INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION

National Educational Technology Standards for Teachers

The National Educational Technology Standards for Teachers (NETS•T) Project is an ISTE initiative funded by the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT^3) grant program.

This ISTE NETS for Teachers document was developed with contributions from

- Apple
- Milken Exchange on Education Technology
- A consortium of distinguished NETS and PT^3 partners and contributors

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ISTE NETS Leadership Team and Project Partners

THE FOLLOWING ORGANIZATIONS HAVE COLLABORATED WITH ISTE IN THE DEVELOPMENT OF THE NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS FOR STUDENTS AND TEACHERS

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Special thanks to Apple; Dr. M. G. (Peggy) Kelly, California State University San Marcos; and the teachers and students of Carrillo School for many of the photographs used in this booklet.

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Our Educational System Must Produce Technology-Capable Kids

To live, learn, and work successfully in an increasingly complex and information-rich society, students and teachers must use technology effectively. Within a sound educational setting, technology can enable students to become:

- *Capable information technology users*
- *Information seekers, analyzers, and evaluators*
- *Problem solvers and decision makers*
- *Creative and effective users of productivity tools*
- *Communicators, collaborators, publishers, and producers*
- *Informed, responsible, and contributing citizens*

Through the ongoing use of technology in the schooling process, students are empowered to achieve important technology capabilities. The key individual in helping students develop those capabilities is the classroom teacher. The teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate students' use of technology to learn, communicate, and develop knowledge products. Consequently, it is critical that all classroom teachers are prepared to provide their students with these opportunities. Both professional development programs for teachers currently in the classroom and preparation programs for future teachers must provide technology-rich experiences throughout all aspects of the training programs. Standards within this document provide guidelines for all teachers but specifically for planning teacher education programs that will prepare teachers to play an essential role in producing technology-capable students.

Ready or not...

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The World Is Different

Kids are different...

Learning is different...

And Teaching Must Be Different, too!

Today's classroom teachers must be prepared to provide technology-supported learning opportunities for their students. Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher's professional repertoire.

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Teachers must be prepared to empower students with the advantages technology can bring. Schools and classrooms, both real and virtual, must have teachers who are equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills. Real-world connections, primary source material, and sophisticated data-gathering and analysis tools are only a few of the resources that enable teachers to provide heretofore unimaginable opportunities for conceptual understanding.

Traditional educational practices no longer provide prospective teachers with all the necessary skills for teaching students who must be able to survive economically in today's workplace. Teachers must teach students to apply strategies for solving problems and to use appropriate tools for learning, collaborating, and communicating. The following chart lists characteristics representing traditional approaches to learning and corresponding strategies often associated with new learning environments for PK–12 students. These new learning environments should also be established in teacher preparation programs.

ESTABLISHING NEW LEARNING ENVIRONMENTS

Incorporating New Strategies

Traditional Learning Environments	→	New Learning Environments
Teacher-centered instruction	→	*Student-centered learning*
Single-sense stimulation	→	*Multisensory stimulation*
Single-path progression	→	*Multipath progression*
Single media	→	*Multimedia*
Isolated work	→	*Collaborative work*
Information delivery	→	*Information exchange*
Passive learning	→	*Active/exploratory/inquiry-based learning*
Factual, knowledge-based learning	→	*Critical thinking and informed decision-making*
Reactive response	→	*Proactive/planned action*
Isolated, artificial context	→	*Authentic, real-world context*

To provide a sense of what teachers must prepare students to be able to do, the following page lists the standards and performance indicators for students at specified grade ranges. Each profile of performance indicators builds on the prior list of competencies. Teachers must be able to create learning experiences that enable students to achieve these competencies in a meaningful way.

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The technology standards for students are divided into six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students. These categories provide a framework for linking performance indicators found within the Profiles for Technology-Literate Students to the standards. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.

TECHNOLOGY STANDARDS FOR STUDENTS

1. Basic operations and concepts

- Students demonstrate a sound understanding of the nature and operation of technology systems.
- Students are proficient in the use of technology.

2. Social, ethical, and human issues

- Students understand the ethical, cultural, and societal issues related to technology.
- Students practice responsible use of technology systems, information, and software.
- Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

Profiles for Technology-Literate Students

GRADES PK–2

Prior to completion of Grade 2 students will:

1. Use input devices (e.g., mouse, keyboard, remote control) and output devices (e.g., monitor, printer) to successfully operate computers, VCRs, audiotapes, and other technologies. (1)
2. Use a variety of media and technology resources for directed and independent learning activities. (1, 3)
3. Communicate about technology using developmentally appropriate and accurate terminology. (1)
4. Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning. (1)
5. Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)
6. Demonstrate positive social and ethical behaviors when using technology. (2)
7. Practice responsible use of technology systems and software. (2)
8. Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)
9. Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)
10. Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)

GRADES 3–5

Prior to completion of Grade 5 students will:

1. Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)
2. Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)
3. Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)
4. Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
5. Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
6. Use telecommunications efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4)
7. Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
8. Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem-solving, self-directed learning, and extended learning activities. (5, 6)
9. Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)
10. Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources. (6)

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GRADES 6–8

Prior to completion of Grade 8 students will:

1. Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)
2. Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)
3. Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)
4. Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)
5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
6. Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
7. Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
8. Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
9. Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (1, 6)
10. Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)

GRADES 9–12

Prior to completion of Grade 12 students will:

1. Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)
2. Make informed choices among technology systems, resources, and services. (1, 2)
3. Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)
4. Demonstrate and advocate for legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)
5. Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)
6. Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
7. Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications, and productivity. (4, 5, 6)
8. Select and apply technology tools for research, information analysis, problem-solving, and decision-making in content learning. (4, 5)
9. Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)
10. Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

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3. Technology productivity tools

- Students use technology tools to enhance learning, increase productivity, and promote creativity.
- Students use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.

4. Technology communications tools

- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5. Technology research tools

- Students use technology to locate, evaluate, and collect information from a variety of sources.
- Students use technology tools to process data and report results.
- Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.

6. Technology problem-solving and decision-making tools

- Students use technology resources for solving problems and making informed decisions.
- Students employ technology in the development of strategies for solving problems in the real world.

ISTE NETS Essential Conditions for Teacher Preparation

A combination of essential conditions is required for teachers to create learning environments conducive to powerful uses of technology.

The most effective learning environments meld traditional approaches and new approaches to facilitate learning of relevant content while addressing individual needs. For these new learning environments to develop, certain prerequisite factors or essential conditions must be present in every phase of an aspiring teacher's education—in the university's general education programs, in the chosen major, in teacher preparation programs, and at the school sites hosting student teachers and interns. First-year teachers cannot be expected to put into practice what they have learned about how to use technology without the presence of these essential conditions in their new job environment. Policy decisions supporting technology use greatly affect a new teacher's ability to use technology effectively.

