Development of an assessment system for technology integration and teacher preparation

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Introduction

The ability of teachers’ to effectively incorporate technology in today’s classrooms is essential, both at the PK-12 as well as post-secondary levels of instruction. It is imperative that colleges of education equip students pursuing professional careers in teaching and related fields with the skills and knowledge necessary to effectively integrate technology in their instruction. In addition, as these courses as well as others throughout post-secondary disciplines continue to expand their offerings of coursework via distance learning (e.g., through the World Wide Web), the ability to evaluate these courses, regardless of discipline, effectively and efficiently becomes increasingly crucial.

There are multiple ways to consider adequately preparing new teachers in the use of technology in the classroom. Some venues to consider include demonstrating such integration through modeling it in their own instruction, providing lessons on how to use technology in teaching and designing student outcomes, products, or other assessments requiring the use of technology.

The scope of assessing how well a university prepares students in the use of technology is broad and complex. Fortunately, the International Society for Technology in Education (ISTE), has, over the past five years, provided guidance to aid in this process. In June of 1998, they provided the National Educational Technology Standards (NETS) for students. Similarly, a series of NETS were provided to teachers in 2000 that build on the student NETS and then administrators in 2001 (NETS, 2003).

The degree to which an individual instructor may or may not use technology, either as a means of instruction or as a student outcome/expectation, may depend upon a variety of issues. Considerations about the appropriateness and extent of technology use and integration in a particular course may include such issues as the subject being taught (e.g., history of education, educational measurement), the method of course delivery (e.g., classroom, Internet, satellite), availability of resources (e.g., computers,
laboratories (labs), student composition (e.g., prior technology experience/skill, traditional or non-traditional student, and typically underserved populations). These considerations must be taken into account when developing and conducting assessment systems that have a broad focus such as the use of technology in pedagogical practices.

This study is, at least in part, an initial foray into developing an evaluation and assessment system for teacher preparation programs regarding their effectiveness in preparing new teachers for technology use and integration in their profession. As such, this study has the following goals regarding effective preparation of teachers in the use and integration of technology in their classrooms: First, to develop an appropriate assessment system and framework that will allow universities, colleges, and other teacher preparation institutions to assess how effective they are in equipping students to function in this ever-increasingly complex technological society. Second, to conduct initial implementation of this assessment to inform and help guide subsequent phases of the long-term study. In addition to these goals specifically aimed at teacher preparation courses, this study also addresses development of an evaluation system that can be used not only for teacher preparation courses delivered online but for virtually any course delivered from a distance, including those that incorporate synchronous and/or asynchronous tools, use satellite feeds, etc.

Operational Definition of Technology

Depending on the context in which it is used, the term ‘technology’ can have a variety of interpretations in meaning. It is, to some degree, subjective based on the experience and skill of the users, the intended application, and the professional venue in which it is being engaged. For example, the use of an overhead projector in a computer-applications development company might not be considered as ‘technology’, whereas in a small, rural school district, it might be the most sophisticated example of technology available. As such, it is important to provide an operational definition of technology in studies such as this that have technology as a focus.

Technology may be broadly defined for the purposes of this study as human innovation, change or modification of the natural environment that is brought about to solve problems and extend human capabilities. As applied in this research using an educational context, technology may further be defined as tools of information and
communication that are used to enhance the teaching and learning process. For the purpose of this study, technology has been operationally defined as encompassing all products and equipment requiring the use of electricity for educational purposes. This definition allows the inclusion of relatively primitive technology (tape recording/playing) to more sophisticated technology (computers, with their applications and products to videoconferencing equipment, etc.). According to this definition, an instructor’s request that an assignment be typed is an example of student use of technology, based on the presumption that students do not use manual typewriters anymore, and would be considered as evidence of technology integration into the course instruction.

Context of the Research

This research was conducted at a Carnegie Doctoral Research Extensive Institution in the Southeastern United States serving a diverse population of approximately 40,000 students across four campuses. Within this university, there are fourteen individual colleges, including the College of Public Health, the College of Arts and Sciences and the College of Education. Within the College of Education a variety of undergraduate degrees for teacher preparation are available, including physical education, elementary education, mathematics, etc. Most of these programs share a set of common core courses that include prerequisite classes for entrance into the College, as well as a core of professional education and ESOL endorsement courses.

Sample

The sample for this research consisted of two subpopulations of courses available within the university. One sample was used for the more prominent focus of the research, the development of a framework to assess technology integration in teacher preparation programs, and to begin development and implementation of this framework. The other sample was chosen to begin development and validation of the assessment system to be used for online courses.

