is used and how students learn.

Sneak Preview

ISSUE: Lack of professional development for technology use is one of the most serious obstacles to fully integrating technology into the curriculum (Fatemi, 1999; Office of Technology Assessment, 1995; Panel on Educational Technology, 1997). But traditional sit-and-get training sessions or one-time-only workshops have not been effective in making teachers comfortable with using technology or adept at integrating it into their lesson plans.

Instead, a well-planned, ongoing professional development program that is tied to the school's curriculum goals, designed with built-in evaluation, and sustained by adequate financial and staff support is essential if teachers are to use technology appropriately to promote learning for all students in the classroom.

OVERVIEW: The role of the classroom teacher is the crucial factor in the full development and use of technology in the schools (Office of Technology Assessment, 1995; Trotter, 1999). Yet, many teachers do not have the technical knowledge or skills to recognize the potential for technology in teaching and learning. Just knowing how to use a computer is not enough. Instead, teachers must become knowledgeable about technology and self-confident enough to integrate it effectively in the classroom.

To reach the goal of preparing teachers for effective technology use, a well-designed professional development program is essential. Professional development in a technological age requires new definitions and new resources. It cannot take the traditional forms of individual workshops or one-time training sessions. Instead, it must be viewed as an ongoing part of teachers' professional lives. Two requirements help ensure the success of professional development for effective technology use.

First, professional development for technology use should be an integral part of the school technology plan or an overall school-improvement plan, not just an add-on. Initial inclusion in the technology plan ensures that professional development is considered an essential factor in using technology to improve teaching and learning.

Second, professional development for technology use should contain essential components that research has found to be important. These components include the following: a connection to student learning, hands-on technology use, a variety of learning experiences, curriculum-specific applications, new roles for teachers, collegial learning, active participation of teachers, ongoing process, sufficient time, technical assistance and support, administrative support, adequate resources, continuous funding, and built-in evaluation.

www.ncrel.org/sdrs/areas/issues/methods/technlgy/te1000.htm

Coming in 2001...

Integrating Technology Into Literacy Instruction

Critical Issue:

The advent of computer technologies will inevitably change the way we understand what it means to be a literate person in the 21st century. Just as the Gutenberg press augmented the currency of communication and information from an immediately shared oral-based mode of exchange to include a time-transcendent text-based mode "of exchange, so will the advent of digital technologies augment the exchange of communication to include even richer representations of communication, allowing greater flexibility in "hearing" and "reading" the messages.

While these changes in the possibilities of communication afford us with new ways to understand and make use of the world around us, they have been embraced with as much enthusiasm as they have been held with suspicion. Stepping outside of this value-laden drama, educators instead need unbiased recourse to current research, succinct information, and innovative yet sound practices regarding the potential efficacy these technologies might have via-a-vis literacy education. This upcoming *Critical Issue* document, which provides the latest research on technology and literacy, is intended to help educators establish and implement reading comprehension strategies that incorporate the use of technology and have a positive impact on how students learn to read.

Promising Practices: Integrating Information and Communication Technologies Into Teacher Education Programs

By Richard B. Bryant, Jr.
Program Associate, NCRTEC

Our challenge and our charge are to see to it that all teachers have the capacity to effectively and appropriately use technology in the classroom. Many schools and colleges of education are making strides in integrating information and communication technologies throughout their teacher preservice programs. Three examples of these promising innovations in teacher preservice programs are provided below. Two are from programs within the U.S. and one is from the Netherlands.

A Leap for the Future in Teacher Education in the Netherlands

The Dutch government established the Committee on Multimedia in Teacher Training (COMMITT) to consider the process of learning in the future and how teacher training must change to embrace the central role of information and communication technologies (ICT). COMMITT concluded that technology's potential will only be realized when the roles of teachers and students are changed. Accordingly, higher education in the Netherlands was challenged to create sustainable models for teacher training that would support movement "out of the box," a paradigm shift for teacher preservice education.

This program of planned transformation was labeled "A Leap for the Future." It focuses on serving the current needs of education while developing the human capital to serve the needs for the future. The new model focuses on independence, flexibility, individualization, and customization by fully integrating information and communication technologies into the curriculum. This integration allows for "anytime/anyplace" learning by the student teachers, providing them with the ability to escape the typical "school-as-a-building" philosophy.

