

## **Implementing ISTE/NCATE Technology Standards in Teacher Preparation: One College's Experience**

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In an age of information technologies, the preparation of teachers includes a wide variety of technological skills and knowledge. The appropriate process for doing so is a topic of spirited discussion among institutions of teacher education. Beginning with a framework of current national standards, this article describes one college's experiences with designing and implementing a required "technology strand" for teachers. Topics addressed include rationale, initial implementation, division of content, feedback from faculty and students, and effects on instruction. Based on their experiences with this project, the authors ultimately recommend an approach in which basic technological knowledge and skills are addressed in an introductory experience required of all teachers, and more advanced topics such as curricular integration are addressed as an integral part of other teacher education coursework.

During the past generation, enormous changes have taken place in the way industrialized societies handle information. Authorities as various as

Alvin Toffler (1980) and Robert Reich (1991) have spoken to these changes in great detail. Schools, which both reflect the needs of society and also function within a societal context, have wrestled with these changes in many ways. Questions of curriculum, administration and pedagogy have been central to these discussions. It has been necessary for schools to modify both what they teach and how they teach it. Along the way, colleges and universities have had to make significant revisions to the ways in which they prepare teachers. These revisions have been reflected in the recommendations of learned societies such as the International Society for Technology in Education (ISTE) (International Society for Technology in Education, 2000) and of accreditation agencies such as the National Council for the Accreditation of Teacher Education, NCATE (Wiebe & Taylor, 1997). At the core of such recommendations is the intent to equip both teachers and students with the knowledge and skills requisite to functioning effectively in a world where the methodologies of information handling are intrinsically technological. The purpose of this article is to describe the ways in which one urban college of teacher education chose to implement these changes, the consequences of these changes (both positive and negative), and recommendations for other educators confronting similar dilemmas.

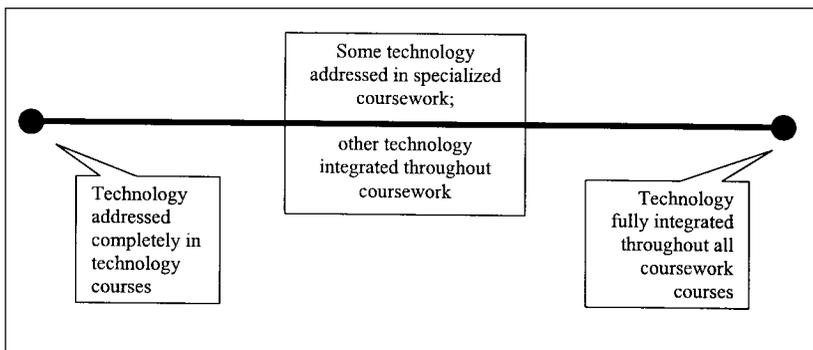
## RATIONALE

### Standards for Technology in Teacher Education

Wiebe and Taylor (1997) reported on the results of more than a decade of collaborative work between ISTE and NCATE, resulting in 17 performance-focused accreditation standards for teacher education programs across the United States. The revision is comprised of three categories including (a) Basic Technology Operations and Concepts, (b) Personal and Professional Use of Technology, and (c) Application of Technology in Instruction. The first of the three consists of knowledge and skills necessary for any use of technology (e.g., using floppy disks; naming and organizing files); the second of those required for effective use of the technology to meet an individual's needs (e.g., the ability to create graphic images or edited documents), and the third of those involving the application of instructional principles to the use of technology with learners. Essentially all teacher educators acknowledge the necessity of implementing these standards. The disagreement ensues when the question turns to the methodologies to be employed: *how* will these standards be incorporated in coursework for teachers?

### Implementing These Standards within a Teacher Education Program

One might consider the available approaches as a continuum stretching between two extremes. At one extreme is the approach, which places all technology skills and knowledge into one or more technology courses taken by teachers; this allows a high degree of control and efficiency at the expense of portraying technology as an isolated body of knowledge. At the other extreme is an approach, which recognizes quite rightly that technology in the real world is integrated throughout other activities, and places all technology within the context of courses whose major purpose is other subject matter (e.g., educational research; social foundations; curriculum development). The latter is the “integration” approach, which shows technology in its natural setting at the expense of control and efficiency. In the middle of the continuum is a balance, which places certain technology skills and content into specialized coursework, and integrates other technology skills and content throughout the rest of a student’s coursework (Figure 1).



**Figure 1.** Continuum of technology implementation

This is the approach our institution has chosen. ISTE/NCATE categories one and two have been placed into a single technology experience required of all graduate students early in their program of study, and worked to integrate the content in category three throughout all of the coursework in the teacher education program. This ensures that all students have basic competencies needed throughout their coursework, and places the instructional application of technology into an integrated setting.

