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RICHARD ROSE

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RICHARD ROSE
West Texas A&M University

Teacher education graduates in their early years of service are ill-prepared to act as building-level change agents who can advocate for the enhanced use of technology in the classroom. In this study, a group of experienced teachers seeking the M.Ed. in Educational Technology suggest that the lack of confidence which new teachers show in relation to technology can be traced back to the absence of rigorous technical skill-building in both their Introduction to Educational Technology class and methods classes. These tech-savvy mid-career teachers then identify obstacles to enhancing pre-service teacher education programs with more effective preparation in teaching with technology and discuss ways to overcome these obstacles. They conclude that a rethinking of how technology teacher training programs are conceptualized and administered is needed.

Keywords: administration, technology, education, personnel, training

State education agencies have long talked with determination about making technology a primary instrument for educational reform. Virginia was typical of many states when it released an educational technology directive that reads more like a political manifesto than a set of suggestions for incremental enhancement (Virginia Department of Education, 1996). School districts followed the lead of their states with statements of faith in the new creed of school technology. The Rocky Point document is typical in its tone of deep conviction (Rocky Point ISD, 2008). Teachers also soon learned the right things to say about technology. The Nordheim and Connors study (1997) on the attitudes of high school agriculture teachers in the Northwest was typical: 85% of the teachers surveyed felt that computers would make them more efficient in the classroom; 82% said that computers were an essential teaching tool; and 69% said they were comfortable in using computers in their teaching.

While these types of statements were flowing from every level of the American education establishment, the Office of Technology Assessment issued a first report showing that the reality in the classroom was not matching the rhetoric. Teachers were not teaching with technology very often. When they were, they were only scratching the surface of what technology could do (Office of Technology Assessment, 1988). Even after an additional seven years of workshops and in-service training opportunities, a subsequent report showed technology was still not being meaningfully integrated into the classroom (Office of Technology Assessment, 1995).

As time went by, obvious barriers to technology integration were gradually removed, but without much effect. By the beginning of the 21st century, most schools had computer labs, most classrooms had computers, and steady progress was being made at increasing the ratio of computers to students within each building (Parsad & Jones, 2005). The need for technical support for those computers and their related peripheral equipment had been recognized and, to a large extent, addressed (Bailey & Pownell, 1998). Tutoring, coaching, networking, and mentoring were widely implemented strategies for raising the awareness of teachers concerning the possibilities of technology (Ike, 1997; Miller, 1998; Norton & Gonzales, 1998). Still Trotter (1999) reported that 30% of teachers said their students used computers for only one hour per week, and 40% said they did not use the computers in their classrooms at all.

Prensky (2009) discovered that the minority of teachers that were doing a great job of richly integrating technology into their classrooms had gone through four stages: dabbling with the computers out of curiosity; doing old things in old ways with a little help from technology; doing old things in new ways possible only with technology; and, finally, doing new things in new ways that pushed the available technology to its limits.

Still many teachers were "permanent beginners" when it came to technology and used it for only three things: exhibiting whatever media was on the CD that came with the textbook; showing the occasional supplementary Website to the entire class in lecture mode; and using the computer as a modern version of an overhead projector.

In spite of all the documents prepared for public consumption by state education agencies and local districts, the individual teacher still largely determines the extent to which she will use technology in the classroom (Bitner & Bitner, 2002; Romano, 2003; Zhao & Cziko, 2001). If teachers don't feel comfortable and effective with technology, the most full-featured computers will sit unused.

Current training strategies have not always convinced teachers that they can employ technology without seeming inept in the eyes of their administrators, peers, or students (Anderson & Maninger, 2007; Milbrath & Kinzie, 2000; Wang, Ertmer, & Newby, 2004). Pre-service teacher education programs typically have only a single course designed to enhance new teachers' sense of self-efficacy with technology. It is usually called something like Introduction to Educational Technology. This study examines why these courses are not succeeding and what can be done within and beyond such courses to create teachers who are better prepared to change school culture toward a deeper use of technology. Clearly new ways of conceptualizing and administering technology teacher training programs will be needed to empower our newcomers to channel their energy as agents of change.

INTRODUCTION TO EDUCATIONAL TECHNOLOGY COURSES

Ten syllabi were chosen for examination (see Table 1) because they were easily accessible on the Internet, they were reasonably transparent as to what was actually being taught, and they represented a cross-section of institutions from small regional colleges to a major university. There are strong commonalities among these courses.