Through COMMITT, the Dutch government held a competition for universities and schools of education to design and, ultimately, implement new models for educating future teachers. The two winning institutions were the Ichthus University of Professional Education and the University of Twente. Ichthus dubbed its innovative and experimental program, Explo. The following characteristics centering on uses of Information Technologies (IT) are some of the features that clearly set the Explo program apart from the norm in teacher education and distinguish it as a promising program. IT serves as:

1. A link between learning-as-you-work in practice and learning-as-you-work during coursework (the Internet).
2. An aid in providing adaptive education in elementary schools in a multicultural and international context (multimedia software, the Internet).
3. A means for students to develop vision and skill in the use of IT in education: "being digital" (a laptop as a mobile toolbox for daily use).
4. An impetus for lecturers and students to be innovative colleagues in designing learning environments (digital).
5. A hub for exchanging knowledge (Web site, electronic discussion platform) and for maintaining the organization's external contacts (e-mail).

The goal of the Ichthus faculty through Explo is to train teachers who:

- Learn as they work and are innovative.
- Function in a multicultural and international environment.
- Use information technologies with vision and skill.

Project KITES (Kids Interacting with Technology and Education Students)

Using Technology to Provide Authentic Learning Experiences for Teachers

Another promising program in preservice teacher education exists through a collaborative initiative of the College of Education and the University Lab School at Louisiana State University. Project KITES (Kids Interacting with Technology and Education Students) provides preservice teachers with an opportunity to integrate technology throughout their student-teaching experience.

Project KITES integrates the learning and practicing of technology skills into real-world teaching contexts. Though the preservice teachers enrolled in this project were taking their first professional education course and had not yet taken the required technology course, they emerged with a deep awareness of and comfort level with integrating technology into real learning experiences.

Each preservice teacher is paired with a fourth grader at the University Lab School to work on technology-based projects in the language arts area. KITES activities, such as Fourth Grade Friends, engage students in a variety of technology-based learning applications. Students create individual newsletters to introduce themselves, a friend from another

class, and their college "colearner"—the assigned preservice teacher—to fourth graders in Cameroon. After interviews are conducted and digital photographs downloaded, the finished newsletters are sent via the Internet to Cameroon.

Likewise, student teachers partner with fourth graders to conduct research and collect data on a topic of interest: favorite television shows, soft drink preferences, favorite foods, and so on. The students then create charts and graphs depicting their data and summarize their findings in a "lab" report.

The project has been a significant departure from earlier education classes for preservice teachers at LSU. In the past, preservice teachers were required to take one introductory educational technology course. Attempts to integrate technology into and across disciplines and to develop technology-based teaching methodologies were seldom made.

Data collected at both the beginning and end of Project KITES strongly suggest that changes in perception and attitude of preservice teachers is strongly linked to the real experiences and insights gained through the project participation. As one preservice teacher commented, "This project has made me realize that I am not teaching a classroom with 32 people in it. I am teaching 32 individual students, and it is important not to look at them as a whole, but as individuals."

The challenge now for the LSU teacher education program is to build on this solid foundation and to continue to integrate technology-based experiences throughout their programs. By so doing, these preservice teachers will leave their program with the skills and confidence needed to become full partners in the technology-rich school learning environments in the years to come.

CREST (Collaborative Redesign of Education Systems in Texas)

An Intensive Yearlong Field-Based Teacher Preparation Program

Now in its fourth year of operation, CREST was designed and implemented out of the Center for Professional Development and Technology at the University of Texas at Arlington. The program was designed collaboratively by teachers, principals, education professors, and business and community leaders to begin to address the need for systemic change in teacher education. The stakeholders wanted to create a plan that would produce teacher education graduates who would be "job ready" and fully prepared to be successful classroom teachers capable of using all available tools for improving instruction.

Participating schools are labeled "CREST Schools," and students selected to participate are chosen through a thorough screening and interview process. Classroom teachers, building administrators, and supervising professors collaboratively determine which students will be placed at each CREST School. A cohort group of ten students is selected for each school and placed there for two consecutive semesters. Students follow the public school calendar and not that of the university.

Preservice students are called "interns" during their first semester of service and "residents" during their second. They spend five days a week from 8:00 a.m. to 4:00 p.m. in university seminars at their assigned CREST school and working with their assigned mentor teachers in K-6 classrooms. The assigned mentor teachers volunteer their services and are committed to integrating technology through research-supported best teaching practices.

