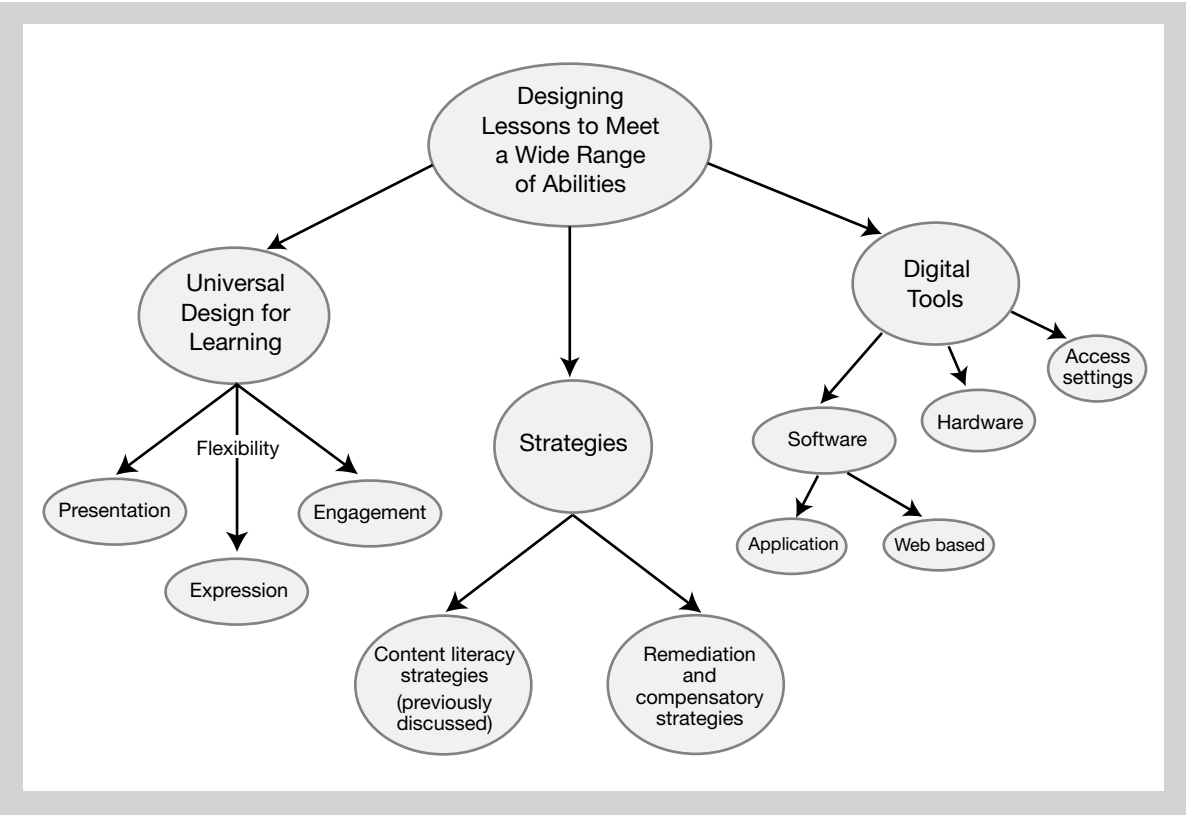
CHAPTER 3

Designing Lessons to Meet a Wide Range of Abilities

Seeing Forward

The evidence-based content learning strategies just reviewed are tools for developing academic literacy—the reading, writing, speaking, listening, and viewing skills needed to accomplish school-based tasks (Brozo & Simpson, 2007; Fisher & Ivey, 2005). Designing lessons that enable all students to acquire and apply these skills can seem daunting, given the diversity of today's students and increasingly inflexible curriculum and assessment demands. In this chapter we ground the use of content literacy strategies within the framework of Universal Design for Learning (UDL), a way of looking at planning that can maximize the learning potential for all students. A universally designed lesson gives students the flexibility needed to compensate for their learning challenges. Digital tools provide much of this flexibility and support. Designing lessons that combine digital tools with evidence-based literacy strategies can improve learning for all students, but especially for students who struggle (Zorfass, Fideler, Clay, & Brann, 2007).



