Assessing Technology Preparation of Teachers

Assessment is an ongoing process aimed at understanding and improving student learning. It involves making our expectations explicit and public; setting appropriate criteria and high standards for learning quality; systematically gathering, analyzing, and interpreting evidence to determine how well performance matches those expectations and standards; and using the resulting information to document, explain, and improve performance. When it is embedded effectively within larger institutional systems, assessment can help us focus our collective attention, examine our assumptions, and create a shared academic culture dedicated to assuring and improving the quality of higher education. (Angelo, 1995, p. 7)

The components of an effective assessment process include determining the purpose or reason for collecting the information, selecting appropriate methods of measurement, evaluating the results, and using the information to inform teaching and learning. To accomplish these purposes, the assessment system should follow a balanced approach. The elements include performance assessment (projects, presentations, student teaching), a portfolio (a purposeful collection of items to demonstrate efforts, progress, and achievement), as well as traditional assessment strategies (multiple choice, true and false, essay, teacher-made, and standardized tests). Within the context of general assessment strategies, this chapter will explore the ISTE NETS assessment model by discussing

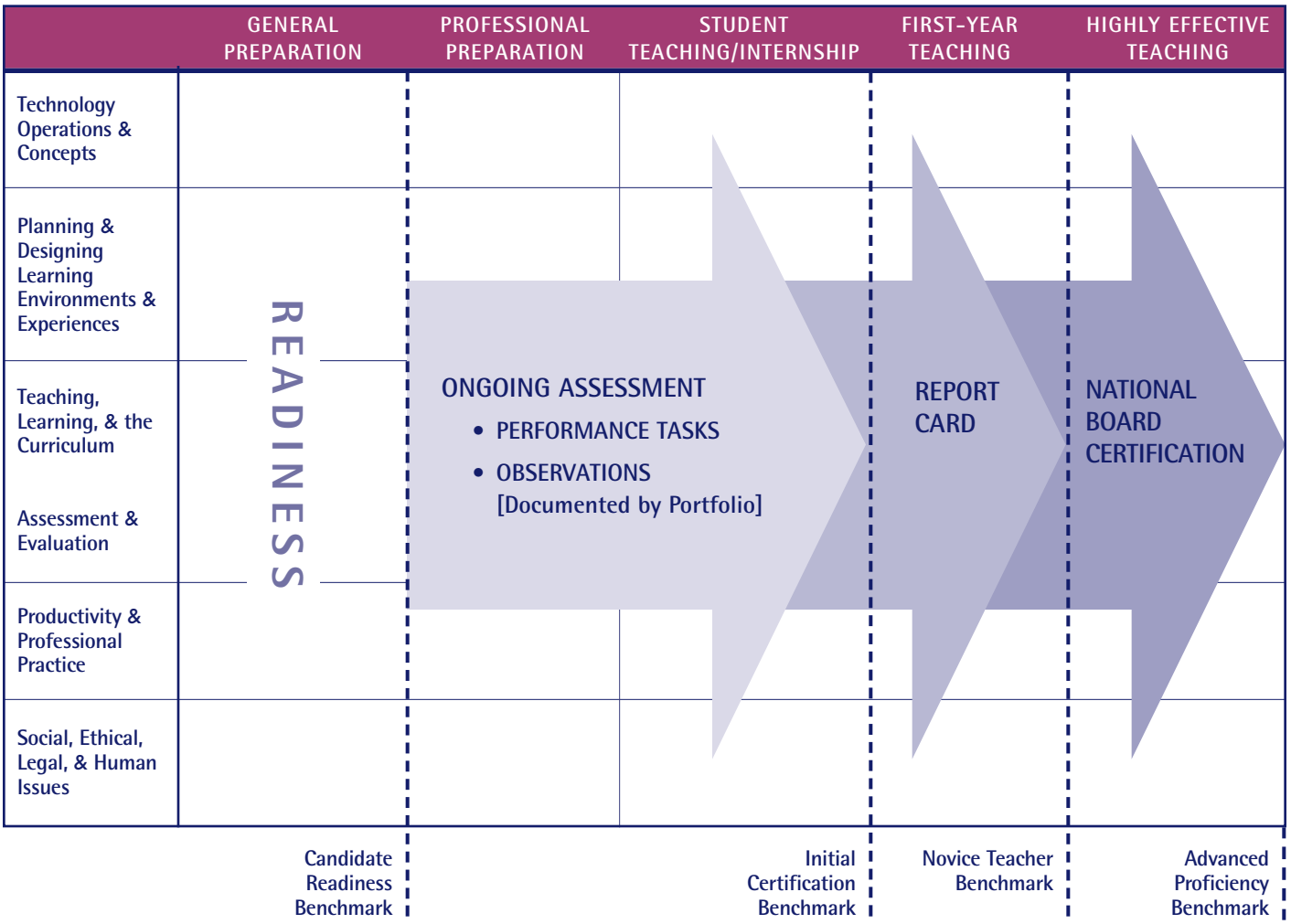
- Attainment of ISTE NETS for Teachers,
- General Preparation—the candidate readiness benchmark,
- Professional Preparation and Student Teaching/Internship—the initial certification benchmark, and
- Portfolios.

Assessing Attainment of ISTE NETS for Teachers

The NETS for Teachers Project developed the NETS for Teachers Assessment Model (see Figure 1) to effectively measure progress toward attainment of ISTE educational technology foundation standards and performance indicators in a sustainable, scalable system. This model includes multiple measures for ongoing formative performance measurement and summative assessment to address both individual progress and program effectiveness. Providing guiding principles and feedback for continuous improvement supports NCATE's (2000) Principles for *Performance-Based Assessment Systems in Professional Education Programs* and ISTE's mission of advocating career-long professional development in the use of technology to enhance teaching and improve student learning.

The NETS for Teachers Assessment Model illustrates the relationship between the NETS for Teachers and the phases of professional growth in teacher preparation including levels beyond initial certification, such as the first year of teaching and accomplished teaching.

NETS for Teachers Assessment Model



The horizontal rows of the model represent the six NETS for Teachers (ISTE, 2000). The columns of the model represent the four NETS Performance Profiles (General Preparation, Professional Preparation, Student Teaching/Internship, and First-Year Teaching) of a teacher preparation program, as well as Highly Effective Teaching. As candidates advance through their teacher preparation program, each profile designates the minimum level of competence candidates should achieve prior to the subsequent benchmark assessment. The dashed lines designate four benchmark assessments that comprise the NETS assessment system for teacher preparation:

CANDIDATE READINESS BENCHMARK: An initial benchmark assessment measures the applicant's readiness for entry into the teacher education professional coursework component. This entry-level assessment provides information to the candidate about the skills that will be required for the teacher education program, and information to the teacher education program about the technology skills individual candidates still need to develop. It provides diagnostic information regarding the teacher candidate's current technology knowledge, skills, and dispositions. Results can be used to decide on admission to the professional teaching component (i.e., upper division, professional preparation program). The information may also be used to advise the candidates on a course of action for improving in any areas where their performance indicates that they have not yet met the general preparation standards.