Because there are many avenues to becoming a teacher, this document addresses a wide variety of teacher preparation program designs. In the context of university-based programs, teacher education must be viewed as a university-wide responsibility. Prospective teachers must experience and observe effective uses of technology in their general education and major coursework. School and college of education coursework must consistently model exemplary pedagogy that integrates the use of technology for learning content

GENERAL PREPARATION	PROFESSIONAL PREPARATION
SHARED VISION—There is proactive leadership and administrative support from the entire system.	
University leaders share a vision for technology use in all appropriate courses and content areas.	The professional education administration and faculty share a vision for technology use to support new modes of teaching and learning.
ACCESS—Educators have access to current technologies, software, and telecommunications networks.	
Access to current technologies, software, and telecommunications networks is provided for all students and faculty both inside and outside the classroom.	Access to current technologies, software, and telecommunications networks is provided for teacher education faculty, classes, and field sites, including technology-enhanced classrooms that model environments for facilitating a variety of collaborative learning strategies.
SKILLED EDUCATORS—Educators are skilled in the use of technology for learning.	
Faculty teaching general education and major courses are knowledgeable about and model appropriate use of technology in their disciplines.	Teacher education faculty are skilled in using technology systems and software appropriate to their subject area specialty and model effective use as part of the coursework.
PROFESSIONAL DEVELOPMENT—Educators have consistent access to professional development in support of technology use in teaching and learning.	
University faculty and students are provided with opportunities for technology skill development and reward structures that recognize the application of technology in teaching, learning, and faculty collaboration.	Personnel in teacher education and field experience sites are provided with ongoing professional development.
TECHNICAL ASSISTANCE—Educators have technical assistance for maintaining and using the technology.	
Timely technical assistance is available for all faculty to ensure consistent, reliable functioning of technology resources.	Technical assistance for teacher education faculty and students is readily accessible and includes expertise in the use of technology resources for teaching and learning in PK–12 settings.
CONTENT STANDARDS AND CURRICULUM RESOURCES—Educators are knowledgeable in their subject matter and current in the content standards and teaching	
Prospective teachers have knowledge in the subject area(s) they intend to teach.	Technology-based curriculum resources that address subject matter content standards and support teaching, learning, and productivity are available to teacher candidates.
STUDENT-CENTERED TEACHING—Teaching in all settings encompasses student-centered approaches to learning.	
University faculty incorporate student-centered approaches to learning (e.g., active, cooperative, and project-based learning).	Teacher education faculty and professional teaching staff model student-centered approaches to instruction in education coursework and field experiences.
ASSESSMENT—There is continuous assessment of the effectiveness of technology for learning.	
University faculty and support staff assess the effectiveness of technology for learning to examine educational outcomes and inform procurement, policy, and curriculum decisions.	Teacher education faculty and professional teaching staff model the integration of teaching and assessment to measure the effectiveness of technology-supported teaching strategies.
COMMUNITY SUPPORT—The community and school partners provide expertise, support, and resources.	
Prospective teachers experience technology use in real-world settings related to their general education and courses in their majors.	Teacher preparation programs provide teacher candidates with opportunities to participate in field experiences at partner schools where technology integration is modeled.
SUPPORT POLICIES—School and university policies, financing, and reward structures are in place to support technology in learning.	
University faculty are provided with resources for meeting subject area needs and with reward structures that recognize the application of technology in teaching, learning, and faculty collaboration.	Policies associated with accreditation, standards, budget allocations, and personnel decisions in teacher education programs and field experience sites support technology integration. Retention, tenure, promotion, and merit policies reward innovative uses of technology by faculty with their students.

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with methods for working with PK–12 students. In school-based programs, candidates must continually observe and participate in the effective modeling of technology use for both their own learning and the teaching of their students. Technology must become an integral part of the teaching and learning process in every setting supporting the preparation of teachers.

The following elements are necessary to be in place at the university, the college or school of education, and the school site.

- Shared Vision
- Access
- Skilled Educators
- Professional Development
- Technical Assistance
- Content Standards and Curriculum Resources
- Student-Centered Teaching
- Assessment
- Community Support
- Support Policies

STUDENT TEACHING/ INTERNSHIP	FIRST-YEAR TEACHING
University personnel and teachers and school administrators at the cooperating school site share a vision for technology use in the classroom.	Schools, districts, and universities share a vision for supporting new teachers in their use of technology in the classroom.
Access to current technologies, software, and telecommunications networks is provided for student teachers/interns and their master teachers/mentors/supervisors in the classroom and professional work areas.	Access to current technologies, software, and telecommunications networks is provided for new teachers for classroom and professional use, including access beyond the school day.
Master (cooperating/supervising) teachers and university supervisors model technology use that facilitates students' meeting the ISTE National Educational Technology Standards for Students.	Peers and administrators are skilled users of technology for teaching and school management.
Cooperating/master teachers and supervisors of student teachers/interns are readily provided with professional development in applications of technology in teaching.	Faculty has continuous access to a variety of professional development opportunities in several delivery modes, with time to take advantage of the offerings.
In field-experience settings, technical assistance is onsite to ensure reliability of technology resources.	Technical assistance for faculty and staff is timely, onsite, and includes mentoring to enhance skills in managing classroom software and hardware resources.
methodologies in their discipline.	
Technology-based curriculum resources that are appropriate in meeting the content standards in teaching areas and grade ranges are available to teacher candidates at the student/intern site.	The school district provides professional development opportunities related to local policies and content standards and the technology-based resources to support the new teacher's efforts to address those standards.
Opportunities to implement a variety of technology-enhanced, student-centered learning activities are provided for teacher candidates/interns.	Faculty routinely use student-centered approaches to learning to facilitate student use of technology.
Cooperating/master teachers work with student teachers/interns to assess the effectiveness of student learning and of technology in supporting that learning.	The district and school site support the classroom teacher in the assessment of learning outcomes for technology-supported activities to inform planning, teaching, and further assessment.
Student teachers/interns teach in partner schools where technology integration is modeled and supported.	Schools provide beginning teachers with connections to the community and models of effective use of local and other resources.
Student teaching/internships are located at sites where administrative policies support and reward the use of technology.	School induction-year policies, budget allocations, and mentoring assignments support the first-year teacher's use of technology. Hiring practices include policies regarding technology skills of prospective hirees.

This chart provides guidelines for the NETS for Teachers essential conditions that should be in place for each phase in the teacher preparation process to support effective use of technology to improve learning, communication, and productivity.

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Technology Standards and Performance Indicators for Teachers

The ISTE National Educational Technology Standards for Teachers (NETS•T), which focus on preservice teacher education, define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. All candidates seeking certification or endorsements in teacher preparation should meet these educational technology standards. It is the responsibility of faculty across the university and at cooperating schools to provide opportunities for teacher candidates to meet these standards.

Performance indicators for each standard provide specific outcomes to be measured when developing a set of assessment tools. The six standards areas with performance indicators on the facing page are designed to be general enough to be customized to fit state, university, or district guidelines and yet specific enough to define the scope of the topic. The standards and the performance indicators also provide guidelines for teachers currently in the classroom.

THE EVOLUTION OF ISTE TECHNOLOGY STANDARDS

ISTE Technology Standards for Teachers have provided a framework for implementing technology in teaching and learning that has been widely used in universities, state departments of education, and school districts across the nation. This document includes the third revision in the evolutionary development of the standards.

