Excerpted from

ISTE's Technology Facilitation and Leadership Standards

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Schools today must meet the growing need for highly qualified educational technologists. Superintendents, principals, and cabinet-level policy makers need guidance as they create and define jobs. Educators must prepare themselves by increasing their skills and competencies.

ISTE's Technology Facilitation and Leadership Standards: What Every K–12 Leader Should Know and Be Able to Do is an easy-to-follow guide for any educator wanting to be an effective technology facilitator and/or educational leader. The standards provide guidance in designing and delivering professional learning, managing budgets and staff, constructing a shared vision, and leading change, as well as assisting with implementation through scenarios, case studies, discussion questions, and resources. With a step-by-step approach, this book provides everything needed for understanding, meeting, and exceeding the standards.

Fundamental change is more likely to occur by a process of shifting . . . a series of small sustainable steps rather than a rapid conversion to a new order. Each shift acknowledges the local context and sets the foundation for a new shift. Each shift interacts with and modifies the prevailing web of forces in a way that permits the next shift to occur. Over an extended period of time, this accumulation of shifts translates into a profound educational transformation.

— ROGERS, 1995

Chapter Two

TF/TL STANDARD II

Planning and Designing Learning Environments and Experiences

Technologies such as personal computing, productivity software, and the Internet offer new tools and opportunities for learning. Using technology tools to solve problems or create original products can aid students in constructing meaning and demonstrating their learning—often in ways similar to practicing professionals in the field. The Internet provides students with access to information, tools to collaborate with others, and new places to publish their work. The connected classroom even affords students opportunities to contribute knowledge to a disciplinary field and to participate in civic action.

However, realizing this potential is not easy. Integrating technology into classroom practice requires teachers to engage in sophisticated planning and design processes, but there is no guarantee that teachers will have the support they need to accomplish their tasks successfully. This is why enacting TF/TL Standard II plays a key role in the advancement of instructional technologies in K–12 education. TF/TL Standard II provides a comprehensive description of how technology facilitators and leaders can support teachers during critical instructional planning and design phases.

Current Context: The Need to Help Teachers Plan and Design Learning Experiences

Despite technology's potential to augment and transform instruction, teachers generally have not implemented technology as frequently as hoped. A 2005 survey of 1,000 randomly selected teachers revealed that although 85% of teachers used technology for administrative tasks (such as taking and reporting attendance), less than 50% ever used technology to support instruction (CDW-G, 2005). In another random national survey in 2006, only slightly more than half (54%) of teachers reported that technology had significantly changed the way they teach. In the same study, only 37% responded that they integrate technology on a daily basis, and only 26% felt "highly competent" in integrating technology into instruction. Only 7% of educational leaders ranked teachers in their system as "very good" or better at integrating technology into the learning experience (Consortium for School Networking, 2005).

Frequency rates drop even further when measuring the use of technology to support constructivist practices. In repeated and ongoing analyses of classroom practice using the Level of Technology Implementation (LoTi) framework (see Table 2.1), researchers consistently find that the most common technology uses in classroom are not aligned to research-based best practices (Moersch, 2002). In the aggregate results from national LoTi project schools in 2005, nearly half (48%) of technology-supported practices are best described at Levels 0–2, ranging from no use at all to uses supporting lower-order cognitive goals. Less than 11% occur at the three highest levels (4B and above), which are characterized by higher-order thinking, authentic tasks, collaboration, student-directed learning, and performance-based assessment (Moersch, 2001; see Figure 2.1). Although instruction at all LoTi Levels is valid under certain conditions, this data suggests a lack of balance and a virtual absence of the technology-supported instructional strategies most likely to support student understanding, retention, and transfer of knowledge.

TABLE 2.1 ■ Levels of technology implementation (LoTi) framework

LEVEL	DESCRIPTION
0 Non-use	Technology is not used for instructional purposes.
1 Awareness	The use of technology-based tools is (1) one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs), (2) used almost exclusively by the classroom teacher for classroom and/or curriculum management tasks (e.g., taking attendance, using grade book programs, accessing e-mail, retrieving lesson plans from a curriculum management system or the Internet), and/or (3) used to embellish or enhance teacher-directed lessons or lectures (e.g., multimedia presentations).
2 Exploration	Technology-based tools supplement the existing instruction at the knowledge/comprehension level. The electronic technology is employed as extension activities, enrichment exercises, or technology-based tools and generally reinforces lower cognitive skill development relating to the content under study.
3 Infusion	Technology-based, complement-selected instructional events at the analysis, synthesis, and evaluation levels. Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry).
4A Integration (mechanical)	Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and/or outside resources (e.g., assistance from other colleagues), and/or interventions (e.g., professional development workshops) that aid the teacher in the daily management of their operational curriculum. Technology is perceived as a tool to identify and solve authentic problems as perceived by the students relating to an overall theme or concept. Emphasis is placed on student action and on issues resolution that requires higher levels of student cognitive processing and in-depth examination of the content.
4B Integration (routine)	Technology-based tools are integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. At this level, teachers can readily design and implement learning experiences that empower students to identify and solve authentic problems relating to an overall theme or concept using the available technology with little or no outside assistance. Emphasis is again placed on student action and on issues resolution that requires higher levels of student cognitive processing and in-depth examination of the content.

