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Adapting the 2008 NETS-T Standards for Use in Teacher Education: Part II

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A problem with many statements of standards, including the ISTE NETS technology standards for teachers, is that they are analytic and attempt to be much more prescriptive and specific than is meaningful when dealing with professional practice. One option is to take a holistic and integrated approach that emphasizes qualitative differences across levels of practice. Further, the use of holistic instead of analytic rubrics to measure the achievement of standards is more helpful in pre-service teacher education programs because it helps teacher educators plan the type and level of technology experiences pre-service teachers need and also respects the diversity and uniqueness of each program. This paper outlines a plan of teacher education program development and ongoing evaluation that begins with an "audit" of current practices and moves through several stages including the development of holistic rubrics and portfolio-based evaluation systems, and the creation of a supportive infrastructure.

Keywords: educational technology, teacher education, technology integration, analytic rubrics, holistic rubrics, program evaluation, portfolio-based evaluation system, ISTE, NETS, NETS-T

In a recent article in this journal (Willis, 2012) I began an exploration of the new National Educational Technology Standards for Teachers (NETS-T) and the implications they have for teacher education. The NETS-T standards (ISTE, 2008) are the result of the broadest and most intensive effort thus far to develop a useful set of guidelines that specify what skills, knowledge, and dispositions a practicing teacher should have with regard to educational technology. This in itself is very important, but another reason the NETS-T standards are important is because they are part of the national accreditation process for teacher education programs. The International Society for Technology in Education (ISTE) developed the National Educational Technology Standards (NETS) for teachers, students, and administrators, and ISTE is one of the "specialized professional associations" (SPAs) that are part of the National Council for the Accreditation of Teacher Education (NCATE) system for accrediting teacher education programs in the US. The "ISTE Standards" for teachers, which are also called NETS-T, are what teacher

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education programs look to when collecting data and developing the "SPA" report for NCATE on how they prepare teachers to use technology. In a previous paper (Willis, 2012) I discussed the newest version of NETS-T, noted that some of its characteristics make it difficult to use in teacher education, and suggested some modifications. For example, the new NETS-T standards and rubrics are written to provide details on what practicing teachers should be doing in their classrooms and schools. To be most meaningful to teacher education, they must, therefore, be converted to standards and expectations for preservice teachers. This is not easy because of the nature of the NETS-T rubrics. They are analytic rubrics which mean the criteria for rating a teacher as being within the Beginning, Developing, Proficient, or Transformative level vary in terms type of behavior across the levels. This is a problem because a teacher being rated can actually exhibit several different types of behavior that represent different levels – from Beginning to Transformative.

A COMPREHENSIVE SOLUTION: AN INTEGRATED APPROACH TO TECHNOLOGY STANDARDS

Previously (Willis, 2012), I suggested that some of the problems teacher educators have with the NETS-T standards could be addressed by using holistic instead of analytic rubrics to assess pre-service teacher performance on the ISTE standards. Holistic rubrics use qualitative differences to assess performance across levels. The behavior being assessed is the same whether the rating is Beginning, Developing, Proficient, or Transformative. What determines the level is the quality of that behavior.

Use of holistic rubrics may solve some problems, but leaves others untouched. Like analytic rubrics, holistic rubrics also focus on the performance of individual students (McGatha & Darcy, 2010). This approach can provide detailed information about the status of student performance relative to specific standards, but in teacher education any assessment procedure should tell us more than that. It should help us identify where and how students are learning to use educational and information technologies in classrooms and in their professional practice. Assessment should help identify areas of the teacher education curriculum that are not working as expected, areas that can be exemplars for other parts of the program, and areas where changes in teaching methods, content, or assessment methods are needed. Using holistic rubrics is not a particularly strong way of accomplishing these additional goals. For example, both the analytic rubrics proposed by ISTE (2008), and my own suggestions about holistic rubrics, focus on the outcomes rather than the process. Teacher educators also need information on the different processes in their programs. They need to know what is working, what isn't, and ways to enhance the readiness of teacher education students to use educational technology (ET) and instructional technology (IT) in sophisticated and appropriate ways when they graduate.

This broader set of needs calls for information about two additional areas:

1. The program's teaching and learning experiences relevant to the preparation of students to use ET/IT.
2. The goals and objectives for those teaching and learning experiences.

One resource I have relied on in developing this paper is the work my colleagues and I at the University of Houston did for the Congressional Office of Technology Assessment when it produced the 1995 report, *Teachers and technology: Making the connection.* For example, programs need to know more than whether technology was covered in a particular learning experience. They need to know how technology was addressed. In the University of Houston research we used a four level categorical scheme to get at that question:

Advocate a particular use or approach.
Model a particular use or approach so students see how you do it.
Teach students how to implement a particular use or approach.
Facilitate/Mentor students' IT/ET use in simulated or real teaching.

These are four very general approaches, but they are different enough to be useful in categorizing ways of helping pre-service teachers become proficient users of ET and IT. Each of these approaches are often associated with a particular group of teaching methods (see Figure 1).

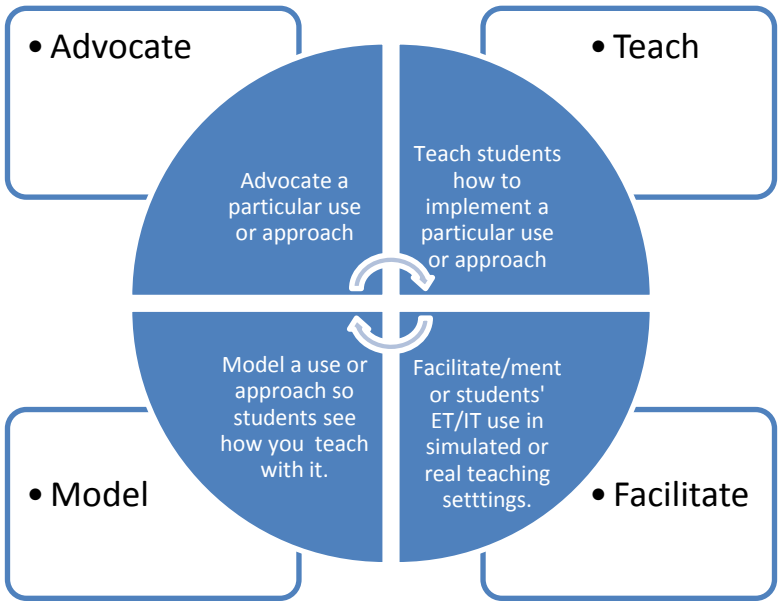

Figure 1. Four approaches to technology integration in teacher education and common methods associated with each of them.