INITIAL CERTIFICATION BENCHMARK: This assessment generally occurs at the end of the student teaching/internship and prior to initial licensure. At this point, the faculty in the program determine the readiness of their pending graduates to be successful teachers. After ongoing formative assessment of effective technology use during the teacher education professional coursework and student teaching/internship components, it is essential to apply a summative assessment to determine the candidates' ability to apply technology in their own classroom. The teacher candidate who obtains initial licensure should meet the ISTE NETS for Teachers at least at the Approaching level.

NOVICE TEACHER BENCHMARK: Within the early years of teaching, colleges of education and school districts will assess new teachers' effectiveness in the classroom and continue to support their professional growth. Based on criteria from the Higher Education Act (Title II, Section 207, often known as the Federal Report Card for Teacher Preparation), colleges of education may be required to include data on their graduates in a Title II report submitted annually to the U.S. Department of Education. Additionally, school districts will likely seek to determine the level of technology competencies that new teachers demonstrate and use this information to plan appropriate professional development opportunities. The benchmark assessment will evaluate the performance of teachers on each of the six standards as Initial, Developing, Approaching, Proficient, or Exemplary. The teacher meeting the ISTE NETS for Teachers at the Proficient level has performed at a level at which they are prepared to take an assessment that results in an ISTE NETS Certificate. ISTE is currently working with nonprofit and for-profit groups to develop assessments for those seeking the ISTE NETS Certificate.

ADVANCED PROFICIENCY BENCHMARK: A teacher scoring at the Exemplary level has performed technology integration at a level commensurate with Advanced or National Board Certification. In the future, ISTE will work, possibly in conjunction with the National Board for Professional Teaching Standards (NBPTS), to identify technology performance proficiency at this "accomplished" level. The purpose is to recognize those highly effective teachers who integrate technology into the teaching and learning experiences in their classroom and who provide models for others to emulate.

This chapter will focus on assessments designed for the first two benchmarks as they are within the direct control of teacher education programs. The last two benchmarks will be addressed in a later ISTE publication.

A LITTLE BACKGROUND ON ISTE NETS ASSESSMENT

The NETS for Teachers Project held a focused Assessment Writing Meeting in Tempe, Arizona, in December 2000. Through an exhaustive selection process, an elite group of educators from across the nation were selected to thoughtfully examine the issues of assessment and technology. The contributing team members included teachers, technology coordinators, administrators, teacher educators, college of education administrators, and professionals from the assessment community. Four subcommittees were formed, each of which worked on different strategies to assess the NETS for Teachers. The areas of focus for each subcommittee and their tasks were:

- **General Preparation—***Listed specifications for the assessments meeting the tasks described in the profile*
- **Performance Assessment Tasks and Rubrics—***Developed a metarubric to address the Professional Preparation and Student Teaching/Internship Performance Profiles*
- **Electronic Portfolio—***Outlined the process and content for development of an electronic portfolio for the Professional Preparation and Student Teaching/Internship Performance Profiles with links to the First-Year Teaching Performance Profile*
- **Observation and Survey Tools—***Identified a series of options to address the Student Teaching/Internship and First-Year Teaching Performance Profiles*

The outcomes of the Assessment Writing Meeting contributed to the basis of this chapter. Additional specific products and ideas from the meeting will be found in later ISTE publications.

General Preparation—Candidate Readiness Benchmark

Establishing a national assessment instrument designed to determine the technology proficiency of those applying for admission to the teacher education professional coursework component presents several problems. First, institutions of higher education have various program models for the preparation of teachers. Some programs and state-level directives purposefully separate the general preparation from teacher preparation by requiring candidates to hold an initial degree before admission to the teacher preparation; other programs integrate general preparation and teacher preparation within a four-year undergraduate program. Second, many colleges of education have little influence over the content and sequence in the general education component typically offered by the college of arts and sciences. This variability in program and lack of control contribute to the difficulty in establishing a common method of assessment.

Collaboration throughout all aspects of the university is essential. NCATE encourages the collaboration between the college of arts and sciences and teacher education through its accreditation requirements. Several other initiatives have emphasized the importance of essential conversations between the two groups; the Technology Literacy Challenge and Preparing Tomorrow's Teachers to Use Technology grant initiatives, the CEO Forum Star Charts, and ISTE NETS for Teachers including the related essential conditions have each emphasized the shared responsibility for the preparation of new teachers among teacher education, arts and sciences, and the P–12 community. Critical to colleges of education is the institution's readiness to provide opportunities for their candidates to apply technology. This readiness is defined in the ISTE NETS essential conditions (see Section 1, "Establishing National Educational Technology Standards for Teachers"). Without strong support for integration of technology across all phases of the teacher education, successful preparation of candidates to use technology to improve student learning is severely limited.

Developed by the ISTE NETS Writing Team subgroup on General Preparation, the following box provides a preliminary list of tools and experiences teacher candidates should have before admission to the professional program. This list does not include discipline-specific experiences teacher candidates should have as part of their general liberal arts or major course of study.

TOOLS AND EXPERIENCES FOR THE GENERAL PREPARATION PERFORMANCE PROFILE

1. **Operating system**—*Can save and move files, format disks, and perform other maintenance tasks; understands what a network is compared with a stand-alone system; knows what an operating system is and its purpose; can install and use application programs (such as a CAI program that teaches Spanish)*
2. **Trouble-shooting**—*Can solve routine hardware and software problems (e.g., installing software, selecting the correct printer, hooking up the projector)*
3. **Computer purchases**—*Understands basic criteria for purchasing hardware, software, and services*
4. **Word processing**—*Understands word processing capabilities as well as basic desktop publishing, page design, and layout principles*
5. **Spreadsheets**—*Has sufficient knowledge to create a gradebook and make charts*
6. **Multimedia**—*Can use draw and paint programs, digital video, and digital cameras; can import graphics; can use images in presentations and publications*
7. **Database management**—*Can use an existing database (search, sort, and enter data into a template); can organize and develop own database*
8. **Presentation software**—*Will use appropriate design principles in classroom presentations prepared with software*

9. **E-mail**—*Is able to send and receive messages and attachments, sort and handle e-mails, embed pictures in messages*
10. **Devices**—*Understands mouse, keyboard, printer, and scanner*
11. **Ethics**—*Understands copyright law, intellectual property, ethical use, and netiquette (such as inappropriate "spamming")*
12. **Health and safety**—*Is aware of issues such as ergonomics, predators on the Internet, inappropriate sites, proper use of children's names and pictures, and the dangers of completing surveys and divulging personal information*
13. **Web research**—*Knows how to evaluate the quality and objectivity of Web sites; employs efficient and effective searching techniques*
14. **Web pages**—*Is able to create simple Web pages*
15. **Diversity, equity, and access**—*Is aware of diversity, equity, and access issues*

A forthcoming ISTE NETS document will include specifications for test developers to create the entry-level assessment that in many aspects aligns with the NETS for Students.