1993

First Edition—ISTE Technology Standards for All Teachers adopted, 13 indicators

1997

Second Edition—ISTE Technology Standards for All Teachers, 18 indicators organized into the following three categories:

1. Basic Computer/Technology Operations and Concepts
2. Personal and Professional Use of Technology
3. Application of Technology in Instruction

2000

For standards to continue to be useful, changes in the standards topics and organization must reflect alignment with the ISTE National Educational Technology Standards for Students (NETS•S), research on teaching and learning with technology, and advances in technology. The third edition expands the three previous categories into six categories. These include breaking the Application of Technology in Instruction category into the areas of planning, implementing, and assessing, while adding a category on the social, ethical, legal, and human issues related to technology use.

Third Edition—ISTE *National Educational Technology Standards for Teachers* (NETS•T), 23 indicators organized into the following six categories:

I. Technology Operations and Concepts
II. Planning and Designing Learning Environments and Experiences
III. Teaching, Learning, and Curriculum
IV. Assessment and Evaluation
V. Productivity and Professional Practice
VI. Social, Ethical, Legal, and Human Issues

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ISTE NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS (NETS) AND PERFORMANCE INDICATORS FOR TEACHERS

All classroom teachers should be prepared to meet the following standards and performance indicators.

I. TECHNOLOGY OPERATIONS AND CONCEPTS

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE *National Educational Technology Standards for Students*).

B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

B. apply current research on teaching and learning with technology when planning learning environments and experiences.

C. identify and locate technology resources and evaluate them for accuracy and suitability.

D. plan for the management of technology resources within the context of learning activities.

E. plan strategies to manage student learning in a technology-enhanced environment.

III. TEACHING, LEARNING, AND THE CURRICULUM

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.

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

C. apply technology to develop students' higher order skills and creativity.

D. manage student learning activities in a technology-enhanced environment.

IV. ASSESSMENT AND EVALUATION

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.

B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.

C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. PRODUCTIVITY AND PROFESSIONAL PRACTICE

Teachers use technology to enhance their productivity and professional practice. Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.

B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.

C. apply technology to increase productivity.

D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice. Teachers:

A. model and teach legal and ethical practice related to technology use.

B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.

C. identify and use technology resources that affirm diversity.

D. promote safe and healthy use of technology resources.

E. facilitate equitable access to technology resources for all students.

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Technology Performance Profiles for Teacher Preparation

Today's teacher preparation programs provide a variety of alternative paths to initial licensure. They address economic conditions, needs of prospective teachers, and the demands of employing school districts. Regardless of the configuration of the program, all teachers must have opportunities for experiences that prepare them to meet technology standards. The existence of many types of programs virtually ensures that there will be no one method for providing learning experiences to meet these standards.

The Technology Performance Profiles for Teacher Preparation suggest ways programs can incrementally examine how well candidates meet the standards. The Profiles correspond to four phases in the typical preparation of a teacher. The Profiles are not meant to be prescriptive or lockstep; they are specifically designed to be fluid in providing guidelines for programs to create a set of benchmarks in planning and assessment that align with unique program design.

The four profiles are generally defined as the General Preparation Performance Profile, Professional Education Performance Profile, Student Teaching/Internship Performance Profile, and First-Year Teacher Performance Profile.

General Preparation Performance Profile

Students may be in their major or minor course of study. They may be at the lower division level or may have received skill development through on-the-job training, obtaining a degree or experience in a nontraditional program. Typically, the university arts and sciences areas provide the experiences defined in this Profile. Programs may have multiple ways for candidates to demonstrate that they are able to perform the tasks that go beyond the classroom setting. Upon completion of the general preparation component of their programs, prospective teachers should be able to meet the competencies described in this Profile.

Professional Education Performance Profile

Students have been admitted to a professional core of courses or experiences taught by the school or college of education or professional education faculty. Experiences in this Profile are part of professional education coursework that may also include integrated field work. The school or college of education or professional development school is typically responsible for preservice teachers having the experiences described in this Profile. Prior to the culminating student teaching or internship experience, prospective teachers should be able to meet the competencies described in this Profile.

Student Teaching/Internship Performance Profile

Students have completed or are finalizing their professional education coursework and are out in the classroom completing their final student teaching or intern teaching experience with extensive time spent with students. These individuals will obtain their initial licensure or credential required for a teaching job at the completion of this phase of their education. They are being supervised by a mentor or master teacher on a consistent basis. Upon completion of the culminating student teaching or internship experience, and at the point of initial licensure, teachers should meet the competencies described in this Profile.

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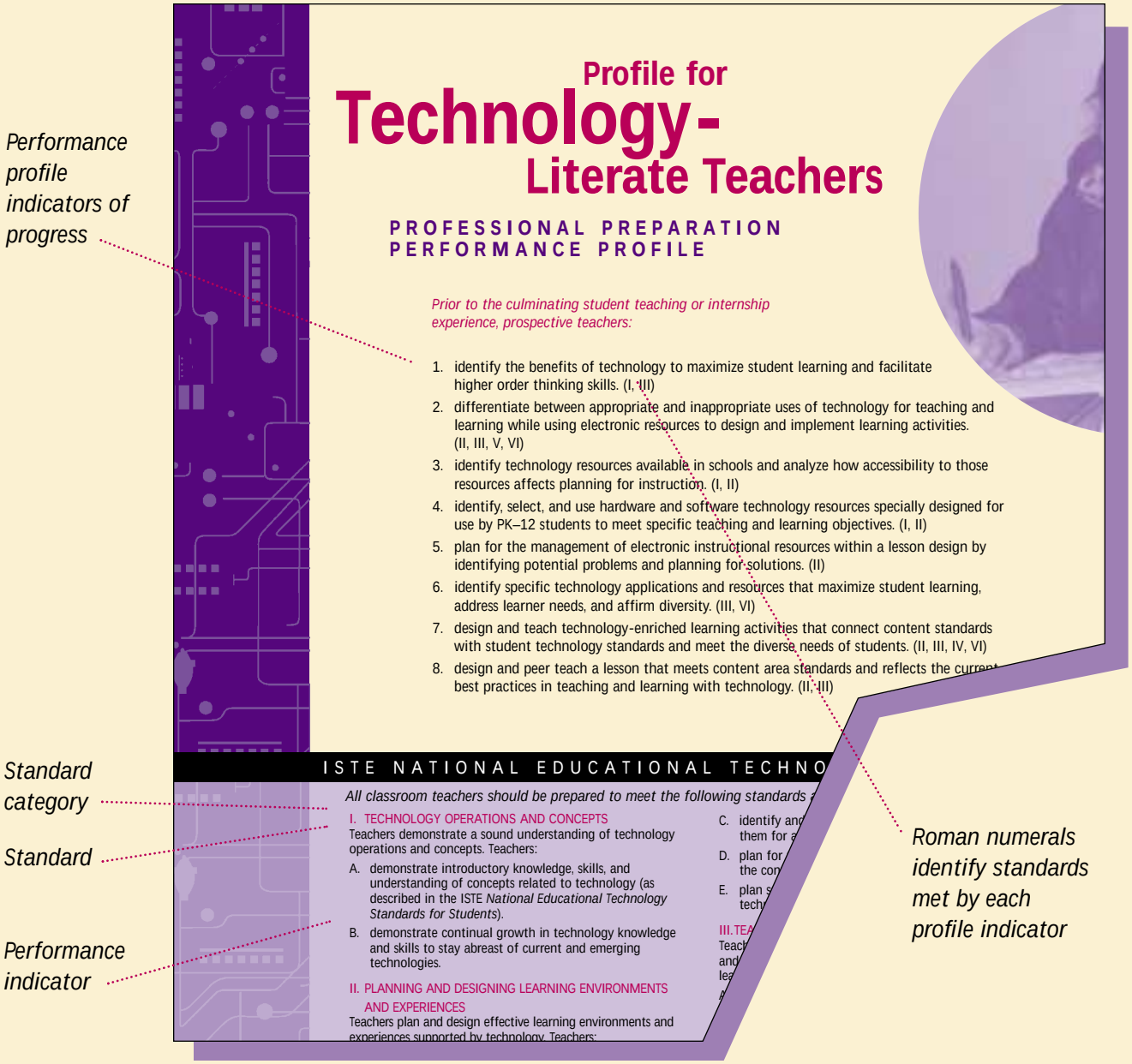
First-Year Teacher Performance Profile