(Continued)

TABLE 2.1 *(Continued)*

LEVEL	DESCRIPTION
5 Expansion	Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle through the Internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme or concept. The complexity and sophistication of the technology-based tools used in the learning environment are now commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the students' level of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.
6 Refinement	Technology is perceived as a process, product (e.g., invention, patent, new software design), and/or tool for students to find solutions related to a "real-world" problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information queries, problem solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available.

Adapted from Moersch, C. (2002). Beyond hardware: Using existing technology to promote higher-level thinking *(pp. 47–49). Eugene, OR: ISTE.*

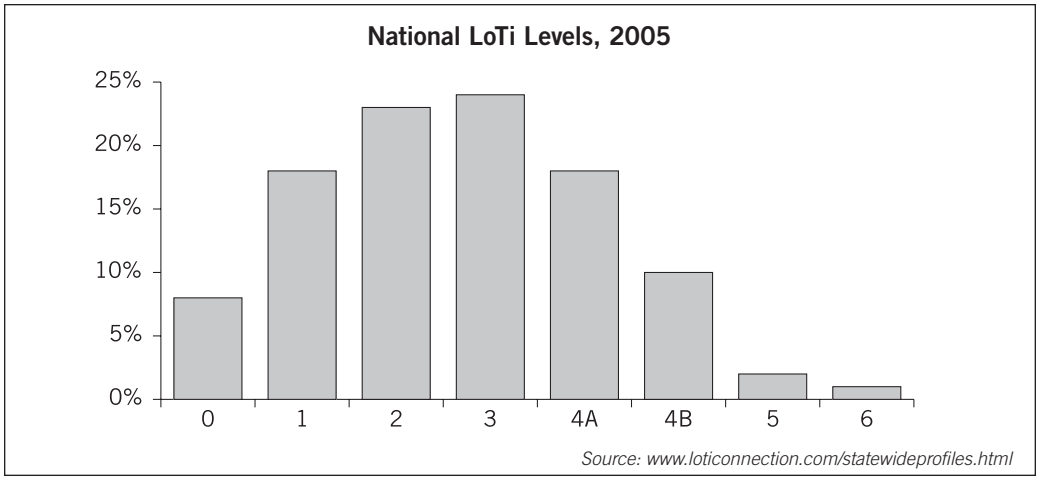

Figure 2.1 National LoTi Levels, 2005

Challenges to Providing High-Quality Support

The infrequent and unbalanced nature of current technology implementations in America's schools highlights the need for professional learning programs focusing

on instructional planning and design. Technology facilitators and leaders must be prepared for the challenges inherent in providing teachers with this type of support.

Researchers and practitioners agree that planning technology-integrated instruction is challenging for teachers (Mishra & Koehler, 2006; Pierson, 2001). Even without the integration of technology, the instructional design process requires teachers to consider multiple factors such as what to teach (content), how best to teach it (pedagogy), what resources to use (instructional materials), how to manage students and resources throughout the learning process (classroom management), and how to monitor student learning (assessment). As teachers plan, they filter their instructional design decisions through a unique set of socially constructed beliefs about what constitutes knowledge in their content area, how people learn best, and what is the right approach for the specific students in their class (Schulman, 1987).

The climate in today's schools frequently complicates the planning process even further. In the quest for school improvement, teachers are currently faced with new sets of learning standards, higher student performance goals, and pressure to implement more innovative teaching methods. At the same time, professional learning opportunities, necessary instructional materials, and time for instructional planning are often limited. Under these conditions, even experienced, exemplary teachers often struggle to create meaningful, rigorous learning experiences that help students understand content deeply and transfer knowledge to new situations (Fullan, 1999).

Asking teachers to integrate technology into their instructional designs invariably adds new layers of complexity to the planning process. Teachers may know how to operate technology (TF/TL Standard I), but they are not sure how to implement technology in the classroom to support student learning. Although teachers frequently select textbooks, maps, and other types of traditional instructional resources to teach specific content, using technology tools is less familiar to them. Because the use of technology in classrooms is a relatively new practice and technology-related professional development is often focused on technology skills instead of integration, teachers do not have many examples of effective technology use for learning. As a result, technology use is often relegated to the peripheries of the learning process. Using technology as a reward when students' "real" work is done and teaching technology skills in isolation from other content areas are two frequently cited examples (Moersch, 2002).

In the planning process, teachers must also consider how students will acquire technical skills needed to complete learning tasks. Though many feel that student technology literacy outpaces the knowledge and skills of educators, implementing technology in the classroom still requires training students how to use technologies for specific learning purposes. Many teachers remain uncertain as to how to embed technical training into instruction and are uncomfortable assuming the role of technical trainer in their classrooms. Because they lack strategies to integrate student computer skills efficiently and seamlessly into instruction, teachers are also concerned that training students to use technology will drastically reduce the amount of time dedicated to achieving mandated content standards.

Teachers must develop new ways to manage resources and students in technology-rich classrooms. Using technology in the classroom affects the learning environment and culture. The mere presence of technology alters space arrangements and the flow of

activities. New technologies foster new social practices for teachers and students. Even when technology-related changes are positive and promising, they can raise questions for teachers. How do I manage student access to computers? How do I manage student safety on the Internet? How can technology be used to implement differentiated instruction and to accommodate students with special learning needs? How do I know the students are learning when they use computers? Answering these questions requires the formation of new practices, policies, procedures, and norms of behavior in the classroom.