Professional Preparation and Student Teaching/Internship—Initial Certification Benchmark

For most teacher education programs, assessment of the outcomes of the Professional Preparation and Student Teaching/Internship Performance Profiles represents the core of the assessment system for the program itself. In planning for a total assessment system, colleges of education must pay particular attention to the notion of alignment. "Alignment does not refer to a comparison... [of] one assessment instrument with a curriculum, but extends to a set of assessment instruments or the assessment system" (Webb, 1997). Assessment of meeting the NETS must be interwoven with assessment of meeting other program standards. NCATE has revised its standards on assessment to emphasize an outcomes-based approach. The purpose of presenting the following assessment tools and guidelines is to provide options for programs to consider in developing their overall program assessment system that include technology proficiencies in teaching and learning.

PERFORMANCE ASSESSMENT

Performance assessment techniques particularly lend themselves to systems that are focused on outcomes-based assessment. Performance assessment concentrates on the direct observation of a candidate's performance. Candidates create projects or perform tasks based on predetermined standards, criteria, and indicators, which are evaluated by scoring rubrics. The results or products from the performance tasks may form the contents or artifacts for a portfolio and become part of an overall assessment of teacher candidates' competence in meeting the standards.

The following table is a sample of the type of rubric being developed for the ISTE NETS Assessment initiative. Note that the sample rubric progresses from high to low performance to force the user to look at best peformances first. The document will contain a metarubric for all NETS for Teachers.

Sample of NETS for Teachers Four-Level Rubric

II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES			
DISTINGUISHED (4)	PROFICIENT (3)	APPRENTICE (2)	NOVICE (1)
Teachers plan and design effective learning environments and experiences supported by technology. The teacher:			
A. Consistently and creatively attends to developmental needs and student diversity	A. Shows adequate attention to developmental needs and student diversity	A. Shows moderate attention to developmental needs and student diversity	A. Shows weak attention to developmental needs and student diversity
B. Applies current research and theory when planning technology-rich learning activities	B. Mentions current research and theory when planning technology-rich learning activities	B. Gives minimal attention to current research and theory when planning technology-rich learning activities	B. Does not utilize conclusions from current research and theory when planning technology-rich learning activities
C. Consistently demonstrates critical thinking in selecting software	C. Shows some critical thinking in selecting software	C. Shows minimal critical thinking in selecting software	C. Rationale for selecting software is weak, lacking evidence of critical analysis
D. Anticipates technology-related classroom management issues and plans multiple courses of action	D. Anticipates technology-related classroom management issues and plans a course of action	D. Anticipates technology-related classroom management issues but does not plan alternative actions	D. Does not anticipate technology-related classroom management issues and does not plan alternative actions
E. Plans multiple strategies to facilitate students' higher-order thinking, critical thinking about electronic information, ethical sensitivity, and technical skills	E. Plans some strategies to facilitate some of the following: students' higher-order thinking, critical thinking about electronic information, OR technical skills	E. Plans strategies to facilitate only technical skills or is focused on only one aspect of technology use	E. Planning is inconsistent and does not cover any strategy well.

The above four-level rubric sample forces the assessor to make a choice in the continuum, whether completed as a self-assessment or by a supervisor. An odd number of levels, such as three or five, would have allowed the assessor to mark the middle option to indicate "average," much in the same way teachers grade students with A through F, with C denoting average.

The descriptive words for each indicator illustrate a developmental sequence—novice, apprentice, proficient, and distinguished. The rubric is designed to be used repeatedly to help teacher candidates to see movement toward the goal of becoming distinguished in each category.

OBSERVATION TOOLS

Once prospective teachers move into their student teaching/internship experience, there is a need for classroom observation tools to assess appropriate uses of technology in the curriculum. Not only will these tools assist with the assessment of prospective teachers by teacher education faculty and master/cooperating teachers, but the tools will also assist administrators as they evaluate the appropriate use of technology in the classroom. In addition to observational instruments, the use of survey information collected from students, parents, and other stakeholders provides valuable data for assessing the effect of technology in supporting student learning.

Following is a sample rubric for assisting in classroom observation. The sample rubric focuses on the Standard III—Teaching, Learning and the Curriculum. Note that the box to the far left states that technology was not used. This enables the assessor to also note that the situation did not exist for examining the use of technology during the observation.

Observational assessment protocols with associated rubrics are being field tested and will be available in another format through subsequent ISTE NETS publications.

III. B. Teachers use technology to support learner-centered strategies that address the diverse needs of learners.

Observation

Element: Is technology being used to support learner-centered strategies?

Definition: Learner-centered strategies place the learner in the center of the learning process. It is distinguished from teacher-centered learning or instruction, which is characterized by the transmission of information from a knowledge expert (teacher) to a relatively passive recipient (student/learner) or consumer. Common learner-centered strategies include portfolio construction and assessment, collaborative learning and team projects, and learning contracts. Guiding theories and practices associated with it include constructivism, problem-based learning, resource-based learning, and collaborative/cooperative learning.

LEVELS OF PERFORMANCE			
UNACCEPTABLE	APPROACHING	ACCEPTABLE	
Technology was not used.	Technology was not used in a way that supported learner-centered strategies.	Technology was used to support one learner-centered strategy.	Technology was used to support more than one learner-centered strategy.

Element: Is technology being used to address diverse needs of students?

Definition: Students have diverse learning needs such as different styles of learning, multiple intelligences, and special needs due to disabilities. Technology lends itself to addressing these needs.

LEVELS OF PERFORMANCE			
UNACCEPTABLE	APPROACHING	ACCEPTABLE	
Technology was not used.	Technology was not used in a way that addressed diverse needs of learners.	Technology was used in a way that addressed diverse needs of some learners.	Technology was used in a way that addressed diverse needs of all learners.

USING RUBRICS

> *A rubric is a set of categories that define and describe the important components of the work being completed, critiqued, or assessed. Each category contains a gradation of levels of completion or competence with a score assigned to each level and a clear description of what criteria need to be met to attain the score at each level. (San Mateo County Office of Education, 1997)*

Rubrics to Assess Teacher Candidate Performance

There are many examples of rubrics in the professional preparation activities in Section 2. The format purposefully differs considerably. Some are organized top-to-bottom or left-to-right from highest to lowest level, showing the target level of proficiency first then working down or to the right. Others show progress from the lowest level (minimum or no proficiency) to the highest or target level. There does not appear to be any preference in the rubric development literature for one format over another; the order appears to be determined by the appropriateness to the task or the situation. Some teachers prefer to show the target performance first (high to low) in order to highlight the level of performance expected of students or teacher candidates. Others prefer to show a developmental continuum, from beginning/emergent/novice to expert/fluent/target levels of performance. Perhaps

when the performances in the rubric are more developmental, the progression from low to high is preferred. This is used so that the novice does not become discouraged by first seeing the descriptions of high levels of performance.

Another example, the ISTE NETS•T Electronic Portfolio Metarubric, is designed to examine the entire portfolio. It is possible to add the scores, arriving at a single score for the entire portfolio. The descriptions are listed from high to low to cause the teacher candidate to read the exemplary description first before proceeding to the less accomplished levels. Likewise, the assessment team developing the Four-Level Rubric for ISTE NETS, found on the preceding pages, preferred showing the exemplary descriptors first to highlight the desired level of performance.