Universal Design for Learning

We ground our examples of lessons that combine reading strategies with appropriate software tools using the concept of Universal Design for Learning (UDL; Rose & Meyer, 2002). Developed by the Center for Applied Special Technology (CAST), UDL is a concept of planning for instruction that accommodates a broad range of learning needs, increasing the probability that all students will be successful. The concept borrows heavily from psychology regarding theoretical constructs about learning and from the field of architecture in addressing issues of access. In a nutshell, the basic concept of UDL is that the learning environ-

ment can be designed in a manner that ensures the greatest possible participation. A frequently stated metaphor for UDL is the curb-cut; this simple sidewalk design eliminates a bumpy barrier for individuals who use wheel chairs, and is now viewed as an accommodation needed for mobility and access (Rose & Meyer, 2002). Community planners usually do not retrofit curb-cuts after requests or petitions from individuals who need them; instead, they try to incorporate these features during the initial design phases of the project. They are built in anticipation that someone may need barrier-free mobility, not in response to an identified need. An unintended consequence of the curb-cut design is that others—people pushing baby strollers, or travelers pulling luggage on wheels, or skateboarders—enjoy it and have come to rely on its strategic placement.

The developers of UDL asked the question, What are similar barriers of access to learning in classrooms? Providing students with learning materials and tools that are flexible, that can be changed according to the needs of the learner, is the cornerstone of the UDL framework. Exclusive reliance on print-based materials and paper-and-pencil tasks alone limit participation for students who may not read as fluently or who struggle to write. Digital materials and tools provide this flexibility, allowing the task to be adjustable from the beginning. The UDL framework is an outgrowth of research on three learning networks in the brain: how people recognize concepts, the strategies people use for new learning, and affective concerns—that which motivates people. Three basic principles of UDL support these networks by encouraging flexibility in presentation, expression, and affect.

Principle 1: Support recognition learning by providing multiple, flexible methods of presentation.

This element of UDL encourages teachers to present content using a variety of methods, materials, and sources. Teaching

methods that support this principle include providing multiple examples, highlighting critical features, providing multiple media and formats, and supporting background context. Adding digital formats, either in addition to or in place of traditional print-based materials, makes it easier to support recognition learning. Digital images, sounds, and other options can be used as multiple examples to illustrate a concept. Text, if in a digital format, can be read aloud or linked to definitions, other files, or websites that supply background information. These features allow teachers to plan flexibly for students who have difficulty reading or understanding the text. Furthermore, digital examples are much more easily stored, searched, and accessed in the modest space of classrooms and schools than are printed text and hard copy images.

Principle 2: Support strategic learning by providing multiple, flexible methods of expression and apprenticeship.

This element of UDL gives students options for how they will show what they have learned. Teaching methods that support this principle include providing flexible models of what the skill looks like; opportunities to practice with supports and ongoing, relevant feedback; and flexible opportunities for demonstrating the skill. For example, in place of always asking for responses by assigning paper-and-pencil tasks, use technology tools that give students choices in expression formats, such as written, oral, slide show, video, or drawing. Even the word processor, a simple technology innovation that has been around for over a generation, can increase student flexibility of expression by taking the tedium out of editing text and giving support for spelling, grammar, and choice of words.

Principle 3: Support affective learning by providing multiple, flexible options for engagement.

This element of UDL attends to student interest and motivation. Teaching methods that support this principle include offering choices in context, content, and tools. For example, allow the student to select an area of interest in the topic being studied to obtain more information from a variety of sources. Digital formats, whether CD-ROM, websites, or tool-based software, are interactive and engaging. Students enjoy the interest they generate. Most students appreciate the power and the independence that they provide. Other teaching methods that support this principle include offering adjustable levels of challenge to match student interests and skills. For example, the authors of many websites hyperlink important terms to a pop-up screen that offers a definition or more information. This type of support is also available in most electronic text programs; dictionary support is available for the majority of the words in the document and can be accessed with a few mouse clicks. A growing number of online learning materials provide examples of flexible text by providing multiple reading levels, choices in interest area, and multilingual versions (see, for example, StarChild, http://starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html and Windows to the Universe, www.windows.ucar.edu).

