

Research Foundation
Paper

Expert Space
Digital Curriculum &
Tools for the 21st Century

**Effective Web-Based Learning Environments:
A Literature Review**



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INTRODUCTION

Today's 21st century students live in a dynamic, interactive world with access to a vast array of information. Yet many students struggle to navigate, evaluate, and use this information appropriately and effectively. Many more are unable to even comprehend what they have read.

To succeed today—and in the future—*all* students need accessible, leveled content-area information, as well as interactive, personalized learning tools to build key 21st century skills such as setting goals, managing information, and evaluating sources.

Expert Space is the powerful online digital curriculum and toolkit that will transform the way students access and deepen content-area knowledge and expertise, plan and complete projects and assignments, and develop 21st century information literacy skills. Anytime, anywhere access ensures that students can find information, conduct research, build skills, and complete assignments wherever there is an Internet connection.

Expert Space is the result of the collaborative work of a research and development team whose expertise spans innovative development and technology application, brain research, curriculum, instruction, and more.

This Research Foundation Paper provides a brief review of how Expert Space uses learning scaffolds and explicit instruction to provide content support, project support, and information literacy support. The supporting research literature and examples from Expert Space are provided for each of these three focus areas.

The Research Says

To build content area knowledge and expertise, students need supports to access both content and meaning (Rose & Meyer, 2002). Digital learning materials have great advantages in terms of providing access to content: they can instantly be transformed into formats that are better matched with individual learners. And, of course, they are easily updated, current, and contemporary. Well-designed digital learning environments also provide guidance and support to help students build understanding. Students who have difficulty decoding can have words, sentences, or texts read aloud via text-to-speech software or can access alternative texts that match their instructional or independent reading level, and learners who struggle to comprehend can have strategy prompts and vocabulary links embedded within the text (Proctor, Dalton, & Grisham, 2007; Rose & Meyer, 2002). While students are working to build their content-area knowledge, they are also working to improve their reading skills.

Digital learning environments that feature Universal Design for Learning anticipate the needs for alternatives, options, and adaptations to meet the challenge of individual learners. To support optimal learning, classrooms must provide opportunities for learning that are matched to students' need and capacities. This differentiation ensures that every student is consistently in his or her "zone of proximal development" (Vygotsky, 1978).

Navigating digital resources to build deep content area knowledge and expertise also requires a new set of skills including managing, accessing, synthesizing, and evaluating information—skills that can be supported by providing anchored instruction, leveled text, read-aloud functionality, and targeted vocabulary support.

Anchored Instruction

Videos anchor instruction by helping students to build background and activate prior knowledge so they can create mental models from text. Anchored instruction is a powerful way to enhance content knowledge by creating a common experience and a shared metalanguage for an individual or group of students. It also motivates and actively engages learners.

- ❑ Video-based anchored instruction improves student motivation (Heo, 2007), comprehension, and achievement (Heo, 2007; Rose, Hasselbring, Stahl, & Zabala, 2005; Strangman, Hall, and Meyer, 2003).
- ❑ Background, or prior, knowledge is one of the critical factors underlying reading proficiency (Torgesen et al., 2007). Prior knowledge of a subject enhances reading comprehension because it helps the reader understand vocabulary, tie ideas in the text together, clarify details, and fill in logical gaps (Willingham, 2009).
- ❑ Anchored instruction supports students' learning by providing a contextualized case story or problem that enables students in a group environment to bring their multiple perspectives to bear on the challenge at hand (Bransford, 1990).

Leveled Text

Leveled text enables students with diverse learning skills and competencies to approach informational materials at a pace they can read with fluency, comprehension, and confidence. Students are then comfortable enough to not get frustrated or discouraged.

- ❑ Providing texts at multiple levels of complexity and challenge is another means of scaffolding the acquisition of both content and meaning (Brabham & Villaume, 2002).
- ❑ The challenge of providing leveled text, of course, is keeping students in the zone of proximal development (Vygotsky, 1962), where support and challenge are balanced enough in order to stimulate growth of reading skills while keeping readers engaged.

Read-Aloud Support

The most common forms of support provide access to the content or additional information needed to comprehend the text.

- ❑ Research suggests that hypertext, hypermedia, and computer-mediated text has the potential to support students' reading development (Kamil, Intrator, & Kim, 2000; Kim & Kamil, 2003; Leu, 2000; Strangman & Dalton, 2005).
- ❑ Digital text offers the kinds of flexible customization of the learning environment that can contribute to improved student outcomes (Coiro, 2003; Kamil, 2003; Strangman & Dalton, 2005).