ISTE NETS•T Electronic Portfolio MetaRubric

	NOVICE 1	DEVELOPING 2	PROFICIENT 3	EXEMPLARY 4
Instructional Units	The unit does not provide adequate detail to guide instruction or does not reflect understanding of student learning. Major elements of the unit are not present. Technology use is in appropriate or underdeveloped.	Some content is inaccurate or out of date. Lessons are not consistently planned according to student abilities, developmental appropriateness, student prior knowledge, experiences, and alignment with standards. Technology use is inconsistent or underdeveloped.	Lesson plans and activities accurately portray content, are appropriate for developmental level of students, in alignment with standards, and focus on developing conceptual understanding. Technology use is appropriate and supports meeting objectives.	Lesson plans and activities accurately portray content and are appropriate for student developmental level. The unit is creative, novel, relevant to learners, in alignment with standards, focuses on developing conceptual understanding, and requires active engagement of learners. Technology use is creative, supports meeting objectives, and increases student technology competence.
Technology in Communication	The plan does not represent consistent communication with families over time.	The plan relies on one strategy for communicating with families.	The plan includes a consistently applied set of strategies for communicating with families.	The plan includes appropriate and creative strategies for communicating with families. Methods used meet the diverse needs of students and families.
Philosophy Statement	The technology section of the philosophy statement is unclear.	The technology section of the philosophy statement focuses on the purposes.	The technology section of the philosophy of education statement is clear and links to the overall statement. Justification is provided for beliefs.	The philosophy statement is clear and comprehensive. Philosophy statements on technology use are clearly described and woven into ideas on teaching and learning. Appropriate references are present to justify beliefs.
Classroom Lesson Plan	The management plan is inconsistent and does not exhibit an understanding of behavior or motivation. Management of technology use is not consistent with the rest of the plan.	The management plan relies heavily on extrinsic motivation sources and is unclear. Management of technology use is not clearly described but shows promise of being part of the overall management plan.	The management plan is clear and relies on one method of appropriately managing student behavior, uses both external and internal motivational theory. Management of technology is an integral	Includes clear management plan that includes multiple methods of managing student behavior and emphasis intrinsic and self motivation. The management of technology use is clear,

	NOVICE 1	DEVELOPING 2	PROFICIENT 3	EXEMPLARY 4
			part of the single dimensional management plan.	integrated into the overall management plans but varied to meet the needs of the students.
Assessment of Technology Use	An attempt at creating an assessment was made. The assessment does not clearly articulate criteria.	The assessment is missing two or three of the following attributes: authenticity, congruence with instructional goals, clear criteria for success, or rubric scoring.	The assessment is missing one of the following: authenticity, congruence with instructional goals, clear criteria for success, or rubric scoring.	The assessment is authentic, congruent with instructional goals, has clear criteria for success, and is scored using a rubric with the results communicated.
Lesson Plan Requiring use of Technology	Lesson plan demonstrates students viewing or having minimal use of the technology.	Technology tools used by the students are not appropriate for the grade or subject. The technology provides minimal support of the learning objectives.	Student use appropriate technology-based tools to support meeting content area standards. Students meet technology standards while addressing content are standards.	Student use appropriate technology tools in meaningful, inquiry-based learning of concepts. Lesson is in alignment with content area and ISTE NETS for Students.
Video Clip	Video clip selected illustrates minimal understanding of how to communicate with students bot verbally and nonverbally.	An authentic teaching experience is illustrated in the video clip, but the producer needs improvement in communications skills.	An authentic teaching experience is illustrated through the video clip. The producer consistently exhibits some characteristics of effective communication skills, but needs some assistance in one or two of the areas.	An authentic teaching experience is illustrated through the video clip. The producer consistently uses a variety of visual communication aids to support student learning and exhibits effective communication skills in the following areas: (1) questioning techniques, (2) explaining ideas, (3) restating ideas, (4) nonverbal cues, or (5) helping students to question, or (6) use of visual communication tools.
Evaluation of Learning Resources	Resources evaluated do not reflect an understanding of what is useful and appropriate for promoting student learning to meet the objectives outlined.	Resources selected are missing several of the major characteristics of exemplary learning resources. The accompanying evaluation is not complete.	Resources selected are inadequate in one or two of the exemplary criteria. Evaluation of the resources is complete.	Resources selected are: (1) grade and subject appropriate, (2) described and critically evaluated, and (3) include interdisciplinary connections.
Reflective Statements	Reflection is more descriptive than reflective or evaluative. Understanding of reflective practice is limited.	Reflections include only one or two of the four exemplary characteristics.	Reflections include two or more of the exemplary characteristics.	Reflections consistently include: (1) justification for selection of artifact, (2) connections between the portfolio artifact and philosophy, (3) evaluation of methods used, and (4) improvements to consider for the future.

Continued on next page.

ISTE NETS•T Electronic Portfolio MetaRubric continued

	NOVICE 1	DEVELOPING 2	PROFICIENT 3	EXEMPLARY 4
Organization	Organization pattern is not clear.	Portfolio is incomplete and hard to follow. All artifacts are labeled according to required component name.	Organization is clear, simple and readily apparent to the reviewer. All artifacts are labeled according to required component name.	Organization is clear, well-thought out, creative, readily apparent, and easy to navigate. All artifacts are labeled according to required component name.
Spelling and Grammar	Errors in grammar, punctuation, word usage, spelling, and format interfere with the reviewer's ability to read the portfolio.	Errors in grammar, punctuation, word usage, spelling, and format are consistent through the portfolio. Most errors would be corrected through spelling/grammar checking documents.	A few inconsistent errors in grammar, punctuation, word usage, spelling, and format are present. The errors do not interfere with the reviewer's ability to read the portfolio.	The portfolio is free of errors in grammar, punctuation, word usage, spelling, and format.

Note: When items are not present, a score of "0" is given.

Some rubrics describe the characteristics of a project and provide simple scoring (5=excellent, 4=good, 3=fair, etc.) without any descriptive language to define the differences between those levels. The rubrics in this book attempt to provide the descriptions or anchors that differentiate levels of performance. For example, see the rubric for the science activity "Bounce Back—The Long and Short of It" in Section 2, "Technology in Middle School Education Programs."

While the simple scoring guides are easier to develop, they often provide little guidance for students as they strive to meet the highest standards. Some simple scoring methods, however, can combine both a description and a general means of separating levels. For example, see the rubric for "Wearing Your Geography," also in Section 2, "Technology in Middle School Education Programs."

Rubrics Developed by Teacher Candidates

An integral part of developing technology-rich lessons is learning how to assess those lessons with students. Many of the rubrics in Section 2 are only partially complete. The incomplete rubrics vary from lacking the assignment criteria to providing only a partially completed table. Within the activities are statements prompting the teacher preparation faculty member to engage in a discussion about the development of the assessment rubric.

As activities are being implemented in the classroom, periodically focusing on the assessment device helps candidates discuss their perceptions of the expectations of the upcoming assignment.

