The challenges of teaching in 21st century classrooms place more demands on professional educators. State and national accountability movements increase the need for teachers to demonstrate their students’ growth as well as their own professional development (Danielson, 2001; Lucas, 1999). The need for support networks for both students and teachers increases as fast as classroom size, while funding for personnel and resources steadily diminish. Teacher preparation programs are not producing enough graduates to satisfy the needs of K-12 classrooms, and a developing challenge for accredited teacher education programs is to demonstrate how their graduates are more adequately prepared to face the mounting expectations of contemporary classrooms than graduates from alternative licensure programs. To address the current challenges in teacher preparation, the Department of Education at Wake Forest University has designed programs built on department-wide values that integrate technology with learning theory and research on practice. Customized instruction in how these components interact in the design and implementation of meaningful teaching and learning activities is a hallmark of the programs.

The development of the National Educational Technology Standards for students and teachers present teacher education programs with a new and multifaceted integration challenge (International Society for Technology in Education [ISTE], 2000). Case studies of exemplary colleges of education reveal myriad “enabling factors” that affect the technology development of future teachers (Strudler & Wetzel, 1999). In order to meet national technology standards and accreditation expectations, institutions must provide
access to equipment, resources, and experienced personnel on campus and in the field. The experienced personnel include higher education faculty, cooperating teachers, training personnel, and support technicians on campus and in K-12 classrooms. These are expensive “factors” that require vision and leadership to implement. Funding is also instrumental in guaranteeing consistent and coherent services to all faculty and students. Strudler and Wetzel’s analysis of four colleges of education identified as exemplary by the U.S. Congress, Office of Technology Assessment (1995) generated a model for preservice teacher preparation and identified several factors that enable meaningful integration of technology into teacher preparation. Wake Forest University addresses all of the enabling factors identified in the model and sustains a technology-enriched environment that promotes full integration of the National Educational Technology Standards for Teachers (NETS*T). The Department of Education shapes the professional development of teacher candidates in ways that encourage appropriate and ethical integration of technology into teaching and learning. This institution-wide commitment to all candidates establishes the teacher preparation programs at Wake Forest University as exemplary and facilitates a unique and personal teacher preparation experience.

The faculty in the Department of Education is committed to helping teacher candidates understand the intricate relationship between all facets of teaching and learning. Long-term collaborative efforts have created programs that scaffold the development of teacher candidates capable of leading 21st-century classrooms, an ongoing process that requires continual collaboration, discussion, and reflection. These efforts have proven both valuable and effective. National recognition for technology integration in the education programs at Wake Forest University is the result of two key factors. An institutional commitment to technology that ensures long-term support, and a departmental commitment that ensures meaningful technology integration into all phases of teacher preparation.

**INSTITUTIONAL COMMITMENT TO TECHNOLOGY INTEGRATION**

Wake Forest University is consistently rated one of the nation’s “most wired” campuses and has a strong commitment to supporting the use of technology to promote teaching and learning. At the end of the academic year 1999-2000, Wake Forest University completed the first step of a
campus-wide technology program, in which each entering freshman receives a laptop computer. This initiative, begun in the fall of 1996, is a component of the Plan for the Class of 2000, a program that was adopted in the spring of 1995 by the faculty, Board of Trustees, and student legislature, “to provide more personal opportunities for faculty and students to collaborate in learning” (Brown, 1999). The critical features of this plan that impact teacher education programs are provision for a new tenure-track faculty position, laptops for undergraduates, ubiquitous connectivity across campus, more technology-enhanced classrooms, and a system for technology support.

The Department of Education gained a new Instructional Design faculty position responsible for technology integration in elementary and secondary programs. Undergraduate students and faculty receive new IBM ThinkPads (laptop computers) with a standard load of software that is renewed every 2 years. Access to the WWW via high-speed Ethernet connections is ubiquitous, and connections are placed strategically, and liberally, across campus. Most classrooms are wired or wireless and access is available in the library, in all offices, and in dorm rooms. Remote server space provides additional digital storage for students and faculty and is often used for web page publication and backing up files. Students are able to dial-up to servers, with some limits to their access privileges while off-campus.