Through a grant from the Texas Education Agency, up to three student workstations and one teacher workstation were provided to each volunteer mentor teacher and located in the classroom. Mentor teachers and preservice interns and residents use these workstations as teaching and learning tools to begin to fully integrate technology into their K-16 classrooms. This is no mistake. These classrooms are deemed K-16 because education professors, working collaboratively with classroom teachers, use this interface to integrate the use of technology into their university methods classes, which are taught on-site at CREST schools.

As a part of their CREST school university seminars, interns and residents can be taken to visit classrooms, other than their preservice teaching placement, by their university professor. CREST students experience the integration and effective use of technology by seasoned professionals within a variety of classroom settings. Through these experiences, they are able to witness proactive problem-solving strategies in action, such as William Glasser's classroom meetings. CREST students can observe brainstorming from a problem-solving forum that is recorded electronically within the classroom and projected for all to see.

Interns and residents experience the tremendous advantages of fluidly integrating technology into instructional practice. They use CD-ROMs and other simulation programs with cooperative learning groups. They become proficient at electronically recording student data. They create mail-merge letters using their word processing database skills to communicate with parents. CREST interns and residents begin to see first-hand how this field-based curriculum and instruction shifts the emphasis to each of them as active producers of knowledge rather than passive recipients. These university students begin to think in an integrated fashion and to apply adaptive, reflective reasoning skills throughout the scope of their work as emerging professionals.

Check Out These Web Sites

The following Web sites contain valuable resources and information about technology and teacher preparation.

Training Cafe
www.trainingcafe.com

Codeveloped by Macromedia and Winstar, Training Cafe is a free service to educators who want to learn more about technology. The site offers interactive training on using Internet technology, accompanied by resources and activities for integrating the Web into the classroom.

Filamentality
www.kn.pacbell.com/wired/fil/

Sponsored by Pacific Bell, Filamentality is a fill-in-the-blank, interactive Web site that guides users through picking a topic, searching the Web, gathering good Internet sites, and turning Web resources into learning activities. The site also helps teachers, trainers, media specialists and others create and post a Web-based learning page.

PencilNews For Kids - Lesson Plans
www.msnbc.com/local/pencilnews/305654.asp

Part of MSNBC's Learning Online Web site, PencilNews For Kids links current events to curriculum content. As a weekly feature, teachers can access free lesson plans complete with printable worksheets and background information.

Pulling Together: R&D Resources for Rural Schools
www.ncrel.org/rural

A product of the National Network of Regional Educational Laboratories, this site houses a collection of research and development resources for educators who work in rural settings. The first edition of Pulling Together's *Quarterly Issue* offers a concise list of resources on a host of technology-specific issues, many of which focus on providing alternatives to the problems faced by rural leaders and educators across the country.

Technology Connections for School Improvement Teacher's Guide
www.ncrel.org/tplan/tplanB.htm

Designed to assist teachers who are just beginning to integrate technology into their daily classroom practices, this guide is a companion piece to the well-known Planners' Handbook. NCREL and the U.S. Department of Education collaborated to distribute both publications to state-level technology coordinators and other key administrators and evaluators nationwide.

The Copernicus Education Gateway
www.EdGate.com

The Copernicus Education Gateway is a starting point and connecting place for teachers, students, and their families, bringing together best-of-the-Web resources in a one-stop destination for the K-12 educational community.

Computer Technology And Instructional Reform
www.crito.uci.edu/tlc/html/tlc_home.html

This site distributes research information from the national survey, Teaching, Learning, and Computing—1998, a study of teachers' use of computer technology, their pedagogies, and their school context. The Teaching, Learning, and Computing study is a research project of the Center for Research on Information Technology and Organizations (CRITO) at the University of California, Irvine.

Technology Professional Development
www.ncrel.org/tech/tpd

You won't want to miss this site if it's your responsibility to develop and implement professional development geared to help integrate the use of instructional technologies. Here you'll find tools, sample activities, and information resources to support your plans and designs.

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Over the years, many preservice teacher educators have expressed interest in our efforts to help classroom teachers develop strategies for integrating technology into the curriculum. Spurred by this interest, NCREL has created a project called *Preparing Teachers for Tomorrow* (PTT). The project's goal is to support education faculty as they explore new ways of preparing teachers for the 21st century.

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Winter 2000

IN THIS ISSUE

Get With the Program: Online Teaching Is Here to Stay

By Raymond Rose

More than 10,000 students in this country are taking courses in virtual schools at the precollege level right now. What is your preservice program doing to prepare graduates to teach in an online environment?