The Challenge of Facilitating and Leading Instructional Change

Although the challenges previously mentioned are formidable, they pale in comparison with facilitating and leading instructional change. Theory and research suggest that technologies with a high degree of alignment to current practice have a greater chance of being adopted and used by practitioners (Fishman, 2005). Yet many new educational technologies are not designed to reinforce traditional practice—especially because scholars and educational leaders are calling for a shift away from those practices to more student-centered, inquiry-based instructional models in classrooms. The work of school technology professionals is therefore more complex than simply helping teachers support traditional, teacher-centered instruction with new technologies. Instead, technology facilitators and leaders are likely to find themselves in the most difficult type of change initiative—one that challenges teachers' long-standing beliefs about teaching and learning.

From the onset of large-scale instructional technology programs, scholars have cautioned educators about the complexity of their tasks. Means (1993) clearly categorizes technology integration efforts as systemic change initiatives aspiring to shift instruction from a conventional to a reformed paradigm (see Table 2.2).

TABLE 2.2 ■ Comparison of conventional and reformed approaches to instruction

CONVENTIONAL INSTRUCTION	REFORMED INSTRUCTION
Teacher directs	Students explore
Instruction is didactic	Instruction is interactive
Students receive short blocks of instruction on a single subject	Students perform extended blocks of authentic and multidisciplinary work
Students work individually	Students work collaboratively
Teacher is knowledge dispenser	Teacher is facilitator
Students grouped by ability	Students grouped heterogeneously
Students who have demonstrated mastery of the basics work on advanced skills	All students practice advanced skills
Students assessed on fact knowledge and discrete skills	Students assessed on performance

Source: Means, B. (1993). Introduction: Using technology to advance educational goals. In B. Means (Ed.), Technology and school reform: The reality behind the promise *(pp. 1–22). San Francisco: Jossey-Bass.*

In a similar way, Jones, Valdez, Nowakowski, and Rasmussen (1995) warn educators that, in order for technology to have the greatest impact on student learning, it must be embedded in effective learning environments. To help educators understand the characteristics of these effective environments, these researchers synthesized information on effective instruction and generated a list of descriptors (referred to as the indicators of engaged learning; see Table 2.3) to guide technology integration efforts. Like Means' (1993) descriptors of reformed instruction, these indicators stand in sharp contrast with current instructional practices and illustrate the substantial cultural and pedagogical shifts that school technologists must encourage and support.

TABLE 2.3 ■ Indicators of engaged learning

VARIABLE	INDICATOR	INDICATOR DEFINITION
Vision of Learning	Responsible for learning Strategic Energized by learning Collaborative	Learner involved in setting goals, choosing tasks, developing assessments and standards for the tasks; has big picture of learning and next steps in mind; Learner actively develops repertoire of thinking/learning strategies; Learner is not dependent on rewards from others; has a passion for learning; Learner develops new ideas and understanding in conversations and work with others.
Tasks	Authentic Challenging Multidisciplinary	Pertains to real world, may be addressed to personal interest; Difficult enough to be interesting but not totally frustrating, usually sustained; Involves integrating disciplines to solve problems and address issues.
Assessment	Performance-based Generative Seamless and ongoing Equitable	Involving a performance or demonstration, usually for a real audience and useful purpose; Assessments having meaning for learner, maybe produce information, product, service; Assessment is part of instruction and vice versa—students learn during assessment; Assessment is culture fair.
Instructional Model	Interactive Generative	Teacher or technology program responsive to student needs, requests (e.g., menu driven); Instruction oriented to constructing meaning, providing meaningful activities/experiences.
Learning Context	Collaborative Knowledge-building Empathetic	Instruction conceptualizes students as part of learning community; Activities are collaborative; Learning experiences set up to bring multiple perspectives to solve problems so that each perspective contributes to shared understanding for all, goes beyond brainstorming; Learning environment and experiences set up for valuing diversity, multiple perspectives, strengths.

(Continued)

TABLE 2.3 ■ *(Continued)*

VARIABLE	INDICATOR	INDICATOR DEFINITION
Grouping	Heterogeneous Equitable Flexible	Small groups with persons from different ability levels and backgrounds; Small groups organized so that over time all students have challenging tasks/ experiences; Different groups organized for different instructional purposes so each person is a member of different work groups, works with different people.
Teacher Roles	Facilitator Guide Co-learner/ co-investigator	Engages in negotiation, stimulates and monitors discussion and project work but does not control; Helps students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options; Teacher considers self as learner, willing to take risks to explore areas outside his or her expertise, collaborates with other teachers and practicing professionals.
Student Roles	Explorer Cognitive Apprentice Teacher Producer	Students have opportunities to explore new ideas/ tools, push the envelope in ideas and research; Learning is situated in relationship with mentor who coaches students to develop ideas and skills that simulate the role of practicing professionals (i.e., engage in real research); Students encouraged to teach others in formal and informal contexts; Students develop products of real use to themselves and others.

Source: Jones, B., Valdez, G., Nowakowski, J., & Rasmussen, C. (1995). Plugging in: Choosing and using educational technology *(p. 9). Oakbrook, IL: North Central Regional Educational Laboratory.*

Responding to the Challenge

Although these challenges represent the context in which school technologists must enact TF/TL Standard II, their tasks—including facilitating and leading change—are not impossible. Researchers have documented how technology facilitators and leaders have successfully navigated teachers toward successful technology integration in the past, and these cases provide a path for the future.