The first sample consisted of courses common to undergraduate teacher preparation programs within the College of Education, identified through the university’s undergraduate catalog. The class schedules for the 2003 Spring and Summer semesters were reviewed to identify which of these courses were offered and
the instructor(s) teaching the course for each semester. As the course itself was the unit of interest, the characteristics of the instructors were not taken into account. Therefore, the courses under consideration could have been taught by full faculty, adjunct faculty or graduate teaching assistants.

The second sample consisted of online courses under development in the College of Public Health, the College of Arts and Sciences, and the College of Education. There were two classes in each of these colleges that were being administered for the first time in the fall of 2003 in their current form. Additionally, two other faculty members and their online classes were used for initial data collection for piloting and validation purposes. These classes will not be used for further data collection but were considered representative of the types of classes and students that would be responding to future evaluations.

Technology Standards

The International Society for Technology in Education (ISTE) provides six standards and associated performance indicators to guide preparation programs in advancing their student’s knowledge and use of technology (ISTE, 2000). The ISTE NETS for Teachers (NETS•T) focus on pre-service teacher education and define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. These standards include preparing pre-service teachers on the modeling of technology use and providing experience using technology. All candidates seeking certification or endorsements in teacher preparation are expected to meet these standards as a result of faculty and staff providing appropriate and sufficient technology related opportunities to students.

The six ISTE standards are designed to be general enough to be customized to fit state, university, or district guidelines, while at the same time maintaining enough specificity to adequately define the scope of the topic. Outcomes are defined by performance indicators that should aid in guiding development of assessment tools and methodologies. Table 1 contains the six ISTE standards and related performance indicators (ISTE, 2000).
Table 1.

ISTE NETS Standards and Performance Indicators

<table>
<thead>
<tr>
<th>Standard</th>
<th>Performance Indicators</th>
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<tr>
<td>I. TECHNOLOGY OPERATIONS AND CONCEPTS. Teachers demonstrate a sound understanding of technology operations and concepts.</td>
<td>A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students) B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.</td>
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<tr>
<td>II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES. Teachers plan and design effective learning environments and experiences supported by technology.</td>
<td>A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners. B. apply current research on teaching and learning with technology when planning learning environments and experiences. C. identify and locate technology resources and evaluate them for accuracy and suitability. D. plan for the management of technology resources within the context of learning activities. E. plan strategies to manage student learning in a technology-enhanced environment.</td>
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<tr>
<td>III. TEACHING, LEARNING, AND THE CURRICULUM. Teachers implement curriculum plans, that include methods and strategies for applying technology to maximize student learning.</td>
<td>A. facilitate technology-enhanced experiences that address content standards and student technology standards. B. use technology to support learner-centered strategies that address the diverse needs of students. C. apply technology to develop students’ higher order skills and creativity. D. manage student learning activities in a technology-enhanced environment.</td>
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<tr>
<td>IV. ASSESSMENT AND EVALUATION. Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.</td>
<td>A. apply technology in assessing student learning of subject matter using a variety of assessment techniques. B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning. C. apply multiple methods of evaluation to determine students’ appropriate use of technology resources for learning, communication, and productivity.</td>
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<tr>
<td>V. PRODUCTIVITY AND PROFESSIONAL PRACTICE. Teachers use technology to enhance their productivity and professional practice.</td>
<td>A. use technology resources to engage in ongoing professional development and lifelong learning. B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning. C. apply technology to increase productivity. D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.</td>
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<td>VI. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES. Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice.</td>
<td>A. model and teach legal and ethical practice related to technology use. B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities. C. identify and use technology resources that affirm diversity. D. promote safe and healthy use of technology resources. E. facilitate equitable access to technology resources for all students.</td>
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These standards, in conjunction with the ten Essential Conditions outlined by ISTE (see Table 2), were the primary guidance used for developing this assessment framework and implementation.

The degree to which pre-service teachers and in-service teachers should be able to meet these standards and the essential conditions is specified in four profiles that occur at different times in an individual’s pedagogical development as a student and
beginning teacher. These four profiles reflect different points in time during a teacher’s preparation and initial teaching experiences and are defined as:

**Profile 1:** at the end of a student’s general preparation program (ideally at the completion of their sophomore year and prior to their junior year)

**Profile 2:** at the end of a student’s professional preparation program (ideally at the completion of coursework, prior to internship)

**Profile 3:** at the end of a student’s internship (ideally at the completion of the internship, prior to entering the field as a professional)

**Profile 4:** at the end of their first year as a classroom teacher (ideally one year after graduation and after a full year as a full-time teacher)

Of course, as student body compositions at university’s and other teacher preparation programs continue to change, these profiles are not as clean cut as might be desired. Students do not always follow a regimented, clear-cut track through the system, nor do teachers attain certification via just one route. Numerous alternative certification venues and processes exist which, in some cases, may not even require internships, etc. These types of issues, though important to recognize, are not an inherent element of this study.