Planning for instruction using these three concepts can reduce or eliminate the need to adapt instruction after the fact, saving planning time and making all students feel included. The UDL framework is an evolving concept. There is no one program, set of materials, or method that provides all the elements of UDL. A universally designed curriculum is not available in one set of commercial products. Rather, UDL is a concept for recognizing a variety of learning needs, and providing for those needs. The Center for Applied Special Technology and the National Center on Accessing the General Curriculum have provided emergent

examples of these concepts in unit and lesson planning that may be useful for further discussion (Jackson & Harper, 2001).

Digital Tools That Support Universal Design

The digital tools that enable teachers to incorporate UDL principles of flexibility in presentation, expression, and motivation are, for the most part, commonly available in most classrooms. They include application software and web-based applications, hardware, and access settings that can be used to support students as they write, develop presentations, read documents, or access information.

Application Software

Word processors, presentation programs, visual learning software, and electronic reading and study systems are examples of software most commonly found in K–12 environments that can be used to design lessons that support literacy development.

The word processor is the most ubiquitous, adaptable, and useful tool for literacy support. During the last 20 years, it has become more common than typewriters and has made the writing process easier for most people. Those who are poor spellers or inconsistent typists can still produce a letter, a chart, or other documents that are professional looking and error free. The word processor takes the tedium out of revising, editing, and sharpening one's written work.

The same advantages work for students. Word processors can support each phase of the writing process, in prewriting, drafting, editing, and producing the final product. Unfortunately for many students, this tool is overlooked as a routine support; it is more often used as a reward in the final stages of writing process. When used during all phases of writing, word processors sup-

port flexible methods of expression and engagement by providing help with spelling, word selection, translation, and grammar, and by supporting the revising and editing process. Standard office-based word processors also have lesser-used features that are often not considered in supporting student expression and engagement. These hidden features, such as voice recognition and executive summaries, allow for greater student independence in accomplishing literacy tasks.

Some students who struggle with academic literacy skills may be able to take advantage of features that are found in specialized word processors. Text-to-speech (TTS) word processors read, or narrate, the text displayed in the document. Word prediction is a feature that suggests a list of intended words from the first few keystrokes, which can provide support for expression for students who have difficulties in transcription, word retrieval, spelling, and fine-motor skills (MacArthur, 1998). Rebus word processors automatically insert a picture above an individual word, which can support flexible student expression and engagement.

Visual learning software offers flexibility in presentation and engagement, bringing the advantages of a digital tool to strategies for text comprehension. These strategies are called a variety of names—idea maps, concept maps, story boards, advanced organizers, webs, or semantic maps. Digital forms of visual learning strategies can be developed using software programs such as Inspiration or Kidspiration (Inspiration, Inc.) or by using the drawing and diagram features on most word processors. When using these digital tools, the display can change in appearance (increasing the size of the screen), in format (having the text read aloud), or in access to further information (using hyperlinks to explanatory files or websites). Teachers can build in these options to support learning differences from the beginning, reducing the need to modify or create alternate assignments or adapt for special learners after the fact (Rose & Meyer, 2002).

Presentation software allows teachers and students to use more than one type of media—text, graphics, audio, animation, and/or video—to communicate a message. PowerPoint (Windows/Mac) and Keynote (Mac only) are the most widely available products, but there are others that were developed for use in school environments, such as Kid Pix Deluxe, HyperStudio, and Intellipics Studio. Video, music, graphics, and text can easily be incorporated into a stand-alone file using Movie Maker or iMovie, programs that are included with most operating systems. Designing lessons that use or develop the multimedia combinations possible through presentation software can increase flexibility in all three areas of UDL—presentation, student engagement, and motivation.

Electronic reading and study systems use text-to-speech technology to read what appears on a computer screen. They also have features that support comprehension strategies, such as highlighting, note taking, bookmarking, and electronic reference. Many also include optical character recognition (OCR) programs that work with a scanner to convert paper-based textbooks to a digital format. These programs increase the flexibility of presentation—away from paper-based text to independently accessed auditory, visual, and interactive accommodations.