Targeted Vocabulary Support

To build deep content area knowledge, students must be able to comprehend what they are reading. Readers with weak vocabulary typically struggle with comprehension, as do some English language learners and students with language or reading disabilities.

- ❑ Vocabulary and reading are said to be reciprocal, in that the size of a student's vocabulary enhances reading comprehension, while continued exposure to reading in turn builds vocabulary (Nagy, Herman, & Anderson, 1985; Snow and Ninio, 1986).
- ❑ Specific features that support increased vocabulary include within-reading scaffolds designed to engage students in actively constructing knowledge of individual words, such as hyperlinked words and individual glossaries (Blachowicz & Fisher, 2007).

Expert Space Delivers

Organized around the most commonly taught, studied, and researched topics in school, each xSpace, or curriculum collection, within *Expert Space* provides the best starting point for learning and exploration in science and social studies. Multiple reading scaffolds ensure that all students can access the content to strengthen their nonfiction reading skills and build deep knowledge and expertise.

The screenshot shows the Expert Space website interface. At the top, there is a navigation bar with the 'expert space' logo, a search bar, and user information (Signed in as: Alex, Home, Help, Sign Out). Below the navigation bar is a 'My Work Zone' for 'Great Depression' with a progress indicator (29 days left, 0% of Tasks Completed) and a 'Tools' section with various resources (Notes, Existing Ideas, Bibliography, Skill Builders, Outlines, Dictionary/Atlas). The main content area is titled 'Xspace Solar System' and includes a 'Watch it!' section with a video thumbnail, a 'Read it!' section with a text block about the solar system, and a 'Dive deeper!' section with 'Featured Topics' and 'Other Objects in Orbit'.

Each xSpace starts with a short anchor video to build background knowledge before students begin reading about the topic.

A read-aloud tool enables over 150,000 articles within *Expert Space* to be read aloud, ensuring that all students can successfully participate in content-area learning.

To build vocabulary, *Expert Space's* embedded, clickable dictionary allows students to look up the meaning of any word during reading.

The screenshot displays the 'My Work Zone: Solar System' interface. At the top, there is a navigation bar with 'xspace Science | Astronomy | Solar System | The Solar System' and a 'Tools' section with icons for 'Turn Read Aloud On', 'Look Up a Word', 'Save', 'Email', 'Print', and 'Take a Note'. Below the navigation bar, the article title 'The Solar System' is prominently displayed. To the right of the title, the reading level is indicated as '1' (Level 1), with options for 'en Español' and 'Lexile: 740L'. The main content area features a large, vibrant image of the Sun. To the left of the image, there is introductory text about the solar system. To the right, a sidebar titled 'More on this Topic' lists various sub-topics like 'The Sun and Planets' and 'Other Objects in Orbit'. At the bottom of the page, there is an 'Image Library' section showing a small image of the solar system.

Every article within *Expert Space* is leveled using the Lexile Framework® of Reading to help match students to text they can comprehend. Articles within each xSpace are written at three reading levels so that all students can study the same topic using one resource (Level 1: 600-800L; Level 2: 800-1000L; and Level 3: 1000-1200L).

The Research Says

Students require support to help them develop time management/executive function skills, organizational skills, and study skills in order to complete projects effectively and efficiently (Leu, 2000). Most students—but especially those with some learning disabilities—need help in learning how to initiate, plan, organize, and synthesize ideas (De La Paz, 1997; Gersten & Baker, 2001; Quenneville, 2001; Stein, Dixon, & Barnard, 2001; Troia & Graham, 2002). Such skills are also essential for academic success and later in life (Meltzer, 2007).

Teaching students the skills to effectively plan and carry out projects can also have a beneficial effect on their attitudes toward their work. Instruction that has an emphasis on strategy and process has been shown to have a positive impact on student motivation and self-determination (Dweck, 2000; Stipek & Gralinski, 1996; Wilson & Trainin, 2007). In addition, students who learn to be more autonomous and self-regulated have higher rates of academic achievement and get more personal satisfaction in school (Deci, Vallerand, Pelletier, & Ryan, 1991).

Executive Function and Time Management Skills

Successful project management starts with creating a plan that includes goals and realistic benchmarks for success. Yet, many students initiate research without a clear plan or explicit research questions (Eagleton, Guinee, & Langlais, 2006; Rankin, 1999; Schacter, Chung, & Dorr, 1998; Wallace, Kupperman, Krajcik, & Soloway, 2000; Watson, 1998).

