Reading As Thinking
Integrating Strategy Instruction in a Universally Designed Digital Literacy Environment
Bridget Dalton and C. Patrick Proctor, CAST
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Abstract

In this chapter, we present an overview of our work developing Universal Literacy Environments (ULEs). Reflecting universal design for learning principles (Rose & Meyer, 2002), a ULE is a digital reading environment that provides the learner with a variety of embedded features that are designed to support individual learning needs, while being sensitive to the interactive nature of the reading process. Focused on comprehension building, ULEs allow print-challenged students to access the same texts as their typically achieving peers through text read-aloud software. Students who struggle with making meaning are supported in an apprentice model of reading strategy instruction where scaffolds decrease as students’ understanding and self-regulation improves. It is our belief that we learn the most from engaging students in the margins of the achievement distribution, and we therefore have pursued projects that target struggling readers, including students who are learning English as a second language, students who are deaf and hard of hearing, and children with significant cognitive disabilities.

Reading as thinking: Integrating strategy instruction in a universally designed digital literacy environment

Maria: I don’t really like to read.

Jay: I can’t read fast enough to keep up.

Moesha: There are too many words I don’t know.

Ricky: I don’t have a clue what this means.

Paola: If I could read this in Spanish, I would understand it.

Children struggle to understand text for a variety of reasons, including lack of engagement, weak decoding and fluency skills, inadequate vocabulary and background knowledge, and ineffective strategies for setting a purpose for reading, monitoring one’s understanding, and resolving problems (Lipson & Wixson, 1997; Paris, Wasik & Turner, 1991). It is rare to have just one area of concern, and if the struggle goes on too long, motivation and engagement inevitably enter into the equation, depressing performance even further (Guthrie & Wigfield, 2000). The two most prevalent reasons for these challenges are lack of access to good instruction and learner differences that often interfere with learning from good instruction.
For the past several years, we have been working with colleagues at the Center for Applied Special Technology (CAST) to develop and research scaffolded digital literacy environments focused on the promotion of struggling readers’ comprehension, engagement, and efficacy. Using high quality novels, chapter books, folktales, informational texts, and picture books, we have created a series of digital multimedia hypertexts, or “universal literacy environments” (ULEs) that are embedded with learning supports and provide opportunities for interactive student responses. Like other authors featured in this volume (McNamara, Levinstein, & Boonthum, 2004; McNamara, O’Reilly, Rowe, Boonthum & Levinstein, this volume; Meyer & Wijekumar, this volume), we are interested in how digital learning environments can improve students’ comprehension and self-regulation through the use of pedagogical agents and guided practice. We situate our work with reading strategies within a larger engagement perspective, as do Guthrie, Taboada and Caddington (this volume; Guthrie, Wigfield, & Perencevich, 2004), and pay special attention to the needs and interests of struggling readers (Williams, this volume; Williams, Hall, & Lauer, 2004).

We have studied the use of ULEs with struggling and typically achieving readers in elementary and middle school classrooms, with the major focus on students in grades 4 through 8. Interested in reaching students functioning at the margins of school success, we have applied a universal design for learning instructional design framework (Rose & Meyer, 2002; Rose & Dalton, 2002) to the development of ULEs for students with diverse learning needs, including struggling readers and students with learning disabilities (Dalton, Pisha, Eagleton, Coyne, & Deysher, 2002), students with significant cognitive disabilities (O’Neil & Dalton, 2002; Coyne & Dalton, 2005), students who are deaf and hard of hearing (Dalton, Shlepper, Kennedy, Lutz, & Strangman, 2005), and students who are learning English as a second language (Proctor, Dalton, & Grisham, in press). In this chapter we describe our instructional design framework, share results from our ongoing research in classrooms, and propose a model of reading comprehension that is sensitive to both traditional reading comprehension processes and the affordances possible in digital environments.