The following briefly summarizes some of the most important lessons learned from these experiences. They should serve as guiding principles for facilitators and leaders as they implement TF/TL Standard II.

Specify what types of learning experiences teachers should design. In the planning process, teachers will benefit from a clear description of what types of learning experiences they should be designing. Providing teachers with a descriptive framework, such as the indicators of engaged learning, is especially important to support change. If no criteria are provided, teachers will continue to plan and design the same types of learning experiences that they have implemented in the past (see Creighton, 2003, pp. 67–75).

Provide teachers with models of the types of technology uses desired in classrooms. In spite of their importance, descriptive frameworks, such as the indicators of engaged learning, are usually not enough to change instruction. Frameworks are most effective when they are accompanied by multiple models of exemplary practice. School technologists must model effective technology use while facilitating professional learning for teachers. Furthermore, scenarios, sample lesson plans, or videos of teachers using technology to engage learners in authentic experiences will help educators envision how technology can improve teaching and learning. Researchers consistently find that these types of models are critical in helping teachers use technology effectively in the classroom—which usually requires a transformation in the way they teach. Without these models, teachers often misinterpret or oversimplify instructional frameworks. Most people require models to understand the framework completely and apply it to practice.

Immerse teachers in professional learning experiences similar to the learning experiences they are expected to design. Often teachers do not have a different vision for learning because they have not experienced this type of learning environment themselves. Therefore, technologists must engage teachers in the types of interactive, complex, inquiry-based learning scenarios that they expect teachers to enact in their classrooms. In these learning contexts, teachers should work collaboratively to solve real problems related to integrating technology into instructional practices, and technologists should serve as facilitators and guides. By designing professional learning in this manner, the technologist provides one of the strongest types of models for change—a model that is based in personal experience (Zepeda, 1999).

Provide teachers with a process for designing. Although a descriptive framework is useful, it does not provide teachers with a process to accomplish their tasks. Even though rigid step-by-step process approaches are usually considered inappropriate for complex, loosely-structured creative tasks such as instructional design, teachers will benefit from a planning model to structure their efforts (Grabe & Grabe, 2007; Roblyer, 2006; Wiggins & McTighe, 2006).

Communicate a research-based rationale for why these types of learning experiences support student learning. Brief but powerful research-based rationales facilitate the change process and provide credibility to planning efforts. Because most educators lack the time to process large numbers of individual research studies, most facilitators and leaders lean on the work of credible scholars who synthesize a body of knowledge, summarize the evidence, and present it in an accessible format for practitioners. A few select readings and a carefully constructed bibliography of additional resources often serve to help educators know they are doing the right thing for their students (Bransford & Cocking, 1999).

Link technology efforts to other curriculum and instruction initiatives. Because successful technology integration has as much—or more—to do with effective pedagogical practices than with technology (Pierson, 2001), TF/TL Standard II highlights the curricular aspects of the technologist's job responsibilities. Because these responsibilities probably overlap with those of other personnel in the organization, Ausband (2006) suggests coordinating efforts with other curriculum and instructional staff and programs focused on school improvement. Such coordination can prevent conflicts among educators with similar purposes, add credibility to educational technology initiatives because they are focused on learning, conserve resources, and reduce the risk of teacher overload from participating in multiple change initiatives (Ausband, 2006; Fullan, 1999).

Understand the change process and build in support for conceptual change. Some researchers describe technology integration, planning, and design as a process that evolves over time. Understanding the stages that teachers may experience during this transformation helps technologists understand their own work better and prepares them to support teachers as they plan and design learning experiences differently (Fullan, 2001; Hall & Hord, 2005; Matzen & Edmunds, 2007; Rogers, 1995).

View the planning as ongoing and cyclical. Collaborative planning and reflection are ongoing cycles in effective schools, but many times professional learning programs do not dedicate resources to this phase of planning, thus truncating teachers' ability to design high-quality lessons and navigate change. When implementing new technologies and instructional designs, teachers benefit from piloting learning experiences, reflecting with peers, and revising plans for future implementation. Teachers also benefit from observing peers and providing feedback (Zepeda, 1999).

Be patient and realistic. Everyone won't change. There are many barriers to instructional change and technology adoption—including school cultures of autonomy and academic freedom that rightfully allow teachers a great deal of latitude in their individual classrooms. Because of this, technology facilitators and leaders can only build social forces toward change over time. The work is slow, tedious, and indispensable.

Summary of Current Context

It is obvious why TF/TL Standard II plays a central role in the advancement of instructional technologies in K–12 education—if technology is going to be fully implemented in classrooms, teachers must plan how they will embed these new tools into student learning and must be supported in implementing technology-integrated instruction. Given the complexities of instructional design generally and the specific challenges of planning for technology use, it is easy to see why teachers need a great deal of support from technology facilitators and leaders. In order to help teachers with these complexities, technology facilitators and leaders need an extensive repertoire of knowledge, skills, and dispositions firmly grounded in theories and research on effective instruction, classroom management, adult learning, and conceptual change. TF/TL Standard II provides a comprehensive description of what this support looks like and how to deliver it.