Teachers have completed their formal teacher preparation program and are in their first year of independent teaching. They are typically in control of their own classroom and are under contract with a school district. Teachers at this stage, as with any teacher in the building, are supervised by their school administrator. The novice teacher may be part of a beginning teacher support program and may be receiving coaching and mentoring. Upon completion of the first year of teaching, teachers should meet the competencies described in this Profile.

HOW TO READ THE PERFORMANCE PROFILES

Example:



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Profile for Technology-Literate Teachers

GENERAL PREPARATION PERFORMANCE PROFILE

Upon completion of the general preparation component of their program, prospective teachers:

1. demonstrate a sound understanding of the nature and operation of technology systems. (I)*
2. demonstrate proficiency in the use of common input and output devices; solve routine hardware and software problems; and make informed choices about technology systems, resources, and services. (I)*
3. use technology tools and information resources to increase productivity, promote creativity, and facilitate academic learning. (I, III, IV, V)
4. use content-specific tools (e.g., software, simulation, environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (I, III, V)*
5. use technology resources to facilitate higher order and complex thinking skills, including problem solving, critical thinking, informed decision making, knowledge construction, and creativity. (I, III, V)*
6. collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works using productivity tools. (I, V)*

ISTE NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS

All classroom teachers should be prepared to meet the following standards and performance indicators.

I. TECHNOLOGY OPERATIONS AND CONCEPTS

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE *National Educational Technology Standards for Students*).

B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

B. apply current research on teaching and learning with technology when planning learning environments and experiences.

C. identify and locate technology resources and evaluate them for accuracy and suitability.

D. plan for the management of technology resources within the context of learning activities.

E. plan strategies to manage student learning in a technology-enhanced environment.

III. TEACHING, LEARNING, AND THE CURRICULUM

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.

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

C. apply technology to develop students' higher order skills and creativity.

D. manage student learning activities in a technology-enhanced environment.

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7. use technology to locate, evaluate, and collect information from a variety of sources. (I, IV, V)*
8. use technology tools to process data and report results. (I, III, IV, V)*
9. use technology in the development of strategies for solving problems in the real world. (I, III, V)*
10. observe and experience the use of technology in their major field of study. (III, V)
11. use technology tools and resources for managing and communicating information (e.g., finances, schedules, addresses, purchases, correspondence). (I, V)
12. evaluate and select new information resources and technological innovations based on their appropriateness to specific tasks. (I, III, IV, V)*
13. use a variety of media and formats, including telecommunications, to collaborate, publish, and interact with peers, experts, and other audiences. (I, V)*
14. demonstrate an understanding of the legal, ethical, cultural, and societal issues related to technology. (VI)*
15. exhibit positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity. (V, VI)*
16. discuss diversity issues related to electronic media. (I, VI)
17. discuss the health and safety issues related to technology use. (VI)

* Adapted from the ISTE *National Educational Technology Standards for Students*.

(NETS) AND PERFORMANCE INDICATORS FOR TEACHERS

IV. ASSESSMENT AND EVALUATION

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.
B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. PRODUCTIVITY AND PROFESSIONAL PRACTICE

Teachers use technology to enhance their productivity and professional practice. Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.
B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
C. apply technology to increase productivity.
D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice. Teachers:

A. model and teach legal and ethical practice related to technology use.
B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
C. identify and use technology resources that affirm diversity.
D. promote safe and healthy use of technology resources.
E. facilitate equitable access to technology resources for all students.

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Scenarios for General Preparation Performance Profile

The following scenarios exemplify technology use in the general preparation phase of a prospective teacher's education.

As part of their general education, students are often required to take courses in the social sciences. A professor of sociology at a midsize northeastern university includes in his course an activity that requires completion of a series of short assignments in researching local social service agencies. As a modification of the assignment, the professor asked students to create an electronic database of local and regional social service agencies, including contact information, scope of work, funding source, and agency URL, if available. The professor noted that the comprehensiveness and quality of the students' work improved markedly over previous semesters after he modified the assignment to include the creation of an electronic database. Students commented that because others in the class would be reading their work, they were motivated to provide accurate and high-quality database entries. When asked how useful certain aspects of their undergraduate program were over time, some of the students noted that the database assignment became a dynamic and invaluable resource for information retrieval and could be expanded to meet job-specific needs.

Many courses in literature and writing departments either focus on or use Shakespeare's writing. At a northwestern university, one course integrates general education material with English history and literature. Unable to visit Great Britain, students at the university use a CD created at Anglia Polytechnic University and a variety of Web sites focusing on Shakespeare and Stratford-upon-Avon. After completing background reading, the students use the information from the Web sites and the CD, and they evaluate the information for accuracy and relevance to their research topic. Prospective secondary English teachers take the Shakespeare course concurrently with a course on the methods of teaching literature. Using the Web sites, they develop lesson plans linking the information learned in their literature course with lesson plans for secondary students.