- ❑ Executive function is defined as the organization of “subprocesses” that include setting goals, planning, organizing and prioritizing materials, managing time, and being cognitively flexible, self-monitoring, and self reflecting (Meltzer, 2007).
- ❑ Data derived from neuroscientific brain research and extensive classroom observation shows that “students who understand the goals of their schoolwork are more likely to stay focused, monitor themselves successfully, and derive satisfaction from their progress” (Rose & Meyer, 2002, p. 88).
- ❑ Data derived from neuroscientific brain research and extensive classroom observation shows that students who understand the goals of their schoolwork are more likely to stay focused, monitor themselves successfully, and derive satisfaction from their progress (Rose & Meyer, 2002).
- ❑ Some [students] may lack the executive function skills to recognize when they are behind schedule or off-track, while others do not realize that inquiry involves an iterative set of steps, such as asking questions, using search tools, evaluating information, asking more questions, synthesizing information, and so on (Rose & Rose, 2007).

- ❑ Extensive research across diverse groups of students and domains has shown that systematically teaching effective executive function strategies helps all students, particularly students with learning disabilities (Harris & Graham, 1992; Meltzer, 1993; Palincsar, Winn, David, Snyder & Stevens, 1993; Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989).
- ❑ Project planners and calendars are the sorts of tools that scaffold executive function skills by offering the student a system to map out the process, move forward, apply strategies, and assess where they are in relation to their goals (Dawson & Guare, 2004).

Organization and Study Skills

Few students can articulate a system for organizing large volumes of information and many lack strategies for notetaking, which is crucial for recalling important information gleaned from reading and for citation generation (Eagleton & Dobler, 2007; Kuiper, Volman & Terwel, 2004).

- ❑ One effective strategy for gathering and organizing information and citing sources is note-taking; however, numerous researchers have found that students of all ages are poor note takers (Boyle, 2001; Garcia-Mila & Andersen, 2007; Guinee & Eagleton, 2006; Hughes & Suritsky, 1993; Robinson et al., 2006).
- ❑ When taking notes, “students’ responsibility for their own learning increases” and when “an adolescent is taking notes, he or she is attending, and if he or she is following a notetaking format, he or she is organizing the information”. (Evans, Pelham, & Grudberg, 1995).
- ❑ The need for support in this area is likely to be even more pronounced in students with some learning disabilities, who, research shows, have difficulty “discriminating between important and not-so-important information...organizing information in a meaningful way, and recording the information fluently and legibly” (Hughes & Suritsky, 1993).

Expert Space Delivers

Expert Space helps students plan and complete assignments and research projects by giving them access to interactive, personalized learning tools such as an assignment planning wizard and calendar. Students can use these tools to set goals, track their progress, and complete their work.

The screenshot displays the Expert Space web application interface. At the top, the user is signed in as 'Alex' and can navigate to Home, Help, or Sign Out. A search bar is available with options for 'SEARCH', 'Advanced Search', and 'Help me search the Internet'. The main interface is titled 'My Work Zone: Solar System' and includes a progress indicator showing '14 Days left' and '60% of Tasks Completed'. A 'What's Next?' section highlights a 'Rough Draft Due March 11, 2009'. The 'Tools' section provides access to various resources like 'Notes', 'Project Ideas', 'Bibliography', 'Skill Builders', 'Outline', and 'Dictionary/Atlas'. The 'My Work' section is organized into 'Stuff I Create' (Bibliography, Note Organizer, Outline) and 'Stuff I Collect' (Articles, Web Links, Other, Project Ideas, Media, Magazines, Xspaces). A 'My Assignment Plan' section shows a checklist of tasks with due dates and a calendar for March 2009.

Automatic status updates at log-in and “what’s next” prompts develop time-management skills.

Saving relevant articles, Web links, note cards and other work to a personal digital locker helps students manage information and develop critical organizational skills.

A calendar and assignment planning tool enable students to set goals, track their progress while providing realistic benchmarks for success, and reflect upon their learning.

Students can save all of their note cards in a digital locker and use the note organizer tool to categorize note cards and evaluate any potential information gaps.