In assisting teacher candidates to develop rubrics, encourage candidates to keep in mind the following characteristics and guiding questions for high-quality rubrics provided by the work of Judith Arter and Jay McTighe (from *Scoring Rubrics in the Classroom,* p. 72, ©2001 by Corwin Press, Inc. Reprinted with permission of Corwin Press, Inc.).

1. Content/Coverage—Does the rubric cover the features that really indicate quality performance?
2. Clarity/Detail—Does the rubric make it clear what you mean with definitions, indicators, and samples of work?
3. Practicality—Do teachers and students find it useful for instruction and assessment?
4. Technical Quality/Soundness/Fairness—Can you get raters to agree on scores? Is the rubric fair to all students?

Considering these characteristics as the discussion takes place will guide candidates into a more substantive discussion of expectations for themselves as teachers and their students as learners.

Below is the video project assessment rubric from the elementary activity "Oral History."

Rubric: Video Project

CRITERIA	LEVELS OF PERFORMANCE 1	2	3	4	5
Editing					The editing is respectful of the subject, includes smooth transitions, only the essential footage.
Alignment with Theme					Holistically the information on the video is in alignment with the selected theme.
Quality					The video includes a title screen and credits, has good camera angles, and is of high enough resolution to be posted on the Web site and viewed through a browser.
Archived					Video is posted on the class Web site, within the time line, and is fully functional through the browser.

TO BE COMPLETED BY CLASS

Note: (1) This rubric uses a numerical scoring mechanism with "5" as the highest and "1" as the lowest possible scores. There are no descriptive words associated with each scoring category. (2) The rubric is created with the lowest score on the left to the highest on the right, which is the opposite of the electronic portfolio rubric.

As the classroom conversation proceeds, the faculty member may ask, "How might the editing of the video actually be disrespectful to the subject of the video?" The conversation would then ensue around the elements of respect for subjects, how videographers can demonstrate insensitivity, and how to edit down to the essential elements of the story without jeopardizing the authenticity of the story being told.

As the elements are discussed, levels one through four can be described. Discussing what is meant by each criterion further clarifies the expectation for the production of the project, thus raising the level of achievement for candidates who otherwise may have misinterpreted the expectations. The discussion of the remainder of the criteria progresses in the same manner as the assignment is being made.

An alternative to holding a whole group discussion involves the use of consensus groups. Each element in the table is assigned to a small group for discussion and drafting of the achievement levels on the specific criteria. The groups then share their outcomes, leading a class discussion to edit the results and ensure comprehension by classmates.

Regardless of the organizational structure used to complete the rubric, the exercise of delineating between the levels of the rubric provides additional experience in rubric development and clarifies the process and performance results for candidates.

REFLECTIONS

Reflecting on one's work in a written form has become a staple in teacher preparation. Often teacher preparation programs include in their mission statement the idea of developing reflective practitioners. The act of reflecting on work completed brings the cycle of planning, implementation, and assessment full circle by linking the assessment to self-assessment of teaching and critical planning for instructional improvement.

Burke (1997) writes, "Without written commentaries, explanations and reflections, the portfolio is no more than a notebook of artifacts or a scrapbook of teaching mementos." The attachment of a reflection to each entry in the portfolio provides the context for assessing the artifact as evidence in meeting the standards. The reflection is a glimpse into the thinking of the candidate, providing the faculty member with more information as to the candidate's understanding of the criteria and how the criteria have been addressed.

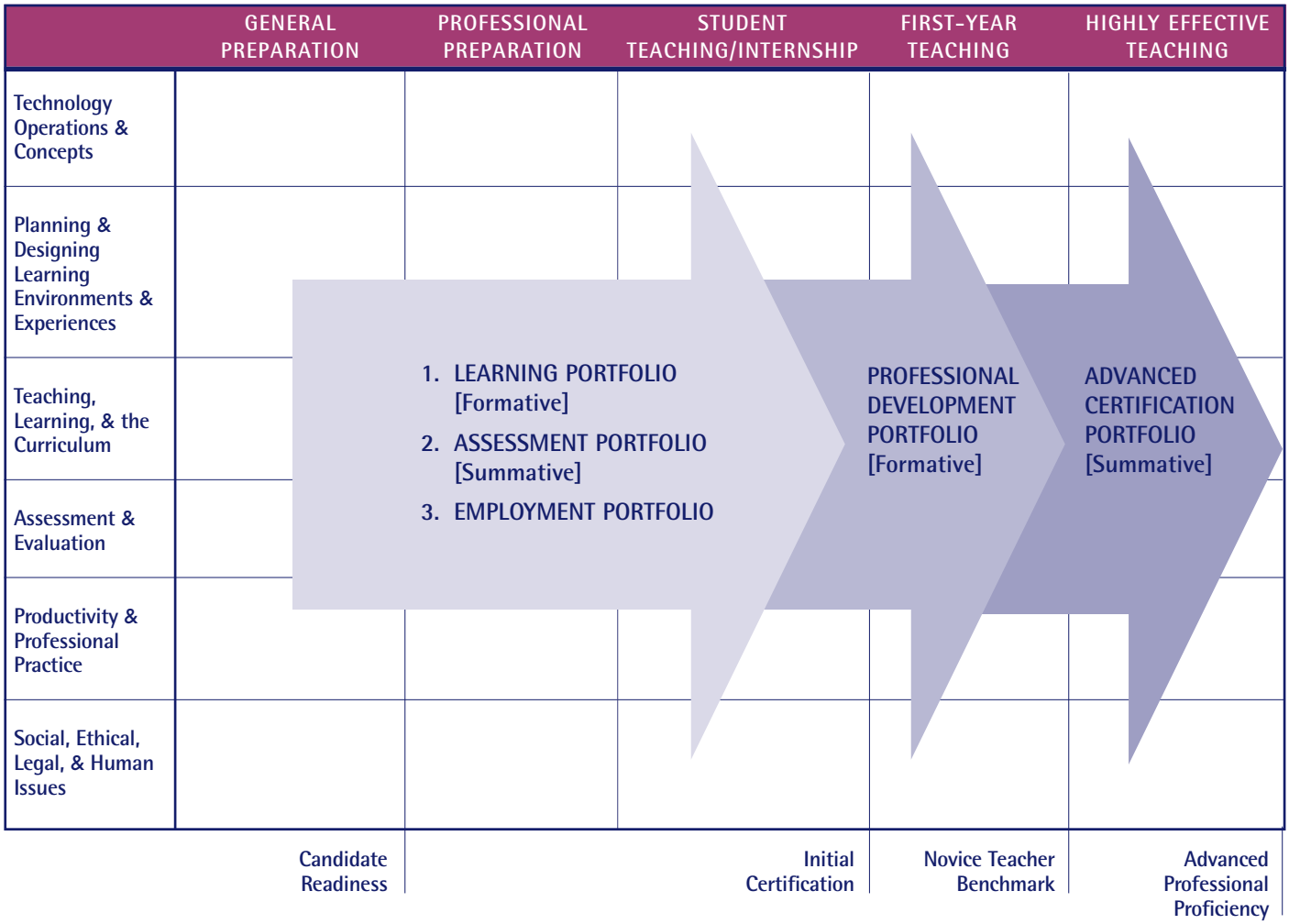
The format for reflections can vary. The seemingly simplistic question of "How does this entry address the standard?", supplemented with additional space for the meaning and value of the entry in addressing the criteria, provides a forum for candidates to address the criteria in a written form. Candidates can complete the reflection as a cover sheet to each entry in the portfolio. Initially, the reflection should be completed immediately as the entry is placed in the portfolio. This ensures that the initial thinking about the entry has been recorded. As the portfolio is being assembled, reflections can be altered to fit the purpose of the portfolio and the criteria being addressed. The strength of the portfolio as an assessment tool lies in the quality of the reflections included.