When applied to a performance indicator in the NETS-T standards like *4d: Develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital-age communication and collaboration tools,* it becomes clearer how this indicator might be addressed in courses and field experiences. The paragraphs that follow illustrate how the four general ways of addressing technology integration listed above might support 4d. Note, however, that what follows are not criteria nor are they intended to be general examples to be followed. They are examples of what might be recorded in an audit of a program's current efforts to prepare technology-savvy teachers. Every program's audit would be different, but the audit would provide very useful data for evaluating current practices and considering potential changes and revisions.

Advocate: In ED 201 students are encouraged to use collaborative software and a set of recommended web sites to communicate with teacher education students in other countries. Evaluation: No formal evaluation.

Model: In ED 345 students participate in a video conference with a professor in Venezuela who is a specialist in the global issues of education and who collaborates on research and writing projects with the Ed 345 instructor. Evaluation: Students write a

reflective paper on how they would deal with global issues in their own classrooms and how they might use the video conferencing software used in the course.

Teach: In ED 261 students are taught to use Moodle and Sakai for synchronous and asynchronous video and audio conferencing as well as collaboration, and they explore several of the global education and multicultural education sites for teachers. Evaluation: Students demonstrate their ability to use video and audio conferencing and collaborative software, and they collaboratively develop a lesson on either global awareness or multicultural education with teacher education students in two other countries.

Facilitate/Mentor: In ED 261 the instructor works with students as they establish an online relationship with students in other countries. In ED 235, 422, and 333, the instructor mentors students as they participate in local and international discussion forums dedicated to the topics of the courses. Evaluation: Using rubrics students are graded on their participation in the forums for both quality and extent of involvement and technical proficiency. Students also write a reflective paper on their experiences and how they might continue them after graduation

These paragraphs show how and where a performance indicator for an NCATE report on technology use might be addressed in a teacher education program. Note that, as you would expect, some learning experiences use more than one general pedagogy and therefore could be mentioned more than once. The information from each program would, of course, be different but such data can provide planners with a clear indication of where and how each of the 20 ISTE/NETS-T performance indicators is addressed. Keep in mind, however, that the assessment system should include performance indicators developed by the program, and also make provisions for, as well as encourage, students to document their professional use of ET/IT even if it does not fit a pre-existing performance indicator.

Figure 2. Four progressively more complex levels of objectives for technology integration experiences.

The *where and how* data, which was illustrated in the samples above, needs to be combined with another type of information: the goals and objectives for each of the planned experiences. Figure 2 illustrates four general levels of potential objectives.

These are a combination of cognitive and professional practice objectives, which is appropriate given that teacher education programs have both academic and professional goals. However, it would not be difficult to add other types, such as attitudinal objectives, to the list.

Most of the types of objectives in Figure 2 are self-explanatory. *Awareness* and *knowledge* refer to the bottom levels of Bloom's Taxonomy of Cognitive Objectives while Higher Order Thinking Skills or HOTS refers to the upper levels of that taxonomy as well as problem solving, innovation, and creativity. The third level is the first of two levels of "professional practice" objectives. All of these objectives are related to skilled performance of professional practices that are essential to successful practice of the profession of teaching. At the level of Professional Practice, three more specific objectives come to mind. *Design* involves the creation of resources, materials, and plans for teaching and learning. *Simulated practice* involves work such as creating lesson plans for a course and teaching a lesson to other teacher education students in a course. *Collaborative practice* is class work or field work done by groups of students. For example, a small group of teacher education students might collaboratively develop and teach a lesson to PK-12 children. *Independent practice* calls for the teacher education student to perform professional practices substantially as they would as a teacher (but with observation and mentoring to help the student improve performance). Professional practice experiences help students develop the practical and tacit skills and knowledge that come primarily from guided and mentored professional practice rather than through the academic study of theories and concepts. The three practice levels help students learn to "do" teaching and "be" teachers.

The top or highest level, *Advanced Expertise* is different from the others. It includes *Metacognition* and *Professional Development.* *Metacognitive* objectives relate to enhancing the teacher education student's ability to develop what are sometimes called "executive control functions" that people use to guide and manage their own learning and professional practice. I include reflective practice in this general category of metacognitive objectives but there are many forms of metacognitive development. Finally, *Professional Development* objectives are about supporting and encouraging a teacher education student's inclinations and skills to enhance their professional growth and development across their careers. Both metacognitive and professional development skills are needed if teachers are to go beyond what they have been taught and to grow and develop as independent professionals. The general term for this level, *Advanced Expertise,* has two meanings. It signifies both the goal of learning advanced teaching skills and the need to develop the advanced skills teachers need to manage their own professional development

CREATING A SENSIBLE PLAN FOR INTEGRATING NETS FOR TEACHERS INTO TEACHER EDUCATION

I recently learned about a professor of education who, upon learning that the institution where he taught had decided to apply for NCATE accreditation, elected to resign. He resigned after it became clear he would be required to participate in the process. Americans in general, and perhaps academics in particular, are an independent lot, and many do not accept new regulations or requirements readily. Resigning when faced with the requirement to participate in an NCATE self-study seems to be a very extreme instance of that independent streak, and I do not see it as a particularly promising approach. Over the past twenty or so years, assessment and accountability has become an increasing part of the landscape of higher education. Professional fields like teacher education have been on the forefront of this change while some fields, especially in the

arts and sciences, still do not have disciplinary assessment procedures. That, however, is changing rapidly, and degree programs that are not subject to the rigors of an NCATE-style assessment seem to be fewer each year.

An all too common faculty approach to both regional accreditation and discipline-specific accreditation requirements is to treat them as annoyances that are best dealt with as efficient as possible and with as little disruption to normal routine as can be managed. The professor who resigned rather than participate in the NCATE process was agreeable to this approach but not to a serious engagement in the process.