**Method**

**Framework**

During this first phase of the research, numerous exploratory ventures were undertaken, including literature reviews, identification of appropriate measurement methods and tools for standards and objectives, and acquisition of materials to guide the assessment. The framework was developed through a cooperative review of the ISTE NETS by a team of nine measurement and research specialists. All members of this team had not only training and experience in educational measurement, statistics and research, but many members brought additional professional experience that enhanced the applicability and knowledge base of the team. Team members included two school administrators, two individuals with previous school-district job experience, four with public school teaching experience, and six with experience as instructors of teacher preparation courses. Additionally, two team members were instructional technology specialists. There is a certain degree of overlap between these different areas of
expertise as some team members brought more than one type of experience to the group. For example, one of the individuals who is well versed in instructional technology also spent time as a classroom teacher.

In addition to a thorough review of the ISTE NETS, additional information about other technology initiatives was gathered for review and inclusion, e.g., the national PT3 grant. University as well as College of Education guidance and directives were reviewed to determine expectations of the teacher preparation programs in the college as a result of common core courses, graduation requirements, syllabi, etc. The team independently reviewed the wide variety of documentation available and then collectively designed a guiding framework to aid the development of the assessment and evaluation system for the preparation of teachers in the use and integration of technology in their classrooms. This framework was designed to allow flexibility during the development and implementation of the evaluation and assessment process while ensuring critical elements, e.g., ISTE NETS and Essential Conditions, were not lost nor forgotten.

**Assessment Initiatives Implemented**

Three components of this long-term research project have been implemented and have been either fully or partially completed. Each of these three independent yet related studies focused on the second of the ISTE NETS profiles, *Professional Preparation*. A multi-method approach was undertaken across these three concurrent studies, incorporating qualitative and quantitative techniques to ensure appropriate methods were used for the various components of both this initial study as well as for the long-term development and validation of this assessment process. Qualitative methods for this initial study primarily consisted of a content analyses of syllabi for the thematic development of an instrument to be used to review syllabi for evidence of technology integration in teacher preparation courses. Quantitative methods included the development and validation of surveys for both students and faculty as well as analysis of data gathered from the qualitative review of documents.

**Content Analysis**

The first of the three components in this study concentrated on identifying evidence of technology integration in core courses of the teacher preparation program
through a thorough review and analysis of course syllabi. Syllabi were considered to be an appropriate starting point as they are a mandatory element of all approved courses and, according to Lowther, Grant and Martens (1989), they serve as an agreement, much like a contract, between students and instructor(s). Additionally, McKeachie (1999) asserts that syllabi provide a reflection of course delivery method, assignments and outcomes, and instructor expectations.

Upon review of requirements for different teacher preparation programs within the College of Education, specific courses were identified as core requirements as evidenced by consistent inclusion as a required course for various programs. Syllabi from different sections of each course were gathered to review for evidence of technology integration.

A team of measurement and content specialists was assembled to develop data gathering instruments for review of these syllabi. A checklist was developed to review each syllabus for evidence of technology integration. This checklist went through subsequent reviews and pilots until a final instrument was agreed upon (see Appendix A). Members of the team reviewed syllabi independently and then met to reach consensus for each element of each course. In total, 22 syllabi, supplied by 19 instructors were reviewed using this checklist. Evidence of technology integration in six main areas were gathered: (1) Electronic Communications, (2) Online Resources, (3) Delivery Vehicle, (4) Processes and Products, (5) Course Administration, and (6) Equipment and Resources. Within each of these six general categories, five to six specific indicators were used to determine the extent to which technology use within each category was evident through the syllabus. For example, within the second category, Online Resources, syllabi were reviewed to see if information for resources for students were provided via an online venue for (1) course syllabus, (2) class notes, (3) readings, (4) websites, and/or (5) other. The final option, other, was provided for all subcategories due to the uniqueness of language used across syllabi.

The team agreed that low inference was to be used during the review, that is, the syllabi must be very specific about the inclusion of technology in the course. Team members were not to interpret vague wording or use personal knowledge of course administration when determining if a particular item was present in the syllabi. For
instance, some team members were actually part of a course taught online and new from personal experience that quizzes were administered online. However, there was no indication of this within the syllabus, therefore the course could not be ‘credited’ with this element of technology integration. On the other hand, it was agreed that if technology use was addressed for an assignment or other aspect of the course that was not mandatory, the course was credited for that element of the checklist. An example of this can be illustrated by the tendency for some instructors to give student’s a list of possible project formats to meet project requirements, some of which required technology, some of which did not. Regardless of the level of mandate, the course was credited with using technology under *Processes & Products*.