Online instruction is more than a fad; it is rapidly becoming a necessity. The U.S. is facing a serious teacher shortage. The best national estimate is that the number of K-12 teachers will need to increase by 8 to 10 percent each year through 2009 to offset the projected surge of retirements (Hussar, 1999). Moreover, this crisis is fuel by new teacher attrition rates of 7 to 9 percent (National Center for Education Statistics, 1997), with the largest losses coming after only two years. Ultimately, we will have too few teachers to fill open positions, and those we will have will be less experienced.

Online teachers can help address this coming crisis. Many schools already are struggling to find well-qualified teachers to cover traditional high-level classroom courses. Online courses can enable schools to share qualified teachers, especially for courses that attract only a small number of students. Online instruction also enables small and rural schools to offer the range of courses their students need to compete with students from larger schools.

Why shouldn't colleges of education just concentrate on developing good classroom teachers if there's a shortage? The number of online education programs is growing rapidly. At least five states have—or soon will start—virtual schools. They have already identified a basic problem: They don't have teachers prepared to teach in the online world!

It's clear from experience and from teacher feedback that being trained in face-to-face instruction does not guarantee success as an online instructor. Not every face-to-face instructor has the skills or knowledge to create and teach a quality online course. Although good learning is good learning, good activities for a face-to-face classes may not translate easily to the online environment. Because teachers teach the way they've been taught, the Virtual High School, which has trained more than 200 teachers to be online course developers and instructors over the past four years, requires teachers to participate in a teacher professional development course that is delivered entirely online.

In the Virtual High School, instruction takes a scheduled asynchronous[1] approach with a project-based focus. Students are scattered across 30 states and six continents. A synchronous approach would be a scheduling nightmare: When could a synchronous event be scheduled

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that would be convenient for so many time zones? The school day would start in Singapore and end in Alaska.

The distribution of the students changes the pace of the online class. Discussion, which happens in text-based, threaded discussion, can't happen as quickly as it would in a synchronous environment. On the other hand, it's difficult for a few students to control the discussion, and the bell doesn't stop discussion. Research shows asynchronous environments result in more reflective learning than takes place in synchronous environments. It's also clear that asynchronous learning can result in strong online communities: Teachers and students report stronger relationships in online courses than in face-to-face classes.

The virtual education programs being developed for K-12 aren't, for the most part, expected to save money by assigning a single teacher to large numbers of students they never see. Rather, one common model delivers courses that students otherwise might not have access to. Another model being explored would provide remediation to students who don't initially pass their state's high-stakes tests. Few of the current models follow the Florida model in which students can earn a high school diploma entirely though online courses (**www.fhs.net**). Expect to see this change in the near future, however.

Many colleges and universities already offer degree programs taught entirely online. For other teacher preparation programs ready to make the move to online education, the big question is usually: What's the right technology? The fact is, it really doesn't make that much difference which one you choose to get started—what's important is that you get started. The technology is evolving and so are the models of learning, but waiting only will remove you from the field. The online education field is constrained by models of the bricks-and-mortar school, but that will change. New models of education that make greater use of the existing technologies are beginning to emerge.

Don't waste time worrying about what to call it, either. The terms "online education," "distance education," "distributed education," and "eLearning" all lack clear, commonly accepted definitions. Distance education includes everything from correspondence courses and telecourses to Internet-based interactive multimedia, synchronous events. Some definitions of online education include synchronous video-based instruction. What it's called is less important than what it is. It's easy to deliver a traditional face-to-face lecture over some sort of technology-enhanced delivery system, but that doesn't necessarily provide good learning.

For teacher preparation programs, it's not a matter of finding the right tool; it's a matter of understanding the realities of online education. The issue shouldn't be to find the right product. Your students will go to institutions that use products you've never heard of. The reality is that all of today's products will change significantly in the next few yeas. As bandwidth becomes ubiquitous and Internet appliances proliferate, the technology will evolve. The models and metaphors for learning will also change.

Online education isn't just about pedagogy. One widely held belief is that online education programs are a second-best replacement for face-to-face instruction. However, as more people experience effective eLearning, this negative perception will be replaced by the understanding that online education can be just as effective, or even more so, than face-to-face learning.

Teacher preparation programs need to offer courses in online environments to provide experience both for their own faculty and for the students they are preparing to be teachers in tomorrow's schools. Education schools must (1) provide a greater understanding of the policy issues that prevent online education from reaching its full potential and (2) research new models of education not constrained by the old metaphors.