Web-Based Applications

Web-based applications allow multiple users to share and collaborate in commenting on, editing, and revising their work. These applications are available to anyone with an Internet connection and a browser. They are based on open-source code that is freely shared, so they do not require purchasing or licensing in order to participate. These web-based applications, known as the Web 2.0, are emerging as useful literacy development tools, especially in areas where collaboration, communication, and creativity are important. The Web 2.0 tools that are basic to educational purposes are blogs, podcasts, and wikis. Other tools

include social bookmarking (favorite bookmarks that are stored on a server), photo sharing sites (such as Flickr, www.flickr.com), and video showcasing (such as YouTube, www.youtube.com). Tools once thought of as the domain of the desktop, word processors, spreadsheets, and presentation programs are also included in Web 2.0 applications (Soloman & Schrum, 2007).

Hardware Tools

The software and web-based applications mentioned can be accessed with desktop or laptop computers that are typically equipped—meaning a relatively recent operating system, a CD-ROM, and an Internet connection, preferably high speed. Other hardware that may be needed include a classroom projection system (stationary or touch-interactive), a scanner, and a printer. Although one computer for every student can be thought of as an ideal (or idealized) situation, progress toward technology integration can nevertheless be made with less equipment. Options include setting up as many computer stations as possible for student use throughout the classroom, and frequently scheduling classroom sets of laptop computers (usually stored in a cart that is moved from room to room). Portable word processors, personal digital assistants (often referred to as PDAs or hand-held computers) and digital audio players (such as the ipod) can all function as alternatives to desktop computer access.

Access Tools

Accessibility options modify the monitor display, magnify the screen, or change how the keyboard operates. Most accessibility options are free—built in to operating system software. They make flexible engagement possible for students who have physical challenges, temporary or otherwise. Although these operating system adjustments are sufficient to meet the needs of most students, some students with more significant physical barriers

to participation will need accessibility software and device combinations that are more specialized, or dedicated for a particular use. In those cases, assistive technology specialists can help with selection and training of accessibility options.

Balancing Remediation and Compensatory Strategies

The reality of today's schools is often expressed by a great diversity in student achievement—in any given classroom, student skills will vary considerably. Many students still struggle with beginning reading skills, exhibiting limitations in some or all areas of phonetic awareness, decoding, syntax, semantics, or comprehension. Difficulties in reading remain one of the most significant barriers to learning for many students (CAST & LD Online, 2007; Allington, 2002). In the past, the approach to students who were showing these difficulties was remediation, developing fluency in sets of prerequisite skills that had to be mastered prior to advancing to next levels. Remediation strategies, providing additional instructional time and different instructional approaches, are still the most familiar to teachers (Edyburn, 2007). When a student does not know a certain skill—he or she is pulled aside and taught that skill.

But teachers also want these students to understand their textbooks in the subject area, and remediation skill building practices do not always generalize to literacy skills in the content area. Compensatory approaches may also be needed to provide the desired level of performance. Compensatory strategies encourage readers to use an array of supports for understanding the information presented, and for expressing and using that understanding. For students who continue to struggle with content literacy skills, these supports are needed to produce the desired level of performance. Compensatory strategies can be quite simple and "low tech," such as mnemonic phrases writ-

ten on index cards, or asking a peer or adult to read a portion of text aloud. But even more progress can be made if compensatory strategies are paired with appropriate digital supports, which can be accessed on-demand and independently. Some compensatory strategies have already become part of the general landscape. Spelling and typing errors are caught using auto-correct or notations in word processing; violations of grammar rules are similarly marked. Instead of turning these features off to assess if students can spell accurately on their own (a remediation strategy), teach the students how to use these supports to check and correct their work (a compensatory strategy). Similarly, when reading fluency is less than the demands of the text, in addition to teaching word recognition strategies based on vocabulary from the selection (a remediation strategy), allow students to listen to an audio version using text-to-speech software in order to use the information (a compensatory strategy). When students do not know the meaning of a word, allow them to look it up or to translate it using on-demand electronic resources (a compensatory strategy), rather than waiting to learn the terms before engaging with the text (a remediation strategy).