The approach described in this section does require serious engagement of both individual faculty and the teacher education organization as a whole. While the discussion focuses on educational and instructional technology in teacher education, the basic principles also apply to the complete NCATE process. Meeting the technical requirements of NCATE for continuing accreditation is a secondary goal of the proposed plan; the primary goal is to design an evaluation and assessment system that can be integrated into the routine of a teacher education program and produce useful information that makes a strong contribution to improving the quality of the institution's teacher education programs.

The suggested plan has three, integrated components which are illustrated in Figure 3. Those components are a technology audit, an assessment system built on holistic rubrics and portfolios, and an organizational support structure that facilitates integration of the process into the routines of the teacher education institution.

Most contemporary teacher education programs of any size teach about and use technology in many nooks and crannies of the program, but few, if any, are completely aware of the breadth and scope of technology integration, nor are they aware of whether the different pieces come together to make a coherent whole. For that reason an audit is often the place to start.

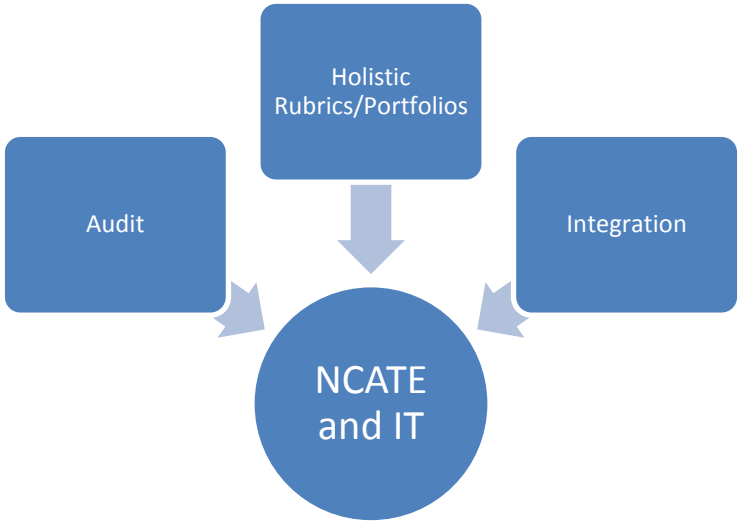

Figure 3. Three components of an integrated approach.

BEGIN WITH AN AUDIT OF CURRENT PRACTICES

Teacher education programs are complex but loosely interconnected structures that address the many aspects of becoming a professional educator. This is perhaps as it should be because teaching is itself a complex profession that requires its practitioners to make decisions about many types of loosely interconnected practices that constitute

teaching. Teaching is not a clean cut, well-structured profession and it should not be a surprise that the programs that prepare teachers are not always clean cut and well-structured. Even when they appear to be so on paper, they are rarely so in practice.

I should acknowledge at this point that the position stated so confidently in the previous paragraph is not universally accepted within the field of teacher education. There exists in the field two contrary trends, one based on the idea that teaching is a technical-rational profession that should be guided by the empirical research relevant to education. Valli (1992) described the technical-rational approach (which she calls the "professional standards model") this way:

> The vision of good teaching found in the professional standards model is more clear-cut and prescriptive. Good teachers apply special knowledge and engage in practices widely agreed upon. Using prescribed knowledge, not personal judgment, is the key to successful teaching. This model is commonly referred to as technical rationality, the goal of which is to ensure that teachers conform to acceptable patterns of behavior. (p. xv)

This approach, called *technical rational* or *standards based* or "evidence based," treats good teaching as applying the relatively universal implications of research to day-to-day professional work. It is called technical rational because it calls on teachers to master a set of technical actions that are judged to be “correct” practice for the well defined tasks of teaching. Valli describes an alternative view of the teaching profession, *reflective practice*, this way:

> While most typologists distinguish four or five conceptions of good teaching and teacher education, Kennedy (1989) offers just two: the reflective practitioner model and the professional standards model. In her schema, reflective practitioners have a thoughtful, contextualized sense of teaching and must ultimately make their own choices about preferred goals and practices. They construct working knowledge out of various frames of reference and alternative viewpoints. This ambiguous working knowledge, which favors personal experience but also includes theory, research, values, and beliefs, is used to critically analyze and continually improve teaching, (p. xv)

The literature is filled with discussions of these two and related visions of teaching and teacher education (e.g. constructivist teaching and teacher education), and in my reading of that literature I see the core of the difference as what we rely on for professional practice guidelines. Technical-rationality is based on the assumption that the implications of empirical research can be considered universal laws or rules that are robust enough to direct and control professional practice. Reflective practice theory, while it acknowledges the importance of theory and research, argues that the context of practice is a crucial component in determining what is "good" practice. You cannot simply apply the implications of research without considering the context in which a professional decision will be made. That means a deep and intimate knowledge of the context, reflectively considered and analyzed, is a crucial aspect of professional decision making in teaching. The approach to NCATE assessment of technology integration described in this paper is based on the assumption that the technical-rational approach to teacher education is a limited and insufficient perspective. Instead, a fundamental assumption is that teaching is a complex, constructively developed, and contextually practiced professor. That is one reason why portfolios are part of the assessment plan. For an interesting discussion of the impact these of contextual meaning and reflective

practice have on how portfolios are used in teacher education (see Tillema & Smith, 2007).

