Technology Integration in Instruction
This chapter will help you answer these questions and meet the following InTASC standards for effective teaching.

- Why teach with technology?
- What are the types of Web 2.0 technologies that can provide new contexts for learning in my classroom?
- How can I promote higher order thinking with the use of technology?
- How can technology help develop the collaborative skills of my learners?
- How will I know when technology is achieving my instructional goals?

InTASC

**STANDARD 2  Learning Differences.** The teacher uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

**STANDARD 3  Learning Environments.** The teacher works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self motivation.

**STANDARD 6  Assessment.** The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher’s and learner’s decision making.

**STANDARD 7  Planning for Instruction.** The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

The previous two chapters have presented the essential skills needed for lesson planning. It is now time to complement your lesson planning skills with the many opportunities you will have to enhance your students’ learning by integrating instructional technology into
your lesson plans. One of the major themes of previous chapters has been the importance of recognizing individual differences among your learners and adapting instruction to learner needs. As you will see in this chapter, your ability to integrate instructional technology into your lesson plans will be one of the major tools you will have to achieve this goal and for your learners to attain higher order outcomes in more authentic real-world environments.

Since the beginning of the twenty-first century, the Internet has been widely integrated into all walks of life, which has made a significant impact on education. Instructional technologies have become a major instructional platform for meeting learner needs. In the beginning of the Internet era, web pages were read-only, and the content could only be created by the website owner. Website visitors were information consumers but not information creators. Newer Internet technologies have revolutionized this static, one-sided, “take it” or leave it” platform for learning, replacing it with tools for dynamic online, real time interaction. Website visitors now can collaborate and create content together online. Learners can go beyond static graphical and temporal boundaries and change with whom they communicate and interact. And, teachers are increasingly becoming accustomed to interactive technological environments and integrating up-to-date technologies into instruction to evoke meaningful learning. This has become an essential complement to effective teaching methods.

Numerous research studies have found that appropriate technology integration can spark the joy of learning and provide students with cognitive tools to process information, to reflect on what they know, and to construct knowledge based on what they know (Jonassen, 1999; Lajoie, 1993). To engage students, learning tasks must be meaningful—engaging them in decision making, problem solving, and inquiry (Howland, Jonassen, & Marra, 2012). As instructional technologies have evolved, the pedagogical paradigm has changed from teacher-centered to student-centered, and technological applications have shifted their focus from users as consumers to users as creators.

In this chapter you will learn about instructional technologies and how they can benefit teachers across disciplines and grades. The content is organized around three questions: Why teach with technology?; What technologies can I use to improve my teaching effectiveness?; and, How can I integrate these technologies into my instruction? The answer to the why question will provide the underlying reasons it is important to integrate technologies into your teaching. The answer to the what question will describe the instructional technologies you will want to incorporate into your classroom. And, the answers to the how question will show you ways to implement these technologies in your classroom. In this chapter, you will also learn some guidelines for evaluating the effectiveness of your technology integration.
Why Teach with Technology?

With pressure from mandated curricula, Common Core State Standards, the rigor and relevance framework, and high-stakes exams, teachers have good reasons to integrate technology into their instruction. But is technology effective for teaching? This is a question that often weighs on a teacher’s mind. The debate on the effectiveness of technology or media on learning has been waged by many scholars since the last century (Clark, 1983, 1994; Kozma, 1991, 1994). From this debate one point is clear: Technology is not a fix for poorly designed instruction. The effectiveness of technology depends on how teachers are able to integrate it into their instruction. In this chapter you will learn that both the teacher and the instructional design are fundamental to achieving effective technology integration.

Many studies have illuminated the educational value of technologies and justify their integration into instruction. Ogle and Beers (2009) in their text *Engaging in the Language Arts: Exploring the Power of Language* indicate that the use of technology in the classroom can:

- Increase student motivation and engagement
- Improve reading and writing skills
- Expand classroom reading materials
- Expand response and collaboration opportunities
- Expand experiences and content knowledge
- Promote imagination, critical thinking, and problem solving
- Promote multicultural understanding
- Support the learning of diverse students—those from low-income families, those with different cultural experiences, those who are English language learners, and those with physical, mental, and emotional challenges
- Increase understanding and use of the new literacies
- Promote professional development and collaboration

The research literature refers to the overall purposes for online interactions as communication, knowledge building, and learning (Joubert & Wishart, 2012). For example, technology provides students with cognitive flexibility (Spiro et al., 1991). Internet technologies now provide a manipulative media environment, called hypermedia, where the different learning needs of students can be met using multiple presentations of information from different sources at different levels of difficulty, along with the opportunity to create new knowledge, not just parrot back existing information. Technologies integrated with your instruction can also support distributed cognition (Hutchins, 1995). Distributed cognition emphasizes the thinking together aspects of cognition and advocates learning that involves the simultaneous interaction among students, computer, and the learning environment.

Because of the dynamic nature of the Internet, students have many opportunities to interpret, process, and transform information into knowledge and skills. Moreover, online technologies can help cultivate communities of practice in which students have abundant resources and facilitative tools to form their own groups, based on their interests, to exchange and create knowledge (Wenger, McDermott, & Snyder, 2002). It is expected that today’s students will as adults work in jobs that do not exist today. Your classroom instruction will need to be designed to equip students with the skills of collaborative learning, inquiry, problem solving, and metacognition that can be applied in, as well as beyond, the classroom to meet these twenty-first century challenges (Knowles, 1975).

To better equip your learners to face these challenges, Anderson and colleagues (2001) revised Bloom et al.’s (1984) taxonomy in the cognitive domain with the newly added behavior of create (see Figure 5.4, Chapter 5, p. 147), whereby students are expected to use their previous experience to synthesize information
and construct an original never seen before idea or product. From this framework we find that the creation of knowledge is not a completely inspirational or unplanned action but can be taught by design when teachers integrate technology into their instruction.

No matter how eloquent a teacher’s presentation to an attentive and motivated class may be, it is not an easy task to solely rely on “telling” and to be able to have students engaged all the time. This is especially so with today’s generation of learners who are accustomed to visual stimuli and multimedia presentations. To gain their attention and to meet their diverse learning needs, teachers will need classroom technologies that update and change the way they teach.