In the coming years, teachers with online education experience will have more opportunities than their colleagues who know only the face-to-face world. Education schools owe their students access to these opportunities. Furthermore, there's a need for online teachers *today*. How much greater will the need be in five years? Education schools need to start making changes today in order to prepare teachers for tomorrow.

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[1]Asynchronous courses are those where the students can "log on" to the course any time and cover materials at their own pace. Scheduled asynchronous courses are those where the progress through a course is scheduled, but individuals still determine, within the schedule or activities, when they log on to the class.

About the Authors

Raymond Rose is a frequent speaker on online education. He directed the NSF-funded online professional development project, INTEC, and is on the Virtual High School project management team. He directs CC Services, the consulting and service arm of the organization.

Kyle L. Peck is a leading authority on the use of technology for education, writing and lecturing extensively on the topic. He is an associate professor of education at Penn State University.

Reforming Teacher Preparation for Effective Use of Learning Technologies

By Kyle L. Peck, Professor of Education, Pennsylvania State University

We have made significant investments in educational technologies, yet most teachers do not use these technologies effectively. Teacher preparation programs can and must address this issue.

In order to use learning technologies more effectively, we must change the beliefs and actions of teachers by strategically redesigning teacher preparation programs. But change happens when the motivation to change is greater than the pull of resistance.

The "ARCS" model proposed by John Keller (1987) suggests that designers of learning experiences can enhance motivation by addressing attention, relevance, confidence, and satisfaction. Attention strategies develop and sustain curiosity and interest. Relevance strategies help learners understand how their needs, interests, and motives are addressed by the learning. Confidence strategies help convince students that they have the ability to accomplish the learning task. Satisfaction strategies help students feel good about their achievements. All four contribute to motivation.

The "12-step program" outlined below follows Keller's ARCS model and can help you motivate students to use learning technologies in important ways.

1. **Ask students to question the value of and roles for technology.** By encouraging students to question the value of technologies, we can create a sense of "disequilibrium" that students then need to resolve. After students examine the contributions of technology, form an opinion, and state their position on the issue, their advocacy will strengthen their commitment to technology use.

2. **Help students think about the ways technologies can help students and teachers.** Once students question the value of technology, they must come to understand the many ways technologies *can* contribute. In considering how technology can help students and teachers, four themes emerge:

In order to use learning technologies more effectively, we must change the beliefs and actions of teachers by strategically redesigning teacher preparation programs. But change happens when the motivation to change is greater than the pull of resistance.

   - Technology can support students during the learning process.
   - Technology can help teachers help students meet academic standards.
   - Technology can help students develop higher-order skills and critical attributes.
   - Technology can enhance teacher productivity and professional development.

3. **Show students that technology use should be based on an individual teacher's goals for students.** Much of what teachers currently do with technology is not very powerful in terms of student learning (Healy, 1998). Help teachers-in-training understand that learning technologies are simply tools that can be used well or badly, for important or trivial purposes. The goal is not simply to use technology in the teaching process but to accomplish something that could not be done as well without the technology.

4. **Show students how other teachers use technologies well.** Help students answer the question, What will technologies do for me? We undermine motivation when we send only generic messages because teachers often perceive that technologies have no power in their teaching role. Teacher preparation programs must demonstrate teachers' successes with technology so students can determine which methods are most relevant to their current or anticipated teaching assignments.

   The Assessing Educational Capability With Technology (AECT) project, funded in part by a U.S. Department of Education "PT3" grant, is identifying the most powerful uses of technology in 37 different teaching roles and developing other mechanisms to help teachers use technologies in these ways. Consider tapping into this project at **http://ide.ed.psu.edu/pt3/**.

5. **Have students develop a personal strategy for technology use.** Based on what they learned in the previous step, ask students to list the ways they can use technologies in their own teaching. Be sure they take into account the quantities of technologies they expect to have available. Each student's strategy should be based on his or her personal beliefs about the ways in which technologies will be able to help with teaching and learning.

6. **Help students identify the prerequisite knowledge, skills, and perspectives they need.** Once students are committed to using technologies in relevant ways, help them identify and develop the knowledge and skills they will need to do so effectively. Help each student develop his or her own "individualized education plan" (IEP) that details the skills, knowledge, and perspectives the student will need to develop.