In a related paper, Smith & Tillema (2007) expanded their discussion of the criteria for assessing teaching portfolios with an emphasis on summative assessment. They criticized the use of explicit standards and criteria because while they do provide detailed specifications for students and assessors they also "narrow the range of permissible exemplifications of teaching activity" (p. 105). They also noted that while the processes used in "summative assessment of portfolios . . . presupposes the existence of a common core of standards on teaching knowledge and skills in order to determine the criteria against which they can be documented and appraised in the portfolio" (p. 105), "there is no consensus about the core teaching knowledge, …. which makes it impossible to introduce a prototype portfolio for professional development and for summative assessment purposes" (p. 106). Smith & Tillema go on to make many other criticisms of standards-based summative assessment of portfolios (e.g., "Standards may lead to a narrow interpretation of teaching . . ., and teachers are discouraged from documenting their own initiatives and creativity in the portfolio if these do not align with the explicit standards" (p. 106), and "Most portfolio frameworks put emphasis on the performance aspects of teaching and do not ensure documentation of underlying understanding based on solid theoretical knowledge of the more technical aspects of the profession. The balance between theory and practice has, as a result of the quest for standards, ended up placing too much weight on performance" (p. 106), and, "Elimination of differences in the way teaching is represented is reductionist.... Teaching is contextual and what is considered "good" teaching in one setting is not necessarily the best approach in a different setting. Teachers differ in personalities, strengths and weaknesses and a portfolio framework which does not allow for differences constrains teachers' professional development if the portfolio entries are compiled in accordance with the explicit standards to ensure positive assessment" (p. 106-107). Both the papers by Smith and Tillema, who are teacher educators in Israel, Norway, and The Netherlands, are excellent sources of theory and concepts that run counter to the dominant technical-rational approach in the United States. Their criticisms and suggestions are very relevant to anyone developing a plan for tracking teacher education's efforts to prepare technology using educators.

NETS for Teachers is admittedly an expression of the technical-rational, standards-based view of teaching, but the suggestions I offer in this paper are based an alternative foundation, which is variously known as reflective practice, constructivist teaching and learning, or narrative pedagogy. Both ISTE's standards and the general approach of the major accrediting agency (NCATE) for teacher education involve evaluating teacher education programs on the basis of how well they conform to standards created by accrediting agencies (Burton, 2007). There are other approaches. For example, the less well known Teacher Education Accrediting Council (TEAC), requires programs to develop their own standards and then demonstrate they are meeting those standards (Burton, 2007). The TEAC approach, which has considerable appeal to me and to other teacher educators who do not find the technical-rational approach defensible, remains a minority viewpoint, especially among policy makers. The ongoing merger of TEAC and NCATE will, hopefully, bring more flexibility to the traditional NCATE process and in doing so make even more room for assessment approaches like the one discussed here.

How to Do an Audit of ET/IT Integration into a Teacher Education Program

Very small teacher education programs may not need a formal audit to develop a full understanding of the ways and means of preparing students to become technology-using

teachers. However, even a moderately sized program with several specializations will probably be sufficiently complex, and involve enough tenure track faculty, adjunct instructors, and collaborating practitioners, to make an audit of current practices worthwhile because it provides participants in the program with a more informed view of how ET and IT are covered.

Michael Apple (2005), a major critical theorist who has focused on the roles technology plays in education, has been critical of audits in teacher education. In his paper titled "Education, markets, and an audit culture" Apple views audits as another method of oppression from neo-conservative forces attempting to control American education. However, Apple sees audits of current practices as part of a wider effort to marketize education that has both neo-conservative and neo-liberal foundations. He questions the value of "the constant production of evidence that you are doing things 'efficiently' and in the 'correct' way by examining the effects on the ground of the suturing together of the seemingly contradictory tendencies of neo-liberal and neo-conservative discourses and practices" (p. 14). He uses the term "audit culture" to describe this tendency and he views the consequences as highly undesirable.

"The ultimate result of an auditing culture of this kind is not the promised de-centralization that plays such a significant role rhetorically in most neo-liberal self-understandings, but what seems to be a massive re-centralisation and what is best seen as a process of de-democratisation. Making the state more 'business friendly' and importing business models directly into the core functions of the state such as hospitals and education - in combination with a rigorous and unforgiving ideology of individual accountability - these are the hallmarks of life today" (p. 15). Apple identifies specific consequences of the audit culture: "the growth of for-profit ventures such as Edison Schools," "increasing standardization and technisation of content with teacher education programmes so that social reflexivity and critical understanding are nearly evacuated from courses," and "the constant pressure to 'perform' according to imposed and often reductive standards in our institutions of higher education" (p. 15).

Apple also notes that those who resist the audit culture and other efforts to impose ideological conformity on education are often branded as "recalcitrant and selfish and as uncaring" (and even "terrorists" by former Education Secretary Rod Page). However, in spite of the pessimistic tone of Apple's paper, he remains optimistic that teacher educators can successfully deal with these pressures and advance the cause of a decentralized and democratic approach to program development and assessment. A first step is to acknowledge that there is support for the anti-democratic and centralized control movements within education:

> It is important to realise that a good deal of the current emphasis on audits and more rigorous forms of accountability, on tighter control, and a vision that' competition will lead to greater efficiency is not totally reducible to the needs of neo-liberals and neo-conservatives. Rather, part of the pressure for these policies comes from educational managers and bureaucratic officers who fully believe that such control is warranted and 'good'. Not only do these forms of control have an extremely long history in education,.., but tighter control, high-stakes testing^ and (reductive) accountability methods provide more dynamic roles for such managers (p. 20).

According to Apple, we must recognize that discipline-specific accrediting agencies such as NCATE, the regional agencies such as Middle States, and collaborating groups like ISTE, now have an institutional stake in implementing and institutionalizing the procedures Apple finds objectionable. However, in the last part of his paper Apple offers

some general suggestions for responding effectively to the pressures from neoconservative and neoliberal management advocates as well as proponents within education and teacher education. He also offered more specific guidelines in the book *Democratic Schools* (Apple and Beane, 2007).

While I do not agree completely with Apple's perspective on American education and the problems of an "audit culture," I do find his concerns and his suggestions worthy of consideration, and they form part of the basis for my suggestions here. The technology audit described below can be a democratically-based effort to bring control and decision-making to the teachers and students in a program while, at the same time, meeting the demands for demonstrating that centrally-planned standards are being met.

A FRAMEWORK FOR AN AUDIT

The term audit generally brings to mind people counting items on shelves in a store or in the warehouse of a large corporation. It is boring, tedious, and, thankfully, only occasionally necessary. In education, some may think of a "technology audit" in the same way – counting the number of computers, printers, and other equipment currently available, and noting their location. The title of Larry Anderson's (2004) manual on technology audits, *Technology Audit Survivor's Guide,* suggests that boring, tedious toil will indeed be involved. However, as you read the guide it quickly becomes clear that taking an inventory of the number of dusty Apple II computers stored in a basement corner is hardly the focus of a technology inventory. Anderson's guide, which was written for K-12 education, identifies many different elements of the technology integration process and discusses how they can be audited. Those elements include the district technology plan, facilities, impact assessment, professional development, the roles and responsibilities of different staff, equipment resources, and much, much more. Anderson proposes several types of audits that vary in scope and intensity, but all of them are relatively comprehensive and give a school district much data to use in making future plans.