Faculty members are encouraged to make use of Blackboard or another medium to communicate information to students about class meetings and assignments, give tests and quizzes, and provide instructional materials asynchronously. Technical support is available through the HelpDesk (http://www.wfu.edu/Computer-information/). Access to technology training and materials for a variety of software applications is provided by Information Systems and through the Information Technology Center. The Student Technology Advisors Program pairs a student with technology skills with a faculty member requesting technology help for a semester. Online support materials, grant programs promoting technology integration, and a university committee representing the technology needs of faculty all support the campuswide vision for ubiquitous technology integration and facilitate the integration of the NETS*T at Wake Forest University (ISTE, 2000).

The Department of Education provides multimedia classrooms and a technology lab with specialized educational software for both graduate and undergraduate students in education programs. All classrooms have Ethernet
connections for students and a presentation station that connects to VHS, cable, electronic overhead, DVD/LD, computer, and A/V input. Ample Ethernet connections in classrooms allow connections to the campus network and the WWW on demand. All undergraduates and faculty members are issued IBM ThinkPads every 2 years. Graduate students are also provided 2-year-old ThinkPads to use during the program and to take with them when they graduate. This effort ensures that all graduates from education programs have a personal computer with productivity software when they enter their first year of teaching. All teacher candidates have access 24 hours a day, 7 days a week, to a technology lab with specialized educational software and use technology to complete assignments, check grades and course information, communicate with faculty/colleagues, and design instructional activities.

DEPARTMENTAL COMMITMENT TO MEANINGFUL TECHNOLOGY INTEGRATION

Two important program changes have helped create a climate conducive to promoting technology in Wake Forest’s education programs. The creation of a tenure-track faculty position for an Assistant Professor of Instructional Design made it possible for one faculty member to teach all technology courses and unify the approach to technology integration across the program areas. Recent restructuring of both the elementary and secondary programs positioned the Technology in Education course in the same semester as content-area teaching methods courses. The addition of a faculty member with K-12 technology integration expertise and the opportunity for collaboration between technology and content area faculty enhances the learning experience for students. The effect of these changes on the education programs is to combine the strength of rich content instruction with technology experiences designed to complement teaching methods. The hope is to permanently affect the instructional design strategies of future teachers so that technology is considered as an integral tool to enrich student learning and to enhance quality teaching (Cunningham, 2001). These program-wide changes have allowed integration of the NETS*T to flourish in all professional preparation courses and field experiences. A feature that makes Wake Forest Education programs unique is the unified effort to prepare teachers to use technology appropriately and in a way that supports the learning needs of all students. This commitment is represented through our conceptual
framework (Figure 1), in which technology is not considered a major component, but rather a support for all facets of quality teaching valued by the faculty. The technology-enriched campus and a unified approach to technology instruction and assessment in all programs ensure that the essential conditions for integrating the NETS*T are satisfied.

Figure 1. Conceptual framework for the Department of Education

The unified effort extends to faculty collaboration with methods and technology course requirements. Collaborative curriculum and professional development projects allow teacher candidates the opportunity to explore pedagogy, professional development, and technology simultaneously within authentic and meaningful tasks. Access to content and technology expertise facilitates the development of instructional units tailored to meet the teaching goals of students in a variety of content areas. Teacher candidates design instructional materials to meet course requirements for use during field experiences and to present at state and national conferences. Multiple experiences with technology integration promote confidence and comfort with a variety of tools and increase the probability that technology will be used in the future. Examples of student research, curriculum development, and use of technology to communicate with the school community are available online (see http://www.wfu.edu/~cunninac/students2k.html).

A departmental commitment to using technology in field experiences promotes a student-centered approach to instruction that affects all participants in teacher preparation at Wake Forest University. Candidates are
placed with master teachers who support and model appropriate technology integration strategies. In addition to equipment available in the schools, hardware and software resources are available within the department for teacher candidates to use with their students or to create and record samples of their work. Communication with e-mail and a listserv make the sharing of knowledge and technology resources easier while fostering a collegial and supportive environment. Sharing resources also includes providing professional development opportunities for local education agency (LEA) partners. Wake Forest University sponsors the Summer Institute for developing technology-enhanced problem-based learning units as a partnership contribution in Project T2, a PT3 (Preparing Tomorrow’s Teachers to Use Technology) Implementation Grant with Elon University and Barton College. In an effort to provide technology development opportunities for educators who support our work with teacher candidates, local teachers are invited to attend this stimulating weeklong professional development experience with teacher candidates, faculty, and other LEA associated with Elon and Barton. Local teachers and university faculty are also invited to the Spring Conference at Elon University co-sponsored by the Alamance Area Education Consortium and Project T2. This conference is provided for teachers at no charge, with substitute fees paid by the Consortium. By stimulating technology awareness and appreciation in the master teachers supporting the development of teacher candidates in the field, the department fulfills a commitment to establishing environments for meaningful technology integration, now and in the future.