Talking Technology Rather than Doing Technology

These courses often spend as much time on theoretical considerations as on technical teaching skills. The objectives statement from the Augsburg College course is typical:

> This course will help you will reflect on the role various forms of electronic and digital technology can play in the teaching/learning process and how you can engage these processes in your classroom. You will become skilled in some of the many digital tools used in today's schools. In addition, you will be exposed to basic theories of communication, selection, evaluation and research, and will be assisted in determining appropriate applications of these theories and techniques in educational settings. (p. 1)

The Augsburg syllabus describes a knowledge-based agenda for the course that includes communications theory, the societal impact of technology, selection and evaluation criteria, future trends in technology, appreciating diverse learning styles, and developing a foundation in research-based practice. San Diego

State adds discussion topics such as cyber-plagiarism, generational shifts in learning through technology, and the social implications of virtualizing education. The University of Arizona at Sierra Vista includes a topic they call "understanding the evolution of technology in education." Kansas University adds a discussion of Public Law 508 accessibility compliance.

Taken as a group, these syllabi tend to reserve between one-third to one-half of total student effort to background knowledge and theory. For example, the Central Washington syllabus has sixteen learner outcomes listed. Nine of these outcomes have strong verbs indicating concern for concrete technical skills such as "use," "develop," "build," and "create." The remaining seven outcomes use weak verbs, indicating only a knowledge-level requirement ("discuss," "be aware of," "be knowledgeable about"). The Purdue course is almost entirely issues-based, rather than hands-on, with the exceptions of some Internet work and word-processing.

No Depth with Technical Skills (an Exposure Strategy)

Although these syllabi devote as little as eight weeks to technical skills, the list of skill topics that many attempt to touch upon is breathtaking. These may include comparative operating systems (IBM and PC), using instructional software, file management, using Web sites, operating media equipment such as scanners, creating personal Web-

Table 1

Syllabi Reviewed

Institution	Location	Course Identification	Web Address
Augsburg College	Minneapolis, MN	EDC 220: Educational Technology	www.augsburg.edu/education/edc220/syllabus.html
Bowling Green State University	Bowling Green, OH	EDTL 230: Introduction to Educational Technology	http://edhd.bgsu.edu/~sbanist/230/syllabus.html
Central Washington University	Ellensburg, WA	EDCS/ BSED 316: Educational Technology	www.cwu.edu/~loverroi/316/syllabus.htm
Florida International University	Miami, FL	SECB 51: Introduction to Educational Technology	http://camppbworks.pbworks.com/f/EME_2040_1091_Wednesday_Syllabus.pdf
Indian River State College	Fort Pierce, FL	EME 2040: Introduction to Educational Technology	http://faculty.irsc.edu/FACULTY/sensmann/classes/eme 2040/sensmann_syllabus.pdf
MacMurray College	Jacksonville, IL	EDUC 237: Technology in Teaching	https://www.mac.edu/academics/pdf/syllabi/2010Spring /EDUC237-SP10.pdf
Purdue University	W. Lafayette, IN	EDCI 271: Classroom Applications of Educational Technology	http://www.edci.purdue.edu/ertmer/edci271/SYLLABUS/docs/271syllabus.pdf
San Diego State University	San Diego, CA	EDTEC 296: Learning, Technology, & Society	http://edweb.sdsu.edu/courses/edtec296/syllabus.html
University of Arizona at Sierra Vista	Sierra Vista, CA	EDP 411/ 511: Computer Applications in Education	www.ic.arizona.edu/ic/edp511/syllabus.html
University of Kansas	Lawrence, KS	ED 301: Educational Technology	www.edtech.ku.edu/courses/301/index.shtml

sites, search engines, HTML programming, digital graphics and imaging, optimizing email, concept-mapping software, electronic grade-books, social networking tools such as blogs and wikis, spreadsheets, and databases. On average, each syllabus attempts to introduce the student to about a dozen types of technology in the limited part of the semester devoted to technical skills.

The large numbers of technical skills touched upon in these courses are, in part, an attempt to cover every item in the National Educational Technology Standards (NETS) and/or the applicable state technology standards in the single course. Some, like Florida International, go so far as to type the entire verbatim text of the standards into the syllabi themselves.

The ten syllabi are not always clear as to how much hands-on practice is offered for each technology. Given the speed with which the instructor must move, it can be assumed there is often little more than some instructor-led or electronically-mediated demonstration of a few features and procedures. There is not time to reach any legitimate level of skill mastery through substantial student practice, much less engage in discovery learning. To their credit, this emphasis on exposure to meet state requirements rather than on skill-building to create competent technology evangelists is made explicit in the MacMurray syllabus: "The goal of this course is to provide teacher candidates with exposure to conceptual information and applied experiences necessary to successfully comply with the Core Technology Standards set by the Illinois State Board of Education" (p. 1).