**Essential conditions**

The second component of this study was concerned with gathering initial data from faculty regarding their use of technology in their administration of teacher preparation courses. A survey was initially developed based on a thorough literature review of course evaluation and technology integration of teacher preparation courses and programs. The items were constructed using the ten essential conditions defined by the ISTE NETS as the primary guidance. Though the ten essential conditions apply to all four profiles (general preparation, professional preparation, internship, first year of teaching), they vary in scope depending on the profile of interest (Table 2).

Survey items were developed to align with the ten essential conditions reflected in Profile Two. Team members developed items through a rather complex series of reviews and restructuring. Each essential condition, as addressed within Profile Two (see Table 2) was individually and uniquely addressed one at a time. Possible items were constructed independently by team members and then collectively reviewed. Items that were deemed appropriate for inclusion, at least regarding focus, were culled from the initial list for refinement and consistency of wording. Once team members were satisfied with the items, the items, as a whole, were further reviewed to ensure consistency and focus throughout the instrument.
Table 2.
ISTE NETS Profiles and Essential Conditions

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<tr>
<th></th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
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<tr>
<td><strong>Shared Vision</strong></td>
<td>University leader’s share a vision for technology use in all appropriate courses and content areas</td>
<td>The professional education administration and faculty share a vision for use of technology to support new modes of teaching/learning</td>
<td>University and cooperating school site personnel share a vision for technology use in the classroom.</td>
<td>Schools districts, and universities share a vision for supporting new teachers in their use of technology.</td>
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<td><strong>Access</strong></td>
<td>Access to current technologies, software, &amp; telecommunications networks is provided for all students and faculty both inside and outside the classroom</td>
<td>Current technologies, s/w, &amp; telecommunications are provided, including technology-enhanced classrooms that model environments facilitating collaborative learning.</td>
<td>Current technologies, s/w, &amp; telecommunications are provided for interns and their master teachers/mentors in the classroom work areas.</td>
<td>Current technologies, s/w, &amp; telecommunication networks is provided for new teachers for classroom and professional use, including access beyond the school day.</td>
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<td><strong>Skilled Educators</strong></td>
<td>Faculty teaching general education/ major courses are knowledgeable about and model appropriate use of technology in their disciplines</td>
<td>Teacher education faculty are skilled using systems and software appropriate to their subject area specialty and model effective use as part of the coursework.</td>
<td>Coordinating/supervising teachers and university supervisors model technology use the facilitates students’ meeting the ISTE NETS.</td>
<td>Peers and administrators are skilled users of technology for teaching and school management.</td>
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<td><strong>Professional Development</strong></td>
<td>Faculty and students have opportunities to develop technology skills. Rewards recognize use of technology in teaching, learning, and faculty collaboration.</td>
<td>Personnel in teacher education and field experience sites are provided with ongoing professional development.</td>
<td>Cooperating/master teachers and supervisors of interns are provided with professional development in applications of technology in teaching.</td>
<td>Faculty has continuous access to a variety of professional development opportunities in several delivery modes.</td>
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<td><strong>Technical Assistance</strong></td>
<td>Technical assistance is available for faculty to ensure consistent, reliable functioning of technology resources.</td>
<td>Technical assistance is available for students to ensure consistent, reliable functioning of technology resources.</td>
<td>In field-experience settings, technical assistance is onsite to ensure reliability of technology resources.</td>
<td>Technical assistance for is timely, onsite, and includes mentoring to enhance skills in managing classroom so resources.</td>
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<tr>
<td><strong>Content Standards &amp; Curriculum Resources</strong></td>
<td>Prospective teachers have knowledge in the subject area(s) they intend to teach.</td>
<td>Technology-based curriculum that address content standards and support teaching, learning, and productivity are available.</td>
<td>Technology-based curriculum resources meeting content standards in teaching areas and grade ranges are available to interns at the intern site.</td>
<td>The school district provides professional development opportunities related to policies, standards and the technology-based resources to support teachers’ efforts.</td>
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<td><strong>Student-centered Teaching</strong></td>
<td>University faculty incorporate student-centered approaches to learning (e.g., cooperative, and project-based learning.</td>
<td>Faculty/staff model student-centered approaches to instruction in education coursework and field experiences.</td>
<td>Opportunities to implement a variety of technology-enhanced, student-centered activities are provided for interns.</td>
<td>Faculty routinely use student-centered approaches to learning to facilitate student use of technology.</td>
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<tr>
<td><strong>Assessment</strong></td>
<td>Faculty/staff assess effectiveness of technology for learning to examine outcomes and inform decisions.</td>
<td>Faculty/staff model the integration of teaching and assessment to measure the effectiveness of technology supported teaching strategies.</td>
<td>Cooperating/master teachers work with interns to assess the effectiveness of student learning &amp; technology supporting learning.</td>
<td>The district/school site support the teacher in assessment of learning outcomes for technology-supported activities to inform decisions.</td>
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<tr>
<td><strong>Community Support</strong></td>
<td>Prospective teachers experience real-world technology use related to their general education and majors.</td>
<td>Candidates are provided opportunities to participate in field experiences at partner schools that model technology integration.</td>
<td>Interns teach at partner schools where technology integration is modeled and supported.</td>
<td>Schools provide beginning teachers with connections to the community and models of effective use of local and other resources.</td>
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<td><strong>Support Policies</strong></td>
<td>Faculty have resources to meet subject area needs. Rewards recognize application of technology in teaching, learning, and faculty collaboration.</td>
<td>Policies, e.g., accreditation, standards, and personnel decisions support technology integration. Rewards recognize innovative uses of technology by faculty.</td>
<td>Student teaching/internships are located at the sites where administrative policies support and reward the use of technology.</td>
<td>Induction-year policies, budgets, and mentoring assignments support use of technology. Hiring practices include policies regarding technology skills of prospective hires.</td>
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Student Evaluation