The screenshot displays the 'expert space' website interface. At the top, there is a navigation bar with the site logo, a search bar, and user options like 'Signed in as: Alex', 'Home', 'Help', and 'Sign Out'. Below this is a 'My Work Zone: Solar System' section with a progress indicator showing '13 days left' and '40% of Tasks Completed'. A 'Tools' menu on the right includes options for 'Notes', 'Project Ideas', 'Bibliography', 'Skill Builders', 'Outline', and 'Dictionary/Atlas'. The main content area is titled 'Comets' and features a text passage about ancient beliefs and modern science regarding comets, accompanied by an image of a comet. Overlaid on the page are two windows: 'My Notes', which lists various notes such as 'Red Dwarfs', 'The Sun', 'Birth of the Sun', 'Blue Supergiants', 'Inner Planets', 'Moon', 'Outer Planets', 'exocvite', 'solar system', and 'what are comets?'; and a 'Note Card' window, which is currently active and shows a note titled 'what are comets?' with a clipped text snippet: 'Scientists think that comets are leftover material from the time when the planets of our solar system formed.' The note card also includes fields for 'Assignment: Solar System', 'Notes in my own words', 'Categories note by group', and 'Citation: Your Citation'. Buttons for 'DELETE NOTE', 'ADD NOTE', and 'SAVE' are visible at the bottom of the note card window.

Digital note cards help students learn to find main ideas, paraphrase information, summarize, synthesize, and cite sources.

The Research Says

Students also benefit from supports that help them develop essential information literacy skills, including online searching, information evaluation, and citing sources. Most students do not grasp the importance of assessing and evaluating the validity or credibility of information and citing sources—but these are essential life skills to develop. Students need to be critical consumers of information because the Internet does not provide filters for weeding out inaccurate or even intentionally misleading information and images.

Online Searching and Evaluating Information

Researchers have found that people of all ages are surprisingly inefficient at finding information on the Internet (Eagleton & Dobler, 2007; Henry, 2006).

- ❑ Students may lack keyword strategies, may not know which sites to choose from a hit list, or may become disoriented and lose sight of their goals in this vast, ill-defined information space. Learners need models, and practice with, online searching strategies (Gillard, 2007).
- ❑ Many students have a hard time identifying promising sites from the hit list (Kafai & Bates, 1997) and have difficulty distinguishing between appropriate and inappropriate results (Large & Beheshti, 2000).
- ❑ Elementary and middle school learners often make hasty decisions about what to read on the Web, which causes them to either waste time on irrelevant information or to bypass useful sources of information (Eagleton and Guinee, 2002).
- ❑ Rather than focusing on moving quickly through the online world, students need to learn how to decide which information is most accurate, relevant, appropriate, and useful for their purposes (Leu, Leu, & Coiro, 2004).
- ❑ Both teachers and students must play the role of healthy skeptic in effective Internet reading (Leu, 1997).

Citing Sources

Plagiarizing ideas and images, whether intentional or unintentional, has never been easier, with as many as half of all high school and college students engaging in some form of Internet plagiarism (McCabe, 2005). Educators at all levels consistently mention this as one of the core issues in learning and researching for today's students.

Learners need models of, and practice with, citing sources and recording information in their own words.

- ❑ The ability to consistently and accurately document sources is challenging for many, if not most, learners, even at the secondary and post-secondary levels. (Bowler, Large, & Rejskind, 2001; McNabb, Hassel, & Steiner, 2002)

Expert Space Delivers

Harnessing the power of technology to provide interactive productivity tools and models, *Expert Space* helps every student develop and practice essential 21st century information literacy skills.

The screenshot displays the Expert Space website interface. At the top, the 'expert space' logo is visible, along with a search bar and user information (Signed in as: Alex). Below the search bar, the 'My Work Zone' for a 'Solar System' assignment is shown, including a progress indicator (48% of tasks completed) and a 'What's Next?' section with a 'Note Cards' due date of February 18, 2009. A 'Tools' menu is also present, listing options like Notes, Project Ideas, Bibliography, Skill Builders, Outlines, and Dictionary Atlas. The main content area features 'xSkills: Skill Builders' with a grid of six interactive buttons: Setting Goals, Searching, Evaluating Sources, Note Taking, Outlining, and Citing Sources. The Scholastic logo and copyright information are at the bottom.

Animated Skill Builder tutorials model best practices in 21st century information literacy including setting goals, searching, evaluating sources, note taking, citing sources, using outlines, organizing notes, and presenting. Teachers can use these for instruction or students can use them for independent learning and practice.

Citations entered on each note card are automatically included in a bibliography that students can print out and submit with the finished project or assignment. Each article in *Expert Space* can be cited in one of three ways: Chicago Manual of Style, APA, and MLA. Students are also given models for citing other resources, such as books, journal articles, and other digital materials.

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