The technology audit proposed here is more modest and more focused than the technology audits described by Anderson (2004). To support the NCATE accrediting process and provide useful information for improving and enhancing the quality of the technology integration in teacher education programs, two related aspects of the program should be audited:

- An audit of the teaching activities that focus on IT and/or ET.
- An audit of the purposes of the activities inventoried, organized by level and type of objective.

While the specific format of the audit would vary from program to program, the basic data gathered would be similar across programs (see Table 1). My advice would be to treat the data on technology integration as qualitative rather than quantitative. Thus, while a particular experience might be "coded" as an instance of modeling on the part of the instructor that lasts less than an hour and is focused on awareness and knowledge level objectives, the coding should be based on a text description of the experience that is detailed enough to be understood by teacher educators who are not personally familiar with it. The data for an audit based on this model could be collected through requests for written information for instructors, via interviews, and through surveys of instructors and program chairs. When the data set is collected and organized, it should probably be integrated into a relational database that is sufficiently flexible to generate a wide range of reports -such as "experiences where the instructor models, teaches, or facilitates/mentors student activities to accomplish Simulated, Collaborative, and

Independent practice objectives" or "all activities with Advanced Expertise objectives (Metacognitive and Professional Development)."

Table 1. *Information Needed About Each Technology Experience.*

Type of Approach	Level of Objective	Duration/Intensity	Evaluation
Advocate	Awareness & Knowledge	Brief*	Portfolio
Model	Higher Order Thinking Skills	Less than a hour	Portfolio
Teach	Professional Practice	1-3 hours	Portfolio
Facilitate	Advanced Expertise	4-10 hours	Portfolio
		_____ Specify Hours	

* Brief experiences might be dropped from consideration so that the focus is on more involved experiences that are more likely to have an impact.

Beginning with what a program is already doing makes sense for several reasons. It establishes what faculty judge important enough to include in the program at a particular point in time. It can also highlight areas of focus that distinguish the program - such as extensive coverage of emerging pedagogies like digital storytelling or widespread use of collaborative tools. An audit also helps you see the range of objectives covered. Do most of the activities in the program focus on basic Awareness and Knowledge objectives while few cover Professional Practice or Advanced Expertise objectives? Is that appropriate? If the program decides this is not appropriate, the audit provides background information that will be useful in deciding how to include more experiences with higher level objectives. Finally, an audit gives you a global view of what the program is doing relative to ET/IT.

The end result of an audit should be a database and a set of reports from that database that provide multiple views of what ET/IT related activities and experiences are currently in the program, where those activities occur, the context, and their objectives. At either this point, or in the next phase, programs should also collect information on how student work on experiences is evaluated.

Although this general framework can be easily adapted to local needs and contexts, there are a number of important questions that need to be addressed early in the process.

How Do You Deal With Different Teacher Education Programs and Certifications?

Should a separate technology audit be done on each certification and licensure program? Or should one audit and one report cover all programs? The answer to this question probably depends on the structure of the program(s) being audited. If a school, department, or college (SDC) of education has five or six different certification programs but all of them participate in a large general core, a single audit probably makes sense with some provision for separating experiences associated with only one program such as special education or language arts or music education. On the other hand, when the SDC of education is very large with many programs or there is very little overlap between the programs, the situation probably calls for different audits of each program. However, because of the vast differences in how teacher education programs are structured from one institution to another, the answer to this question depends heavily on the local context.

Who Should Lead the Audit?

A technology committee is a likely agent that should be responsible for the audit. In some cases that will also mean the committee members take the lead in doing the audit as well. There are, however, many other possibilities. Audits can be led by external experts or consultants, assessment specialists in the provost's or institutional assessment office, an administrator in the SDC of education, or a faculty member with released time to support technology integration, the person who leads and manages the NCATE accreditation process, or the chairs of departments/programs. There are good reasons to select any of these individuals or groups, but my advice would be to ask a representative group of faculty members to do the audit. Faculty have the most intimate knowledge of what actually happens in the teacher education programs and they will ultimately be responsible for making any revisions or improvements. In Apple's (2005) perspective, a democratic approach is preferred and in this instance that means those who do the work should be heavily involved in the process that determines what that work will be. Taken to another level a democratic approach would also involve students in the process.

Is the Audit a One-Shot or Ongoing Process?

One of the most common problems reported in student assessment programs for regional and discipline-specific accreditation is that faculty and administrators often propose and implement assessment projects that are so large, complex, (and often irrelevant to the real interests of faculty and program leaders) that they are neglected and disappear within a few years. The memories of those grand plans remain in the reports submitted to accreditation agencies but even there they gradually fade away - sometimes to be replaced by new grand plans.

In her book on student assessment in higher education, Linda Suskie (2009) advises institutions over and over again to keep assessment programs small enough to be doable over an extended period and to make sure the results are relevant to faculty, programs, and the institution. Every element of an assessment program should be important enough to those who implement it to make the effort worthwhile to them. This is sound advice. All elements of the assessment system should be designed first to be worthwhile and usable by faculty and programs, and then to meet accreditation requirements. Local usefulness should be the first and foremost guideline when creating audits and other elements of an assessment system.

That said, it follows that the audit should be an ongoing process, with the audit revised and updated every two or three years. Revisions should be far less time-consuming than the initial audit, but if the information is kept current it will be useful both in program planning and revision, and in documenting what the SDC of education is doing to meet ISTE *NETS for Teachers*/NCATE requirements.

Should the Audit Be Organized by Technology or Application?