The third and final component of this study was the development of a framework for a comprehensive evaluation process for on-line courses. This evaluation process addresses the unique aspects of courses delivered on-line instead of in the more traditional face-to-face format. Triangulated methods were employed in this part of the study, gathering information from students at various stages of their participation in an online course. Three surveys were developed for administration at various and distinct stages of course delivery to gain a holistic and in-depth evaluation of online courses. Although development and parts of initial validation procedures were accomplished, actual data collection had to be delayed due to problems encountered beyond the control of the research team.

The initial phase of this study required a careful delineation of expectations of the evaluation as well as identification of appropriate domains for each step of data collection. Once the team had determined the general focus for each of the three surveys that would make up the assessment system, subgroups worked on development of the instruments. Once an initial version of each instrument was constructed, the entire team reviewed each for purpose, consistency of focus, wording and uniqueness. The instruments were then refined and finally sent for review by the instructors of six online courses for content, layout, comprehensiveness, applicability, etc.

The first survey, designed to be administered at the beginning of the semester, addresses student expectations and reasons for enrolling in an online course. The second survey, to be administered around the middle of the semester, focuses on the effectiveness of various components of the delivery of the online course. The third and final survey, for administration toward the conclusion of the course, will gather data regarding the students’ satisfaction with their online course experience.

Results and Further Study

This initial phase of the long-term study had two general outcomes. First, a framework to guide the assessment process was constructed. Second, results of initial steps in implementing this framework provided valuable information for ensuing phases.
Framework

The framework created to guide the development of a comprehensive evaluation/assessment system for technology use in teacher preparation programs consists of six components:

1. content analysis of current courses,
2. the ISTE essential conditions,
3. data collection matrix,
4. synthesis with other initiatives, e.g., PT3 National Grant,
5. relationship among assessment elements, and
6. mapping of goals, objectives, and profiles.

Of these six components, this study was able to begin addressing the first part of the framework using the second component to help guide data collection. This content analysis has been completed for a preliminary and baseline analysis but will be ongoing to identify potential trends, improvements and areas of concern.

The third part of the framework, the data collection matrix, was also initialized, focusing primarily on the second phase of the ISTE NETS profile (see Figure 1). Although this is a specific component of the ISTE NETS, it provides a glimpse of the broad spectrum of issues and concerns regarding technology use by teachers and the challenge of measuring the degree to which teachers are being prepared for the use and integration of technology in their classrooms. The research team attempted to identify appropriate and efficient means of data collection for each of the objectives cited in Profile Two of the ISTE NETS. In the figure, these are indicated by a ranking of (1) as the most appropriate or desirable to (3) as the least appropriate or desirable. Written and performance assessments as well as course products were often considered the best means of collecting data regarding degree of preparation for technology use and integration. Additional methods included observations, surveys and interviews. It is expected that a similar process of identification of data collection processes for profiles one, three and four is going to be even more complex and challenging as there is less consistency and availability of data for students and teachers during these three timeframes.
Figure 1. Profile Two of the ISTE NETS with rankings of appropriate data collection methods.