DESIGNING A MEANINGFUL AND RELEVANT INTEGRATION METHODOLOGY

The institutional, programmatic, and human resources available at Wake Forest University allow the Department of Education to design programs that advocate student-centered teaching methods. Small class sizes and high levels of communication between faculty about course connections foster collaboration between colleagues producing integration strategies that model expectations for teacher candidates while scaffolding authentic, valuable, and personal interactions with technology. The following examples of integration strategies provide a sampling of instructional and professional experiences encountered by teacher candidates through all phases of their preparation.
General Preparation Phase

The department does not formally assess the technology skills of candidates as they enter professional preparation courses, although a comprehensive technology skill self-report is administered at the beginning of the Technology in Education (EDU 307/607) course. Undergraduates typically enter the program with many basic competencies developed by virtue of possessing a laptop, and graduates bring skills developed from the workplace or during undergraduate programs. A typical student is a facile manipulator of web-based communication and research tools. Students also know how to word process, probably have some exposure to Microsoft PowerPoint, Access, and Excel and can manage digital audio and video files with ease. Once students begin the professional preparation phase, students build on their personal productivity to develop products and instructional materials that integrate technology appropriately.

Professional Preparation

Technology plays an important role in all courses in the professional preparation portion of the teacher education program, and faculty strive to scaffold experiences with technology in ways that foster the development of appropriate and meaningful integration habits. Undergraduate teacher candidates are admitted to education programs after successful completion of Foundations of Education (EDU 201) and Educational Psychology (EDU 311). These courses include requirements that model a variety of integration strategies appropriate for teaching and learning. Telecommunications tools are used for research, collaboration/document sharing, and communication. Inspiration© (2002) is used by students in Educational Psychology to create causal influence diagrams of relationships between educational concepts, theories, and classroom practice (Figure 2).

Students use Internet resources to research educational accountability and reform movements in a state of their choice then share this information with their peers through a PowerPoint-enhanced professional presentation (PowerPoint 1). For students who have never used these electronic tools, appropriate integration during prerequisite courses provides experiences that model future expectations in the education programs while effectively communicating the relevance of technology in the work of a professional
educator. Prior to program admission, students have multiple opportunities to experience technology for personal productivity, assessment, and professional presentations.

Figure 2. Causal influence diagram of a case study on motivation (Download the Inspiration file)

The Technology in Education (EDU 307 and 607) course takes an authentic task approach to technology instruction and is a required course in all education programs. The emphasis of this course is on appropriate integration, and instruction is customized to address the needs of candidates in all grade levels and content areas. Course projects are realistic teaching expectations that address all of the NETS*T. PowerPoint 2 is a student-created PowerPoint presentation designed for a PTA meeting/parent audience on the topic of ethical, equitable, and accessible technology use in an elementary school. These topics are emphasized throughout the course, but teacher candidates in the technology class also complete projects demonstrating how technology can be used to promote professionalism,
productivity, and a student-centered instructional methodology. See http://www.wfu.edu/~cunninac/students2k.html for details about the course goals and expectations.

A unique feature of Wake Forest’s education programs is the deliberate alignment of the methods and technology courses. These courses are taught concurrently, and professors collaborate on projects that require students to integrate technology appropriately into productivity, instructional practice, and professional development. The instructional design project is a collaborative arrangement between the methods and technology courses. Teacher candidates develop an instructional unit that demonstrates their ability to design standards-based instruction addressing the needs of a diverse learner group and integrating technology in meaningful and relevant ways. Although challenging, this long-term project requires candidates to develop their planning and instructional design skills with support from both curriculum and technology faculty. The faculty works together to instill a student-centered approach to teaching and scaffold recognition and understanding of appropriate and meaningful integration strategies through application of the principles of universal design for learning (Rose & Meyer, 2002). While faculty demonstrate the value of technology as a tool for productivity, teaching, and learning, the main goal is to influence teacher candidates to design instruction that helps all students use technology to analyze data, solve problems, and communicate with experts. Examples of teacher candidate projects that demonstrate their ability to use technology to support teaching, learning, and professional development are available online in their technology portfolios (see http://www.wfu.edu/~cunninac/students2k.html). For specific examples of technology-enhanced content area lessons visit the following sites and follow links to instructional design projects: http://www.wfu.edu/~cunninac/rickph1/ and http://www.wfu.edu/~cunninac/orsee01/. These working portfolios are developed by teacher candidates using Dreamweaver 4 and are a program requirement, as well as an expectation for initial licensure in North Carolina. An explanation of the role of the Technology Portfolio in Wake Forest’s teacher preparation programs is available online (see http://www.wfu.edu/~cunninac/edtech/integration.htm).
Student Teaching and Field Experiences