The audit I have proposed does not make provisions for separating out different types of technology applications (e.g., Internet use, simulations, drill and practice programs, and so on) or technology support for different types of pedagogy (e.g., problem based learning, anchored instruction, and so on). I did not build that into the basic auditing process because it would make the process very complex and I am not sure the information is worthwhile. There are hundreds of ways to divide up ET and IT technologies as well as hundreds of teaching and learning methods that are regularly supported by different types of technologies. Different technologies, such as the Internet,

and different pedagogies, such as web quests, regularly come into vogue and stand out from the many other technologies and pedagogies. However, the status of different pedagogies and technologies is unstable and can change drastically from year to year. Further, even the way they are categorized varies considerably and changes over time. Rather than trying to categorize this type of information as if it were stable and unchanging, perhaps a better approach would be to document the pedagogies and technologies used in activites and make sure your database of information has full-text search capabilities for people who need information on a particular instructional strategy such as anchored instruction or particular technologies such as smart boards.

How Do You Deal With Course Sections That Use Different Syllabi?

In programs where courses have several sections, it can be difficult to explain how coverage of ET/IT is handled in different sections. An instructor in one section may require students to develop and teach a simulated lesson using smartboard technology while other sections either focus on another technology, such as Internet-based content resources, or do not require any use of technology. How should this situation be handled? The simplest way, but the worst way in my opinion, would be for an administrator to mandate that all sections of a course require students to use the same technology. This often does not work because faculty have their preferred technologies and they also have expertise in different types of technology. A messier but perhaps more democratic approach is to simply document different emphases across sections rather than try to enforce uniformity. If a standard approach is needed, it should be developed by faculty who teach the course rather than be imposed on faculty.

In summary, a technology audit is one of three elements in an assessment and evaluation plan that will provide teacher educators with the information they need to make decisions about how to revise, enhance, and maintain a high quality teacher education program that is effective in preparing graduates to be technology-using educators.

THE SECOND ELEMENT: HOLISTIC RUBRICS AND PORTFOLIOS

An audit provides a solid foundation for the next step in the process. The audit describes what happens in the program but it does not always tell you whether the experiences are accomplishing what they are supposed to do. Audits ask how different experiences are being evaluated, but they do not focus on the results of those evaluations. The second element of an integrated plan is assessment of student experiences. This happens at three levels:

Immediate Assessment. Faculty, mentors, and student teaching supervisors who oversee an activity evaluate ET/IT related activities as a routine part of their work. The results of that evaluation can be a starting point for judging how well the program is preparing students to be technology-using educators. Where rubrics are appropriate I have recommended holistic rather an analytic rubrics because holistic rubrics are more suited to the assessment of professional practices and because they are more suited to constructivist (and reflective) approaches to teacher education.

Formative and Summative Portfolio Assessment. In the growing number of programs where a portfolio is required, students should be asked to document and include artifacts relevant to their accomplishment of technology-related standards set by ISTE/NCATE and the program. Again, holistic rubrics can be developed that are customized to the program and to student interests. These rubrics can also meet the ISTE/NCATE criteria. Using holistic rubrics created for each of the standards (and with

options for students to demonstrate accomplishments in other areas of ET/IT), individual portfolios can be formatively assessed at several points in the program to provide students with feedback and guidance on what they have accomplished and what else needs to be done. A final, summative, evaluation of the portfolio could be used to assess student and program accomplishments relative to the standards and the expectations of the program. This assessment work might best be done at the program level by a subset of faculty, mentors, and student teaching supervisors who work in that particular certification program. It is also important to keep in mind that portfolio assessment can serve two purposes. One has to do with an assessment of the progress of individual students. The other purpose is program evaluation. When program evaluation is the goal, a detailed analysis of a sample of portfolios may be more useful than a less detailed study of all portfolios.

SDC of Education Evaluation. The final level of assessment looks at the School/Department/College of Education. A report that summarizes and analyzes the data from Immediate and Formative/Summative Portfolio Assessments should be produced each year, or every other year. At many institutions the person responsible for the NCATE report does this report as well. However, to be maximally useful to faculty and programs, it might make more sense for a faculty committee to do this report. It would serve two purposes. The first and most important purpose would be to evaluate the current situation, identify strengths and weaknesses, and make recommendations about changes, needed resources, and potential innovations. The second purpose would be to provide documentation to accrediting agencies such as NCATE.

Work at these three levels – immediate, portfolio, and teacher education unit - can quickly become onerous and time consuming to the point that those responsible for doing the work eventually abandon the effort. The time-to-benefit ratio should always be a critical component of deliberations about how work should be done at each level. For example, should all raw immediate assessment data be conveyed from individual faculty to those who do reports at other levels? Perhaps not. Instead, it might be as useful for faculty to summarize how they assessed student experiences and activities related to ET/IT, what standards those experiences and activities relate to, and the general findings plus information on any planned changes or revisions.

The next level, formative and summative portfolio assessment, has three purposes:

1. One is to provide feedback to students and for that purpose all portfolios should be evaluated at several points in the program to provide students with feedback and guidance they can use to guide further work related to ET/IT.
2. The second purpose of portfolio assessment is program evaluation. It serves the local purpose of guiding decision making about changes and improvements. Each year a report based on assessment of portfolios should be produced and used as one source of guidance in discussions of program changes and revisions.
3. Third, the report is also the major foundation for a SDC of Education report that provides an overview of the current context to administrators and faculty members.

In addition to providing an overview to program faculty and administrators, the SDC report can also serve another important purpose. It can be submitted to ISTE/NCATE to indicate the SDC's current position with regard to preparing students to be technology-using educators, and to indicate plans for change and improvement. The analysis of portfolios for program evaluation and accreditation reports may require a more detailed analysis that looks at the relationship between student performance and program components. However, as noted earlier, when evaluating portfolios for SCO and ISTE/NCATE reports it may not be necessary to thoroughly analyze every portfolio.

Programs could evaluate a random, or planned, sample of the portfolios in detail for these purposes.

These are only a few of the ways to reduce the effort required to evaluate the SCO's progress toward doing an outstanding job of preparing teacher education students to use technology. Creating a plan that spreads the load of work, and imposes no unreasonable or onerous load on anyone is one of the most difficult, yet one of the most important, aspects of any plan for student assessment and program evaluation. Teacher education programs, especially those that are just beginning to do this type of assessment and evaluation, should probably plan to evaluate the work load required on a yearly basis and be prepared to make adjustments. At the same time the plan should also be evaluated for local usefulness. Is the result worth the effort? Do the reports help faculty and programs improve, enhance, or focus their efforts? Do the reports help the program develop a comprehensive perspective on technology integration and student preparation to use IT/ET?