Portfolios

Two key purposes of using portfolios with preservice teachers are (1) to advance the pace of teacher development in increasing the level of teacher professionalism, and (2) to improve teacher assessment for licensure and employment decisions (Tierney, 1994). Items selected for inclusion in the portfolio show the candidate's best work (Bloom & Bacon, 1995); growth and competence around a variety of themes (content, pedagogy, management professionalism) (Geiger & Shugarman, 1988); or effort, progress, and achievements (Paulson, Paulson, & Meyer, 1991). These items can be required by the teacher education program or selected by the candidate.

From the learner's perspective, portfolio assessment means, "Let me show you" (Fogarty, 1998, p. 10). This type of assessment focuses on growth and development over time, with learners collecting, selecting, and reflecting on artifacts as evidence of their learning. Portfolio entries can take the form of artifacts (items from previous classroom experiences), reproductions (photographs and videos, often of student work), productions (items specifically produced for the portfolio), and attestations (acknowledgements of candidate accomplishments from others who have observed the candidate's work) (Collins, 1992). Portfolios promote self-analysis and critical reflection in ways that help unpack the complexities of teaching (Costantino & DeLorenzo, 1994). Reflections on and about the entries and the processes of developing and using the strategies outlined in the entries provide insight into candidate knowledge, skills, and dispositions as developing professionals. Figure 4 shows an adaptation of the NETS for Teachers Assessment Model to address the progression of the teacher candidate's portfolio through the stages of the teacher education program, to the classroom teaching experience, and on to advanced certification, possibly through the National Board for Professional Teaching Standards.

Portfolio Development Progression—From Preservice to Advanced Certification



To effectively use technology to develop a portfolio, students are encouraged to become "digital packrats" (see Section 2, "Educational Foundations") from the beginning of their teacher education program. From the artifacts they collect and from others that they produce, a teacher candidate can create several types of portfolios.

TEACHER PREPARATION PROGRAM PORTFOLIOS

Learning/Formative Assessment Portfolio

Throughout their teacher education program candidates collect and present artifacts and other evidence demonstrating their journey to becoming an effective teacher. The purpose of this portfolio is to provide evidence of their present competence and might include a plan for professional growth. Evidence might include a philosophy statement, courses taken, course assignments, videos, and evaluations of their work. Ideally each entry would include a reflective component telling how the entry affected their growth toward becoming an effective teacher. Formative feedback takes place periodically by individuals or groups of peers, faculty, practicing teachers, and administrators.

Summative Portfolio

By the end of the student teaching program, the portfolio is used for summative assessment, to demonstrate achievement of any group of standards (i.e., NETS, INTASC). The purpose of this portfolio is

to document attainmentt of the standards. Candidates examine their collection of items and select those that best document their journey toward, and describe them as effective teachers. As items are selected, candidates are asked to include the connection to the teacher education program and/or ISTE NETS goals in their caption or reflection about the artifact. An individual item might address one or more standards, and a group of items might address parts of a standard. If all standards are not met through the items collected within a reasonable amount of space, candidates can produce additional items that address the standard.

TEACHING PORTFOLIO

Employment Portfolio

The teacher candidate may use the items collected during the teacher preparation program to develop an employment portfolio. The purpose of this portfolio is to show that he or she is the right person for the job. The configuration of this portfolio is, again, determined by the audience, the potential employer and the particular job. For example, a secondary science teacher's portfolio might include different items if they were applying for a middle level earth/space science position than if they were applying for a secondary chemistry position. Careful selection from the items collected over time and reflection about these items focused on the purpose (getting the job) is required.

Professional Development Portfolio

Once in the teaching profession, the portfolio becomes more like the Learning/Formative Assessment Portfolio created during teacher preparation. Teachers collect items over the course of their teaching career—evidence of their effect on student work, attendance at conferences, completion of courses—to document continued growth. Each year during evaluation the teacher and administrator or teacher and mentor collaboratively evaluate teaching effectiveness and set goals. The portfolio can be used for performance assessment, based on appropriate teaching standards and individually set goals for professional development.

ADVANCED DEGREE OR CERTIFICATION PORTFOLIO

Advanced Degrees

Many masters and doctoral programs also require the use of a portfolio to document accomplishment of knowledge, skills, and dispositions. Candidates add to and select from their ever-increasing collection of items to fit the purpose of the advanced degree portfolio.

National Board for Professional Teaching Standards Certification

According to its Web site, "the National Board's mission is to establish high and rigorous standards for what accomplished teachers should know and be able to do, to develop and operate a national voluntary system to assess and certify teachers who meet these standards, and to advance related education reforms for the purpose of improving student learning in American schools" (NBPTS, 2001a, www.nbpts.org/about/history.html). The process consists of two major parts, the portfolio entries and the assessment center exercises. The NBPTS also indicates that "a good portfolio reflects the standards and provides evidence of a teacher's level of accomplishment" (NBPTS, 2001b, **www.nbpts.org/nat_board_certification/certification_process.html#portfolio**).

ELECTRONIC PORTFOLIOS TO DEMONSTRATE NETS

The artifacts and reflections from performance activities within a given teacher education program, such as described in other chapters in this book, can be placed into a teacher candidate's electronic portfolio. This electronic evidence can serve to demonstrate the growth in knowledge and skills noted on the NETS for Teachers. When started early, an electronic portfolio can become a tool to organize and present evidence of learning that results from these performance assessment activities over time. Armed with this understanding, the subcommittee from the ISTE NETS Writing Team defined the purpose, audience, process, and various developmental strategies for using technology to maintain authentic samples of a teacher candidates' work, demonstrating achievement of not only the ISTE NETS for Teachers but also

the school of education's teaching standards and any other standards that the candidate is responsible for demonstrating. The purpose of an electronic portfolio is to document the prospective teacher's growth and change over time and provides the ideal container in which to organize and document both the teacher education program standards (INTASC and content area standards) and various performance assessments that demonstrate achievement of the ISTE NETS.