Little Competency-Based Assessment

A clear picture emerged from this review. Universities must assure that teacher candidates reach certain minimal competencies as set down in state standards and/or the national standards from which the state standards are derived. The courses created to meet this need are forced to cover such a wide range of theory and practice competencies that students can spend very little time developing real hands-on skills. These courses are an acre wide and a half-inch deep.

Although a dozen or more technologies may be introduced, many of these courses require little demonstration of competence in any of the skills associated with them. This is in keeping with the limited goal of exposure or "just enough to get the student through the test." The Augsburg course requires only a modest attempt at a personal Web page to earn a passing grade. The bulk of the Augsburg evaluation strategy is carried by short-answer quizzes based on recalling memorized theoretical content from the readings. Florida International and Indian River State College seem to require students to produce a Web Quest and use of some elements of the Microsoft Office Suite. The grading rubrics for several of these courses make clear how little skill achievement is really expected.

In the meantime, the candidates are seeing only the most limited uses of technology modeled by professors in the teaching of their other university courses. This includes online courses that may be little more than correspondence courses ported to a learning management system. The candidates do not progress far enough to have any level of confidence in their ability to work with the technologies touched upon in the classroom. If they then enter school building cultures that are lukewarm to technology to begin with, they will find it prudent to see the role of technology the way many of their experienced colleagues see it: as just one more external requirement taxing their time and patience. Instead of becoming change agents in their schools, they "go with the flow" and use technology in only the most minimal ways. This picture raises the following questions:

1. How could *Introduction to Educational Technology* courses better help new teachers to richly integrate computers into the classroom and to serve as technology evangelists for their districts?
2. What should the role of other education courses, such as teaching methods courses, be in preparing pre-service teachers to use technology?
3. What obstacles need to be overcome in making *Introduction to Educational Technology* courses more effective in preparing teachers?
4. What obstacles need to be overcome in more effectively utilizing methods courses in preparing pre-service teachers to teach with technology?

WHAT TECH-SAVVY EXPERIENCED TEACHERS THINK ABOUT PREPARING NEW TEACHERS IN TECHNOLOGY

The research subjects are 26 M.Ed. candidates in Educational Technology at West Texas A&M University. As both mid-career teachers and emerging technology specialists, they are well-positioned to speak about improving the preparation of pre-service teachers to succeed in integrating technology in the classroom. The near unanimity of their views adds weight to the findings.

The group is 83% female, and 75% White: Non-Hispanic. Ages are distributed between 29 and 57, with an average of age of 41. All are teachers in the Panhandle counties of North Texas. They represent a wide variety of subjects and levels from Grade 1 through Secondary Business. Some have community college teaching experience. Years of teaching experience range from 2 through 31, with an average of 9.

Only 3 of the 26 subjects had personally taken an *Introduction to Educational Technology* course. Several entered the profession through alternative certification routes that did not require such a course. Others were certified before such courses became a common part of teacher preparation. The lack of an equivalent course in their preparation serves the purpose of this study well, since their thinking is not limited by a course they had already taken.

A questionnaire was used to elicit the subjects' views on the ideal pre-service *Introduction to Educational Technology* course and the potential role of methods courses for pre-service technology preparation in relation to each of the five major divisions of the National Educational Technology Standards for Teachers (NETS*T) of the International Society for Technology in Education (ISTE). These divisions are:

1. Student learning
2. Digital-age learning experiences and assessments
3. Digital-age work and learning
4. Digital citizenship
5. Professional growth leadership

The division of technology-related competences into these five aggregates was not meaningful to the subjects. Without exception, they made the same points throughout their responses with little or no regard to which of the five aggregates was the focus of a given question. The findings are addressed below.

A pre-service *Introduction to Educational Technology* class is necessary for new teacher success.

Respondents spoke of the importance of such a class in diminishing fear of technology. They also felt that there are certain basic computer technical skills that are essential for new teachers and that there would never be time to address them adequately anywhere else in a pre-service program. (Respondents apparently discounted as myth the concept that their new young colleagues were "Digital Natives" who would already be comfortable with all things related to computers.)

Introduction to Educational Technology courses need to focus primarily on hands-on mastery of the hardware and software itself.

The lack of impact from the current type of lecture/demonstration *Introduction to Educational Technology* class is epitomized by the 29-year-old teacher who reported, "My transcript says I took such a class, but, frankly, I don't remember anything about it."