Most of your students today are exposed to multimedia and the Internet on a daily basis. They are “digital natives” (Prensky, 2001) or the “Net generation” (Tapscott, 1998). Most will have been born in the last 15 years depending on your grade level and they are different than learners before them. They grew up with the Internet and, for most of them, using technologies is as natural as breathing. Although these digital natives are familiar with communication and gaming technologies, they do not necessarily know how to use or learn from technologies in the classroom (Bennett & Matont, 2010). While technologies integrated with your instruction may be different than some of the technologies with which they are familiar, you will need to reach them in ways that complement what they already know and build upon them. To make this happen, this chapter will present some of the most effective and efficient technologies for adoption and integration into your instruction.

Twenty-First Century Learning Technologies

The technologies in this chapter apply to Web 2.0 technologies, course management systems, and interactivity technologies that can extend and improve the clarity, depth, and scope of your lesson plans. Each of these technologies has its strengths, and you need to know how to use them at the appropriate place and time in your instruction.

Web 2.0 Technologies

In the past decade Web 2.0 technologies have been the most dominant information technologies on the Internet, and they have become an important means for facilitating learning and instruction in your classroom. They are dynamic, intuitively easy to use, social and collaborative, and many of them are free of charge. As a result, students can play more active roles in the learning process. Most importantly, with these technologies students can construct knowledge through social interactions with peers (Vygotsky, 1978).

Web 2.0 technologies, often called social media or social software, have been heralded as a tool for information gathering, communication, interaction, and social networking. Web 2.0 was defined as a platform without boundaries, facilitating communication, interaction, and collective intelligence through animated and refreshing display channels (O’Reilly, 2005). By creating opportunities for collaboration, these social technologies provide learners with user-friendly platforms to enhance communication with teachers and peers, and support the creation of social relationships among learners (Schroeder, Minocha, & Schneider, 2010). Advances in Web 2.0 have brought to life constructivist approaches in which learners are expected to learn by constructing their own view of the world in concert with other learners.

Although there are many types of Web 2.0 technologies, not all of its tools were designed specifically for educational use. As a result, some teachers are hesitant to use them. They struggle to justify their use and to anchor them to their instructional objectives. The next sections will spell out the nature of these technologies to help you adopt appropriate technologies that are matched to your learners’ needs. Specifically, the selection is based on the most dominant student learning needs, their current level of technology acceptance, their potential value in your classroom, and whether or not the technology (website) is free of charge.

For Web 2.0 to have maximum impact in your classroom, you will want to consider inquiry-based learning together with problem and project-based learning. With these methods, students get the opportunity to question and to be questioned while teachers use problems and projects to motivate students to investigate phenomena, create explanations, discuss their findings with peers, and reflect on their conclusions. These methods can be integrated with the different types of Web 2.0
technologies below to create learning tasks that support a commitment to inquiry in authentic learning contexts (Borich, Hao, & Aw, 2006). Table 7.1 illustrates several inquiry goals for integrating Web 2.0 technologies across the K–12 curriculum (Audet & Jordan, 2005).

### Course Management Technology

During the past decade, the number of online courses has been increasing exponentially, and online learning has become commonplace at all levels of education (Hao & Borich, 2009). Studies by the Southern Regional Education Board (2007) indicate that online courses are now being used to prepare students to transition smoothly through advanced and remedial courses, improving school graduation rates and providing online discussion activities that promote higher order thinking (Bonk, 1997). When local schools face some unexpected event, such as severe weather, an incident of violence, or an epidemic that precludes or reduces class attendance, learning online becomes an alternative choice for students. In these cases course management systems are often used to construct online learning environments. Even for traditional face-to-face courses, teachers can use a course management system to enhance student learning in contexts and with experiences that exist outside of the classroom.

What can a course management system offer students and teachers in the traditional classroom setting? In general, course management systems can store course materials, provide discussion boards, bulletin boards, e-mail delivery, assessment tools, and, most important, develop an online learning community for motivating your learners. The strength of the system is in creating a learning environment in which students can move in and out of the formal classroom at will to retrieve and exchange online information, discuss topics, and collaborate with peers and their teacher to construct knowledge (Koschmann, 1996). To get the most out of an online learning environment you will need to promote and nurture your students’ self-regulation and independent learning skills (Bonk & Graham, 2006). Research studies have indicated that students feel more comfortable and have more opportunities to learn and express themselves in online discussions when they have been introduced to and are asked to display these skills (Khan, 1997).

With a course management system teachers can message and communicate asynchronously or synchronously. **Asynchronous learning** is when information and messages are placed online for students to retrieve at their convenience or at the time they may be needed for completing an assignment (e.g., readings, finding reference and resource material, looking up course and subject outlines, seeing examples of assignments and products to be completed, learning the criteria by which they will be assessed, etc). **Synchronous learning** is when information and messages are placed online for the
Graham, Allen, and Ure (2005) report that integrating online learning with traditional learning activities can transform teacher-centered instruction to student-centered learning, increase student access to learning and learning flexibility, and increase the cost-effectiveness of schooling. With the wide adoption of computer-mediated communication (CMC) technologies in education, integrating online learning activities (for example, online discussions) has become a frequent objective in K–12 classrooms.

When designing online learning activities, you will first want to examine your instructional objectives. The course management system Moodle is a good learning platform for the following objectives.

1. **To teach basic skills:** To help students acquire information or obtain knowledge about a person, place, or event (for example, learn about an event pertaining to world events), the teacher can post some website information on a discussion board to which all students would have access. Students schedule their own time to read the content on the website and identify the critical points to be discussed. Students can report what they read in class meetings or in online postings. They can paraphrase or generalize the facts from their own and each other’s postings. Taking advantage of the abundance of authentic materials on the Internet, the teacher can instruct students to find readings outside of class and provide them with questions that help with comprehension. Students can then present their findings either online or in class.

2. **To teach higher-level skills:** To help students apply, analyze, synthesize and evaluate information (for example, investigate the evidence for global warming, the pros and cons of urban development, or wind power), you can upload reading materials in a course management system to have students gain background knowledge of what you will be teaching in class. In class, you can model higher levels of thinking needed to synthesize the materials and, afterwards, ask students to construct, investigate, propose, or conclude their findings in class meetings or in online discussion boards.