Theoretical and Empirical Foundations

Reading comprehension. The RAND Reading Study Group (Snow, 2002) defines reading comprehension as a “process of simultaneously extracting and constructing meaning through interaction and involvement with written language” (p. 11). Meaning is constructed as a transaction between reader, text, and activity, situated within a larger sociocultural context. The RAND report acknowledges the important role of affect, and the changing nature of the text in digital multimedia environments, aspects we believe key to advancing our understanding of comprehension and effective instructional practice. In a digital context, the relationship between reader, text, and activity can be changed in ways that extend the capacity of the reader and transform the text to
take on teaching and learning roles (McKenna, 1998; Strangman & Dalton, 2005). For example, a 7th grade student reading on a 4th grade level due to decoding difficulties may productively engage with texts at his grade level if they are in a digital format that includes a read aloud tool to compensate for weak word recognition skills. Digital texts may also be transformed to offer teaching supports, such as pedagogical agents who model reading processes. The text may also learn about the reader as it collects and analyzes performance data and makes adjustments in the learning environment accordingly. In effect, the reader-text-activity relationship is dynamic in a digital context.

Our work draws on the extensive body of research supporting strategy instruction (National Reading Panel, 2000), and specifically, reciprocal teaching (Palincsar & Brown, 1984), as well as research on hypertext comprehension and digitally supported literacy environments (for a review, see Dalton & Strangman, 2006), multimedia learning (Mayer, 2001) and engagement (Guthrie, this volume; Lepper, 1985). Our ULE prototypes include multiple strategies and supports, with a focus on strategic comprehension and engagement. It fits best within a cognitive apprenticeship model of learning (Cognition & Technology Group, 1993) and an interactive view of reading that ensures bottom-up processes through text-reading technology, while privileging top-down processes so crucial to comprehension building (e.g., Graesser, Singer, & Trabasso, 1994; Rumelhart, 1994). However, we are also guided by a universal design for learning framework, which we describe in the next section.

**A Universal Design for Learning Instructional Framework**

The concept of universal design originated in the field of architecture during the 1970’s in response to a US federal mandate requiring that physical access be provided to individuals with disabilities. Ron Mace (1998), an architect with physical disabilities, argued against the prevailing practice of retrofitting buildings and physical spaces to accommodate individuals with disabilities, suggesting instead that designers consider the needs of the broadest range of users from the beginning of the planning process, with the goal of creating something that would benefit all users. Sidewalk curb cuts and TV captioning are two examples of innovations designed for individuals with physical and sensory disabilities that are now commonplace affordances in our daily lives.

Universal design for learning applies this concept to the conceptualization and implementation of curricula and instruction (Rose & Meyer, 2002; Rose & Dalton, 2002). We believe that the most effective learning environments (i.e., texts, curriculum, assessments, instructional methods, etc.) are those which consider the needs and interests of the broadest spectrum of learners from the outset. This philosophy of learning is at odds with more traditional learning approaches that advocate adapting curriculum, or developing supplemental materials for students who have special needs.
Drawing on recent advances in the neurosciences and our understanding of how the brain learns, as well as the flexibility of new digital technologies and media, UDL employs three basic design principles: (1) To support diverse recognition networks, provide multiple means of representation; (2) To support diverse strategic networks, provide multiple means of strategic learning and expression within an apprenticeship environment; and (3) To support diverse affective networks, provide multiple means of engagement (Rose & Meyer, 2002). While it is possible to apply the tenets of UDL without technology, digital multimedia are at once flexible, scalable, and standardized in such a way as to allow for the most fruitful implementations of classroom-based UDL practices.

Guided by UDL design principles, we have developed and researched a prototype ULE that applies Palincsar and Brown’s (1984) reciprocal teaching approach to reading strategy instruction (for a review, see National Reading Panel, 2000). Reciprocal teaching is a well-validated approach to improving students’ comprehension and self monitoring skills through an apprenticeship model of learning (Cognition & Technology Group, 1993). The teacher and students engage in an instructional dialogue about the text, co-constructing their understanding of the text as they apply several strategies: predicting, questioning, summarizing, and clarifying. Initially, the teacher plays a lead role, demonstrating, modeling, and providing feedback as the group reads a shared text. Students then take turns leading the discussion, with the teacher gradually releasing control to students as their competence increases. The goal of reciprocal teaching is not to teach strategies per se, but rather, to apply strategies in the service of developing deep understanding. Core to reciprocal teaching is the notion of scaffolding, where supports are dynamically adjusted to meet the needs of the learner in relation to the demands of the task (Vygotsky, 1978; Wood, Bruner & Ross, 1976). Figure 1 shows a screenshot from a ULE folktales.