Respondents presented a long list of specific skills that pre-service teachers should be practicing in this type of course. They included these hardware skills:

- Basic computer troubleshooting
- Protecting computers from accidental or intentional damage

- Using and troubleshooting peripheral hardware, such as digital cameras and video equipment
- Using assistive devices to help Special Education students who have been mainstreamed into the classroom

They also included these software skills:

- Social learning and Web 2.0 collaboration tools, such as wikis and blogs
- Making podcasts
- Publishing tools for creating classroom products, such as newsletters
- Tools for creating and maintaining Web sites
- Working with virtual learning environments, such as Moodle
- Microsoft Office software for classroom administrative tasks, such as grade books
- Presentation tools such as PowerPoint and Flash animation
- Teacher tools for creating student evaluation rubrics, such as Rubistar

The respondents felt very strongly that this class should not be a quick whirlwind of "exposure" to these technologies, but should provide sufficient technical depth to offer some reasonable level of mastery. This comment from one respondent is typical: "There is a difference between knowing how to create a PowerPoint slide and knowing how to create an effective PowerPoint presentation. Like organizing your show so you don't end up putting a 300-word paragraph on a single slide. This type of skill should be practiced in the basic class."

Respondents also saw a need for some knowledge on topics related to technology but were less clear on the need for presenting them in an Introduction to Educational Technology class. The following are some of these topics and some places where they thought such topics could reasonably be addressed:

- Legal aspects of technology, such as copyright issues (Foundations of Education class)
- Social problems related to technology, such as cyber-bullying (Educational Psychology class)
- Proper etiquette for using email and other Web-based communication tools (Freshman Composition class)

Methods classes must incorporate teaching with technology.

Methods classes were once based on a single academic subject. For example, candidates intending to teach middle school social studies would take *Methods of Teaching Social Studies In The Middle School*. All primary teaching candidates would take *Teaching Language Arts in the Primary Grades*. Not all institutions have these courses any more. Some universities have one or more generic Methods of Teaching courses, which may or may not address how to teach individual subjects. Subject-specific teaching methods might be addressed in the academic departments with courses such as *History 400: History for Education Majors*.

This study defines methods courses to be whatever courses a university uses, inside or outside the offerings of a department or college of education, to familiarize teaching candidates with the tools and strategies needed to teach specific subjects effectively.

Respondents felt very strongly that technology should be "everybody's problem" throughout a teacher preparation program. Methods classes should pick up where the *Introduction to Educational Technology* classes leave off by providing specific best practices in teaching each subject with technology. Technology should not be something students touch in a single class early in their program and then forget about until student teaching. This respondent's statement is typical:

> I think there should be an *Introduction to Educational Technology* class AND technology should be part of all Methods classes as well. It needs to be interwoven throughout the training. I think technology should be as much a part of English class as prepositions and research papers. 90% of the reading and writing I do is on the computer and that is probably typical these days. In fact, I'm grading research papers right now and am seeing as many technology errors (like margins and spacing) as I see grammatical errors. All English teachers should be experts on technology.

In recommending that methods courses be immersed with technology, two thoughts appeared repeatedly. The first is that a single introductory class cannot possibly offer enough depth to give pre-service teachers confidence with the technology. As one respondent explained, "I think expecting an Intro course to do it all is pushing it. How are you going to achieve FLUENCY with technology systems with only a traditional three credit-hour class?" The second thought is that only the subject area professors know enough about their respective specialties to transmit how best to apply technology to teaching them. Specific elements of technology that respondents want to see included in methods classes are

- Student projects that would involve technology
- Guidance in finding high-quality free technology resources in the subjects they teach, especially Web sites
- Web Quests within each subject area
- Critical software tools within the subject area, such as Mathmatica for math or Timeliner for teaching history. Emerging English teachers need something like PaperRater which has grammar, spell-check, proofreading, and plagiarism checks.
- Technology-based access to the professional community of educators for a subject (Professional Learning Networks)

The need for consistent technology choices in university classes and beyond.

Respondents expressed frustration with lack of standardization of software within pre-service programs. If Web pages are going to be designed in several university classes, one professor should not expect students to work in FrontPage, another in Dreamweaver, and a third in GoDaddy.com or PBWorks.