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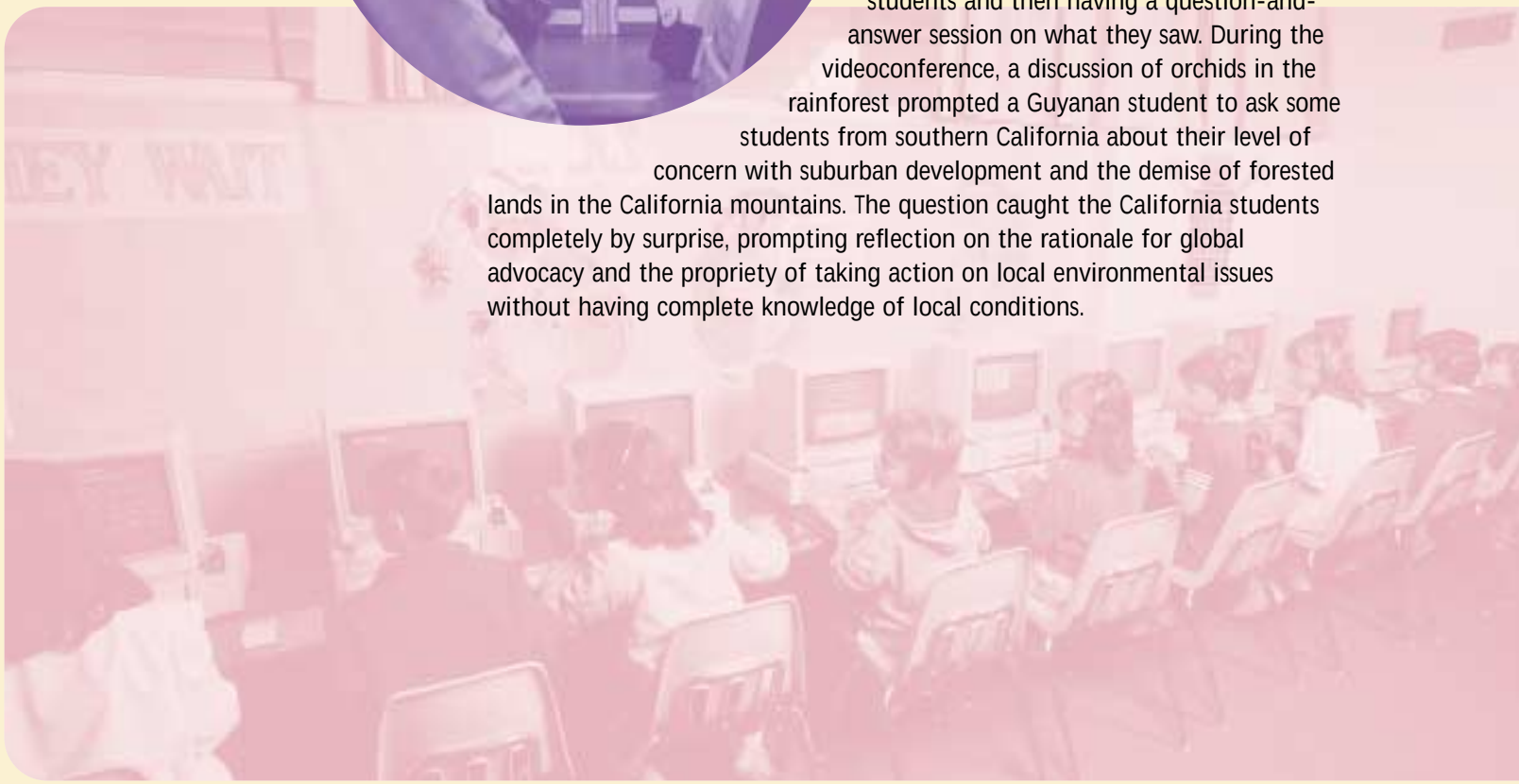
Technology-based resources in the visual arts present new and exciting opportunities for student learning. Students can now learn how to visually convey compelling concepts and ideas without having the talent of an artist, painter, or sculptor. In an introductory visual arts course, general education students are introduced to concepts of visual presentation (e.g., line, balance, pattern, and rhythm) through the use of graphics programs. One of the semester-long projects in the visual arts course involves taking a current social issue in the community and depicting it visually using graphics obtained from various sources.

Students in courses in environmental conservation at several universities in the United States linked with students in a similar course at the University of Guyana to discuss the status of the rainforests in Guyana and northern Brazil. The students submitted questions to one another using e-mail and threaded discussions. A videoconference was scheduled as a culminating activity. In their discussions, students agreed that they could best use their videoconference time by showing species of plants and animals never before seen by partner students and then having a question-and-answer session on what they saw. During the videoconference, a discussion of orchids in the rainforest prompted a Guyanan student to ask some students from southern California about their level of concern with suburban development and the demise of forested lands in the California mountains. The question caught the California students completely by surprise, prompting reflection on the rationale for global advocacy and the propriety of taking action on local environmental issues without having complete knowledge of local conditions.



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Profile for Technology-Literate Teachers

PROFESSIONAL PREPARATION PERFORMANCE PROFILE

Prior to the culminating student teaching or internship experience, prospective teachers:

1. identify the benefits of technology to maximize student learning and facilitate higher order thinking skills. (I, III)
2. differentiate between appropriate and inappropriate uses of technology for teaching and learning while using electronic resources to design and implement learning activities. (II, III, V, VI)
3. identify technology resources available in schools and analyze how accessibility to those resources affects planning for instruction. (I, II)
4. identify, select, and use hardware and software technology resources specially designed for use by PK–12 students to meet specific teaching and learning objectives. (I, II)
5. plan for the management of electronic instructional resources within a lesson design by identifying potential problems and planning for solutions. (II)
6. identify specific technology applications and resources that maximize student learning, address learner needs, and affirm diversity. (III, VI)
7. design and teach technology-enriched learning activities that connect content standards with student technology standards and meet the diverse needs of students. (II, III, IV, VI)
8. design and peer teach a lesson that meets content area standards and reflects the current best practices in teaching and learning with technology. (II, III)

ISTE NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS

All classroom teachers should be prepared to meet the following standards and performance indicators.

I. TECHNOLOGY OPERATIONS AND CONCEPTS

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE *National Educational Technology Standards for Students*).

B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

B. apply current research on teaching and learning with technology when planning learning environments and experiences.

C. identify and locate technology resources and evaluate them for accuracy and suitability.

D. plan for the management of technology resources within the context of learning activities.

E. plan strategies to manage student learning in a technology-enhanced environment.

III. TEACHING, LEARNING, AND THE CURRICULUM

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.

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

C. apply technology to develop students' higher order skills and creativity.

D. manage student learning activities in a technology-enhanced environment.

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9. plan and teach student-centered learning activities and lessons in which students apply technology tools and resources. (II, III)
10. research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information resources to be used by students. (II, IV, V, VI)
11. discuss technology-based assessment and evaluation strategies. (IV)
12. examine multiple strategies for evaluating technology-based student products and the processes used to create those products. (IV)
13. examine technology tools used to collect, analyze, interpret, represent, and communicate student performance data.(I, IV)
14. integrate technology-based assessment strategies and tools into plans for evaluating specific learning activities. (IV)
15. develop a portfolio of technology-based products from coursework, including the related assessment tools. (IV, V)
16. identify and engage in technology-based opportunities for professional education and lifelong learning, including the use of distance education. (V)
17. apply online and other technology resources to support problem solving and related decision making for maximizing student learning. (III, V)
18. participate in online professional collaborations with peers and experts. (III, V)
19. use technology productivity tools to complete required professional tasks. (V)
20. identify technology-related legal and ethical issues, including copyright, privacy, and security of technology systems, data, and information. (VI)
21. examine acceptable use policies for the use of technology in schools, including strategies for addressing threats to security of technology systems, data, and information. (VI)
22. identify issues related to equitable access to technology in school, community, and home environments. (VI)
23. identify safety and health issues related to technology use in schools. (VI)
24. identify and use assistive technologies to meet the special physical needs of students. (VI)

(NETS) AND PERFORMANCE INDICATORS FOR TEACHERS

IV. ASSESSMENT AND EVALUATION

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.
B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. PRODUCTIVITY AND PROFESSIONAL PRACTICE

Teachers use technology to enhance their productivity and professional practice. Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.
B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
C. apply technology to increase productivity.
D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice. Teachers:

A. model and teach legal and ethical practice related to technology use.
B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
C. identify and use technology resources that affirm diversity.
D. promote safe and healthy use of technology resources.
E. facilitate equitable access to technology resources for all students.