Figure 1. Sample screenshot of folktales ULE with embedded supports (copyright, CAST, 2004)
In the following section, we describe the various supports from a UDL perspective. The primary goal of the ULE is to develop engaged, active, and strategic readers who are able to make sense of complex language in a variety of educational content domains. A second important goal is to support students’ access to and progress in the general education curriculum, as mandated by the Individuals with Disabilities Education Act (IDEA, 1997). To accomplish this latter goal, we have selected texts that are age and grade level appropriate, and have embedded learning supports within these texts. At first glance, this appears contradictory to the prevailing recommendation that struggling readers should be taught with texts that are at their independent and instructional reading levels (Allington, 2001). For adolescents who are reading substantially below grade level, this commonly entails the use of high-interest-easy reading materials (which are often anything but interesting). Of course, we agree that students need to read texts at the appropriate level of text difficulty to develop the reading skills required for fluent reading and comprehension. At the same time, students must have access to the grade level texts that provide the foundation for academic learning and future success as knowledgeable, literate citizens.

The flexibility of digital text makes it possible to redefine the concept of “readability” by manipulating the access supports so that students can focus on making sense of the text, rather than decoding the words (Edyburn, 2002; McKenna, Reinking, Labbo, & Keiffer, 1999). A second benefit of this approach is that it directly addresses the issue of engagement. Students want to read the same books, magazines, and websites that their classmates are reading. Adolescents in particular find it difficult to be visibly identified as poor readers, reading different books and participating in different learning experiences than their peers. Fink’s (1995/1996) research on highly successful adult dyslexics reveals the power of interest in driving learners to struggle with texts that were beyond their reading level in order to learn content that was important to them. Indeed, by using age appropriate text, we hypothesize that we are reducing some of the negative affect associated with struggling reader status, with the hope that students will more willingly persist with the challenging task of accelerating their reading growth and becoming engaged readers.

It is important to situate the use of ULEs within the larger instructional context of the classroom. While we may work with small groups of children during the formative stages of development, field testing is carried out by teachers. Although it varies by project, teachers generally participate in a 2-day training institute, followed by occasional coaching sessions during the intervention period. Students also participate in one or two training sessions to learn about the various features and navigation system. Perhaps not surprisingly, even young children with significant cognitive disabilities quickly learn how to use the basic system.
Providing multiple means of representation

It is not possible to read with understanding if you cannot recognize the words accurately and efficiently. Therefore, to support students with decoding and/or fluency issues, the ULE provides a text-to-speech tool (TTS) that allows students to click on a word, phrase, or passage and have it read aloud. The text is read with synthetic voice, accompanied by synchronized highlighting. Students can select their own voice and narration rate, and are asked to read along in the text as they are listening to the TTS so that they are both seeing and hearing the words simultaneously.

There is evidence that TTS benefits students especially when used over an extended period of time, although some research challenges this approach (for a review see Strangman & Dalton, 2005). In our work, TTS is essential as an access tool for struggling readers who would not be able to read the text otherwise, and thus, at a minimum, it plays an important assistive technology role. In several studies, we have found that students reading ULEs improve their performance on print-based measures, suggesting that the TTS is not impeding skill development (Coyne & Dalton, 2005; Dalton et al., 2002; Dalton et al., 2005). Although TTS is an economical means to providing read aloud functionality, there is no doubt that even the most current digital voices do not provide a good model of oral reading expression. In our work with young children, we have complemented TTS at the word level with human voice recordings at the sentence and passage level (Coyne & Dalton, 2005). From a universal design perspective, it would be optimal to offer TTS and human voice so that users could select the format that best served their purpose (e.g., visually impaired individuals often prefer TTS to human voice because it is possible to listen to TTS at high speed without losing intelligibility; Jackson, personal communication).