Implementing the Standard

This section reviews the standard, performance indicators, and performance tasks of TF/TL Standard II, which can be found in the standards table on pages 44–45.

Performance Standards

Although there is a formidable list of challenges that teachers face when designing technology-supported instruction, TF/TL Standard II provides technology facilitators and leaders with a road map to systematically address each one of these barriers in coordinated but unique ways. In Standard II, the difference between the performance

standards for facilitators and leaders hinges on locale. Because technology facilitators are located in school buildings, the facilitators' proximity to practice affords them greater opportunities to plan and design technology-supported learning environments and experiences with teachers. Facilitators may even have the opportunity to model innovative technology-supported instruction in classrooms. By contrast, technology leaders are more distanced from schools and daily instructional practices. Therefore, they generally operate on a broader scale to assist in the planning, designing, and modeling process at the district, state, and regional levels.

Performance Indicators

The performance indicators that technology facilitators and leaders share for TF/TL II are targeted and strategic. They are designed to alleviate the greatest challenges that teachers face when planning for technology use in the classroom. When enacting this standard, facilitators and leaders introduce teachers to high-quality instructional technology tools that are well designed, developmentally appropriate for their students, and tied to content standards. Technologists also provide teachers with models of how other educators have integrated technology into instruction. Supporting teachers as they actually plan technology-rich learning experiences, these suggestions and examples help teachers envision how technology can enrich learning in their own classrooms (TF-II.A., C., F.).

Technology facilitators and leaders also help teachers overcome their questions about teaching technology skills to students, preserving instructional time for content standards in core academic areas, organizing and managing instruction in a technology-rich environment, and meeting the individual needs of all learners. To do this, facilitators and leaders provide teachers with strategies, options, and best-practice examples for managing technology resources and student learning in the classroom (TF-II.D., E.).

Current research on teaching, learning, and technology integration must anchor the work of teachers and technologists as they plan and design technology-supported learning experiences (TF-II.B., F.). Research helps technologists infuse credibility into their work, building teachers' confidence that they are planning the right kinds of experiences for their students. Having a strong research-based rationale for action is especially important for teachers who are attempting pedagogical change. Long-standing beliefs about teaching and learning are deeply ingrained into teachers' practices and identity. Change requires a convincing argument and emotional support. Research can play an important role in providing a rationale and a catalyst for action.

Performance Tasks

In TF/TL Standard II, facilitators assume the key role of directly supporting teachers. Facilitators accomplish this support function by providing options, strategies, resources, and feedback in the planning process. They model strategies, consult with teachers, assist teachers, and support teachers during instructional design. At advanced stages of performance, facilitators may provide formal professional learning programs for teachers, but most often they serve as coaches, consultants, and advisers to teachers when implementing this standard.

Leaders provide that critical "outside-in" collaboration that many experts cite as important for local change initiatives to be successful (Fullan, 1999). While local facilitators work with teachers, leaders scan best practice examples and the professional literature to identify, research, locate, and evaluate information that would be helpful to their building-based colleagues. In advanced stages, leaders also develop products and models to assist other educators in designing learning. Once critical information is located or created, leaders develop mechanisms to disseminate this knowledge, which includes designing and implementing formal, ongoing professional development programs. In these ways, leaders not only provide critical support to teachers and facilitators in schools, they also establish directions, frameworks, and quality control for planning.

Planning and Designing Learning Environments and Experiences (TF/TL-II)	
Technology Facilitation Standard	**Technology Leadership Standard**
(TF-II) Educational Technology Facilitators plan, design, and model effective learning environments and multiple experiences supported by technology.	(TL-II) Educational Technology Leaders assist by planning, designing, and modeling effective learning environments and experiences at the district, state, and regional levels.
TF/TL-II.A. Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.	
Performance Tasks for Facilitators	**Performance Tasks for Leaders**
TF-II.A.1. Provide resources and feedback to teachers as they create developmentally appropriate curriculum units that use technology.	TL-II.A.1. Research and disseminate project-based instructional units modeling appropriate uses of technology to support learning.
TF-II.A.2. Consult with teachers as they design methods and strategies for teaching computer/technology concepts and skills within the context of classroom learning.	TL-II.A.2. Identify and evaluate methods and strategies for teaching computer/technology concepts and skills within the context of classroom learning and coordinate dissemination of best practices at the district/state/regional levels.
TF-II.A.3. Assist teachers as they use technology resources and strategies to support the diverse needs of learners including adaptive and assistive technologies.	TL-II.A.3. Stay abreast of current technology resources and strategies to support the diverse needs of learners including adaptive and assistive technologies and disseminate information to teachers.
TF/TL-II.B. Apply current research on teaching and learning with technology when planning learning environments and experiences.	
TF-II.B.1. Assist teachers as they apply current research on teaching and learning with technology when planning learning environments and experiences.	TL-II.B.1. Locate and evaluate current research on teaching and learning with technology when planning learning environments and experiences.