7. **Create a flexible system through which students can develop skills using technology.** After each student has an IEP, allow students to work through a flexible learning and assessment system that takes diverse backgrounds into account and lets students learn what they need to learn. Make use of the many opportunities to use technologies to support students during the learning process and provide learning resources to students where and when they are needed. By putting learning activities on the Internet and by using learning activities that already are available online, you model the use of technologies.

8. **Educate *and* train students in the use of technologies.** The students entering our teacher preparation programs are in the group that Don Tapscott (1998) calls "screenagers"—people who have grown up with computers, video games, and DVDs. Screenagers want to be active, not passive, and most of them know more than the older generations when it comes to technology.

   However, while screenagers know what buttons to push, they may not know how to apply technologies in a meaningful way to support learning. When it comes to the all-important act of teaching, teacher educators possess an important experience and knowledge base that preservice teachers lack. Many teacher preparation programs waste precious time training students on technology skills that they may already have. This approach leaves little time to educate students on how to make wise use of technology. By combining what you know with what they know, you will prepare powerful teachers.

9. **Model the effective use of technologies.** Teachers teach as they were taught (Goodlad, 1990). Our students learn from our actions and, in most cases, they learn that their professors do not believe that technologies are valuable enough to warrant the time required to use them well. If we understand what technologies can do for students and teachers and reorganize our own teaching to take advantage of this power, our students will emulate what we do. Promotion and tenure processes, especially in colleges of education, should be changed to reward teacher educators who invest heavily in promoting student learning through modeling powerful teaching.

   Keep in mind that, before entering college, a preservice teacher has experienced more than 15,000 hours of traditional teaching, very little of which used technologies well. If we want students to use learning technologies well, we must model applications of technology that are powerful enough to overcome their previous experiences.

10. **Change assessment practices from competitive-based to competency-based.** If we care about preparing teachers to use technologies well, we need to give all students the opportunity to develop and demonstrate capability. It's time to acknowledge that students learn and develop at different rates. We need to develop an assessment system that measures and tracks student progress and that does not penalize students who take longer than others to develop important skills. Instead of holding time constant and allowing performance to vary, hold performance constant and allow students to take the time they need to meet our expectations. If we take this approach, students will believe, correctly, that they can succeed.

11. **Track student progress against individualized education plans.** Satisfaction comes from a job well done. Use the individualized education plans to track individual student's progress. If we have high expectations, assess well, and recognize the real achievements of our students, students will experience satisfaction. This satisfaction will increase their confidence in tasks to come.

12. **Issue a certificate or other formal statement upon graduation.** Issue a certificate or an open letter to potential employers stating that your graduates have developed the skills and perspec-

tives required to use technologies effectively today, as well as the ability to learn more as technologies change and new opportunities arise. Such certification will increase student satisfaction and confidence. It also will be a powerful recruiting device.

Technologies have a great deal to offer to education. It's important to ensure that teachers understand how technologies can serve both their students and themselves. Teaching this lesson takes a lot of work, but nothing could be more important in effectively preparing teachers for the future.

Noteworthy: The InTime Model

If technology is indeed a facilitator of quality education, how will it be used? How can developments in information technology facilitate a new paradigm for education appropriate for the 21st century while enhancing student achievement in core areas deemed important to our democratic society? The InTime model, being developed at the University of Northern Iowa in Cedar Falls, may hold some of the answers. It includes five major dimensions:

1. Students at the center of their own learning
2. Principles of good learning
3. Aspects of information processing
4. Standards from content disciplines
5. Tenets of effective citizenship in a democratic society

With the students at the center of their own learning and with principles of good learning as a constant, a learning activity could use any of the components of the model as the departure point for instruction. For example, the development of a particular information-processing skill could be the focal point for instruction, with democratic principles and content standards being seen as a subset of that learning activity. The power of the learning model is, of course, when the various components of the model are brought into alignment so that the learning experience is achieving multiple objectives.

InTime provides a framework for thinking more holistically about the educational process. It incorporates the best of what we know about learning with activities designed to develop the dispositions and skills students need to process the massive flow of information available to them. It provides for rich and appropriate content as defined by the disciplines themselves, and it organizes learning experiences and student activities to promote effective citizenship in a democratic society. Technology is brought to bear on the components of the model as an essential mechanism to achieve the larger goals of our educational system.

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For more information about InTime, visit the project's Web site (www.intime.uni.edu) or contact Dr. William Callahan, project director, at bill.callahan@uni.edu or 319-273-2719.

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