While a read aloud tool is the primary means of providing access to the words, it does not meet the needs of individuals who are deaf and hard of hearing. In a recently completed project with the Laurent E. Clerc Center at Gallaudet University, Dalton and colleagues (2005) embedded American Sign Language (ASL) video and Signing Avatar clips (VCom3D) in digital texts for middle school students. Students could click on a word or passage and view it signed in ASL (see Figure 2). In this case, the “reading” of the word is necessarily connected to its meaning, since ASL is a fully developed language system where the sign and meaning are interrelated (finger spelling is an exception). Just as TTS is no substitution for human voice, the expressivity of a signing avatar is fairly restricted, and thus was used for more routine messages to the student.
There are three other ways that ULEs offer multiple means of representation – multimedia vocabulary hyperlinks, background knowledge hyperlinks, and first-language translations of directions and supports for English Language Learners (ELLs). For example, a fifth grade student reading a folktale about “How Coyote Stole Fire” encounters menacing Fire Beings with talons for hands. Not sure what talons are, but curious, the student clicks on the word to obtain a definition, example sentence, and two graphics illustrating talons, one a photograph of an eagle in the wilderness and the other a diagram of a bird of prey that more clearly shows the talons. A Spanish-language translation of talons (garras) also appears, on which the student may click to hear its pronunciation in English or Spanish. Again, the goal is to provide multiple representations of “talon” – in text, with audio, with graphics, in languages other than English, and in different contexts.

Also accessible are background knowledge links, which are varied, depending on the ULE content, and are designed both to build background knowledge that would be helpful in understanding the text, but also to provide opportunities for extension and enrichment. For example, the student described above who was reading a Native American tale about the trickster Coyote, could access links to websites to learn more about coyotes and to read online folktales. Adolescents reading a novel set in Korea and Japan during the closing days of World War II had the option of clicking on a series of maps that situated the events in the story in their geographical location, and others reading about Martin Luther King, Jr. and the March on Washington could access a biographical timeline and links to websites about the Civil Rights movement. The greatest push to expand the role of background knowledge support came through our work with young children with severe cognitive disabilities (Coyne & Dalton, 2005). We included “real life” video segments to help students with missing background
knowledge and to promote text-to-life connections. For example, we embedded a video of children playing hide and seek in a ULE picture book about children playing this game. For these students, hide and seek was an unfamiliar experience, and so viewing the video helped them to not only understand the story, it led to their playing hide and seek in the classroom, writing their own hide and seek book, and in one class, creating their own hide and seek video. Although the children could access it at any point during their reading, the video appeared to serve an anchoring function similar to that of the introductory video used in the technology-based reading program developed by Hasselbring and colleagues (Hasselbring, Goin, & Wissik, 1989).

And finally, a third type of representational support is the provision of language translations for ELLs, and specifically, students who are native Spanish speakers (Proctor, Dalton, & Grisham, in press). All directions and instructional supports are provided in Spanish, both in written and TTS read aloud formats. One of the pedagogical agents is bilingual, and students may toggle back and forth between hearing the agent speak in Spanish or English. The bilingual coach also supports students in applying first language knowledge to English through cognate alerts. Thus far, we have not translated the core text into Spanish, given our focus on improving English reading achievement; however, this is an avenue of needed exploration that would surely be helpful to many newcomer students in American classrooms.

Providing multiple means of strategic learning and expression

Consistent across the various ULE research projects has been a focus on developing students’ comprehension and strategic reading through embedded strategy instruction. As described above, we have adapted reciprocal teaching (Palincsar & Brown, 1984) to a digital context. In thinking about how to extend this approach to a digital literacy environment, we first made the decision to contextualize the ULE within the larger classroom context, so that teachers and students would be applying strategy instruction with print texts, as well as the ULEs. While it would be useful to develop a stand-alone program, class discussion is a key aspect of the learning experience that we wanted to maintain since we thought it would deepen interest in reading the texts and promote transfer. We are also interested in learning more about the role of the ULE as a teaching and learning tool that facilitates teachers’ skill in reading comprehension strategies and enables them to differentiate instruction more effectively.