Must educators decide if the best course of action is remediation or compensation (Edyburn, 2007)? Perhaps this dichotomy produces a false argument. We envision classrooms where teachers are comfortable enough with content literacy strategies and with technology that they are able to incorporate both throughout the curriculum, offering freely accessible supports for those who enjoy them as well as for those who need them. For example, using talking ebooks could support students who are required to understand and use text that is beyond their reading levels. Students who are limited from study by time demands may also take advantage of same supports, listening to text on an iPod in between commutes.

The "yet unimagined literacy" skills needed for the technological world that society is fast becoming demands that students

become critical consumers of the information they encounter (IRA, 2001). Remediation strategies alone will not develop these skills. Using compensatory strategies and supports is consistent with the principles of UDL to maximize the potential that all students will be successful by providing flexibility in presentation, engagement, and motivation.

Designing Content Literacy Lessons That Incorporate Technology

The following suggestions will assist in the process of designing content literacy lessons that incorporate technology.

During the initial planning for a unit or a lesson, try to incorporate the three principles of Universal Design for Learning in as many instructional activities as possible.

There are many models for how to plan a unit or a lesson—from direct instruction models, explicit instruction models, and those involving constructivist approaches. However, the important quality, whichever model is used, is attention to as many of the three principles of UDL as possible—flexibility in presentation, expression, and engagement. Not every lesson can incorporate each principle, but analyzing when you are giving students more than one option for receiving, expressing, and engaging with the learning task will maximize your efforts in planning for the successful participation of all students. In addition to CAST's (www.cast.org; Jackson & Harper, 2001) examples of lessons that incorporate UDL principles in unit and lesson planning, the International Society for Technology in Education (ISTE) (www.iste.org) provides lesson plan examples using technology that have been submitted by preservice and inservice teachers across the country. Consider the match of ideas these technology plans describe with the design principles of UDL.

Review the tasks involved in implementing potential content literacy strategies and match these tasks with the salient features of software tools and with your students' instructional needs.
The content strategy and the materials you have to work with should influence the technology you choose for the lesson. The examples provided in subsequent chapters demonstrate text-to-speech, presentation, visual learning software, digital pictures, blogs, and word processing. Use a form of technology appropriate for the task and the students involved. Early elementary students may need more direction and simpler technology (Richardson, 2004).

Remember that technology enhances the learning process; technology is not learning.
The technology is the means for accessing learning. The focus is on the curriculum and learning; technology use per se is not the purpose of the lesson. Technology integration is defined by how and why it is used, not by its amount or type. Use the simplest tool that you are comfortable with (Richardson, 2004). If that solution happens to be a low-technology item (like a sticky note), then don't contrive a technology application to fit.

Technology changes quickly. Make it your personal mission to learn as much about the hardware, software, websites, and social networking sites as appropriate for the ages and subject-area interests of your students.
Become proactive. Learn how the applications presented here can be used to access new learning. Observe student performance and success in using technology, and advocate for needed hardware, software, and services for classroom use.

How does one learn the various software features, and how do you learn to implement them? The International Reading Association (2001) has listed a number of responsibilities for preservice teacher preparation programs in this area, all designed

to develop technology-savvy novice teachers. The IRA position paper on integrating literacy and technology in the curriculum suggests that inservice teachers take full advantage of professional development opportunities. Stay current on the research on practical ideas for using technology by exploring strategies and resources developed by others through professional electronic mailing lists, as well as professional publications such as books and print and online journals.

THINK and APPLY

1. Take the opportunity to explore further the concepts presented here. Visit CAST's website: www.cast.org. How did UDL evolve? From links on the homepage, explore CAST's development of WiggleWorks and the Thinking Reader. How can these products inform your own lesson design process? Choose the link *Articles about UDL* and read one article of interest. Bookmark these locations on your own computer and make notes on your perceptions.
2. Learn more about IRA's position on literacy and technology by reading *Integrating Literacy and Technology in the Curriculum* retrieved from www.reading.org/downloads/positions/ps1048_technology.pdf. How might you work with your colleagues to achieve the vision proposed in this paper?