## CONTEXT

### Institution and Student Body

This is a college of teacher education within an urban university setting in the Midwestern United States. Almost all of the students are commuters, which generally means they visit campus only once or twice each week. Of the graduate students served by the College of Education, nearly 3/4 are currently employed in a K-12 school setting; as a result, almost all graduate classes (such as the ones described in this article) meet after work on weekdays. The combination of full-time employment with graduate coursework means that most students have extremely full personal schedules. This, in combination with our “commuter” setting, means that the long-term schedule predictability needed for cohort programs is hard to come by, and that in practice students take required coursework in every possible sequence. This has direct implications in choosing where to put fundamental content which supports all graduate courses, especially in a political setting where it simply was not feasible to add an entire new course located at the beginning of graduate study.

### Course Sequencing

One core course required of all graduate students is Educational Research, which students are encouraged to take within the first two academic terms of their program of study. In the initial efforts to incorporate technology into the teacher education curriculum, we chose to attach to this course a one-credit “technology strand.” The content of this strand consists of knowledge and skills drawn from the ISTE/NCATE categories one and two. The technology strand carries one credit and is pass/fail. Students must successfully pass the technology strand before they are allowed to receive a letter grade and credits for Educational Research.

## CONTENT AND CURRICULUM

### Technology Strand Content

Having addressed the issue of where in the curriculum to place this specialized content, there remained the issue of precisely what territory this

experience should cover. Five different areas viewed by the faculty as essential for graduate study were addressed, understanding that many of the students already had at least some of these competencies well in hand.

The technology strand is organized into five modules: (a) operating systems, (b) World Wide Web (WWW or Web), (c) e-mail, (d) word processing, and (e) spreadsheet. The first module teaches students the skills of organizing and handling files under two user interfaces (Macintosh and Windows). The WWW module provides an overview of the Web and basic use of Web browsers. The e-mail module covers sending and receiving electronic mail and attachments. The word processing module teaches document creation, editing, and formatting, and the spreadsheet module covers the skills of setting up and editing a simple spreadsheet.

The five modules are divided into five three-hour segments, and all instruction is heavily hands-on for all students. Because many students already have mastery of some of these skills, students may test out of any one or more segments—in fact, testing out is actively encouraged. Detailed content outlines and materials are available on reserve in the library, on the class Web site, and online through electronic course reserve, courtesy of the university libraries. The technology strand is a “gatekeeper” experience: do you or do you not have the knowledge and skills you need to proceed with your graduate studies? It is not intended to enhance or enrich the skills and knowledge of students who already have technology skills adequate for graduate study.

### **Curriculum Beyond the Technology Strand**

Mentioned earlier was that content from categories one and two of the ISTE/NCATE standards was consciously placed into the technology strand, leaving the third category—application of instructional principles to the use of technology with learners—to be addressed in the other graduate courses encountered by a student. What does this mean in practice? Each of the technology strand’s five modules is examined in turn and the activities, which they now make possible in the other courses of a graduate teacher’s curriculum, are considered.

One reality of technology in K-12 education is that it encompasses both Windows and Macintosh operating systems, and for all the similarities in these systems a remarkably large number of educators are competent in only one of the two. Most of the students have only one of these systems at home. The College computer facilities contain both, and the faculty mirror

K-12 teachers in that they are typically comfortable with only one or the other system. The result of this situation is a frequent need to “cross platforms”—that is, to work on the “other” system temporarily while away from one’s home base, or to transfer a file provided by a student or instructor from one platform to the other. This first module of the technology strand ensures that all of the students can use any computer on campus regardless of operating system, and that files provided by any instructor in either system can be readily converted by a student for personal use.

The Web module supports two major functions in graduate coursework. The first and most obvious is that all faculty can now require students to access Web-based content simply by specifying a URL as one would have previously specified a title and author for a bound volume. Previously, some small portion of a class was typically unfamiliar either with basic Web access procedures or with the actions needed to retrieve Web content for personal use. Since the most current content in many fields is to be found on the Web, access for all students has the effect of including more “cutting edge” resources in our class resources than was previously the case.

The second function supported by the Web module is less obvious. Course readings on reserve have traditionally been read by physically visiting a library to borrow a printed copy; over the past few years, the university library has emphasized scanning these readings and making them available over the Web by way of “electronic course reserve,” which has turned out to be extremely popular with the students who know how to use it. However, the documents are generally made available in Adobe PDF format, which requires the use of free *Adobe Acrobat Reader* software in combination with a Web browser. While this is not difficult, it is a sufficiently large “stretch” for a student just learning to use the Web that many students (especially the older ones) had not made the transition prior to the technology strand—and instructors were reluctant to make their readings available in this format if they knew that they would need to use class time to explain how to access the materials online. All instructors can now readily make use of Electronic Course Reserve without this concern, which means that reserve readings may now be used without worrying that they force students to make separate trips to campus for access.