In addition to the four reciprocal teaching strategies of predict, question, clarify and summarize, we added visualization as a fifth strategy (Pressely, 2000) and a feeling response option to encourage students to make a personal connection to the text (Rosenblatt, 1978). As students individually make their way through the text, they are periodically prompted to stop and apply a strategy. They enter their response in writing
or audio-recording and save it to an electronic worklog that can be viewed at any time by the student and teacher. The scaffolding of the text centers on students’ strategy use. For example, the folktales ULE offers five levels of support that move students from high support to low support to independent application of the strategies, ending with an open response option that can be used for any purpose (e.g., making a journal entry). The support is available “just in time” at the point of student use. We built the scaffolding system to manipulate the representation of the strategy task, students’ response option, and the availability of pedagogical agents. Further, we varied the level of scaffolding so that strategies that are more difficult, such as summarization, offered more support than strategies that are easier, such as prediction. This ensures that from the outset, all students, including the weakest readers, are being asked to respond to open-ended prompts.

To illustrate the scaffolding framework, consider the cases of summarization and prediction. At Level 1, students are asked to select the best summary from among three responses presented in multiple choice format. They may click on a strategy coach who offers a think aloud or a hint coach. If students select an incorrect choice, they receive corrective feedback and are asked to try again. At Level 2, students are presented six points and asked to select the four most important points to include in the summary. Again, they may access a strategy coach or a hint coach, receive corrective feedback and a prompt to try again. At Level 3, students are asked to generate and type or audio-record their own summary into a text box, and complete a self-check rubric, making revisions as needed. Since the response is open-ended, the strategy coach offers a think aloud and model response. Further, key information is highlighted in the passage to help students develop their summary. At Level 4, students are prompted to choose their own strategy and type or record their response. The hint coach is present, but the strategy coach is no longer available. Finally, at Level 5, students are presented an empty text box that can be used for note-taking or other response purposes.

In contrast to summary, a lighter scaffold supports students’ development of prediction. Even at Level 1, students are asked to generate their own prediction in an open-ended format. However, the coaching support varies. At Level 1, there are two strategy coaches who each offer a think aloud and model to demonstrate that there is no single correct response, as well as the hint coach. At Level 2, one of the strategy coaches drops out, and at Level 3, the strategy coach drops a model prediction and only provides a think aloud. Levels 4 and 5 operate just as they do with summary, with students choosing their own strategy or other response option. Tables 1 and 2 present examples of coaching scripts and student responses.
Question Strategy Prompt: Ask a question about something that is important to know and remember. Be sure to include the answer to your question.

<table>
<thead>
<tr>
<th>Text Specific Coaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy Coach 1</strong></td>
</tr>
<tr>
<td><strong>Think Aloud:</strong></td>
</tr>
<tr>
<td>Maui’s brothers are still angry with him. I asked a question about that because it seemed like a major problem.</td>
</tr>
<tr>
<td><strong>Model:</strong> Question:</td>
</tr>
<tr>
<td>What did Maui’s brothers do when they saw him?</td>
</tr>
<tr>
<td><strong>Answer:</strong> When Maui’s brothers saw him they paddled quickly to get away.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Generic Coaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Think Aloud:</strong> I skimmed the text to find something really important about one of the characters. I used this information to make my question</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Table 1. Examples of strategy coach thinkalouds, models, and hints.
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>predict</td>
<td>I predict Hideyo will join the war no matter what his mother said. He wants to fight for his country like his father.</td>
</tr>
<tr>
<td>question</td>
<td>Where does the story take place?</td>
</tr>
<tr>
<td>clarify</td>
<td>A confusing part of the passage is why Yoko can’t visit the corporal. A confusing word is communist.</td>
</tr>
<tr>
<td>summarize</td>
<td>Yoko and Ko and her mother were on a train. It was bombed by planes and lots of people were hurt.</td>
</tr>
<tr>
<td>visualize</td>
<td>I visualize a small house in North Korea and bamboo trees everywhere surrounding the house. But a big cop comes up to the door with his shining gold badge on his coat. Then Yoko’s mother comes to the door.</td>
</tr>
<tr>
<td>feeling</td>
<td>I feel sorry that Yoko doesn’t know that Hideyo is still alive.</td>
</tr>
<tr>
<td>Self-reflect</td>
<td>I’m understanding things better now. Using the strategies, you can reflect on what you’ve read, it does help a lot.</td>
</tr>
</tbody>
</table>