Respondents also objected when a regional teacher preparation university makes no effort to coordinate its hardware and software choices with the school districts in which its new graduates are likely to work. There was considerable frustration expressed on this point. While it is easy to sympathize with students wanting to master one tool, rather than becoming only slightly acquainted with multiple tools for the same job, there is a limit to the legitimacy of this point. New teachers will have to learn new software packages repeatedly throughout their careers. The role of the university is not so much to make them experts on "Product X Version 5.1.2," as to give them the ability to see the similarities between the software packages they are learning now and other software they need to learn at a future time. Then they can easily transfer their software mastery skills from the old to the new.

Universities also need to balance their obligation to make students confident users of technology with their graduates' equally important role as leaders in the local educational community. If all universities ever teach is what the local school districts decided to buy in past years, our graduates will never be in the vanguard of introducing their districts to the best tools newly available to the profession.

DEALING WITH OBSTACLES AND OBJECTIONS TO SKILL-BASED PREPARATION: THE INTERVIEWS

Interview Methodology

If offering skill-based *Introduction to Educational Technology* classes were easy, departments of education would have required all such courses to be skill-based long ago. The same can be said for technology-rich methods courses. After decades of emphasis on constructivism, discovery learning, and other "learning-by-doing" philosophies, skill-based training in teaching technologies would seem to be the obvious course to take. The subjects were interviewed to determine the obstacles to skill-based approaches and what could be done to mitigate them.

The subjects were ranked according to the care and effort they put into completing the original questionnaire, as evidenced by the completeness and thoughtfulness of their responses. The top 16 were asked to participate in the 30-40 minute interviews. By the end of the interviews, the thinking of the respondents had become so repetitive that the authors are

convinced that the sense of the group has been well-captured. The demographics of the group of 16 are entirely representative of the original subjects.

The authors used a semi-structured methodology in conducting the interviews. Each interviewee was asked what they thought might be preventing skill-based *Introduction to Educational Technology* courses and technology-rich teaching methods courses from being adopted. They were then asked how the obstacles might be addressed. Each successive interviewee was asked for mitigation strategies not only for the obstacles they came up with, but also for the obstacles mentioned by all earlier interviewees. Before long, the list of obstacles had stabilized, with additions to the list becoming increasingly rare.

Balancing Quality with Realism

Two themes, which could be labeled as "quality as the highest priority" and "the limitations of our current K-12 school systems," ran through the interviews.

With almost total unanimity, the interviewees approached the costs of introducing skill-based training with the some form of the same question: "Do the keepers of the purse-strings really care about the quality of our teaching?" It is widely known that a huge percentage of teachers do not succeed and leave the profession after a short stint in teaching. The interviewees generally held that an important reason is the lack of practical preparation to succeed in the classroom, which today includes succeeding with technology.

The interviewees fully realize what a "tough sell" this is. Consumables are always harder to justify than capital improvements. If a university builds a new field house, they have "something to show for it" for a generation. When a university sends higher quality teachers into the local school systems by investing in them through richer (though more expensive) technology training, it is often more difficult to prove that there is "something to show for it," since higher student achievement may be both difficult to measure and gradual in coming. For all the emphasis in modern education on quantifiable results, the interviewees see a need to accept as a first principle that teachers who are highly proficient in teaching with technology will help produce generations of K-12 graduates who will be more confident and more capable of meeting future challenges of both higher education and the changing workplace.

Nor do the interviewees have any patience with the ways in which university systems attempt to mask their priorities from scrutiny. The idea that we have money to build a field-house but not for more effective pre-service courses because "the money is in the capital budget and not in the personnel and equipment budgets" simply begs the question, "Why is the money in the capital budget and not the personnel and equipment budgets?" Budgeting is simply institutional priorities expressed in coin.

The interviewees were equally strong on pointing out that even the highest quality new teachers are going to have only a modest and gradual effect on the quality of teaching-with-technology in the buildings that they enter. Their lack of building-level political capital as new employees is only one reason. The priority of improving the use of technology cannot be ladled out of the witch's cauldron of competing and conflicting interests which is the modern school system to be dealt with separately. Obscured by louder issues such as falling school budgets, lack of public confidence, high-stakes testing, No Child Left Behind and its latest federal progeny, ever increasing unfunded or under-funded state mandates, and rampant political influences on the curriculum, it will always be an uphill struggle to get technology-rich pre-service teacher education the attention it deserves. Our schools are in crisis and, as has often been noted, families on social assistance are highly unlikely to be focused on funding retirement plans.

Having noted these general observations on the part of the interviewees, we can move on to the specific obstacles they mentioned and their strategies for managing them.

Managing Obstacles to Reconceptualizing Introduction to Educational Technology as a Hands-on Skill-based Course

Objection 1: Our hands are tied by state requirements.