TF/TL-II.C. Identify and locate technology resources and evaluate them for accuracy and suitability.	
TF-II.C.1. Assist teachers as they identify and locate technology resources and evaluate them for accuracy and suitability based on district and state standards.	TL-II.C.1. Identify technology resources and evaluate them for accuracy and suitability based on the content standards.
TF-II.C.2. Model technology integration using resources that reflect content standards.	TL-II.C.2. Provide ongoing appropriate professional development to disseminate the use of technology resources that reflect content standards.
TF/TL-II.D. Plan for the management of technology resources within the context of learning activities.	
TF-II.D.1. Provide teachers with options for the management of technology resources within the context of learning activities.	TL-II.D.1. Identify and evaluate options for the management of technology resources within the context of learning activities.
TF/TL-II.E. Plan strategies to manage student learning in a technology-enhanced environment.	
TF-II.E.1. Provide teachers with a variety of strategies to use to manage student learning in a technology-enhanced environment and support them as they implement the strategies.	TL-II.E.1. Continually evaluate a variety of strategies to manage student learning in a technology-enhanced environment and disseminate through professional development activities.
TF/TL-II.F. Identify and apply instructional design principles associated with the development of technology resources.	
TF-II.F.1. Assist teachers as they identify and apply instructional design principles associated with the development of technology resources.	TL-II.F.1. Identify and evaluate instructional design principles associated with the development of technology resources.

ISTE's Essential Conditions and TF/TL Standard II

When implementing TF/TL Standard II: Planning and Designing Learning Environments and Experiences, technology facilitators and leaders help teachers understand and implement *Student-Centered Learning*, an important essential condition for achieving ISTE's NETS•S. In helping teachers shift from teacher-centered to student-centered learning, technology facilitators and leaders assume the role of professional learning coaches as they help teachers learn how to integrate technology to support engaging approaches to learning. Therefore, TF/TL Standard II technologies also strengthen two other essential conditions—*Ongoing Professional Learning* and *Skilled Personnel*.

Performance Scenarios

At a faculty meeting, the school's technology facilitator introduces himself and offers to provide assistance to teachers who want to use technology for instruction. After the meeting, the fourth-grade team asks the facilitator to help them infuse technology into one of their favorite units on immigration. The technology facilitator gathers relevant videos from the Internet and locates an online project where students share their family immigration stories with other students from all over the world. The teachers preview these items and integrate them into their unit. Because the teachers have not participated in an online project before, the technology facilitator agrees to be in class to support the teachers as they introduce the project and teach the students how to use the website.

A district technology leader attends a seminar on adaptive and assistive technologies offered at the local university and realizes that schools already have many tools that can support the needs of diverse learners, such as concept mapping and text-to-speech functions in word processors. After the seminar, the leader shares this information with technology facilitators, who are able to assist teachers in deploying these tools in the classroom.

Although classroom technology use is becoming more frequent, a district technology leader is concerned that teachers are not maximizing the use of technology to support student-centered learning and higher-order thinking—central goals of the district's strategic plan. To encourage different types of uses, the leader gathers models of preferred types of technology uses and presents them to technology facilitators. The models help facilitators understand what types of technology uses best support the district's goals, and they encourage teachers to shift their practices when planning learning environments and experiences.

In a current research journal, the technology leader reads an article on the effective uses of technology to support student learning in math. The leader shares this study with the math curriculum director and the facilitators in the district. The article creates an understanding of why technology should be used to support student-centered learning and higher-order thinking, and the facilitators apply this knowledge as they help teachers plan and design math instruction in the local schools.

case study

Technology Leader Debbie Childress

SHAPING HOW TEACHERS USE TECHNOLOGY

Authentic Training for Teachers

The Cherokee County School District, located approximately 35 miles north of Atlanta, is committed to transforming its schools into 21st-century learning environments through Teach21, a comprehensive reform effort to help teachers use technology for learning.

The program provides an interactive whiteboard, a student response system, a mounted LCD projector, a teacher laptop, and five new student computers in each classroom. More importantly, under the direction of Instructional Technology Supervisor Debbie Childress, the program also provides extensive support for teachers as they learn about these new technologies and plan for their use.

Teach21 is the brainchild of Superintendent Frank Petruzielo, who knew that without proper training and support the teachers would not be able to take full advantage of the tools they were being given. The superintendent challenged Childress to draft a professional development plan and sample district policies to support the initiative. To complete her task, Childress drew on her professional learning and teaching experience, her colleagues, local university faculty, and a review of professional literature.

The plan immerses teachers in the same type of engaging, authentic learning experiences that Childress hopes teachers will implement with students. In return for receiving equipment in their classrooms, Teach21 teachers commit to spending 100 hours to complete various technology integration projects throughout the first year and a more extended capstone project at the end of the first program year. The teachers are allowed to request additional technology to complete their projects. Mobile laptop labs, digital video cameras, and microphones for creating podcasts are the most requested equipment for the Teach21 classrooms. The capstone project is defined as an action research project or a standard-based instructional unit designed to engage students. These projects are completed collaboratively by teams and published in online portfolios.

"The portfolios accomplish three things," said Childress. "First, they allow us to share ideas and learn from one another. Second, they show the teacher's growth over time. Third, the public forum raises the bar for high-quality work. If there is an authentic audience, learners will look at their work differently."

To ensure that teachers are designing high-quality integration projects, Childress has published criteria and evaluation rubrics for these projects. These criteria are grounded in NCREL's engaged learning indicators and Moersch's Level of Technology Implementation (LoTi) framework. Teachers use the rubrics to reflect on their own work, and others use the rubrics to provide collegial feedback for improvement.

"Without criteria that challenge teachers to do different things, we might have experienced technology use that overemphasized direct instruction and lower-order cognitive skills. The framework stretched all of our thinking," noted Childress.