Teacher candidates are expected to integrate technology appropriately into productivity and instruction during field experiences. Formal observation documents require descriptions of technology use, and cooperating teachers are aware of the departmental expectations for student teacher performance. Teacher candidates use technology to collect and edit video samples of their work. An edited video that demonstrates the candidate’s growth in an area of teaching is a requirement of the secondary education programs.

Teacher candidates sometimes take advantage of international field experiences to design meaningful instruction that integrates technology appropriately. One excellent example of integrating artifacts from a trip to South America into meaningful elementary science instruction is found at http://www.wfu.edu/~cunninac/Rainforest%20Pagelesson%20plan%20index.htm. This website was created by a teacher candidate in the elementary education program after a summer visit to Peru. The candidate obtained grant funding to purchase a digital camera with the intention of designing a teaching resource for elementary science educators using images from the Peruvian rainforest. Her website of instructional activities for elementary science classrooms includes her photos, scanned images, and links to other appropriate web resources. This project was completed as a personal venture outside of the education program and is an outstanding example of professionalism, commitment to quality teaching, and service to education. It is also a tribute to departmental efforts to prepare future teachers to use their technology skills in ways that contribute to the greater educational community.

A benefit of a program-wide philosophy of technology integration is the continued development of integration strategies that embrace emerging technology resources. After several pilot studies, the Department of Education is currently implementing a digital video initiative that helps teacher candidates develop skills with digital video technologies that support instruction and promote reflection on practice. Teacher candidates learn how to use digital video tools in the Technology in Education (EDU 307/607) course by experiencing the process of creating an instructionally relevant digital video anchor. Teacher candidates develop a variety of skills associated with digital video capture, editing, and publication (Figures 3 and 4). These skills are then practiced during the student teaching semester when candidates collect video in the field and share clips with advisors and peers during the Student Teaching Seminar (EDU 354/654).
Figure 3. Picture of students using iMovie.

Figure 4. Picture of students exploring the features of a digital camcorder.
These clips are then edited with videotaped reflections and incorporated in the Student Teaching Portfolio and the Professional Development Portfolio for graduate students. Due to the personal nature of the reflections on performance in authentic classroom settings, teacher candidates are able to share their video anchor and professional portfolio with faculty, evaluators, and prospective employers on a DVD.

First-Year Teaching

Graduates of Education programs leave Wake Forest University and begin their first jobs with their own IBM ThinkPad, a basic load of software, and a printer. This equipment ensures that graduates have a means to continue communication with faculty and peers via the Internet. First year teachers are also eligible for $200 to use for classroom supplies, software, or to support professional development. It is common for graduates to e-mail, phone, or visit faculty, and many graduates remaining in the university area participate in departmental programs or initiatives. In the 2003-2004 academic year, the Department of Education will launch the first year of the Emerging Teacher Leaders Network, a new program designed to provide continued support for graduates, especially during their critical first year of teaching. In an effort to receive feedback from our students, a survey is sent to graduates from all programs after their first, third, and fifth years of teaching. Surveys include items about technology and are sent to the graduate and the graduate’s lead administrator. The information gained from the survey and the continued contact with graduates provides an informal support mechanism for novice teachers and valuable information to sustain the quality of our programs.

CONCLUSION

Teacher candidates in education programs at Wake Forest University are prepared to use technology to support a student-centered instructional methodology, to appropriately communicate with the educational community, and to model ethical behavior and professionalism. Meaningful and relevant technology experiences are designed throughout all phases of teacher preparation. Both the department and the university are committed
to long-term support of technology for faculty and students, and the collaborative approach to program development supports the continual cycle of action, reflection, and planning that is required to maintain the quality and integrity of teacher preparation at Wake Forest University. These efforts ensure that graduates from the Department of Education are prepared to meet the challenges of 21st-century classrooms and emerge as educational leaders.

References


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