Looking Back

There is much work to do. Students are exposed to an online world where anyone can print or produce anything, without conventional societal constraints for veracity or point of view. The adults we are training as students now will need to be able to critique information developed in a variety of formats, developed from points of view that are not always transparent. These students already have skills in accessing an array of technology tools—cell phones, text messaging, social networking sites—that can be harnessed for literacy development. Yet, even though the students possess or easily generalize technology skills, schools have lagged behind in their efforts to integrate technology into regular classroom practice. For example, the IRA position statement on integrating reading and technology in the curriculum criticizes the fact that not one state allows the use of the word processor in writing assessments, and all states have ignored all but paper-and-pencil tasks in their assessment of reading abilities. And although professional organizations that are devoted to technology integration (such as ISTE) list planning for technology as skills in their standards for teachers, the practice has not yet been realized. When it comes to using technology as part of pedagogy, many teachers are either occasional or nonusers (Cuban, Kirkpatrick, & Keck, 2001). Hopefully, highlighting the work of researchers in the areas of literacy, technology, and universal and instructional design will demonstrate possibilities in literacy development that are indeed "as yet unimagined" (IRA, 2001).

In the following chapters we pair literacy strategies with technology features and put them together in prototypical lessons in social studies, reading and language arts, science, and math. The following chart previews the content literacy strategy, a technology application, and the UDL principles each lesson supports. We hope that you will be able to take these ideas and put them to use in different contexts and for different purposes, while retaining the basic aspiration of maximizing success for all learners.

Content Area	Content Literacy Strategies	Digital Tools	General UDL Features: Flexibility in 1 = Presentation, 2 = Expression 3 = Engagement
Social Studies			
Readiness	SQPL	Visual learning software	1, 2
Interactive comprehension	Process Guide	Word processor, electronic reading and study system	1, 3
Extending new learning	SPAWN	Presentation software	1, 2, 3
Reading and Language Arts			
Readiness	KWL	Visual learning software	1, 3
Interactive comprehension	GISTing	Presentation software, word processing, blogs	1, 2, 3
Extending new learning	RAFT	Word processing, presentation software	1, 2, 3
Science			
Readiness	Anticipation Guide	Word processing	1, 2
Interactive comprehension	QAR	Word processing, visual learning software	1, 2
Extending new learning	Reader-Response Writing	Presentation	2, 3
Math			
Readiness	Lesson Impressions	Blogs, visual learning software, presentation software	1, 2, 3
Interactive comprehension	Word Grid	Word processing, electronic reading and study systems	1
Extending new learning	RAFT	Word processing, presentation	2, 3

Questions for Study

- Individually or as a group or committee, analyze elements of the current curriculum. Are there places where flexibility in presentation and/or student expression could be included or improved on? What resources would be necessary to integrate these principles?
- Individually or in small groups, access NASA's site for students (StarChild, http://starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html). Compare the content and wording between levels 1 and 2 of this site, and then explore the advanced level. What elements of universal design for learning do you recognize in this site? What design elements are the most completely developed? How might you apply these design principles to content that you are teaching?

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CHAPTER 4

Social Studies: Content Literacy and Technology

Seeing Forward

Thus far, we have made the case based on policy, research, and practical knowledge for the integration of technology and content literacy into the instructional routines of classroom teachers. In this chapter and the three to follow, we present actual specific content examples of how technology integration can occur. This chapter is devoted to demonstrating numerous ways content literacy strategies for social studies learning can be supported and extended through the use of technology tools. A lesson focus and content literacy strategies from the three primary phases of a quality lesson—readiness, interactive comprehension, and extending new learning—are presented. With technology applications, these strategies become even more interactive and engaging to young learners from across the ability spectrum. What's more, the information and ideas gleaned from this chapter will provide teachers of social studies and other content material the tools for creating their own technology-mediated content literacy lessons.