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Scenarios for Professional Preparation Performance Profile

The following scenarios exemplify technology use in the professional preparation phase of a prospective teacher's education.

Service learning is a notion of growing importance in university courses. Having students link their university learning to making a contribution to the community has proven to increase students' comprehension of concepts as well as have a positive effect on the community. In one such program, small groups of prospective teachers in a children's literature course offer support to younger students in an after-school program by communicating with them electronically in the persona of a well-known character in a book or series. Over the course of the semester, the children e-mail the character with questions related to the character's perceptions of situations in the book and to situations outside the text. The preservice students strive to accurately and creatively respond to the students in ways that maintain the flavor of the language and setting of the books. The after-school program directors have found that the young students are motivated to read more extensively and more carefully in order to better communicate with the personified characters.

Dr. Fernando Hernandez at California State University, Los Angeles, uses a software package designed to allow faculty to easily create Web-based classes to teach parts of his Psychological Foundations of Education course. Half of the course meetings are face to face, and the other half are done online. The online portion of the course has three components:

1. Video Viewing—Students view videotaped classroom episodes that demonstrate a variety of strategies (e.g., constructivism, classroom management, and behaviorism). For each activity, supporting resources such as content standards, performance standards, and rubrics for student reference are provided. Students post their responses to the videos in an electronic forum.
2. Testing—Students take some course exams. The online tests are intended to encourage students to read the text rather than to serve as graded exams. Thus, each student is given two attempts at the test, which they must take weekly. Tests are timed and made available only for about a week.

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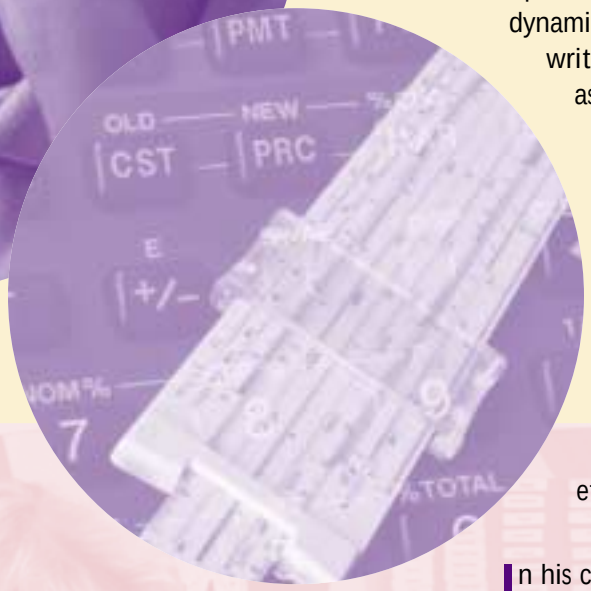

3. Communication—Students access e-mail from their professor informing them about assignments, course announcements and issues, and professional conferences and presentations of interest to the field. Students post reports about professional development conferences to the conference forums. A reference section links students to important Web sites in psychology, learning, and teaching.

At Texas Tech University, Dr. Sandra Cooper has integrated Math-ed-ology™ (T.H.E. Institute) software to increase her students' understanding of the NCTM standards. In her class, preservice students view videoclips of teachers conducting lessons that align with specific aspects of the standards. Because of the dynamic nature of this medium, students are able to write more integrated, connected narrative assignments that address the underlying philosophy of the standards with specific regard to students' needs and teachers' roles. These are written in the preservice teachers' own words and not as restatements of what was written in the standards. Rather than being the customary recitation, their work reflects a recognition of their students' needs, promotes student interaction, defines the teacher's role as facilitator, and reports on their increasing effectiveness with manipulatives.

In his course entitled Integrated Mathematics, Science, and Technology, Dr. Alfinio Flores, who teaches at Arizona State University, has prospective middle-grade teachers study the parachute jump of a small toy gorilla from the fourth floor of a local building. Students design and construct the parachute using inexpensive materials such as a trash bag and string. With an ultrasonic motion detector and a graphing calculator, students can collect up to 99 discrete data points in 2 seconds. After graphing the data, the students share the results of the experiments with their peers. They discuss the scientific and mathematical issues involved, such as free fall and fall with friction, accelerated motion and constant velocity motion, linear graphs and functions, and graphs representing non-uniform motion. The assignment helps Dr. Flores's students understand the value of modeling active learning.

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Profile for Technology-Literate Teachers

STUDENT TEACHING/INTERNSHIP PERFORMANCE PROFILE

Upon completion of the culminating student teaching or internship experience, and at the point of initial licensure, teachers:

1. apply troubleshooting strategies for solving routine hardware and software problems that occur in the classroom. (I)
2. identify, evaluate, and select specific technology resources available at the school site and district level to support a coherent lesson sequence. (II, III)
3. design, manage, and facilitate learning experiences using technology that affirm diversity and provide equitable access to resources. (II, VI)
4. create and implement a well-organized plan to manage available technology resources, provide equitable access for all students, and enhance learning outcomes. (II, III)
5. design and facilitate learning experiences that use assistive technologies to meet the special physical needs of students. (II, III)
6. design and teach a coherent sequence of learning activities that integrates appropriate use of technology resources to enhance student academic achievement and technology proficiency by connecting district, state, and national curriculum standards with student technology standards (as defined in the ISTE *National Educational Technology Standards for Students*). (II, III)

ISTE NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS

All classroom teachers should be prepared to meet the following standards and performance indicators.

I. TECHNOLOGY OPERATIONS AND CONCEPTS

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE *National Educational Technology Standards for Students*).

B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

B. apply current research on teaching and learning with technology when planning learning environments and experiences.

C. identify and locate technology resources and evaluate them for accuracy and suitability.

D. plan for the management of technology resources within the context of learning activities.

E. plan strategies to manage student learning in a technology-enhanced environment.

III. TEACHING, LEARNING, AND THE CURRICULUM

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.