(Continued)

case study *(Continued)*

Childress believes that focusing the professional learning component around planning and designing learning experiences is powerful. "This design addresses what students and teachers have to do. They have this equipment. They want this equipment. Now they have to figure out how to use it for instruction. This is the authentic question on all of the teachers' minds. Why not help them answer it?"

This authentic question puts teachers in the driver's seat, and Childress and the eight technology integration specialists who serve on her team assume the roles of mentors and coaches. "The task we have established for the teachers is challenging, so we have to have a comprehensive program to support them," commented Childress.

The comprehensive support for planning includes a required orientation to the program, which includes an overview of engaged learning, models of effective technology integration, and a discussion on the changing needs of 21st-century learners. In addition to this required orientation, teachers are also required to choose from a menu of professional learning options offered by the instructional technology supervisors (ITSs). These training requirements comprise another 100 hours of professional learning in addition to the 100 hours of more informal, collaborative work to design and publish learning experiences.

However, this project requires the Cherokee tech team to do much more than teach technology classes. The ITSs also support Teach21 teachers in four or five schools. According to Childress, this type of in-class coaching, one-on-one support, and small-group consultation is critical during instructional change. "During planning, teachers need a more experienced facilitator to help them solve problems, provide responses, add ideas to the mix, and help them visualize what the learning experience will be like," explained Childress.

Worried that the ITSs wouldn't be able to meet all the demands for local support during change initiatives, the district also budgeted for one tech mentor at each school. Tech mentors are teachers who retain their teaching duties but receive an extra-duty stipend to provide technical support for participants, and serve as liaisons between the local school and the district technology staff. Other roles of the tech mentors include easing the technical demands on the ITSs during the term of the project and serving as points of contact when the ITS isn't in the building.

"It is a commitment for us and for the teachers, but this is what it takes to plan and design high-quality, technology-supported learning experiences," acknowledges Childress. "There are no shortcuts, but at least Teach21 provides some support and incentives for the hard work that needs to be done."

Teachers receive their equipment at the beginning of their two-year commitment, but once they complete the capstone, they also earn a technology endorsement from the district and a $400 stipend. "I was worried that we weren't offering enough money for teachers to go through all that planning," Childress reflected, "but I've learned it's not about the money. Teachers want to have the technology and they want to plan new learning experiences that are meaningful and exciting to students. They just need the structured time and support—and the challenge—to do so."

To visit Cherokee Counties Teach21 website, go to: http://webtech.cherokee.k12.ga.us/tech/endorsement/

Discussion Questions

- Describe how technology is currently used in your school, district, region, or state. How frequently do students use technology for learning? How do they use technology? Are you pleased with the frequency and context of technology use? What other uses of technology would you like to see and why?
- What challenges do teachers face as they integrate technology into learning experiences for students? How can technology facilitators and leaders help them overcome these challenges?
- The LoTi framework or the engaged learning indicators emphasize the importance of student-centered, inquiry-based learning models that support higher-order thinking. What types of technology use and tools are best suited to supporting these instructional goals? How often do you see technology being used in these ways?
- Do you believe technology implementations are skewed toward lower-order cognitive skills and didactic learning environments? If so, why do you think teachers most often implement technology in this way?
- As teachers plan technology-supported learning experiences, what questions do they have about managing the technology in their classrooms? What strategies have they implemented to manage technology effectively in their classrooms?

Resources

The resources identified under TF/TL Standard II pertain to planning and designing learning environments and experiences. Journals are included providing current ideas for using technology in the teaching and learning process. Software review sites help inform technology facilitators and leaders when selecting software titles. Current texts provide current thinking on how technology can be used to support meaningful learning. Numerous websites are included to keep technology facilitators and leaders informed on a range of topics, including assistive technology, best practices, differentiated instruction, instructional design, online collaborations, 21st-century skills, and innovative learning models.

Periodicals

From Now On
www.fno.org
This site by Jamie McKenzie is an online educational technology journal promoting engaged learning and educational technology literacy.

Learning & Leading with Technology
www.iste.org/LL
ISTE's flagship periodical provides practical ideas for improving educational outcomes with technology.

Technology & Learning
www.techlearning.com
This magazine provides K–12 educators with essential resources for managing, teaching, and training with technology.

Software Reviews

California Learning Resource Network
www.clrn.org/home/
This site is a searchable database with hundreds of learning resource reviews.

Educational Software Preview Center
www.temple.edu/martec/onlinetools/preview.html
This site by MAR*TEC is a searchable database of educational products and software. Reviews on usability and accessibility are available for some titles.

EvaluTech
www.evalutech.sreb.org
This site by the Southern Regional Education Board (SREB) includes more than 10,000 reviews of software and print resources.

SuperKids
http://superkids.com
This site provides software reviews for teachers published as part of a resource site for teachers and parents.

Books

Ashburn, E., & Floden, R. (Eds.) (2006). *Meaningful learning using technology: What educators need to know and do*. New York: Teachers College.

Boss, S., & Krauss, J. (2007). *Reinventing project-based learning: Your field guide to real-world projects in the digital age*. Eugene, OR: ISTE.

Grabe, M., & Grabe, C. (2007). *Integrating technology for meaningful learning* (5th ed). Boston: Houghton-Mifflin.