The third module covers e-mail and the use of MIME attachments. At the very beginning of the technology strand, a significant number of students lacked personal e-mail accounts, and the strand focused on the standard software through which our university provided free student e-mail accounts (*Eudora* and *POPmail*). Within two years, two things became clear: almost every student enrolled for graduate study had their own working e-mail account, and few of them preferred those provided by the university.

Some used free Webmail accounts, some accounts provided by their school districts, some accounts provided by their personal ISP... but nearly all could reliably send and receive basic e-mail using one program or another. Eudora and university accounts continued to be used by a few students who lacked all other access, usually by way of a personal tutorial on the part of the instructor, but the focus of this strand soon shifted to the area where many otherwise experienced e-mail users experienced major problems: the sending, receiving, and successful use of e-mail attachments.

In its current form the third module supports two major functions throughout graduate coursework. The first and most obvious is regular e-mail communication between instructors and students; instructors can (and do) now expect this communication without having to wonder whether they are being unfair to some unknown fraction of their class who may not have used e-mail. Since many graduate classes meet only once per week, this can have the effect of extending a student's time on task across the intervening six days. The second function is the ability of instructors and students to exchange computer files by way of e-mail. In practice this takes two major forms: instructors distribute handouts and supplementary course materials as e-mail attachments, secure in the knowledge that students should be able to successfully receive them, and students submit projects and assignments as attachments in the knowledge that instructors should be able to successfully receive them. Some instructors have taken the next obvious step of setting up class mailing lists to which all members of a class subscribe, and by means of which class communications are conducted in off hours.

The word processing module is fourth in the technology strand. Many can remember the era of the typewriter, when it was common for instructors to specify detailed page formatting instructions for graduate assignments. There followed an era during which professional societies (e.g., the APA) continued to require standardized formatting, but during which students were often heard to plead either that their word processors were incapable of meeting such requirements, or that they lacked the technological savvy to do so. The irony was and is that modern word processing software actually made meeting sophisticated document format requirements far easier than had been the case with a typewriter, but the missing piece was specialized word processor competence on the part of the student. The primary function supported by the word processing module is a sufficient level of skill on the part of students to submit graduate writing assignments in full APA format. Since word processed documents by definition result in a digital file, a secondary function is that these papers are automatically stored in a form which may be submitted as an e-mail attachment rather than requiring a

printout. The instructors are now able to reasonably require documents meeting professional standards, and some prefer to receive, annotate, and return them online rather than on paper.

The fifth and most controversial of the modules covers the use of an electronic spreadsheet. It is probably the most controversial because fewer students and fewer instructors have actively encountered spreadsheets in a hands-on way. Those who do favor spreadsheets do so quite vigorously, and the inclusion of spreadsheets here is done for three reasons. First is the understanding that almost all teachers use grade books of one type or another, and that spreadsheets provide an ideal tool for customizing a grade book. Second is the fact that all current spreadsheets provide powerful graphing functions, a useful capability of which surprisingly few students and faculty are aware. The third reason is connected closely with the context in which the technology strand is placed: it is part of an educational research class, and the educational research instructors are by far the most likely both to use spreadsheets themselves and to expect their use on the part of students. Thus, while many of our graduate courses do not in fact make use of student spreadsheet activities, this module of the technology strand supports them as a part of the required educational research class to which the strand is attached.

It should be acknowledged that the precise makeup of this course is a matter of ongoing, animated discussion. While proponents can be found for almost every conceivable topic, the current selection has proven reasonably robust with allowance for evolution over time. The single most likely contender for inclusion has consistently been the use of presentation software (e.g., *PowerPoint*), and its support grows stronger as more faculty incorporate these skills and techniques into their own teaching. It's not that students need specialized training to view an instructor's PowerPoint slides, but that instructors who use them begin to understand the benefits that such programs can have for the K-12 teacher.

## FEEDBACK

### Faculty Reactions

The implementation of the technology strand has effectively addressed a long-standing dilemma. Clearly, students needed to use technology as an intrinsic part of their graduate study. Obviously, instructors needed to include technology-based activities and materials as a part of their curriculum. However, not all students had the basic skills needed to handle this,

and instructors were going quietly (or sometimes perhaps not so quietly) crazy trying to combine the teaching of their assigned content with technological remediation. Some instructors simply refused to enter the technological waters at all until this conundrum was addressed.