Table 2. Examples of 6th grade struggling readers’ strategy responses to the novel, So Far From the Bamboo Grove.

In developing this scaffolding framework, there were trade-offs to be made. We limited our use of closed response options so that students were being asked to stop and think much like they would if they were reading on their own or participating in a discussion. This meant that corrective feedback was limited within the ULE, and that it would be even more important to connect students’ reading within the ULE to opportunities for class discussion and reflection, as well as teachers’ reviews of students’ work logs. While this could be viewed as a positive feature of this approach, it is also more challenging for teachers to implement.

While the strategy levels represented scaffolds, the use of particular support features within levels was left up to the individual student. In other words, students could self-scaffold by choosing to use the coaches, access the multi-media glossary, and have the text read aloud via TTS. We anticipated that making choices about when and where to use supports would contribute to students’ self-regulation and investment in the learning. Across projects, observational data suggest that students like to make choices. However, it is also clear that some students make better choices than others, and that some types of supports are viewed to be more helpful. For example, struggling readers consistently access the TTS help to have the text read aloud. The use of coaches is more
variable, with some students consulting the coaches frequently, and others doing so rarely, even when it would be beneficial for them to do so. Of these three supports, the multimedia glossary hyperlinks tended to be accessed least frequently. Students rated TTS and coaches as ‘very helpful’, with glossary links as ‘helpful’ (Dalton, unpublished data). From a practical perspective, students’ choices appear to be efficient – they need the TTS to read text that is challenging, and the coaches provide examples of how to respond to the strategy prompts. The glossary hyperlinks are only indirectly related to their task requirements, and thus may be viewed by students as tangential.

In a recent study using folktales and partner informational texts, we added event usage tracking to the ULE so that we could more systematically investigate the relationship between support use, comprehension, and reader characteristics (e.g., struggling vs. typically achieving readers) (Proctor et al., in press). We also changed the task requirements so that vocabulary learning was a required component to see if it would increase students’ use of the glossary hyperlinks (e.g., in addition to pre and post reading vocabulary activities, students were required to add a minimum of 3 words per text to their personal online glossary and explain why they selected the word). Students did view more glossary items than had previously been observed, with many adding more words to their glossary than was required. Proctor et al. also noted that struggling and typically achieving readers’ accessing of the strategy coaches was positively correlated with comprehension. We are continuing to investigate this issue in our current work, exploring different ways to stimulate students’ strategic use of the supports. It seems likely that there will be instances when supports should be “pushed” at the learner, and other times when they should be “pulled” by the learner (Dalton & Strangman, 2006). Previous research in this area has shown that students often over-access or under-access supports, and that those most in need are often least strategic (McKenna, 1998; Anderson-Inman, Horney, Chen, & Lewin, 1994). In one of the few studies investigating this issue, Reinking and Schreiner (1985) found that children benefit from having support pushed. However, a follow-up study did not find any difference between mandatory and optional presentation of support (Reinking, 1988).