Each state requires teaching candidates to know about technology-related topics, such as legal and copyright issues, Internet safety, and the mechanics of digital data storage (bits and bytes). States may also require famil-

iarity with classes of software, such as word processors, spreadsheets, databases, presentation graphics, and Web design tools. Since there is usually only one educational technology course in a pre-service program, this course has to touch everything needed for the state test, which precludes going into any depth with particular skills.

Suggestions for Managing Objection 1.
a. The long term solution is to persuade the state-level writers of standards that less is more, if that smaller list of objectives is mastered thoroughly. The mechanics of how this re-education of state officials might be accomplished is beyond the scope of this study.

The interviewees stressed that the problem of overly-broad standards leading to shallow skill levels is not unique to technology. It needs to be part of a more holistic revisiting of state education standards and how they are generated. They also acknowledged that, given the glacial pace at which state education departments respond to this type of issue, there is a need for more immediate ways to address this problem.

b. Many of the knowledge-based topics that are currently included in *Introduction to Educational Technology* courses could find a reasonable home in other courses. For example, copyright concerns extend to all intellectual property and not just that distributed through technology. This topic could be in an Educational Foundations course. Cyber-bullying might be best discussed in an Educational Psychology course.

c. Multiple standards-based requirements could be addressed in individual hands-on student projects. For example, the legal doctrine of "fair use" of previously published materials could be used to practice creating a database of usable resources.

d. Not everything mentioned in a state standard must be the topic of a lecture in the classroom. Purely factual information can be delegated to reading assignments. The professor's role would then be limited to clearing up any questions that were generated by that reading. This would free up class time for hands-on-technology skills.

Objection 2: Truly skill-based textbooks are not available for Introduction to Educational Technology courses.
The current generation of textbooks demonstrates a sincere concern for not "spooking" technophobic students (and faculty!) by going too deeply into the technology itself. It follows the comforting track of reading the material and answering the questions. The texts also follow the state standards in embracing the broad-but-shallow approach to these courses.

Suggestions for Managing Objection 2.
a. The approach taken by textbooks is determined by the state standards in effect where those textbooks are sold. If the standards shift to a more truly performance-based paradigm, the textbooks will follow.

b. There are plenty of trade books that focus directly on technology skills. Instructors should not be afraid to make a "textbook" out of something that does not come from a textbook publisher. A corollary benefit of using trade books is that they often address technology skills much more directly and cheaply than overpriced textbooks.

Objection 3: Skill-based testing is not practical. The only way to measure students' mastery of technical teaching skills is by observing them solving relevant teaching problems with technology. This is analogous to the test flights which student pilots are required to make with their flight instructors on-board.

Skill-based testing is complex, expensive, and time-consuming compared to the machine-scored multiple choice quizzes typical of current Introduction to Educational Technology courses. Since there is no feasible way to do competency-based testing, we are effectively precluded by fairness from doing competency-based teaching.

Suggestions for Managing Objection 3.
a. Computer-based testing methods using software simulation tools can make live skill-based testing both cost-

effective and manageable. This is routinely done by industries, such as aerospace, where the cost of testing with real equipment is prohibitive. While building the simulations themselves can be expensive, they can be reused by multiple sections of a class. Product portfolios created under controlled conditions can largely replace the need for having students perform in the presence of an instructor.

Objection 4: University economics requires that we offer Introduction to Educational Technology classes online. Administrators intuitively assume that classes about technology are ideal candidates to be taught with technology, but undergraduates learning technical teaching skills often need more help than they can get in an online learning environment.

While technical companies have considerable success teaching their employees computer skills online, undergraduate Education majors may find it heavy slogging. They will be frustrated by impediments beyond their troubleshooting skills and will need the scaffolding that can only be provided by a live supervised lab environment.

Suggestions for Managing Objection 4.

a. Perhaps *Introduction to Educational Technology* is just the wrong course to be attempting to teach entirely online. Hybrid (blended) class models offer many of the advantages of online learning while providing live supervised lab sessions at appropriate intervals.

b. Scaffolding for technical skill development can be provided in many ways:

> **i.** Remote support software, like Bomgar, allows an instructor to view and take control of a student's computer display as if they were sitting in the same room.
>
> **ii.** Movie-making tools based on screen capture, such as Camtasia or Captivate, are ideal for creating technical demonstrations. Such filmed lessons may be better than live since the student can control the speed of the demonstration and watch the difficult parts multiple times.
>
> **iii.** Online help files, lists of frequently asked questions (FAQs), and other searchable databases can provide speedy answers to common problems.

c. Teaching assistants can be used to supply some of the support needed for online students struggling with the technology.

d. Study groups can operate effectively through online social learning tools. These can provide a basic level of support, providing they are heterogeneous in ability and all the neediest students don't end up in the same group. To assure this, the groups must be instructor-selected and not self-selected. Provide suitable incentives so that the more capable students will wish to help the less capable.