3. **Inquiry-based activity:** There are different types of inquiry learning, from teacher-centered to student-centered. To equip students with inquiry skills, a teacher can adopt WebQuest, an online learning activity that can transform a teacher-centered classroom to a student-centered framework (Dodge & March, 1995). WebQuest is a type of inquiry learning in which the learning is cyclical and starts with questions. Then, hypotheses are tested, answers are presented, and new questions are formed. In the scenario of WebQuest, the teacher first introduces students to some problem or activity. Then, students are required to conduct an investigation. In the process, the teacher provides specific steps or support to help students accomplish the task and provides and organizes information and resources for the students to search for the answer. Furthermore, the teacher informs students of the information on how their work will be graded. Checklists or rubrics can be created for the evaluation. Finally, the teacher concludes the WebQuest inquiry by summarizing the student’s accomplishment and relating it to the learning goals. Depending on the level of inquiry, a teacher can manipulate the level of teacher-directedness and inquiry. Dodge and March (1995) have a website, which explains WebQuest process, http://webquest.org/.

4. **Online discussions:** The main activity in asynchronous online learning is the online discussion. Teachers can design an array of asynchronous online discussions by encouraging students to critique each other’s work, by raising contradictory issues for students to debate, by inviting experts to share experiences and thoughts with students, or by raising some problem for students to solve or some case to discuss. Students often learn more in online discussions compared with face-to-face class meetings (Harasim, 1997). A combination of face-to-face and online discussions can provide an optimal learning environment in a heterogeneous classroom. To make online discussions a success, the teacher needs to choose topics interesting to students, stating clearly the goals and expectations for the discussion. There should be opportunities for both informal and task-oriented discussions. Furthermore, the teacher needs to facilitate online discussions by developing a social presence in the learning community, emphasizing the value of student-to-student interactions, promoting equitable collaboration, and providing constructive feedback for students in the discussion process (Rovai, 2007). Finally, the teacher needs to moderate the discussions.
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5. Online learning communities and collaborative learning: To motivate your students in online learning, you will need to design learning tasks that get your students’ attention and engages them in the learning process. You will want to engage students by having them collaborate online to develop a sense of community. To develop a sense of community, you can have students share ideas, experiences, and resources (Rovai, 2000). Palloff and Pratt (2005) suggest developing this community by explaining the importance of collaboration, providing guidelines for the collaboration, modeling the process of collaboration online, and helping to guide and evaluate the process.

learner to receive and process immediately (e.g., instant e-mail messaging and discussion and bulletin boards for immediate student interactivity and feedback). Asynchronous and synchronous messaging provide alternative, but not mutually exclusive, ways for your students to access information and knowledge online. Their use in combination with face-to-face instruction is sometimes referred to as blended learning. For extended online assignments, you will want to provide some information asynchronously to provide resource material, timelines, and assessment tools that can aid assignment and project completion (Palloff & Pratt, 2003). If you want to augment your face-to-face classroom instruction with timely suggestions for your students, student-to-student and student-to-teacher feedback, idea sharing, and online discussion boards, you will want to provide some information synchronously with instant messaging. See In Practice: Focus on Applications of Online Learning.

With the emergence of Web 2.0 technologies that provide information sharing and collaboration, most course management systems tend to be embedded with the features of some social media (for example, blogs, or wikis) platform from which your students can interact. To avoid outsiders from gaining access to the identities and information being communicated by your students, course management systems provide the option of a closed system that keeps the main features of Web 2.0 (sharing, communicating, and collaborating) from being seen by others.

Moodle (https://moodle.org) is an example of a free and open source course management system for creating a personal communication tool by which you can maintain contact with your students in or outside of your classroom. It can be used to provide emergency announcements, resources for completing assignments, updates and timelines for work to be completed, as well as motivation for promoting higher and more in-depth levels of performance. You can use your personal computer as the server for Moodle and install it to run a personal Moodle from your classroom or home. Your school’s support staff should be able to help set up Moodle to provide your classroom with access to the system and technical support.

Moodle can be regarded as an alternative to a physical classroom and is considered an ideal course management system. It is suitable for both teacher-centered and student-centered interaction. After posting course or subject content, introductory information, handouts, explanations for homework or practice exams, and so on, you can refer students to these online resources and thereby have more classroom time for teaching subject-specific content. When there is insufficient time to have a thorough discussion about a particular topic, you can open a discussion forum in Moodle. If the discussion forum is interspersed with face-to-face presentations, students can participate at their convenience, while you specify homework assignments, deadlines, and assessment criteria to ensure student participation. As an additional aid to your instruction, your course management system can include tracking tools that will record and report how much time each student spends on the online tasks that you assign.

When you try to build an online discussion community, some students might be hesitant to join. In order to break the ice and jump start a discussion, you can ask a personal question that they are motivated to answer (e.g., What do you like about school?, What are your favorite subjects?, etc.). Salmon (2004) suggests a five-stage model as a framework for moderating online discussions. The stages are:

- **Access and motivation** (the teacher welcomes and encourages students)
- **Online socialization** (the teacher helps students become familiar with one another and with the online learning environment)
- **Information exchange** (the teacher facilitates students sharing information)
- **Knowledge construction** (the teacher provides for and facilitates learning activities)
- **Student reflection** (the teacher encourages students to reflect on what they’ve learned)
In addition to your moderating function, individual student assistance should be available at each stage. Your assistance should include directing how to send and receive messages (e.g., e-mails), helping with navigating the system, conferencing with groups of classmates, and searching the Internet for resources needed to complete an assignment. With your classroom management system, your students will have the opportunity to express themselves, exchange thoughts, and evaluate ideas.

When your students are required to work in groups, you can set up group norms and group member responsibilities before discussion activities begin. (See the stages of group development for which you can design online group work in Chapter 3, pp.73–77.) You can also use your course management system to help initiate a discussion by providing rubrics for communicating what your students are expected to accomplish and how they will be assessed, as suggested in Figure 7.1.

Through online discussions, you will naturally get to know more about your students, to elaborate on their ideas, and bring their thoughts into face-to-face class meetings for further structuring and elaboration. Your students can also submit assignments online by uploading files to Moodle. You can learn more about creating e-learning activities and the application of online learning tools from Bonk (2006), Shank (2007), and Simonson, et al. (2012).