Marzano, R., & Kendall, J. (2007). *The new taxonomy of educational objectives*. Thousand Oaks, CA: Corwin.

Roblyer, M. D. (2006). *Integrating technology into teaching* (4th ed.). Upper Saddle River, NJ: Pearson.

Solomon, G., & Schrum, L. (2007). *Web 2.0: New tools, new schools*. Eugene, OR: ISTE.

Wiggins, G., & McTighe, J. (2006). *Understanding by design* (2nd ed.). Upper Saddle River, NJ: Pearson.

Websites

Apple Education
www.apple.com/education/k12/
This site provides information and resources for K–12 educators who use Apple products.

Apple Learning Interchange
http://edcommunity.apple.com/ali/
This site is sponsored by Apple and serves as a social network for educators with a wealth of content and resources available.

Assistive Technology Resources
www.onlineconferencingsystems.com/at.htm
This site serves as a one-stop for free assistive technology resources.

Assistive Technology and Special Needs Resources
www.Internet4classrooms.com/assistive_tech.htm
This site provides links to assistive technology resources for educators.

Assistive Technology
www.4teachers.org/profdev/index.php?profdevid=at
This site provides numerous links to assistive technology centers, assistive technology organizations, and funding opportunities for educators.

Center for Applied Research in Educational Technology (CARET)
http://caret.iste.org
This site evaluates the research on educational technology to improve overall technology decisions.

CyberBee
www.cyberbee.com
This site provides fresh ideas on how to use technology and integrate it into the curriculum.

Differentiated Instruction
www.Internet4classrooms.com/di.htm
This site offers a list of resources on learning styles, instructional theory, practical tips for the classroom, and sample units and lessons.

Education World
www.educationworld.com
This site offers a wide variety of resources for educators, including lesson plans, practical information for educators, information on how to integrate technology into the classroom, articles written by education experts, site reviews, and more.

Eduscapes
http://eduscapes.com/tap/topic84.htm
This site is designed to help educators effectively integrate technology into teaching and learning environments.

Edutopia
www.edutopia.org
Edutopia documents and disseminates exemplary programs in K–12 schools. It has a video library of classroom uses of technology that are especially useful as models in professional development. The site allows educators to order custom DVDs of their favorite clips. To engender change, technology facilitators and leaders will be particularly interested in reviewing videos categorized as project-based learning.

Encyclopedia of Educational Technology
http://coe.sdsu.edu/eet/
This site is a collection of short multimedia articles on a variety of topics related to the fields of instructional design and education and training.

Gateway to 21st Century Skills
www.thegateway.org
This site provides access to thousands of learning resources, teaching tools, and assessments.

Global Schoolhouse
www.globalschoolnet.org/GSH/
This site is dedicated to online collaborations for educators, parents, students, and the community.

Harnessing the Web
www.gsn.org/web/
This site is a tutorial that helps teachers implement collaborative, project-based learning on the Internet.

IBM Education
www-03.ibm.com/industries/education/
This site offers IBM solutions that can help educators utilize technology to enhance teaching and learning, streamline administrative processes, and build a strong infrastructure.

Indicators of Engaged Learning
www.ncrtec.org/capacity/profile/profwww.htm
This profile tool helps compare current instructional practices with a set of indicators for engaged learning and high-performance technology.

Intel Education
www.intel.com/education/
This site provides free tools and resources to support collaborative student-centered learning through the use of technology. It also provides information about Intel's global programs to help improve math, science, and technology education.

Kathy Schrock's Guide for Educators
http://school.discovery.com/schrockguide/
This site contains a categorized list of sites useful for enhancing curriculum and professional growth.

Let Your Mentors Do the Coaching
www.techlearning.com/story/showArticle.php?articleID=164302277
This article provides insights on how to create a successful coaching and mentoring program.

Spotlight Resource

LoTi
www.loticonnection.com

One of the significant problems in technology implementation has been—and remains—a lack of a clear standard by which teachers can measure their proficiency in integrating technology into instruction. This has resulted in a number of teachers believing that they are quite technologically proficient, yet seldom integrating technology for higher-order thinking and problem-solving. LoTi is a tool for assisting technologists in both assessing the current level of technology implementation in schools and providing teachers with a standard for technology implementation against which they can measure themselves. By providing and categorizing specific indicators of technology use, educators obtain a clear understanding of their current level of technology implementation as well as indicators of more sophisticated technology use.

Microsoft Education
www.microsoft.com/education/
This site includes Microsoft's technology, tools, programs, and solutions to help address education challenges while improving teaching and learning opportunities.

Partnership for 21st Century Skills
www.21stcenturyskills.org
This site provides a framework for 21st-century knowledge and skills needed to succeed as effective citizens, workers, and leaders.

TeachersFirst
www.teachersfirst.com
This site offers an extraordinary collection of lessons, units, and Web resources for teachers.

Teachnology
www.teach-nology.com
This site provides thousands of free and easy-to-use resources, such as lesson plans and rubrics for teachers.

Understanding by Design Exchange
www.ubdexchange.org
The UbD exchange contains tools and resources to help teachers design curriculum, assessments, and instruction that "leads students to deep understanding of content."

U.S. Department of Education Office of Educational Technology
www.ed.gov/about/offices/list/os/technology/
This government website provides information and resources on the department's educational technology policies, research projects, and national technology summits.

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February 2009
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