Another aspect to this issue of who has control over support access, at least when applications are implemented by teachers in classrooms, is the influence of the teacher on students’ views and use of the supports. For example, in a study of struggling adolescent readers’ use of ULE versions of novels, we observed some teachers who used the coaches as an active teaching resource, prompting students to “click on Big Al [a strategy coach] to see what he has to say” when responding to a strategy prompt, and appropriating the coaches’ language in their offline teaching with print books (Dalton et al., 2002). Just as students tended to view the vocabulary hyperlinks as less helpful, so did teachers. In fact, some viewed them as an interruption to the reading process, as evidenced by one teacher aide who rather loudly admonished her student to “quit clicking on the vocabulary, just keep reading!” However, for students whose vocabulary needs were quite significant, such as middle school students who are deaf, there was frequent use of the vocabulary hyperlinks.
Providing multiple means of engagement

All learning is filtered by affect (Seidel, Perencevich & Kett, 2005). Students’ perceptions about themselves as readers and learners, their ability to persist in the face of challenge, their interest in a particular topic or author, the fact that they had a fight with their best friend that morning, etc., influence their process and outcomes for any particular reading experience. Strategic reading requires that learners set goals and a purpose for reading, and monitor their progress, adapting processes and strategies in response to difficulties and task requirements. As Guthrie (2000) states, engaged readers are strategic readers. We addressed engagement in our ULE design in several ways: scaffolding supports to vary the level of challenge; providing students’ choice and control over access of supports and options for response; including self-assessment so that students could reflect on their progress and set goals; connecting reading with ULEs to classroom discussion and peer interaction; and selecting authentic literature that was age-appropriate, interesting, and in service of the general education curriculum standards. In the preceding section, we described the scaffolding and choice features, since they also are core to supporting strategic learning and expression. Therefore, we will address the roles of self assessment, social interaction, and authentic literature in this section.

Given our focus on helping students become more strategic and in charge of their learning, we included self-evaluation prompts in the ULE and developed a student-teacher conferencing procedure. Students review their work logs to find examples of best work and to identify an area of improvement. They then meet with their teacher to discuss their progress, set goals, and decide together whether to move up a level. The goal is not to move the student up a level, but rather, to help the student become more aware of how he is thinking and responding as he reads, and to highlight strategies that are particularly useful. Table 3 illustrates a conference between a seventh grade boy with learning disabilities and his teacher.

T – All right honey, so let’s see… honestly, what do you feel about the book?

Student – I like the parts about the war.

T – You like the war parts. OK, but… is there a but?

Student – No, the book’s OK.

T – Good, that makes me happy. OK, now what do you think is your best work?

Student – I don’t know, it’s all bad. Visualization?

T – OK, let’s look at some [in the worklog].

Student – Most of my questions don’t even make sense.

T – Is that what you want to work on?

Student – yeah.
T – OK, Rick, the part most people get hung up on is explaining why the question is important, you have to take the time to type in why you picked that answer. It’s two parts – the right question and why it’s important. Call me over if you need some help! OK, so we’ll work on that – [writes on conference sheet] “by calling the teacher over to me and discussing why the question is important”. So then if one person thinks this part is important. We can discuss it, all right? OK… clarification is good!

Student – I think visualization is so easy, that’s probably why I’m so good at it.

T – You know what, I gotta tell you though, Rick, your predictions are really good, too. [reads one aloud from the worklog]. See, this is a very good prediction. [reads some more examples aloud]. I’m gonna write, “awesome predictions, great visualizations, and wants to work on questioning”. Good for you, picking out one you want to work on and talking about it. OK, you’re on Red [level], do you want to move up? You don’t have to.

Student – I’ll stay at Red.

T – OK, good job, Rick

Table 3. A conference between a 7th grade boy with learning disabilities and his resource room teacher about reading progress and strategy use.

We view students’ self assessment as core to the learning process and the long term goal of developing readers who not only feel in charge of their own learning, but who feel they have the skills needed to accomplish their goals. That said, teachers found it challenging to find the time to review students’ work logs, which could contain several pages of response, and meet with them to discuss their progress. Students also found it challenging, since they were unaccustomed to reflecting on their learning and setting goals. We are currently exploring ways in which we can build teacher evaluation and response options into the student worklog environment so that teachers can use this qualitative data more efficiently, as well as embedding additional objective measures, such as comprehension quick checks, that can give them a sense of how students are comprehending the text. We are also expanding the ways in which we will provide students information about their performance to support their self-evaluation and help them make better decisions about when to access the various learning features.