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

C. apply technology to develop students' higher order skills and creativity.

D. manage student learning activities in a technology-enhanced environment.

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7. design, implement, and assess learner-centered lessons that are based on the current best practices on teaching and learning with technology and that engage, motivate, and encourage self-directed student learning. (II, III, IV, V)
8. guide collaborative learning activities in which students use technology resources to solve authentic problems in the subject area(s). (III)
9. develop and use criteria for ongoing assessment of technology-based student products and the processes used to create those products. (IV)
10. design an evaluation plan that applies multiple measures and flexible assessment strategies to determine students' technology proficiency and content area learning. (IV)
11. use multiple measures to analyze instructional practices that employ technology to improve planning, instruction, and management. (II, III, IV)
12. apply technology productivity tools and resources to collect, analyze, and interpret data and to report results to parents and students. (III, IV)
13. select and apply suitable productivity tools to complete educational and professional tasks. (II, III, V)
14. model safe and responsible use of technology and develop classroom procedures to implement school and district technology acceptable use policies and data security plans. (V, VI)
15. participate in online professional collaboration with peers and experts as part of a personally designed plan, based on self-assessment, for professional growth in technology. (V)

(NETS) AND PERFORMANCE INDICATORS FOR TEACHERS

IV. ASSESSMENT AND EVALUATION

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.
B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. PRODUCTIVITY AND PROFESSIONAL PRACTICE

Teachers use technology to enhance their productivity and professional practice. Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.
B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
C. apply technology to increase productivity.
D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice. Teachers:

A. model and teach legal and ethical practice related to technology use.
B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
C. identify and use technology resources that affirm diversity.
D. promote safe and healthy use of technology resources.
E. facilitate equitable access to technology resources for all students.

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Scenarios for Student Teaching/ Internship Performance Profile

The following scenarios exemplify technology use in the student teaching/internship phase of a prospective teacher's education.

To model active learning by students and assist an intern teacher's development of a Grade 8 unit on the periodic table of elements, a master teacher and the intern in a Westport, Connecticut, school district developed an activity in which students created a series of electronic lesson guides. Students worked in pairs to conduct research and develop a PowerPoint™ (Microsoft Corporation) presentation for each element in the periodic table. A few students built a Web site to link all the PowerPoint presentations on the school's local area network. The students used each other's presentations as study tools for the unit test. The activity guidelines spelled out the requirements for the content and format of the presentations. The students' research provided the intern with far more resources than he himself had time to create, and his students gained a sense of ownership of their own learning.

Matthew, a deaf student, requested that his student teaching assignment be at the Tennessee School for the Deaf in Knoxville, Tennessee. To make this possible, Dr. John Olive, at the University of Georgia, arranged to "meet" with Matthew once a week using computer conferencing. Timbuktu Pro™ (Farallon Communications, Inc.) was installed on a computer in the media center at the University of Tennessee and on Dr. Olive's office computer. Using the "control" feature, Matthew was able to control Dr. Olive's desktop computer so that the two could communicate in real time using typed notes in SimpleText. This was an ideal medium for Matthew, who was not able to communicate easily through speech. Using SimpleText rather than the conferencing utility in Timbuktu provided a quicker response time as well as an archived record of all the exchanges. Dr. Olive and Matthew were also able to work together using software tools such as spreadsheets and Geometer's Sketchpad® (Key Curriculum Press) to plan activities that Matthew could use with his students at the Tennessee School for the Deaf. Dr. Olive was thus able to monitor and support Matthew's student teaching experience in Tennessee while remaining in his office in Athens, Georgia. Videotapes of Matthew's teaching were also exchanged, and a local graduate student from the University of Tennessee assisted with in-class supervision. Matthew successfully completed his student

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teaching, received his degree, and has since obtained his master's degree in deaf education from Gallaudet University. He now teaches mathematics at a residential school for the deaf.

As part of the university abroad program, a student teacher from New York met other aspiring teachers from the Midwest in a language immersion program in France. Part of the program included setting up electronic means for participants to support one another after their experience in France. To create opportunities for mutual support, the student teachers and master teachers collaborated online to find Web sites that evaluated texts, offered virtual tours, provided opportunities for links between their students and French students, and offered forums for discussing issues related to professional practice.

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Profile for Technology-Literate Teachers

FIRST-YEAR TEACHING PERFORMANCE PROFILE

Upon completion of the first year of teaching, teachers:

1. assess the availability of technology resources at the school site, plan activities that integrate available resources, and develop a method for obtaining the additional necessary software and hardware to support the specific learning needs of students in the classroom. (I, II, IV)
2. make appropriate choices about technology systems, resources, and services that are aligned with district and state standards. (I, II)
3. arrange equitable access to appropriate technology resources that enable students to engage successfully in learning activities across subject/content areas and grade levels. (II, III, VI)
4. engage in ongoing planning of lesson sequences that effectively integrate technology resources and are consistent with current best practices for integrating the learning of subject matter and student technology standards (as defined in the ISTE *National Educational Technology Standards for Students*). (II, III)
5. plan and implement technology-based learning activities that promote student engagement in analysis, synthesis, interpretation, and creation of original products. (II, III)
6. plan for, implement, and evaluate the management of student use of technology resources as part of classroom operations and in specialized instructional situations. (I, II, III, IV)
7. implement a variety of instructional technology strategies and grouping strategies (e.g., whole group, collaborative, individualized, and learner centered) that include appropriate embedded assessment for meeting the diverse needs of learners. (III, IV)

ISTE NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS

All classroom teachers should be prepared to meet the following standards and performance indicators.

I. TECHNOLOGY OPERATIONS AND CONCEPTS

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE *National Educational Technology Standards for Students*).

B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

B. apply current research on teaching and learning with technology when planning learning environments and experiences.

C. identify and locate technology resources and evaluate them for accuracy and suitability.

D. plan for the management of technology resources within the context of learning activities.

E. plan strategies to manage student learning in a technology-enhanced environment.

III. TEACHING, LEARNING, AND THE CURRICULUM

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.

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

C. apply technology to develop students' higher order skills and creativity.

D. manage student learning activities in a technology-enhanced environment.

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8. facilitate student access to school and community resources that provide technological and discipline-specific expertise. (III)
9. teach students methods and strategies to assess the validity and reliability of information gathered through technological means. (II, IV)
10. recognize students' talents in the use of technology and provide them with opportunities to share their expertise with their teachers, peers, and others. (II, III, V)
11. guide students in applying self- and peer-assessment tools to critique student-created technology products and the process used to create those products. (IV)
12. facilitate students' use of technology that addresses their social needs and cultural identity and promotes their interaction with the global community. (III, VI)
13. use results from assessment measures (e.g., learner profiles, computer-based testing, electronic portfolios) to improve instructional planning, management, and implementation of learning strategies. (II, IV)
14. use technology tools to collect, analyze, interpret, represent, and communicate data (student performance and other information) for the purposes of instructional planning and school improvement. (IV)
15. use technology resources to facilitate communications with parents or guardians of students. (V)
16. identify capabilities and limitations of current and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (I, IV, V)
17. participate in technology-based collaboration as part of continual and comprehensive professional growth to stay abreast of new and emerging technology resources that support enhanced learning for PK–12 students. (V)
18. demonstrate and advocate for legal and ethical behaviors among students, colleagues, and community members regarding the use of technology and information. (V, VI)
19. enforce classroom procedures that guide students' safe and healthy use of technology and that comply with legal and professional responsibilities for students needing assistive technologies. (VI)
20. advocate for equal access to technology for all students in their schools, communities, and homes. (VI)
21. implement procedures consistent with district and school policies that protect the privacy and security of student data and information. (VI)

(NETS) AND PERFORMANCE INDICATORS FOR TEACHERS

IV. ASSESSMENT AND EVALUATION

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.
B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. PRODUCTIVITY AND PROFESSIONAL PRACTICE

Teachers use technology to enhance their productivity and professional practice. Teachers:

A. use technology resources to engage in ongoing professional development and lifelong learning.
B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
C. apply technology to increase productivity.
D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice. Teachers:

A. model and teach legal and ethical practice related to technology use.
B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
C. identify and use technology resources that affirm diversity.
D. promote safe and healthy use of technology resources.
E. facilitate equitable access to technology resources for all students.