Portfolio Entries

Because the portfolio evolves over time and can be repurposed for various uses, many artifacts should be obtained to allow maximum flexibility for the candidate as well as provide evidence for the attainment of the NETS for Teachers. To assist in determining what might go into a portfolio to demonstrate that these standards have been met, Figure 5 provides a list of artifacts that could be included in an electronic portfolio, demonstrating each of the NETS for Teachers performance indicators. One item, such as a comprehensive teaching unit, might address parts of several standards. This list of items is not meant to be exhaustive. Rather, it is designed to provide faculty and programs with a starting point to determine the data that might be collected by both candidates and programs to demonstrate the NETS for Teachers.

NETS for Teachers Electronic Portfolio—Suggested Artifacts by Standard

STANDARD I

TECHNOLOGY OPERATIONS AND CONCEPTS

A. Evidence of proficiency as described in the ISTE NETS for Teachers (General Preparation Performance Profile assessment results)

B. Evidence of professional development in technology plan and action steps

STANDARD II

PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES

A. Evidence of instruction that connects appropriate technology resources, curriculum content, and assessments for specific student populations:

- Unit and lesson plans in which the candidate has selected a broad range of technology resources to adapt instruction to different learning needs and ability levels, to enable participation of students with special needs, and to support second language learners.
- Candidate work samples in which a broad range of technologies have been used to adapt instruction to different learning needs and ability levels, to enable participation of students with special needs, and to support second language learners.

B. Evidence of knowledge of current research and the application of current research to designing effective learning environments and experiences including:

- Citations or references to current research on teaching and learning with technology are cited in technology plan or unit plan.

C. Evidence of a rationale for inclusion of specific technology resources in a unit or lesson plan, including how these resources were identified, located, evaluated, and selected. Technology resources may include software, Web-based media, peripherals, video, and so on.

D. Evidence of orchestration of activities to maximize student learning by matching the most appropriate technology setting and resources to instructional and learner needs.

- Classroom technology plan includes how technology resources will be matched to student learning experiences.
- Instructional unit reflects appropriate match between technology resources and student learning experiences.

E. Evidence of adapting to a variety of technology-enhanced learning environments, such as one-computer classrooms, multi-workstations, portable technologies, and computer labs.

- A variety of technology-enhanced environments included in technology plan.
- A variety of technology-enhanced environments used in unit and lesson plans appropriately matched to instructional strategies.

STANDARD III

TEACHING, LEARNING, AND THE CURRICULUM

A. Evidence of unit and lesson plans that specifically reference NETS.

B. Evidence of units and lessons that use technology resources to individualize instruction to address diverse learning needs.

C. Evidence of units and lessons that allow students to explore higher-order thinking and problem solving by using technology to extend and expand (go beyond the classroom) instruction.

D. Evidence of student learning activities that demonstrate adaptation to a variety of technology-enhanced learning environments, such as one-computer classrooms, multi-workstations, portable technologies, computer labs, including:

- Examples of student work produced using a variety of technology resources.
- Observations.
- Reproductions (images, video, audio) of students using a variety of technology resources while learning.

STANDARD IV

ASSESSMENT AND EVALUATION

A. Evidence of using technology to collect and analyze student performance data may include electronic gradebooks, Web-based testing, spreadsheets, databases, student electronic portfolios, and other performance task end products.

B. Evidence of using technology to interpret student assessment information, report results, analyze trends, recognize patterns, and draw conclusions about classroom performance to improve instructional practice, including:

- Technology-supported individual learning reports for parents and students.
- Assessment data across years for individual teaching, across schools, and across students to show long-term gains or effects of changes in teaching pedagogy.
- Reflections including specific references.

STANDARD V

PRODUCTIVITY AND PROFESSIONAL PRACTICE

A. Evidence of participation in continuing education (educational technology conference attendance, curriculum integration workshops, online courses).

B. Evidence of professional development in technology plan and action steps.

C. Evidence of using technology to collaborate, prepare publications, and produce other creative work

D. Evidence of using technology tools for sustained communication, (e.g., e-mail, listservs, shared network folders, Web pages, videoconferences).

STANDARD VI

SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES

A. Evidence of:

- Lessons that include copyright policy, and citations.
- Student work that includes appropriate references, and lessons that model intellectual property rights and acceptable use policies.
- Classroom rules that address issues of privacy, security, appropriate access, and implementation of acceptable use policies.

B. Evidence of:

- Selecting and using a broad range of technology resources to adapt instruction to different learning needs and ability levels and support second language learners.
- Arranging equitable access to appropriate technology that enables students to engage successfully in learning activities across subject-content levels.
- Purposeful use of assistive technologies to enable all students, regardless of special needs, to participate in learning.

C. (See A) Evidence that classroom use of technology is organized in ways that
   - Are developmentally appropriate,
   - Do not put student health at risk (ergonomically sound, time appropriate, etc), and
   - Ensure the security of student data and information.

D. Evidence of classroom planning and management, including scheduling, room arrangement, and rules, that ensure all students have access to technology resources (i.e., a classroom technology plan).

Required Entries

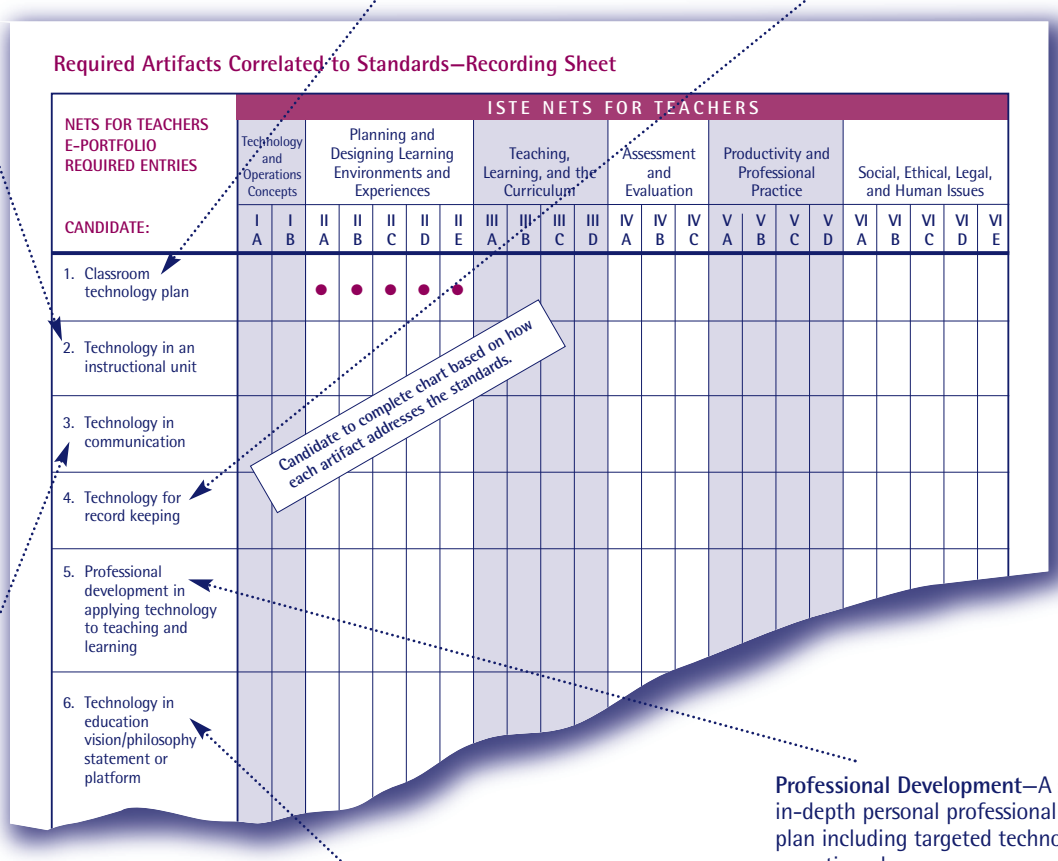
For the purposes of program assessment and improvement, the subcommittee identified six required entries for the portfolio that should be expected from all students. *Required Artifacts Correlated to Standards—Recording Sheet* lists these six pieces of evidence to be included, with specifications for each item. The development of each item should become embedded in the teacher preparation program with several opportunities for review and enhancement based on growth and experiences.