Preliminary steps with respect to the synthesis of this work and existing initiatives (fourth element of the framework) were taken through attendance at the 2003 Symposium on 21st Century Teaching Technologies and review of material from the
Preparing Tomorrow’s Teacher’s for Using Technology (PT3) grant initiative currently in place at the university. Additionally, members of this research team have begun work on another research project with a technology focus that extends beyond teacher preparation programs, namely the Innovations in Technology and Teaching (ITT) initiative. The collaboration between these two groups has provided valuable opportunities to employ the processes established with respect to our overarching framework. For example, this research team has used the content checklist for syllabi for courses developed under the ITT grant. As such, informative data were gathered regarding suggestions that might be made to faculty involved with teacher preparation programs regarding ways to enhance technology use in their courses.

The fifth and sixth elements of the framework are in the very early stages of development and implementation. As the team continues to move toward an enhanced understanding of processes and products needed for all four profiles under the ISTE NETS, relationships among assessment measures and the mapping of goals, objectives and profiles will gain clarity and focus.

The framework that we provide guides and informs the next steps needed in this research endeavor. Although it was developed based on current guidance and expectations of the field, it is inherent to recognize that education and technology alike are constantly evolving and changing. As such, this framework will serve as a guide at this stage of the research and should be used to guide further development and refinement not only of the development of the assessment system, but also the framework itself.

**Assessment Initiatives Implemented**

**Content Analysis**

Results from the content analysis of syllabi revealed a substantial degree of variability among courses regarding the extent of technology use in course delivery, as evidenced in course syllabi. To one extreme, 100% of the syllabi indicated some degree of *Electronic Communications* present in the syllabi, including email communications, student postings, etc. On the other extreme, only slightly more than half (55%) of the course syllabi contained evidence of using technology-based *Equipment and Facilities*, during the delivery of the course. This latter finding is an example of what is believed to
be an underrepresentation of technology integration through syllabi. Team members were aware of at least one course, and possibly more, that used and/or made available computer labs for students, which was not specified in the syllabi. Due to the low inference nature of this analysis, this course, and possibly others, could not be ‘credited’ with this element of technology integration. This phenomena is suspected to be present, in varying degrees, within the other five categories.

The number of indicators observed within each category also contained an interesting range of frequency across the syllabi. In approximately 77% of the syllabi reviewed, two or more indicators were present to support the category of Online Resources. The presence of two or more indicators for the remaining categories, in descending order, were: Course Administration (68%), Processes and Products (65%), Electronic Communications (40%), Equipment and Facilities (18%) and Delivery Vehicle (5%). The interpretation of these varying levels of number of indicators should be done with caution. The nature of the different categories must be taken into consideration. For example, one would not typically expect more than one indicator to be noted within the category Delivery Vehicle. Conversely, it would seem to be desirable to have more multiple indicators on a subscale such as Online Resources. For more specific results, see Rendina-Gobioff, Ducher, and Hess (2003).

While not surprising, these findings will not only help guide subsequent phases of this assessment process, but provide the basis for recommendations for the College of Education regarding documentation of technology use by faculty in their courses. It is quite possible that as the integration of technology continues to mature, syllabi have not been updated frequently enough to reflect the use and integration of technology in teacher preparation courses. Conversely, results of this research may help guide and inform faculty of elements of their instruction and course conduct that could benefit from more uses of technology in their classes.

*Essential Conditions*

The development of a survey for faculty regarding the ISTE NETS ten essential conditions focused on identification of appropriate domains to be reflected as well as initial content validation procedures. The resulting instrument addressed all ten domains of the ISTE Essential Conditions for Profile Two (see Table 2 and Figure 1).
Scales for the different domains were consistent over nine of the ten, although the domain *Skilled Educators* required a unique scale due to the nature of the questions. The scale for this domain used a six-point scale intended to reflect an instructor’s awareness and use of specific types of technology, e.g., specialized software. The resulting scale ranges from (1) *I’m unaware of this technology* to (6) *I regularly use this technology in new and innovative ways*. The other nine domains, *Shared Vision, Access, Professional Development, Technical Assistance, Content Standards and Curriculum Resources, Student Centered Teaching, Assessment, Community Support,* and *Support Policies* used a five point scale to measure prevalence, or frequency of specific issues within each domain, ranging from (1) *Never* to (5) *Almost Always.* In addition, a *Don’t Know* option was included.

Once the items and scales had been finalized, the survey was then formatted and adapted for online administration using guidelines identified by Carey, Dailey, & White (2001) and Dillman (2000) with some minor exception (see Lang, Hogarty, Helmick, Phan, Ducher, Reninda-Gobioff, 2003 for details). The use of Dreamweaver MX permitted the flexibility necessary to ensure that the survey will be easy to use by respondents. Features such as drop down boxes, radios buttons and text boxes were used, depending on the question, to gather data. Specifically, radio buttons are used when asking questions for the five and six point scales employed under the ten domains of interest, dropdown menus are considered to be an efficient means of collecting demographic data, e.g., department, academic rank, and text boxes are employed to allow respondents a free response capability for comments, concerns, or other information they deem important.