**Blog Technology**

**Blogs**. also called web logs, provide a platform for your students to publish text, audios, or video online (called video blog, vblog, or vlog). Students visiting blogs can leave comments or directly interact with the blog owner or with other visitors asynchronously in addition to your planned instructional content. Blogs provide a platform for self-reflection and self-expression by showing your students’ work online and by publishing it for others to see. Content is displayed in reverse chronological order (latest first). Blogs functioning as personal or group journals can facilitate metacognitive and higher order thinking (Gunawardena et al., 2009). In essence, a blog is a reflective tool providing students with an effective platform for reflection (Hao, 2009). When students blog, they reflect and articulate thoughts through writing, audio recording, or video, thus enhancing their cognitive and metacognitive skills.

**Podcasting**, the equivalent of blogging in the audio form, and video blogging, the equivalent of blogging in the video form, are alternative types of blogs. Podcasting differs from posting audio files online in that users receive podcasts automatically—like a radio broadcast transmitted through the Internet. A podcast is a series of online audio files distributed by **Really Simple Syndication (RSS)**. An additional tool affiliated with the use of blogs is the RSS feed. It is a technology that allows your students to subscribe to a particular blog, podcast, or video blog and have it download to their electronic devices automatically, for example, a computer, an MP3 player, and even a smart phone.

For at-risk learners, many writing assignments go unattempted or are begun only halfheartedly because these learners recognize their written work will not meet minimal writing standards. To aid these students, consider assigning an audio or video podcast project at the beginning of the school year.
These platforms have the advantage of avoiding errors in spelling, syntax, and writing at a critical time in the learner’s development. Podcasting may consume more of the learner’s time than blogging or video blogging, but it can bring a real-world flavor and enhancement to classroom teaching. For information on how to make a podcast, see Podcast for Teachers (http://www.podcastforteachers.org/).

Because blogs are accessible and provide accountability, they are suitable for developing online portfolios and learning journals. After developing online portfolios, students can assess each other and themselves with assigned rubrics to develop their digital literacy. To develop a complete digital portfolio, a student can use blogs as the portfolio platform and follow a few simple steps (Hartnell-Young & Morriss, 2007).

Google Blogger is one blogger tool that is readily available. Students can open an account at Google (http://www.blogger.com) to collect their work (especially their significant work). They can upload files to Blogger to establish personal archives. If the work is not digital, it can be photographed and/or scanned. Then, students can write a statement of their goal or vision—what they intend to accomplish—so that you will have a clear understanding of what to look for in reviewing their portfolios. Keep in mind that initial entries in a portfolio are more suitable for formative assessment, used for assessing development or progress, than summative assessment, used for selection and grading. Therefore, in your students’ vision statement, they should list the specific content and steps that will form the framework of their portfolios, so that they have a guide to follow in their portfolio development. When the framework is ready, students select work from their personal archives to validate their competency. Each work should be unique. To make connections between the items of work, your students may need to create graphic organizers (for example, a chart or table). Finally, to make the portfolio comprehensive, students will need to write an introduction and a reflection for each work and a reflection on the portfolio as a whole. To help your students present their whole portfolio, there are free Web 2.0 applications for concept mapping and online presentation, which will be described later.

Blogs are especially suitable as a reflective tool. After conducting a learning task, students can reflect on their learning experience and journal about it in their blogs. However, you should not expect students to automatically know how to reflect. You can post content-related topics or raise questions in blogs to stimulate students’ thinking and reflection using questions as prompts following the framework outlined below or others suggested by Schon (1987), Postholm (2008), and Smyth (1989).

- Reflection before action (thinking about prior experiences and theories before taking action): “What do I already know and can I use in developing my blog?”
- Reflection in action (thinking that takes place during practice): “How can I arrange my blog for maximum impact in fulfilling my purpose?”
- Reflection on action (reflection after practice has been completed): “How might I revise my blog or do things differently?”

If you want a website for your classroom, a blog should be your first choice. Your students already know or will quickly learn how to write and reply to e-mails which is all that is required in order to blog. Teachers do not need knowledge of website construction to use blogs. For safety and security reasons, it is suggested that your students write blogs in a closed system, like Moodle, with access limited just to your school.

Knowledge Organization and Construction Technology

Some Web 2.0 applications are ideally suited for knowledge organization and construction. Social bookmarking, social presentation, and concept mapping are online technologies that can facilitate your students’ organization and construction of knowledge. Let’s look at each of these tools to learn how they can be integrated into your instruction.

Social Bookmarking. Social bookmarking applications facilitate the building of an easily accessible online bookmark warehouse. After logging into a social bookmarking website, users assign descriptions (tags) to a chosen website, and then the website becomes searchable to members or to the public. Tags allow users to manage their researched knowledge (Gunawardena et al., 2009).
Users can browse their own bookmarks by time, by tag, or by topic (Farkas, 2008). This technology facilitates knowledge organization by putting together the bookmarks saved and having the connected users (through tags) share the bookmarks with each other.

Social bookmarking can be integrated into your instruction whenever you assign students to work on a project and students need to search for and organize information, especially on the Internet. Many times students find the same or related information and waste time on overlapping tasks. Social bookmarking is one of the Web 2.0 applications that can help avoid these problems to make your instruction more efficient. Del.icio.us (http://delicious.com/) is a good social bookmarking tool for the elementary and high school grades.

When a teacher starts a group project, students go to Del.icio.us to open a free account. By setting up a personal account, students can assign their peers as friends and share the bookmarks they keep at Del.icio.us. In addition to the website information friends save through bookmarks, students can look at all user-saved information of other websites that can help them learn from other related resources. With social networking, your learners are connected through common interests with a global community.

**Social Presentation.** The social presentation tool is another application that adopts the concept of the Web 2.0 framework to help students share and work together to organize and construct knowledge. The task is to make an online presentation. To accomplish this, users log into a social presentation website, name the presentation, and start to construct the content. Friends can create slides together online, and the finished presentation content can be watched online with an accompanying website link. Through a social presentation, student presentations to the class can have a professional appearance and are easily edited during development as more knowledge is organized and constructed representing the best thinking of groups of students working collaboratively.

Web 2.0 social presentation tools can be integrated into your instruction whenever a group response or presentation is assigned. One social presentation tool is Prezi (http://prezi.com/). When students collaborate on a project and are going to present their work, they can make their presentation come “alive” with Prezi. After logging in, the students have to organize the content and sequence it in a logical way. The tool is social and collaborative; that is, students can share and work together with peers online to complete the task. Prezi also provides animation effects that make the tool especially popular with young learners.