Feedback from faculty has been clear in this area. Instructors are now able to count on these five major areas of competence in planning their course activities, which has allowed them to incorporate a significant variety of technological activities in their classes while releasing them from the need to encumber portions of their class time covering basic technological skills needed by only a portion of their students. This has not been a “silver bullet” solution which caused all faculty to magically maximize every technological possibility in their classes, but it *has* resulted in a dramatic increase in the use of technology in graduate classes—and the trend continues steadily upward.

Significantly, faculty discussions about the technology strand have shifted entirely away from debates over whether or not it should exist to scheduling issues and consideration of which topics should or should not be included in its syllabus—a tacit acknowledgement that it fulfills a useful function within the structure of the curriculum.

### **Student Reactions**

In planning the technology strand, the authors were often asked whether they might not be pitching the content too close to the beginner end of the spectrum. They gathered self-report data from students immediately prior to the beginning of the class and found that about 74% described themselves as “experienced computer users” with the other 26% choosing “little or no experience.” In other words, the majority already *thought* themselves competent. In practice, it soon became apparent that the majority of the students did not in fact have complete mastery of all the content included in the technology strand.

It was clear from both written and oral student feedback that the range of skill levels for those entering the course was quite wide. They ranged from the most extreme novices (who often felt that the course contained too much new material) to those with high levels of technical proficiency (who felt very much the opposite). Well over 2/3 of the students found the knowledge and skills in this class to be an important and valid requirement (though an equal number felt that its status as part of an Educational Research class was inappropriate).

A number of students reported having used the knowledge and skills from the technology strand in teaching their own classes; some went so far as to request permission to use the same instructional materials used in the class. One student specifically articulated that the reason for his attendance was not to acquire new skills, but to observe the approach taken by the technology strand instructor to this content area, and to learn from her modeling of good pedagogy in a technological context. His refrain was later echoed by others “I know how to *do* this, but I don’t know how to *teach* it to my students.” Positive feedback was also received from students who indicated that the technology strand served the purpose of helping them update specific technical skills which had originated on older equipment or software, and from others who offered the observation that taking this class had convinced them to purchase their own computers for the first time.

### Areas for Further Development

There are two areas where feedback has consistently indicated a need for modification in the technology strand. The first is something of an administrative issue, but it affects the ways in which other institutions might choose to implement this content. Specifically, the status of the technology strand as an “educational research lab” rather than a separate course is universally unpopular. It deserves a separate course designation in its own right, to be required very early within a student’s program of study, and we are in fact in the midst of implementing that change at our institution. The authors’ experience with the technology strand has proven sufficient to move such a new course from “simply not feasible” to “offered next Fall semester” in the values of the institution.

The second has to do with a necessary balance within the course content. This course has always been aimed at students with relatively limited technological backgrounds, but as ever higher levels of technology permeate our society the definition of “technological novice” becomes ever more sophisticated. It is clear that what must be built into this course is an annual content review, with an eye toward slowly but steadily raising the level of content covered to match the rising tide of student and instructor knowledge. Eventually, entire modules are likely to be phased out or replaced, and the number of modules involved will be modified.

## CONCLUSIONS

Those who prepare teachers in the current information age are nearly unanimous in their recognition of the need to incorporate technology skills in some fashion. Based on what the authors learned in their attempts, they would affirm that it *is* absolutely essential to do so, and to do so in a fashion that requires all teachers in training to acquire both confidence and competence in this area.

Prior to the implementation of this technology strand, there was much disagreement within the faculty over the best structure within which to introduce technology. For close to a decade, all agreed that technology should be a component throughout the curriculum. Unfortunately, since no entry level technology skills were required of any student, technology in all other courses was forced to appear at a “lowest common denominator” level, and appeared only in sporadic ways. Since a few students in every course knew little or nothing about technology, every instructor was forced to occupy class time in teaching and re-teaching basic technology skills pitched at the lowest common denominator.

Based on the experiences recounted in this article, the authors believe the choice to implement ISTE/NCATE basic competencies (categories one and two) as a separate experience, and allowing instructors in other teacher preparation courses to handle category three competencies, was the correct one. This approach has helped move toward the dual goals of helping teachers in training learn more effectively, and faculty teach more efficiently. It has concentrated basic technology skills for students in one experience placed early in their program of study, freeing instructors in other courses to incorporate more advanced technology-based experiences throughout the curriculum.

Any change in basic requirements is threatening, and technology requirements are no different in this respect. If you have not yet implemented requirements of this sort at your institution, it is likely to involve much wailing and gnashing of teeth. It is recommended that you talk to all parties involved, strive to balance the conflicting needs on all sides, and take the plunge. To do any less is to shortchange your students as they seek to hone their own professional skills, and to undermine your instructors as they seek to bring technology into their own teacher training classrooms. In the final analysis, as teacher educators we really have no choice—and the approach described in this article has proven a worthy structure within which to meet this responsibility.

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