Faculty members have been identified for further content review and pilot testing. These faculty span the disciplines found in the teacher preparation common core coursework to maximize content validity. Feedback on wording, topics, and content will be solicited and used for further instrument refinement prior to full implementation.

*Online Student Evaluation*

The third and final evaluation initiative undertaken at this point of the research was the development of a comprehensive and inclusive system for evaluating online courses. The result of this process is a three-pronged approach to gathering data from
students of online courses. The research team, working collaboratively with another research team involved with evaluation of a federal award, the Innovations in Teaching and Technology, developed domains and items for each of the three instruments. Initially, five domains were identified based on an extensive literature review and then further collapsed into three after extensive review and mapping of items to domains by the research team (see Smith, Helmick, Kromrey, Carey, Lang, Ducher, et al., 2003 for further details). The three resulting domains were identified as: (1) Course Delivery, (2) System, and (3) Design. Additionally, a fourth domain was added for the purposes of overall evaluation, (4) Satisfaction. Depending on the nature of the items and the domain, response scales varied from ‘yes/no’ to likert-type scales, to open response items. A more thorough discussion of these scales and examples can be found in Smith, et al. (2003)

Once the items and scales had been reviewed and refined by the research team, each of the instruments were reviewed by six faculty members currently involved in online courses as instructors. These faculty members represented not only the College of Education but also the College of Public Health and the College of Arts and Sciences. Their input guided further refinement and adjustments to the instruments. For example, one of the instructors suggested, adding an item asking students about the source and processes needed to acquire materials necessary for the course, e.g., did they buy books in person at the school bookstore or online. Table 3 contains a summary of the instruments that were developed as a result of this process.

Table 3.
Description of Student Surveys for Online Courses

<table>
<thead>
<tr>
<th>Survey</th>
<th>Purpose of the Survey</th>
<th>Expected Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning of Term</td>
<td>To gather data on the reasons students choose to take an online course</td>
<td>Within the first two weeks of the semester</td>
</tr>
<tr>
<td>Middle of Term</td>
<td>To gather data on students’ perceptions of the useability and effectiveness of elements of the online course (e.g., navigation, online resources, etc.)</td>
<td>At approximately the mid-semester point</td>
</tr>
<tr>
<td>End of Term</td>
<td>To gather data regarding student satisfaction with the course. This survey is somewhat analogous to the typical end-of-course survey administered to in-class students</td>
<td>Within the last two weeks of the semester</td>
</tr>
</tbody>
</table>
Further Study

These three initial evaluation and assessment efforts lay the groundwork for a wealth of opportunities for future research. All the steps taken thus far only address or can be used in support of the second profile in the ISTE NETS, that of Professional Preparation of future teachers. The other three profiles need to be more fully addressed. The challenge of determining the appropriate data as well as identifying effective and efficient means of gathering such data is expected to be quite a challenge. The first profile, occurring at the conclusion of a student’s general preparation, provides obstacles regarding the myriad of venues that students may acquire their general preparation requirements. The third and fourth profiles, internship and conclusion of first year of professional teaching, are both focused on students’ field-work, either as an intern or teacher. As such, logistic issues (geographic distance, access, etc.) as well as inconsistencies in individual schools (e.g., differences in technology available, school/grade level, instructional content area) provide great challenges in constructing and implementing an effective and efficient means of assessing how adequately the teacher was prepared for integrating and using technology in his or her classroom.

Additionally, even within the single profile for which an evaluation/assessment system has begun, there is much to be done. The development and initial validation of instruments for students and faculty has been accomplished; however much more needs to be accomplished through piloting and field-testing these instruments. The content analysis is ongoing and is expected to continue to be an element of study as, hopefully, faculty are informed of these findings and either 1) make adjustments to their syllabi to better reflect technology use that is currently a part of their instruction and course, or 2) enhance their use and integration of technology both in their instruction and student performance demonstrations.

The immediate future contains online administration of the four surveys developed thus far (one for faculty in teacher preparation courses and three for students of online courses). The essential conditions survey is anticipated to be administered during the latter part of the fall 2003 semester, whereas the three student surveys will be administered during the spring semester of 2004. Data will be used to provide initial
Technology Integration Assessment System

feedback to instructors, although the primary objective will be to gather data to conduct an analysis of the psychometric properties of the instruments in order to inform and guide further refinement of the courses.