**Concept Mapping.** Concept mapping is a type of graphic organizer—or mind tool—for knowledge organization that can help students interpret, represent, and organize information by making a graphic in cooperation with one another. Concept mapping has been recognized as an effective way to visualize what’s in one’s mind and portray the organization of knowledge (Novak & Gowin, 1984; Novak & Musonda, 1991). Teachers can use any subject or grade level content with concept mapping as a mind tool to help students achieve the interrelationship among ideas and promote the higher order thinking skills called for when analyzing, synthesizing, and evaluating (Jonassen, 1999).

When teaching a set of related ideas or a concept, you can consider using concept mapping to enhance students’ comprehension. One concept mapping tool, bubbl (https://bubbl.us/), is a good example of a platform for integrating concept mapping with your classroom presentation. A teacher can invite students to create a free account at bubbl. Once logged in, students can start drawing diagrams alone or with peers. Peers do not have to be online at the same time.

There are a few guidelines to making a concept map (Novak & Musonda, 1991). First, the teacher has to choose a particular question for students to answer, called a focus question. The question functions as the context for the concept map. Second, the teacher guides students to include cross-links. These are links between concepts in different domains of the concept map. Cross-links are lines or connecting points between segments of a concept that help students illustrate how a concept in one domain is related to a concept in another domain. Specific examples that help to clarify the meaning of a given concept can be added. You saw some concept maps for interdisciplinary units in Chapter 6.

In addition to helping students grasp the concepts, concept mapping can be used as an assessment tool that asks learners to graphically show their comprehension of the overall concepts or themes in what they have read. Teachers can also use bubbl to graphically illustrate lesson plans, as shown in Chapter 6.
Collaborative Writing Technology

The word “wiki” derives from the Hawaiian word “hurry” and represents a website where users, assigned in groups, can create content collaboratively. A wiki differs from *wikipedia*, which is an online encyclopedia. Wiki pages can be open to the public or limited to a group. The wiki is a collaborative tool because the content generation of the wiki is contributed by all participants in a shared digital space (O’Reilly, 2005). A strength of the wiki is that the content entered is continuously visible, so individual contributions of group members can be monitored. Through the mechanism of wiki participation, “communities of practice” (Wenger, 1998) can develop a collective intelligence to create knowledge and understandings while the spirit of constructivism—fostering meaningful group learning—is being carried out.

You will want to consider integrating a wiki into your instruction whenever you want your students to collaborate on a project or construct meanings together for a class. But sometimes there may be insufficient class time for students to collaborate and adequately develop their ideas. In this case, Wikispaces is a solution (http://www.wikispaces.com/). After you create a wiki, you can assign students to different groups and send them an invitation to open an account. Following the link, students can open an account and schedule time together to work on their group wiki; their contributions will be recorded. It’s important for the group participants to take collective responsibility for knowledge construction by making complementary contributions, responding to, and building on, the ideas and contributions of others (Joubert & Wishart, 2012). You can co-create content with your students and make contributions to each group’s wiki.

To make the best use of a wiki, you will want to follow a few guidelines.

1. You will need to set up clear expectations both for individual and group contributions with respect to the quality and quantity of work expected.
2. Your timeline should be limited to exert disciplined decision making to avoid some students being left behind and posting content at the last minute.
3. Ask students to cite references and sources to provide evidence of content accuracy. You will want to encourage your students to challenge each other’s thoughts and contributions but respect each other’s work.
4. Finally, you will want to examine each group’s work regularly to check on their progress.

Keep in mind that your monitoring responsibilities include providing models of possible solutions that can lead students to the right or an acceptable solution as well as encouraging them to challenge each other’s thoughts. You will also want to schedule a time for check-ups that can steer learners away from poor choices or inefficient paths of inquiry. When there is group work, the wiki is a good choice to examine each person’s contribution and to monitor the quality of work while promoting the spirit of participation.

Virtual Worlds Technology

Virtual worlds provide an interactive environment, often in a two- or three-dimensional format, that is especially popular with K–12 students. They can provide the context where users are immersed in an online role-playing game for instructional purposes. In this eye-attractive, authentic world, users choose or create characters (called avatars), whose identities they assume and interact with in real time. In this imaginary world, a user plays an avatar that can be personalized to fit any role or learning context corresponding to your instructional goals (e.g., a corporate director of a space age technology company, a chairperson of a city council, or a geologist exploring uncharted territory). This simulated world can provide contexts for learning or an environment for social interaction. In this environment, users can observe, experience, and create what would be difficult or too costly in real

Watch this video that discusses virtual field trips. What are some of the advantages to this type of technology?
life, for example, to solve problems of pollution in a simulated city or geographic region, resolve a controversy involving the location of recreational facilities in a city park, or present arguments for and against rerouting of an oil pipeline.

Virtual worlds provide an environment ideal for role playing, simulation, work display, communication, and foreign language training. How does it do all these things? A teacher can display a problem through a virtual world, making the problem authentic and relevant to students. The environment is ideal for students to manipulate objects and to test hypotheses in an authentic context for inquiry-based learning. Whyville (http://www.whyville.net/smmk/nice) for children ages 9–16 and Woogi (http://www.woogiworld.com/) for elementary-age children provide this experience. Also see In Practice: Focus on Digital Gaming in the Classroom.

Green and Hannon (2007, p. 38) capture the great wave of technology that has swept through students of the digital age with the remark, “Children are establishing a relationship to knowledge gathering which is alien to their parents and teachers.”

Educators can be overwhelmed by this wave or they can ride it to a new educational level that is both dynamic and interactive. It is no secret that games and simulations have been key in the training of doctors, scientists, business people, and military personnel alike. It is now beginning to wash ashore in the classroom as well.

According to a May 2012 national survey of teachers conducted by the Joan Ganz Cooney Center, nearly 70 percent of educators reported that lower-performing students engaged more in subject matter content with the use of digital games than without them; while three-fifths reported increased attention to specific tasks and improved collaborations among all students. Sixty percent said that using digital games helped personalize instruction and better assess student knowledge and learning and that games made it easier to teach a range of learners in their classrooms.

Research (Facer, 2003) indicates that playing video games results in the development of new cognitive abilities that translate into key skills, indicating that games help learners:

- Process information quickly
- Determine what is and is not of relevance in a problem solving situation
- Process information in parallel—at the same time and from a range of different sources
- Become familiar with exploring information in a non-linear fashion
- Access information through imagery and then use text to clarify, expand, and explore the information
- Achieve the capacity to see one’s environment as a form of problem-solving

The Education Arcade, a collaboration between the Comparative Media Studies Department at MIT and Microsoft iCampus, has sought ways to minimize “the sharp disconnect between the way students are taught in school and the way the outside world approaches socialization, meaning-making, and accomplishment.” Of particular note is the Games-to-Teach Project featuring next-generation media for math, science, and humanities education (http://www.educationarcade.org/gtt/proto.html).