Objection 5: Very few faculty members are prepared to teach a competency-based skill-intensive version of an *Introduction to Educational Technology* course.

It is common practice to assign faculty to teach extra sections of popular classes on short notice due to fluctuations in enrollment. While any sharp education generalist can get by in a lecture class using a standard textbook, only a true technology specialist is going to be effective teaching a performance-based skill-intensive *Introduction to Educational Technology* class, where they will be expected to respond to student problems in real time.

Suggestions for Managing Objection 5.

a. Teaching a subject effectively in the 21st century means teaching it effectively (in part) with technology. If the existing methods faculty is not ready to do so, appropriate in-service training to skill them up should be both available and mandatory.

b. The ability to teach with technology should also be a prerequisite for new professors entering the teacher education field.

Objection 6: A teacher education program with a reputation for requiring it students to demonstrate substantive teaching-with-technology skills (rather than just requiring them to answer multiple choice questions about doing so) may lose low-end students to less demanding programs.

Students afraid of failing in a more technically-demanding program because they see themselves as "not good with computers" are likely to enroll somewhere else.

Suggestions for Managing Objection 6.

a. A program that takes a competency-based approach to teaching with technology is more demanding, but, for many students, it will also be perceived as more engaging. Such a program is also more likely to lead to a desirable teaching position and long-term success in that position. Students who understand this will likely choose the program even if it is not the "path of least resistance" to teacher certification. It becomes a matter of marketing.

b. We should not assume that all teacher candidates are looking for the easiest way. Some will be genuine altruists sincerely seeking the best possible preparation to do a good job in the classroom.

c. The problem would disappear if state education agencies would take the totally justifiable step of requiring all teacher education programs to provide competency-based teaching-with-technology instruction and evaluation.

Managing Obstacles to Introducing Competency-Based Teaching-With-Technology Content into Methods Courses

Objection 1: Methods faculty may have little sympathy with or interest in teaching with technology. In fact, they use as little technology as possible in their own teaching. They will claim that they are too busy to learn teaching-with-technology skills and they have done just fine to date without them.

Suggestions for Managing Objection 1.

a. This is where leadership has to come in. University administration has to make it clear that, if they are going to prepare new teachers to teach in this century, methods faculty members are going to have to know where technology fits in. Each campus will differ as to what combination of carrots and sticks will be required to accomplish this, but it clearly will not be achieved solely by persuasive rhetoric.

b. Methods professors will also need to have abundant access to the hardware and software required to incorporate teaching-with-technology into their courses. Faculty will consider any persistent problem with the availability or condition of equipment as ample excuse to go back to dry markers on the whiteboard.

Objection 2: There is a lack of established standards as to what are the essential hardware and software skills required for teaching each subject with technology. Professors wishing to incorporate teaching-with-technology into their methods courses have little guidance as to where to begin.

This is a very legitimate concern. Both the state and the national teaching-with-technology standards as promoted by ISTE as so vague that it would be hard to reliably measure which teacher educators are making a good faith effort to address them and which are not.

Suggestions for Managing Objection 2.

a. Until state and federal authorities deliver measurable competency-based standards, each university will need to create its own. A good starting place would be the best practices of both the highest achieving local school districts and the training departments of local business partners.

b. There is no need for competencies to be stated in terms of brand names. For example, every English teacher helping eighth graders to write research papers should be able to use the Advanced Search Features input page for any of the standard search engines, as they all work in roughly the same way. Whether this competency is

demonstrated on the Google, AltaVista, or Yahoo search engines is irrelevant.

c. While brand names are not always required, local standards should be sensitive to what the "real world" is using. If 90% of the local school and business communities are using Adobe Dreamweaver for Web page design, there is little justification for training teachers with Microsoft FrontPage. It is inexcusable to have students hand-coding HTML in Notepad because that is what a faculty member learned in school a decade ago.

d. While being sensitive to "what is out there" in the school districts where the university expects its teaching graduates to be placed, the university's vision should not be limited to a narrow employee training role. Program graduates should also have some experience with the "best-of-breed" software and hardware, regardless of whether it has been widely adopted by the local school districts. Only in this way can the university function, through its graduates, as the positive change agent it was meant to be. A university is not a trade school; we have community colleges for that.