Limitations

An irony of this research is that much of the planned and anticipated data collection was delayed as a result of technology issues. Although somewhat frustrating, it is a reality that must be acknowledged. As technology continues to become a more integral part of the education realm, our dependence on it also continues to grow. This dependence, whether from a researcher’s perspective, an instructor’s perspective or a student’s perspective can be problematic and even detrimental to goal accomplishment. The wide variety of technology, such as different platforms (e.g., MacIntosh vs. PC), different software with similar objectives (e.g., FrontPage vs. Dream Weaver), different delivery vehicles (e.g., WWW direct vs. BlackBoard vs. WebCT), different internet access venues (e.g., Explorer vs. Netscape), all add to the complexity of effective and efficient use of technology. This complexity is likely to increase, not decrease, and as a result, more challenges and issues will arise associated with technology use.

Except the logistical issues confronted during this research, there were few limitations or problems encountered at this stage of the study. It is anticipated that limitations will be prevalent as subsequent stages of this research are conducted, especially concerning gaining data from interns and teachers in the field.

Conclusions

These preliminary steps into the development of an evaluation and assessment system for gauging the breadth, depth, and effectiveness of technology use and integration for teacher candidates was quite revealing, both in the information that could be gained as well as that which was not obvious. It is believed that there is a greater prevalence of technology use in teacher preparation courses than was evident in the initial syllabi analysis. This belief is based on anecdotal knowledge of the research team that was not brought out in the data. As such, clear recommendations may be made to faculty and administrators regarding appropriate information, both in clarity and specificity, that should be in documents such as syllabi. The technology difficulties experienced by the research team also hint at what issues enhanced inclusion of
technology in classes might result from this changing nature of instruction. This is a vital element that should not be glossed over. In a way, it is beneficial if at least some problems with technology emerge during a teacher candidate’s training as it will provide him or her with some experience with how to resolve such issues in the field, should they occur.

We are experiencing, by all indications, an almost historical shift in the way we approach instruction, at all levels. It is critical that teacher preparation programs address the use of technology, as a tool and as a product, effectively in order to allow new teachers to enter their classrooms with up-to-date tools and methods. As such, appropriate and exhaustive methods and tools are needed to assess how well this is being accomplished. The results of this initial research on developing such a system substantiate the complexity of the issue, which further underscores the need.

References


Author Note

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Appendix A
Use of Technology in
Common Teacher Preparation Courses

Course#: Title: Instructor:
Specific software:
____________________________________________________________________

<table>
<thead>
<tr>
<th>Electronic Communications</th>
<th>Online Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>____ email</td>
<td>____ syllabi</td>
</tr>
<tr>
<td>____ chat</td>
<td>____ class notes</td>
</tr>
<tr>
<td>____ student postings</td>
<td>____ readings</td>
</tr>
<tr>
<td>____ instructor posting</td>
<td>____ websites</td>
</tr>
<tr>
<td>(i.e., announcements)</td>
<td></td>
</tr>
<tr>
<td>____ other:</td>
<td></td>
</tr>
<tr>
<td>__________________________</td>
<td>__________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Delivery Vehicle</th>
<th>Processes &amp; Products (student creates or interacts with technology)</th>
</tr>
</thead>
<tbody>
<tr>
<td>____ WebCt</td>
<td>____ projects/presentations</td>
</tr>
<tr>
<td>____ Blackboard</td>
<td>____ (e.g.)</td>
</tr>
<tr>
<td>____ WWW</td>
<td>____ homework</td>
</tr>
<tr>
<td>____ teleconferencing</td>
<td>____ (e.g.)</td>
</tr>
<tr>
<td>____ other</td>
<td>____ exams/quizzes</td>
</tr>
<tr>
<td>____ don’t know (can’t</td>
<td>____ web searches</td>
</tr>
<tr>
<td>tell)</td>
<td>____ audio/video</td>
</tr>
<tr>
<td>__________________________</td>
<td>__________________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Administration</th>
<th>Equipment &amp; Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>____ prerequisites</td>
<td>____ computers (explicit use in classroom)</td>
</tr>
<tr>
<td>____ objectives/expectations</td>
<td></td>
</tr>
<tr>
<td>____ online instruction</td>
<td>____ labs</td>
</tr>
<tr>
<td>(content; new knowledge)</td>
<td>____ smart system</td>
</tr>
<tr>
<td>____ assignments (i.e.,</td>
<td>____ video/audio</td>
</tr>
<tr>
<td>online submission)</td>
<td>____ TV</td>
</tr>
<tr>
<td>____ grades</td>
<td>____ other:</td>
</tr>
<tr>
<td>____ other:</td>
<td>____________________________</td>
</tr>
</tbody>
</table>

Additional Notes:

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