Another issue to consider is that the 2008 *NETS for Teachers* has many performance indicators that emphasize certain teaching methods, particularly those based on constructivist theory. This is one example of the increased overlap between ISTE standards and the standards from other disciplinary groups that also participate in NCATE. Another way to reduce the workload is to make sure the data gathered for one aspect of the NCATE reports is used across reports rather than gathered and analyzed anew when that is not necessary.

PORTFOLIO ASSESSMENT GUIDELINES

A core task of a planning committee for this work is to develop ways of evaluating portfolios, if they are used. The use of holistic rather than analytic rubrics to assesses portfolios has already been discussed. However, portfolios are complex documents that can be very rich sources of useful information. The way portfolios are assessed is an emerging field of scholarship and professional practice, but there are, fortunately, a number of useful publications in the scholarly and professional literature. Some are based on a technical-rational approach to teacher education and others use a reflective practice foundation (Chetcuti, 2007). Stansberry and Kymes (2007) detail their development of a "teaching with technology" electronic portfolio that emphasizes a reflective approach to teacher education. They describe the role of portfolios this way:

> Paper-based and electronic portfolios have been used to allow undergraduate and graduate students to demonstrate best practices; showcase exemplary lessons and student products; show compliance with local, state, and national certification requirements and professional behaviors; and provide spaces for honest self-reflection and personal growth, (p. 488)

In their summary Stansberry and Kymes acknowledged that their approach to portfolios does not represent the current technical-rational mainstream. "In the current climate of standardized testing and compliance with No Child Left Behind ..., there may be little room for authentic assessment through portfolios" (p. 495) but they nevertheless argue that the use of e-portfolios based on the principles they discuss in their paper, "can foster transformation in teacher beliefs through critical reflection, ownership of learning, and personal agency" (p. 495). This paper, from the *Journal of Adolescent and Adult Literacy*, was part of a special issue (March, 2007) that includes many worthwhile papers on the use of portfolios in teacher education.

A discussion of the resources on development and use of portfolios in teacher education is never complete without mentioning the work of Helen Barrett at the University of Alaska. Her website (http://electronicportfolios.org/) contains links to many different types of resources. Dr. Barrett is one of the major contributors to the professional practice knowledge of creating and deploying portfolios in teacher education.

Other useful resources include Imhof & Picard (2009) who offered suggestions on how to organize the use of portfolios in teacher education that increases acceptance by students as well as efficient and worthwhile use by faculty. In another interesting paper, Wray (2008) explored the complex issues of revising portfolio requirements when the purpose of the portfolio changes. Her paper is about a shift in purpose for the portfolio from summative student evaluation to formative evaluation, and the process the institution used to make those changes.

There are also a number of sources of information on how to design portfolios for different areas of teacher education. For example, Hill (2008) presents a model for music education while Lee and Hare (2007) discuss web-based portfolios in physical education programs. This paper also evaluates several of the commercial programs for creating e-portfolios. For teacher educators preparing English teachers Hallman's (2007) paper is useful

Finally, there are resources on the creation and use of electronic portfolios in teacher education. A paper by Lin (2008) used feedback from students to analyze the structure of e-portfolios and make recommendations for improvements. Another interesting paper (Chuang, 2008) on electronic portfolios describes the development of weblog-based e-portfolios in teacher education that are based on a reflective practice model.

THE THIRD ELEMENT: ORGANIZATIONAL SUPPORT AND INFRASTRUCTURE

One of the most common and most serious shortcomings of multifaceted projects is the failure to integrate the components into a working system. As I think back over the last twenty years I can remember working on several serious problems in a teacher education program that seemed to have cropped up suddenly with little or no history. However, after we talked to faculty who carried much of the institutional history in their heads, we learned that these were not new problems and that most of them had already been addressed by previous committees or administrative offices. In one case there was the issue of an institute for policy studies that was authorized at the highest levels of the institution but did not seem to have been operating for many years. However, after meeting with faculty with longer institutional memories than ours, we learned that just three years previously a committee of administrators and faculty had developed a plan for reviving the institute and submitted it to college and university administrators. The committee, considering its work done, had disbanded, and no faculty member or administrator had followed up on the recommendations. With a little digging we found a tattered copy of the committee report resting peacefully in the file cabinet of a professor who had served on the committee. I could describe many other similar instances but I am sure you could do the same. The point is that most projects, including ones dealing with the use of *NETS for Teachers* in teacher education programs, are multifaceted projects that require articulation and integration of efforts across several steps and several organizational units. Each organizational border, such as the one between the committee making recommendations on how to revive the institute and the administrative offices that would implement the recommendations, is an opportunity to lose momentum. The results of a technology audit, for example, do not automatically transport themselves to a group that is working on portfolio assessment, nor do they fall automatically into the

hands of faculty looking for helpful information as they plan how they will cover topics related to ET/IT in their courses. In earlier times, it was customary to assign teaching about ET/IT to what I have previously called the "techno-ghetto" of teacher education - a small group of faculty teaching "educational technology," "instructional technology," or "educational computing" who took charge of what was usually a stand-alone course with a title like "Technology in Education" or "Educational Computing." The time has past when a single, isolated course taught by techno-ghetto faculty is sufficient to prepare students to be technology-using educators. There is too much to know, and important skills and knowledge are often embedded in the methods and content of specific disciplines like special education, literacy education, mathematics education, and social studies education. Further, the advanced use of IT/ET calls for sophisticated understanding and practical knowledge of pedagogy, content knowledge domains, and the ways technology can support learning. If students are to require such expertise, there must be articulation and collaboration across all the elements of a teacher education program. What is needed is an infusion rather than an isolation model, and that requires considerable collaboration across different elements of a teacher education program. I believe this can only be accomplished through an extended, ongoing, collaborative effort that values and uses the input from many faculty. One way of accomplishing that is illustrated in Figure 5.