Following are some of their new-age digital games designed for the classroom.

### Physical Science

**Hephaestus:** Students design robots, create a topology (terraform) and colonize a planet, named Hephaestus. Students study environmental variables such as distance, elevation, and surface type corresponding to physical concepts from which questions of ethics, logistics, economics, and politics can be studied.

**Dreamhaus:** Students learn principles of engineering and physics by investigating virtual architecture sites, solving environmental engineering puzzles, and designing buildings.

**Environmental Detectives:** Students play different community members investigating health problems in their city stemming from pollution problems. They develop inquiry skills and learn the science behind contaminants such as mercuric chloride and the properties of chemicals.
Physics

La Jungla de Optica: Students rescue an archeologist and his niece from a band of tomb-raiding marauders. Players work through the Temple of Light, solving optic puzzles and constructing lenses to thwart the marauders and lead Professor Carlson and Melanie to safety.

Supercharged: Students race through 3-D mazes consisting of electrostatic forces, magnetic fields, and electric fields by adopting the properties of charged particles and placing other charges in the environment.

Life Sciences

Replicate: Students role play a virus and replicate inside a host organism. They migrate through the circulation system and enter target cells in order to outwit the human immune response, without killing their host upon whom they depend for survival.

Biohazard: Students begin as junior doctors and become agents for the Center for Disease Control. They diagnose patients, identify the sources of epidemic outbreaks, and devise ways to prevent the spread of disease.

History

Revolution: Students play a citizen in Colonial Williamsburg. They experience the events of the American Revolution and negotiate their meanings with a virtual community of players. They then play out the interconnections among the social, personal, and political issues of that era.

Foreign Languages

Periodista: Students complete photographic missions in Spanish-speaking countries. They use their knowledge of cultures and language ability to negotiate with non-player characters and player characters to gain access to insider information and obtain better photographs.

Psychology

Sole Survivor: Students are kidnapped on an alien vessel and are the subject of psychology experiments. They must use their knowledge of psychology to train a race of human prototypes and find safety.

Mathematics

The Lure of the Labyrinth: The Lure of the Labyrinth, designed at the MIT Education Arcade in collaboration with Maryland Public Television, Johns Hopkins University, and Macro International, has as its primary goal to enhance pre-algebra mathematics learning with a secondary goal of improving literacy.

Labyrinth: This is a web based adventure game played over a series of sessions. The game’s storyline is a persistent narrative that evolves over time, where the player’s character enters the game looking to recover a lost pet and subsequently is led by clues through a fantasy world—an underground populated by mythical monsters who are stealing pets. As a result, the player exploring this space learns how to navigate it and solves puzzles with algebra and mathematical reasoning to earn enough points to free the captive pet.

In addition to these selections offered from The Education Arcade, many commercial, off-the-shelf games also have had educational impact. Civilization is one example. This game originally appeared in 1991. As a result of the game’s popularity, multiple versions in the series have been developed. The goal of the game is to successfully build an enduring empire. The latest version, Civilization IV, allows players to form teams in order to increase collaboration and plan strategy. In this turn-based strategy game, players must make decisions for their civilization around societal development and diplomacy—including when and where to build new cities, what societal advances in knowledge should be sought, and when and how to handle adversarial and nonadversarial neighboring civilizations. At the onset of the game, players even have the choice of which civilization to play—Aztecs, Romans, Mongols, and so on. As time advances in the game, new technologies emerge (such as pottery and nuclear fission), and civilization leaders have the choice to try to capitalize on these technologies.

Many other games with animated, curriculum-based content that engage students at the elementary level can be accessed at http://www.brainpop.com/video_tutorials/gameup_tutorial/.

Classroom Response Technology

The classroom response system (or clickers) is another type of interactivity technology. This technology was initially used in corporate training during the 1980s. But its recent miniaturization and lower cost has now made it popular in some elementary and high school classrooms. A classroom response system includes a hand-held transmitter, smaller than the size of a TV remote control, with buttons labeled A, B, C, and D. Each student can push buttons to respond to multiple-choice questions spoken
or displayed by the teacher (e.g., on PowerPoint slides). Students respond to questions, and the distribution of responses from all the students are stored in a computer and displayed as a bar chart for all to see. With this technology, you can make the best use of practice test items, provide instant feedback on student learning (keeping students engaged), and immediately diagnose instructional problems to improve learning. Its most optimal use has been when a teacher may not have time for individual student feedback or for stimulating class-wide dialogue after the number responding to each alternative answer is shown to the class (Bruff, 2009). When using a classroom response system, carefully formulated and thought-provoking questions can significantly impact the effectiveness of your instruction and lead to a class-wide discussion in which all your students are participating in the inquiry process (Cheesman, Winograd, & Wehrman, 2010). Schmid (2008) indicates a few pedagogical implications for the classroom response system that can make your questioning more effective. To avoid students guessing an answer, you will want to make one of your alternative responses “I don’t know.” This will encourage your students to respond honestly and reduce guessing.

If your classroom response system has “confidence buttons” that allow students to indicate the confidence they have in the answer they have chosen (for example, no confidence, a little, some, a lot), you can begin the discussion and inquiry process by examining the facts and reasons individual students may have differed in degrees of confidence. You can also have your students discuss the answers with peers or in groups before choosing the confidence option. This will make your students more confident before choosing an answer and less likely to guess. Research has indicated the importance of group discussion and idea sharing before as well as after an individual or group answer is chosen. To avoid the use of your classroom response system becoming teacher-dominated, try involving your students in the selection of questions by modeling the types of test questions that might be asked.