Objection 3: There is already too much to cover in methods classes. There is no room for additional content, much less hands-on practice and assessment of teaching-with-technology skills.

Suggestions for Managing Objection 3.
a. Non-technology-based content could be taught in these classes using technology-based methods. The modeling of teaching-with-technology would supplement direct instruction.

b. Interviewees felt strongly that much of what is currently taught in methods courses could either be offloaded to self-study or simply omitted. They suspect that some of the material in these courses is there simply because it always has been, and not because it provides the most effective methods for teaching today. If useful technology-based methods push out some of the dated content of these courses, so much the better.

Objection 4: If a large university program, like teacher education, starts to require significant additional hands-on computer work from its students, the Help Desk charged with providing computer support for these students will be overwhelmed with trouble calls.

This problem could be aggravated if Call Center personnel are not familiar with the educational software with which the students require help. This would send the help requests right back to the methods class professors themselves, who might be overwhelmed by this additional demand on their time.

Suggestions for Managing Objection 4.
a. "Level Zero" computer hardware skills, such as how to make progressive backups and do simple swap-out troubleshooting, should be required of all students. These could be learned either in a brief non-credit course or as part of the *Introduction to Educational Technology* experience. This will limit the number of trouble calls that need to be routed.

b. Graduate assistants in the academic disciplines could be given appropriate technology training and assembled into a first-tier support team. They would refer problems they could not handle to second-tier professional support.

c. The existing Call Center support staff could be selectively trained so that each discipline-specific methods course would have its designated support person or people. These staff members would be responsible for learning the hardware and software associated with that discipline.

CONCLUSION

The education profession has done so much so quickly with so little for so long that the larger society sometimes expects us to accomplish everything with nothing by yesterday. When challenges such as multiculturalism, equality of access for the disabled, and globalization emerged in the society-at-large, education was in the vanguard of meeting these challenges. The Digital Age has been no different.

But the education profession is sometimes better at starting initiatives with much fanfare than at quietly following them through to fruition. As the initial burst of resources dries up, we look to "the next big thing" that might interest funding sources. Then Education's part in the solution of the previous challenge can degenerate into simply a "story" told to stakeholders to demonstrate that we are still doing something to address the problem that has long since been recognized, but is no longer fashionable. Thus, the Head Start program was allowed to stumble along for decades in spite of strong suggestions that it lacked effectiveness (US Department of Health and Human Services, 2010). The national challenge of diversity spawned departments focused on various aspects of multicultural studies, only to have these departments face increasingly narrow roles (or extinction) with every round of budget cuts.

Addressing the need of new teachers to become teaching-with-technology experts by using a single pre-service *Introduction to Educational Technology* course supported only by multiple-choice testing has become just such a story. With this approach, technology is not the unifying factor for integrating the curriculum it should be, but just one more academic subject to tick off on the pre-graduation checklist. This approach is not sending our new teachers into the classroom with the confidence to use technology effectively or with the skills needed to serve as technology change agents.

Our research subjects have offered some useful suggestions on how an *Introduction To Educational Technology* course could be optimized. They have also suggested that a complete solution must include making the rich integration of technology the responsibility of every professor of teaching methods. Only when the English education professor becomes a specialist in teaching English with technology and the math education professor excels in teaching math with technology will our graduates have the tools they need to assist their school districts to the next level of technology integration.

Making this a reality will require substantial administrative resolve. Universities have a growing agenda of fiercely competing needs chasing a diminishing pool of dollars. But what could be more important than preparing our students for the technology-driven future? If they can't compete with technology, they can't compete at all. In 1900, Great Britain was the unquestioned global superpower due to its dominance in the technologies of the day. It had the largest military, the most respected education system, and its currency was the standard of value for the world. History is clear on what happens to civilizations that think they have better things to do than provide resources to stay ahead of the curve on technology.

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Richard Rose, Ph.D. (rrose@wtamu.edu) *is the Program Chairman for Instructional Design and Technology at West Texas A&M University in Canyon, Texas. He has served as a Senior High School Principal in upstate New York, and District Computer Administrator in Sweetwater, Wyoming. He has also enjoyed a twenty year corporate career as Senior Instructional Project Manager for Microsoft Corporate Headquarters and Team Lead for Instructional Materials for the 727/737 Asian Pilot Training Project at Boeing Corporation. He served as Lead Instructional Designer for the SQL Server Team in Microsoft's Certified Database Administrator program. He is Master Certified Novell Engineer, Microsoft Certified Engineer, and Senior Microsoft Certified Trainer.*