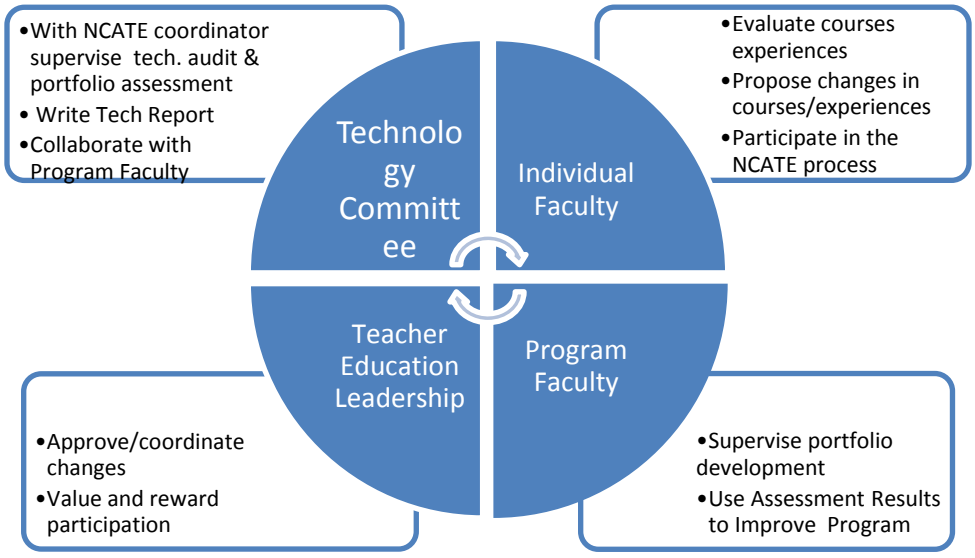

Figure 4. A basic structure of an integrated approach to assessing and revising IT/ET related goals and activities in teacher education programs.

The outside rectangles of Figure 4 represent the actions of an integrated plan and the inside pie shapes indicate what groups or individuals are responsible for the actions. Each of the four rectangles includes responsibilities for gathering data and for making use of the data to develop recommendations and suggest changes. The curved arrows highlight the interconnectedness of these actions.

One way of organizing the process depicted in Figure 5 is to think of the work of these groups as an instance of participatory action research (Mclntyre, 2008; James, Milenkiewicz & Bucknam, 2008; Willis (2008). Many papers and books on action research focus on individuals or small groups of practitioner/researchers. Others describe ways university faculty and teacher education students can collaborate with practicing teachers who do action research in their own classrooms. However, there are also

numerous papers and some books on the use of action research in teacher education programs to improve those programs. For example, the Summer, 2006 issue of *Teacher Education Quarterly* contains a number of articles on the use of action research in teacher education, and the book, *Improving Teacher Education through Action Research,* which is edited by Hui and Grossman (2008), is devoted to an exploration of how action research can be used in teacher education programs. Other papers describe the use of action research to support program evaluation and change in other fields such as child protection services (Seymour & Davies, 2002), healthcare reform (van Eyk, Baum, & Blandford, 2001), inclusive school programs (Dymond, 2001), and psychosocial services (Rogers & Palmer-Erbs, 1994). Journals such as *Action Research* and *Educational Action Research* are also worthwhile sources of information on action research methods as well as web sites such as http://www.goshen.edu/soan/soan96p.html at Goshen College, the emTech action research site at http://www.maisplace.org/action research.html and QualPage at http://www.qualitativeresearch.uga.edu/QualPage/methods action.htm.

Regardless of the way the plan is implemented it is important that someone have responsibility for facilitating the interaction between the different components of the plan. Who this is, the range of their responsibilities, and how they are compensated for the work, depends heavily on how the particular SDC of Education is organized and structured. An administrator, a faculty member, or a department chair are all possibilities. The important point is that someone have that responsibility and is interested in serving as a facilitator (and be given the time to do so). Timelines and scheduled dates for meetings and submitting reports are all management behaviors that can encourage integration and collaboration. Newsletters and other ways of acknowledging and making the work of different groups public are also important. However, regardless of the process and the specific local details of how it is done, the end result should be a process that is fully accepted and integrated into the daily life of the teacher education program.

SUMMARY

The 2008 ISTE NETS for Teachers standards are different enough from the original 2000 version to require teacher education programs to reconsider how they are incorporated into programs. There are a number of issues that should be considered in that process. This paper suggested an alternative to the approach presented in ISTE (2008). The alternative relies more on reflective and constructive approaches to teacher education and on the use of portfolios and holistic rubrics rather than dependence on analytic rubrics and a view of teaching as a technical-rational activity. The alternative also puts a heavy emphasis on the creation of a system that helps teacher educators continuously monitor and improve their programs, with NCATE-related accreditation issues playing an important but secondary role. This is not to say that NCATE expectations and requirements are ignored, only that within the flexibility available to teacher education programs, the suggested system is shaped and molded by the local context, goals, and vision of the program.

The resulting plan thus acknowledges the importance of the *NETS for Teachers* standards but does not focus entirely on those standards. Instead there are opportunities for programs to highlight their own special interests and areas of excellence with regard to the use of educational and information technology in education, as well as to encourage students to pursue and document their own special interests in technology-supported teaching and learning as well as their personal professional development. The proposed plan has three components: (1) an audit of current practices, (2) three levels of assessment and reports that rely heavily on portfolios and holistic rubrics, and (3) a systematic effort to integrate the elements of assessment and curriculum development

into a meaningful and interactive system that makes reasonable demands on faculty and staff while providing useful information to guide decision-making related to the program's efforts to prepare technology-savvy and technology-using graduates. This plan is not, however, presented as a "solution" or "answer" that can be delivered to campus, installed, and then operated for years without much attention. Instead, it is a conceptual starting point for local planning and thinking that will very likely lead to many major and minor changes, revisions, and reforms in the process. This is an era in which higher education in general can no longer assure the rest of society that the programs it offers are excellent and not expect to be asked what evidence there is to support those assurances. This is new to many disciplines in higher education but it is not to teacher education. For decades we have faced a wide range of criticisms. The growth of accountability movements as well as their incorporation into regional and discipline-based accrediting systems is an indication this is not a fad that will soon pass. We can view increased and more detailed scrutiny as an unnecessary burden that distracts us from other more important tasks, or we can treat it as an opportunity to develop systems that will allow us to continuously develop better and better teacher education programs. My advice is to treat it as an opportunity and then to make sure the system you implement is one that contributes significantly to the quality of your program.

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