Assessment of the Effectiveness of Technology Integration

To design your instruction and technology integration for meaningful learning, the learning tasks your students complete should be active, constructive, collaborative, authentic, and goal oriented (intentional) (Howland, et al., 2012). Following are some guidelines and websites that can help you achieve and assess these five criteria:

- **Active**: Students are engaged in tasks in which they manipulate the objects of the environments and observe the result. (Second Life http://secondlife.com/, Prezi http://prezi.com/)
- **Constructive**: Learners are engaged in tasks in which they can articulate their doings and reflect on the experience. (Blogger http://www.blogger.com/, Wikispace http://www.wikispace.com/, bubbl.us http://bubbl.us/)
- **Collaborative**: Learners are engaged in tasks that require discussion with others to find meanings and create understandings. (Wikispace http://www.wikispace.com/, Prezi http://prezi.com/)
- **Authentic**: Learners are engaged in tasks that are project or problem based, containing the complexity of real-world contexts. (Second Life http://secondlife.com/, Delicious http://delicious.com/)
- **Intentional**: Learners are engaged in tasks that are goal oriented. (Bubbl.us http://bubbl.us/, and Moodle http://moodle.org/)

To evaluate whether your chosen technologies are integrated into your instruction effectively, you can ask these fundamental questions:

- Did the technology address my instructional goals?
- Did the technology make an impact on my students’ learning?
- In what ways did it make an impact on my students’ learning?
- To what degree did my choice of technology foster the instructional goals of my pedagogical approach?
To help answer these questions, the North American Council for Online Learning (2011), a non-profit association for K–12 online learning, has provided criteria for evaluating the effectiveness of your technology integration. In Chapter 13, we will present some specific assessment tools that will help you determine the effectiveness of your technology integration on your students’ learning.

While technologies for instruction abound in the marketplace and are being commonly used in educational settings, you should be mindful to thoughtfully select the classroom technology you choose and not be influenced by the popularity of any technology. And, although your students may already be users of digital technologies, they have not always used them as learning tools. Therefore, you should design appropriate learning tasks to model how your students can use the technologies presented in this chapter with and without your immediate assistance (Bennett, et al., 2012). The concept of assessing technology integration is simple: The design of an appropriate learning task is the key to effectively integrating technology into your lesson planning and teaching. This design should be based on your pedagogical approach and the outcomes you wish to achieve. If your technology follows from your pedagogical approach and outcomes, you will have achieved the effective integration of technology into your instruction.

Case History

Mr. Medina teaches middle school language arts to honors students. The class is generally balanced between boys and girls whose reading scores are in the top 20 percent, although a few students have self-selected this course and may have scores in the average range. Many of them come from families with professional backgrounds, and they seem to have ready access to all the latest high tech communication devices, a situation that, at times, has caused some distraction in class.

Though cell phones are officially prohibited from the classroom, more than once Mr. Medina has had his instruction interrupted by the unique ring tones emanating from a device secretly stowed in someone’s purse or backpack. And he is sure that texting goes on behind his back when he is writing on the chalkboard, not to mention the near addiction to gaming that seems to have taken the place of eating in the school cafeteria.

The class is currently reading Ray Bradbury’s The Illustrated Man, and Mr. Medina cannot help but smile inwardly at the timeless lesson of the first short story presented there, “The Veldt.” Though written in 1950, it seems to him to be fairly accurate in predicting our future fascination with technology and how it can cause human relationships to take a back seat to the comforts and the fantasy life offered by science.

The “Happylife Home” described in the futuristic short story is not that different from what is available today. “The house is filled with machines that do everything for the family from cooking meals, to clothing them, to rocking them to sleep. The two children, Peter and Wendy, become fascinated with the ‘nursery,’ a virtual reality room that is able to connect with the children telepathically to reproduce any place they imagine.”

Mr. Medina decides that he will not be like the parents in the story, George and Lydia, who become victims of the unbridled use of technology by their children. Instead, Mr. Medina intends to use technology to engage his students.

His plan will use student blogs to teach a lesson in the importance of point of view. After having his students register at www.blogger.com for free individual accounts, he asks them to rewrite the main events of the Bradbury story, originally narrated in the third person—mostly from the father, George’s, point of view—from the view point of either of the children, Peter or Wendy. The style should be informal and personal. Each student will read at least three blogs written by fellow students and post comments. These comments may concern the different feelings and interpretations evoked by changing the teller of the story.

Case History and Licensure Preparation

DIRECTIONS: The following case history pertains to Chapter 7 content. After reading the case history, go to Chapter 7 in the Book Specific Resources section in the MyEducationLab for your course. Upon completion of the test, scored answers to the short-answer and multiple-choice questions will be provided.
Chapter 7  Technology Integration in Instruction

Summing Up

The main points in this chapter include the following:

Why Teach with Technology?
1. The effectiveness of technology depends on how teachers are able to integrate it into their lesson planning.
2. Lajoie (1993) summarizes four types of cognitive tools that technologies can provide to your learners. They are:
   • Supporting students’ cognitive processes, for example, memory or metacognitive processes
   • Relieving students’ cognitive load by providing for lower-level cognitive skills, leaving more time and effort needed for teaching higher-level cognitive skills
   • Allowing students to engage in cognitive activities in an authentic environment that would be impossible or too costly to replicate in the classroom
   • Allowing learners to generate solutions and assess themselves in a context they will encounter in future assignments, advanced grades, and the world of work
3. The research literature refers to the purposes for online interactions as communication, knowledge building, and learning (Joubert & Wishart, 2012).
4. Internet technologies provide a manipulative media environment, called hypermedia, where the learning needs of individuals can be met using multiple presentations of information, from different perspectives, with the opportunity to create new knowledge.
5. Distributed cognition emphasizes the social aspects of cognition and advocates learning that involves the simultaneous interaction among students, computers, and the learning environment.