Across projects, we have used authentic, age-appropriate texts that we thought would appeal to students. In some cases, we selected award winning books; in other cases, we created texts on topics that are of general interest to students of the targeted age and field tested them to obtain student feedback. Classroom observations and student and teacher interviews indicate that students find the texts interesting, and that this is part of what motivates them to keep reading. Although we have some dramatic examples of students who were transformed into readers once they were able to experience success reading in a supported environment, the fairly limited numbers of ULE texts does not allow us to explore the role of text choice, or the effect of text quantity, both factors that we know are important to students’ reading development and engagement.
Discussion and Conclusion

A framework for reading comprehension in the digital age

The goal of the Universal Learning Environment is to ensure facile interaction between the UDL-defined recognition, strategic, and affective networks in the service of improved reading comprehension outcomes. To this end, our work in literacy development centers around the hypothesized association between the development of oral and written vocabulary (Nagy, 1988), reading comprehension strategy use (Palincsar & Brown, 1984), and reading comprehension. Ideally, our ULEs facilitate this interaction through the following:

1) Easing and promoting recognition networks for decoding skills and oral language development. Decoding skills difficulty is managed through TTS supports, which allow the student to focus on the comprehension demands at hand. Indeed, observations of struggling readers using our ULEs support the notion that children who have trouble with decoding English text access TTS supports with a high degree of frequency. Recognition demands are enhanced for oral language and reading vocabulary development as well. By providing multiple representations of words through example sentences, images, definitions, and Spanish-language translations, students have multiple means of tapping a core understanding of word meanings.

2) Developing strategic networks focused on comprehension and word learning strategies. In our ULEs, students consistently stop and think about what they are reading and respond to a targeted “think aloud” such as “Make a prediction about what will happen next in the story”. Students respond through a written or oral medium, and their work is then stored for future viewing and/or sharing with classmates. Prior to, during, and after reading, students may also engage in targeted word learning activities which are designed to increase semantic and morphological understandings between and among words, such as completing online semantic word webs, and building a personalized multimedia glossary. Activities such as these serve to promote deliberate choice-making about individual learning needs based on interest and perceived strengths and needs.

3) Providing engaging digital learning environments. ULEs are designed for interactivity and student engagement. However, we do not pretend to simulate a video game environment. While there is some theorizing being done in the arena of human learning and gaming (see, for example, Gee, 2003), we do not expect to achieve such a hypnotic level of student engagement. Indeed, a ULE is designed to provide motivation and engagement within the system, but unlike gaming environments, the learning that occurs in a ULE is meant to be brought back and applied broadly in the classroom across the content areas.
Further, recognizing that the “future is in the margins” (Meyer & Rose, 2005, p. 13) and believing that society, as well as individuals, derive great benefit from inclusiveness, we have applied this basic universal design literacy framework with young children with significant cognitive disabilities (Coyne & Dalton, 2005), deaf and hard-of-hearing students (Dalton et al., 2005), Spanish-English bilinguals (Proctor et al., in press), and other struggling readers (Dalton et al., 2002). The results have been promising, and we are expanding this work in several ways. First, we are integrating digital scaffolded reading environments with scaffolded multi-media composition environments, so that students are learning with, through, and about language and media in receptive and expressive forms, situated in a larger communication space. Second, we have developed a web-browser tool to support students’ strategic reading and viewing on the Internet, where text is defined by hypertext structure, multimedia, interactivity, and social networking. While the Internet poses new demands on the reader, such as a heightened need for critical analysis and speed of processing (Leu, Kinzer, Coiro & Cammack, 2004), it also offers untold affordances that could potentially level the playing field for diverse learners and support individuals in developing and sharing their knowledge, skills, and talents (Dalton & Strangman, 2006; Palincsar & Dalton, 2005). And finally, we are broadening our view of what constitutes a scaffolded literacy environment to include more supports for teachers, so that they too are able to get just in time support to help them better understand, assess, and teach children to become strategic, engaged readers and learners.

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References