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Scenarios for First-Year Teaching Performance Profile

The following scenarios exemplify technology use in the first-year teaching phase of a teacher's education.

A team of novice teachers at Nichols Middle School in Evanston, Illinois, worked together to teach their students how to write a research paper. Erin Murphy, who teaches social studies, and Amy Busch, who teaches language arts, collaborated to facilitate their students' use of technology in writing research papers on a selected decade between 1920 and 1970. The language arts classes used Inspiration® (Inspiration Software, Inc.) software to map, or outline, their papers. Students exported their files to a word processor to finish writing their papers. The language arts teacher checked the papers for grammar, organization, and style. The social studies teacher checked for accuracy in the content. The school posted the final papers on its Web site for sharing with others.

The University of Chicago hosts a summer program called WIT (Web in Teaching), in which educators meet every morning or afternoon for four weeks to learn how to design curriculum-related Web pages. Working in teams or individually, the participants construct their own pages. All groups have two mentors who assist them in creating their finished products. Participants also attend plenary sessions related to their particular interests. The emphasis is on aims, goals, and objectives. Participants have time to reflect on their creations and design interactive modules for use in the curriculum.

Raechel Perry, a new teacher at Kraxberger Middle School in Gladstone, Oregon, teaches journalism classes. She uses www.highwired.com as a site for developing and posting the school's newspaper. Because students at the school are on a six-week exploratory rotation, the journalism classes publish an online edition of the school paper every six weeks. Students write their stories, convert the text to HTML, load pictures to illustrate articles, and obtain any necessary permissions and copyright clearances. Using the online format allows students to see their work in a professional environment almost immediately after posting it.

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Jennifer Doughty, a first-year teacher at Triadelphia Middle School, Wheeling, West Virginia, brings a knowledge of remote sensing devices and their effect on understanding geography to her seventh-grade students. Using public domain satellite images available from NASA and the USGS Web sites, Jennifer helps her students explore the geography of the world in an active, dynamic way. Using current Landsat 7 images of the Panama Canal area, her students examine vegetation patterns and track changes in the concentration of vegetation between the border of Guatemala and Mexico that have resulted from conservation efforts. Jennifer has found that her students more closely identify with world conservation issues when they can see the effects of political decisions on the global landscape.

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The NETS Project

The National Educational Technology Standards (NETS) Project was initiated by the International Society for Technology in Education's Accreditation and Professional Standards Committee. ISTE has emerged as a recognized leader among professional organizations for educators involved with technology. ISTE's mission is to promote appropriate uses of technology to support and improve learning, teaching, and administration. Its members are leaders in educational technology, including teachers, technology coordinators, education administrators, and teacher educators. ISTE supports all subject area disciplines by providing publications, conferences, online resources, and services that help educators combine the knowledge and skills of their teaching fields with the application of technologies to improve learning and teaching.

The primary goal of the NETS Project is to enable stakeholders in PK–12 education to develop national standards for the educational uses of technology that facilitate school improvement in the United States. The NETS Project is developing standards to guide educational leaders in recognizing and addressing the essential conditions for effective use of technology to support PK–12 education.

Student Standards

Over the period of the NETS Project, standards have been or will be developed in the following areas:

National Educational Technology Standards for Students (©1998)

Describes what students should know about technology and be able to do with technology.

NETS for Students—Connecting Curriculum and Technology (©2000)

Describes how technology can be used throughout the curriculum for teaching, learning, and instructional management using the student standards with subject matter standards.

Educational Technology Support Standards

Describes systems, access, staff development, and support services essential to support the effective use of technology.

Standards for Student Assessment and Evaluation of Technology Use

Describes various means of assessing student progress and evaluating the use of technology in learning and teaching.

Teacher Standards

The ISTE Accreditation and Professional Standards Committee has developed standards for accreditation of teacher preparation programs for specialization in educational computing and technology, participated in the development of the NCATE 2000 Standards, and completed a revision of the standards for all teachers.

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The specialization guidelines have been adopted by the National Council for Accreditation of Teacher Education (NCATE) and are currently being used in the accrediting of teacher preparation programs in many universities. See www.iste.org for more information.

NETS for Teachers (NETS•T) is an ISTE initiative funded in part by the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT^3) program. ISTE's PT^3 grant is designed to:

1. Develop for all teachers a comprehensive set of performance-based technology standards reflecting fundamental concepts and skills for using technology to support teaching and learning.
2. Define essential conditions for teacher preparation and school learning environments necessary for effective use of technology to support teaching, learning, and instructional management.
3. Develop standards-based performance assessment tools to measure achievement of the technology standards and to serve as a basis for certification, licensing, and accreditation.
4. Disseminate models of teacher preparation in which candidates receive experiences that prepare them to effectively apply technology to support student learning.
5. Establish the National Center for Preparing Tomorrow's Teachers to Use Technology ($NCPT^3$), which will provide coordination, leadership, and support for the PT^3 initiative and dissemination of program results.

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About ISTE

The International Society for Technology in Education (ISTE) is a nonprofit professional organization with a worldwide membership of technology-using educators. We are dedicated to the improvement of education through the integration of computer-based technology into the curriculum. ISTE's role is leadership—we provide our members with information, networking opportunities, and guidance as they face the challenge of incorporating computers, the Internet, and other new technologies into their schools.

ISTE directs the National Educational Technology Standards for Teachers (NETS•T) Project and further supports it through:

- curriculum ideas for the classroom in *Learning & Leading with Technology* (*L&L*).
- its Special Interest Group for Teacher Educators (SIGTE).
- research in teacher education and models and curriculum for teacher preparation in SIGTE's journal—*Journal of Computers in Teacher Education* (*JCTE*).
- research on teacher educational models and curriculum through ISTE's Research and Evaluation Department.
- books about educational technology and its use in the classroom.
- symposia and other special events addressing current topics, resources, and trends in teacher education and teacher professional development.
- collaboration with the National Educational Computing Conference (NECC) to ensure an exemplary strand on teacher education for the annual conference.
- workshops for teachers and teacher educators based on NETS•S and NETS•T.

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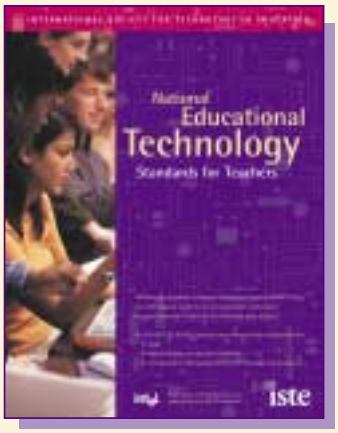

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ISBN 1-56484-162-6

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ISBN 1-56484-162-6