Twenty-First Century Learning Technologies
6. To meet the learning needs of your students in the twenty-first century, your classroom instruction will have to be designed to teach inquiry skills with pedagogies that include self-directed, problem-based, and project-based learning.
7. Moodle is an example of a free and open source classroom management system for creating a personal communication tool by which you can maintain contact with your students both in and outside of your classroom.
8. The strength of a classroom management system is its learning environment in which students can move in and out of planned instruction to retrieve and exchange information, discuss topics with the teacher, and collaborate with peers to construct knowledge (Koschmann, 1996).
9. A blended course is a traditional course of instruction incorporated with online materials and/or intermittent online discussion.
10. Web 2.0 technologies, often called social media or social software, are tools for information gathering, communication, interaction, and social networking that provide a platform for learners to learn by constructing their own view of the world in concert with others.
11. Responsibilities for teachers moderating online discussions include: welcoming and encouraging students, helping students to become familiar with one another and with the online learning environment, facilitating students’ sharing of information, and designing and facilitating learning activities.
12. Web 2.0 technologies will have maximum impact in your classroom when you consider inquiry-based learning together with problem- and project-based learning.
13. Blogs, also called web logs, provide a platform for your students to publish text, audios, or video online (called video blog, vblog, or vlog) and are an ideal tool for developing portfolios.
14. Podcasting, the equivalent of blogging in the audio form, and video blogging, the equivalent of blogging in the video form, are alternative types of blogs.
15. Social bookmarking applications facilitate the building of an easily accessible online bookmark warehouse, whereby your learners can organize, tag, and store information collected from the Internet.
16. Social presentation is another Web 2.0 application for students to share and work together to organize and construct knowledge for an online presentation.
17. Concept mapping is a type of graphic organizer—or mind tool—for knowledge organization that can help students interpret, represent, and organize information by making a graphic in cooperation with one another.
18. A wiki represents a collaborative tool and website where users assigned in groups can create content collaboratively and where a teacher can monitor their work.
19. Virtual worlds is an interactive environment in which users are immersed in online role-playing games in which they choose or create characters (called avatars) whose identities they assume and interact with in real time. This simulated environment provides contexts for creating what would be impossible or difficult to do in real life.
20. A classroom response system includes a small, handheld transmitter with buttons that students can push to respond to multiple-choice questions spoken or displayed by the teacher.
Assessment of the Effectiveness of Technology Integration

21. For your instruction and technology to provide for meaningful learning, your learning tasks must actively engage your learners by having them:
   • Manipulate objects in the environment, real or virtual, and observe the result
   • Engage in tasks with which they can articulate their ideas and reflect on the experience

22. You should choose and assess the effectiveness of the technologies you use by how well they meet your learners’ needs and your instructional objectives.

Key Terms

Asynchronous learning  Distributed cognition  Social presentation
Blended learning  Hypermedia  Synchronous learning
Blogs  Moodle  Virtual worlds
Classroom response system  Podcasts  Web 2.0 technologies
Concept mapping  Really Simple Syndication (RSS)  Wiki
Course management system  Social bookmarking

Discussion and Practice Questions

Questions marked with an asterisk are answered in Appendix B. Some asterisked questions may require student follow-up responses not included in Appendix B. Go to the Assignments and Activities section of the various topics on the MyEducationLab for your course to complete additional practice activities related to this chapter’s content.

1. Identify four types of cognitive activities that technologies can provide to learners.

2. Provide a definition of hypermedia and an example of its use in the classroom.

3. What is distributed cognition? Provide an example of how technologies can support distributed cognition in the classroom.

4. What is meant by the older “take it or leave it” platform for learning? Contrast it with Web 2.0.

5. What is Moodle and what would be an application of it in your teaching area?

6. What is an asynchronous learning environment? Describe one for a subject you will be teaching.

7. What are Web 2.0 technologies?

8. What is a blog and what can it be used for?

9. What is Really Simple Syndication (RSS)?

10. What is the purpose of social bookmarking? Provide an example for a subject you will be teaching.

11. What is the purpose of social presentation? Provide an example for a subject you will be teaching.

12. What is concept mapping and how would it be used in a subject you will be teaching?

13. What is the purpose of a Wiki and how could it be used in a subject you will be teaching?

14. What is the major purpose of virtual world technology?
Field Experience and Practice Activities

Questions marked with an asterisk are answered in Appendix B. Some asterisked questions may require student follow-up responses not included in Appendix B.

1. Prepare an instructional scenario in a subject that you will be teaching that combines traditional seat work and teacher presentations with online resources and activities to enhance and expand ongoing classroom instruction.

2. Create a classroom assignment in a subject you will be teaching that combines social bookmarking, social presentation, and group work. Provide some online resources that you and your learners could use to complete the assignment.

3. Provide an instructional objective and activity related to a problem in your subject area, such as the pollution of streams and lakes, identity theft, or a problem encountered with characters in a story being read. Cast your objective and activity in the form of a 3-D animation using virtual worlds technology in which characters (avatars) look for evidence for how to solve the problem.

4. Create a class assignment that divides your class into groups of six students each whose assignment is to create a podcast exploring different alternatives for improving student life in your school. Groups can choose improvements regarding such topics as the cafeteria, school library, sports facilities, school grounds, and so on. Your students’ podcasts must be limited to ten minutes.

*5. Identify three Web 2.0 applications that are readily adaptable to small group work. Choose one of them and describe how it would be used to complete an assignment in a content area you will be teaching.

Digital Portfolio Activities

The following Digital Activities are related to InTASC Standards 5, 7, and 8.

1. In Field Experience and Practice Activity 1 you created an instructional scenario as an example of learning, combining traditional teacher presentations and seat work with online resources and activities. Place your instructional scenario in a digital portfolio folder labeled “Blended Learning” to which you can add other examples of technology integration that you observe or read about.

2. In Field Experience and Practice Activity 2 you created a 3-D animation using virtual worlds to teach about a problem with a subject you will be teaching. Place your virtual world animation in a digital portfolio folder titled “Virtual Worlds” as an example of the instructional uses of virtual worlds technology.
Go to MyEducationLab (www.myeducationlab.com) for Effective Teaching Methods: Research-Based Practice where you can:

- Find learning outcomes for the various course topics course along with national standards that connect to these outcomes.
- Complete Assignments and Activities that can help you more deeply understand the chapter content.
- Apply and practice your understanding of the core teaching skills identified in the chapter with Building Teaching Skills and Dispositions coaching activities.
- Check your comprehension of the content covered in the chapter with a book specific Study Plan. Here you will be able to take a chapter pretest, receive feedback on your answers, and then access personalized Review, Practice, and Enrichment exercises to enhance your understanding of chapter content. After you complete the exercises, take a posttest to confirm your comprehension.
- Learn how to address common classroom management issues in the Simulations in Classroom Management.
- Access video clips of CCSSO National Teachers of the Year award winners responding to the question, “Why Do I Teach?” in the Teacher Talk section.
- Create, update, and share quality lesson plans with the Lesson Plan Builder.
- Access state licensure test requirements, overviews of what tests cover, and sample test items in the Certification and Licensure section.
- Learn how to create a high quality teaching portfolio in the Preparing a Portfolio section.
- Access tips, advice, and other information on resume writing and interviewing, your first year of teaching, and law and public policies in the Beginning Your Career section.