When combining the required entries with other artifacts selected by the candidate, an organizing table should be provided to validate how each artifact relates to meeting the standards. *Required Artifacts Correlated to Standards—Recording Sheet* is an example of a candidate recordkeeping chart showing how the candidate perceives each of the required items addressed by ISTE NETS for Teachers. An expansion of this table, providing for more self-selected entries, allows teacher candidates to maintain a record of the types of documents in their portfolios and which standards they address. Because candidates may improve upon previous work, several variations of an entry might be listed with dates and updated reflections showing continued progress moving from novice to distinguished in performance. Teacher education and professional development programs are highly encouraged to use multiple artifacts that address general standards. Additionally, progress toward meeting the standards should be documented with multiple assessment opportunities throughout the program. Therefore, it will not be unusual for the following recording sheet to have several marks in each line and column.

Classroom Technology Plan—A classroom-wide year-long plan that focuses on systematic curriculum integration to meet student standards and classroom management of student access to technology resources.

Instructional Unit—Curriculum unit that includes (among other elements) technology goals and objectives, technology management plan, sample lessons, and electronic student work samples.

Record Keeping—Examples of a comprehensive strategy for maintaining student data, curriculum planning information, electronic examples of student work, and tracking student progress.



Required Artifacts Correlated to Standards—Recording Sheet

NETS FOR TEACHERS E-PORTFOLIO REQUIRED ENTRIES	ISTE NETS FOR TEACHERS																				
	Technology and Operations Concepts		Planning and Designing Learning Environments and Experiences					Teaching, Learning, and the Curriculum				Assessment and Evaluation			Productivity and Professional Practice				Social, Ethical, Legal, and Human Issues				
CANDIDATE:	I A	I B	II A	II B	II C	II D	II E	III A	III B	III C	III D	IV A	IV B	IV C	V A	V B	V C	V D	VI A	VI B	VI C	VI D	VI E
1. Classroom technology plan			●	●	●	●	●																
2. Technology in an instructional unit																							
3. Technology in communication																							
4. Technology for record keeping																							
5. Professional development in applying technology to teaching and learning																							
6. Technology in education vision/philosophy statement or platform																							

Candidate to complete chart based on how each artifact addresses the standards.

Professional Development—A section of an in-depth personal professional development plan including targeted technology goals and an action plan.

Communication—Samples of technology-based ongoing communication that occur among the teacher, family, and student, teacher to teacher and teacher to community.

Education Vision/Philosophy Statement—Part of a larger philosophy statement focusing on the personal beliefs and rationale for technology to improve teaching, learning, and assessment.

Note: A complete description and associated scoring rubric for each suggested required artifact can be found in the ISTE NETS Assessment document.

Assessing the Electronic Portfolio

Many elements are assessed in an electronic portfolio. Not only are the entries and reflections assessed, but, as with a paper portfolio, issues of presentation and design enter into the user's perception of the portfolio's contents. The process of developing an electronic portfolio itself becomes a performance assessment task.

Conclusions

Many strategies can be used to assess whether teacher candidates have achieved the NETS for Teachers. The primary types of assessment measures discussed here include performance tasks, many of which are outlined in this book, along with assessment rubrics. A teacher candidate's evidence of meeting the standards, organized and presented in an electronic portfolio, supports an emerging trend in balanced assessment that provides a richer picture of achievement than can be gained from more traditional, objective forms of assessment. ISTE will be developing a more in-depth resource on assessing the NETS for Teachers to provide further support for teacher educators and school leaders. An electronic portfolio has the potential to become a dynamic celebration of learning that documents a teacher's professional development across his or her career.

References

Angelo, T. A. (1995). *AAHE Bulletin*, November 1995, 7.

Arter, J., & McTighe, J. (2001). *Scoring rubrics in the classroom*. Thousand Oaks, CA: Corwin Press, Inc.

Barrett, H. (2000). Create your own electronic portfolio. *Learning & Leading with Technology, 27*(7), 14–21.

Bloom, L., & Bacon, E. (1995). Professional portfolios: An alternative perspective of the preparation of teachers of students with behavioral disorders. *Behavioral Disorders, 20*(4), 290–300.

Burke, K. (1997). *Designing Professional Portfolios for Change*. Arlington Heights, IL: Skylight Professional Development.

Collins, A. (1992). Portfolios in science education: Issues in purpose, structure, and authenticity. *Science Education, 76*(4), 451–463.

Costantino, P., & DeLorenzo, M. (1994, February). *Developing a professional portfolio: Suggested guidelines for preservice and inservice teachers*. Paper presented at the annual meeting of the Association of Teacher Educators, Atlanta, GA.

Fogarty, R. (1998). *Balanced assessment*. Arlington Heights, IL: Skylight Professional Development.

Geiger, J., & Shugarman, S. (1988). Portfolios and case studies to evaluate teacher education students and programs. *Action in Teacher Education, 10*(3), 31–34.

International Society for Technology Education. (2000). *National educational technology standards for teachers*. Eugene, OR: ISTE.

National Board for Professional Teaching Standards. (2001a). *History of the National Board* [Online]. Available: **www.nbpts.org/about/history.html**.

National Board for Professional Teaching Standards. (2001b). *National Board certification process* [Online]. Available: **www.nbpts.org/nat_board_certification/certification_process.html#portfolio**.

National Council for Accreditation of Teacher Education. (2000). *Principles for performance-based assessment systems in professional education programs*. Washington, DC: NCATE.

Paulson, F. L., Paulson, P. R., & Meyer, C. A. (1991). What makes a portfolio a portfolio? *Educational Leadership, 48*(5), 60–63.

San Mateo County Office of Education. (1997). *Project-based learning with multimedia* [Online]. Available: **http://pblmm.k12.ca.us/PBLGuide/ThoughtPieces/Rubric.html**.

Tierney, D. (1994, April). *Teacher portfolios: Would an assessment by any other name smell as sweet?* Paper presented at the annual meeting of the American Education Research Association, New Orleans, LA.

Webb, N. L. (1997). *Criteria for alignment of expectations and assessments in mathematics and science education.* Washington, DC: National Institute for Science Education.

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