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Critically Evaluating Educational Technologies for Literacy Learning:
Current Trends and New Paradigms

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Educational software and Internet resources are increasingly being recognized for their potential to foster literacy learning in and out of the classroom. Recent studies have shown the benefits of using technology to develop skills such as phonological awareness (Wise & Olson, 1995), word recognition (Davidson, Elcock, & Noyes, 1996), comprehension (Matthew, 1997), spelling (Higgins & Raskind, 2000), writing (Rowley, Carson & Miller, 1998), and motivation to read (Nicolson, Fawcett & Nicolson, 2000), each of which represents an important facet of a comprehensive literacy curriculum. Furthermore, software and/or Internet technologies can improve literacy learning for typical students (Allen & Thompson, 1995) and at-risk learners (Howell, Erickson, Stanger & Wheaton, 2000) as well as for students with learning disabilities (MacArthur & Haynes, 1995) or mixed handicaps (Heimann, Nelson, Tjus & Gillberg, 1995). Studies also illustrate the positive effects of technology in out-of-school literacy contexts (Hull & Schultz, 2001). These benefits and the evolving role of technology have the potential to greatly influence the ways in which educators think about effective literacy instruction.

Recently, however, the beneficial aspects of technology in education have been overshadowed by four confounding issues that challenge those responsible for evaluating which particular educational technologies to use with students. First, the sheer number of software programs and Internet websites available to evaluate is overwhelming for educators already short on time and resources. The number of software programs has grown exponentially in the last decade (Buckleitner, 1999) while, as of January 1, 2003, there were 171,638,297 Web hosts worldwide (Zakon, 2003). As a result, identifying quality materials from this array of electronic resources can be a particularly time consuming and arduous task.

The nature of many digital media products poses a second set of challenges for educators. Much of the children's educational market is dominated by shallow drill and practice programs

with slick technical features and fancy packaging (Shade, 1996) while many websites designed for children incorporate product advertisements merged with content (Aufderheide, 2001). Now, more than ever before, educators must look “beyond the catch phrases, bargains, flashing animations and online sales pitches to ensure that it [the information] addresses the range of diverse literacy needs that challenge educators in the classroom” (Geissenger, 1997).

Furthermore, new multiliteracy perspectives (e.g., Cope & Kalantzis, 2000) support the careful consideration of the effects that using a particular electronic resource will have on the social and cultural literacy practices that occur in the classroom. The lack of quality control applied to these technologies (e.g., Ciolek, 1996; Luke, 2000) requires educators to not only assume higher levels of screening responsibility, but also to better prepare students to make good decisions about the information they find on their own.

A third challenge to effective technology evaluation is that new technologies often require new ways of thinking about reading, writing and communicating (e.g., Lankshear & Knobel, 2003; Leu, Kinzer, Coiro, & Cammack, 2004). Applications of technology such as non-linear hypertext, multimedia software, interactive simulations and real-time chat rooms present new literacy experiences for students. Nicholls and Ridley (1997) have observed a tendency for literacy educators to consider these technologies in the same way as print based instructional materials for students, yet, they argue, today’s digital instructional materials require qualitatively different evaluation practices. Specific guidelines for evaluating emerging technologies in the context of authentic literacy practices need to be established and validated by curriculum coordinators and classroom teachers if we are to make progress in this area.

Finally, teachers attempting to learn more about effective technology evaluation practices are hindered by the challenge to keep up with the current demands for school wide curriculum

integration and accountability. Most states have imposed standards making computer learning an essential part of the curriculum (ISTE, 2000) while federal guidelines encourage schools to incorporate scientifically research-based literacy practices and materials into daily instruction (No Child Left Behind, 2001). Strategies for integrating technology into the literacy curriculum have been outlined, for example, by literacy organizations such as the International Reading Association (1984; 2001) and by technology organizations such as the Southern Regional Education Board's EvaluTech (1997) and Florida's Panhandle Area Educational Consortium (2004). However, with regard to evaluating the technology materials themselves, there are few acceptable models with theoretically grounded guidelines (Bader, 2000; Buckleitner, 1999). The issue of evaluating instructional technologies and their impact on literacy learning demands a complex process (Bader, 2000), yet research suggests that pre-service and in-service teachers are given little instruction, support or time in learning how to evaluate technology resources (Education Market Research, 1999).

It is within the context of the challenges outlined above that we frame this chapter and reconsider effective evaluation practices. Technologies for learning have considerable potential when selected carefully to fulfill a logical purpose. Yet, as we move into the future, great difficulty lies with trying to arrive at a flexible set of evaluation criteria that characterize the potential for literacy learning with different technologies, for different purposes and for different audiences. In fact, as we move forward with evaluation of technology, it will be important to develop procedures that allow us to begin with the learner and his or her purpose rather than the technology and its potential.

At the outset, we want to stress that it is not our intention, in this chapter, to cite specific research-based reviews of particular software or websites for literacy instruction. Instead, we

seek to provide a critical pathway through the literature as it more generally pertains to the following three questions:

- What can we learn from existing research and recommendations about effective and ineffective practices for evaluating and selecting technology resources for literacy learning?
- Do recommended evaluation practices align with emerging theories and perspectives of literacy and learning with software, Internet and other information and communication technologies? and
- What new approaches to technology evaluation should be considered in light of the dynamic and changing notions of literacy and learning within digital environments?

With these questions in mind, we began by informally reviewing the literature since 1980 on evaluation of software (Julie), print-based resources (Sharon) and Internet technologies (Rachel). Each of us identified emerging themes related to current and past evaluation practices of technology for literacy learning within each medium. Then, we examined the similarities and differences across mediums to arrive at a set of common themes that characterize the literature in this area.

In structuring the chapter, we begin with a brief review of the perspectives that guided the nature of our review of technology evaluation practices. Because we chose to pursue a more critical discussion of the literature in this area, we felt it was important to define our particular stance early on. We follow with a discussion of seven themes in evaluation practices that we argue fall short of the multidimensional considerations required for effective evaluation of current technologies. We then match these arguments with a parallel set of seven promising

practices that we believe more carefully consider current and emerging theories of literacy and technology. Finally, we conclude this chapter with a series of recommendations for an updated model of technology evaluation that reflects current perspectives of literacy and learning, new technological capabilities, and new learning outcomes for students.

THEORETICAL ISSUES

Interpreting the effectiveness of technology for learning (and of practices for evaluating technology) is greatly influenced by the lens with which one sees the world (Labbo & Reinking, 1999). It is important to understand from the beginning, then, that we have adopted an approach to evaluation that embraces multiple perspectives of literacy, learning, and technology integration in an effort to avoid what Dole (2000) describes as “a series of pendulum-swinging fads” (p.65) that continue to plague education and more specifically, literacy instruction (see more in Venezky, 1987). Because technologies change so rapidly and new technologies emerge faster than we can keep up (Leu, 2000), our thinking about evaluation needs to be flexible, open to new perspectives and considerate of more traditional ones. What works for one learner may be different than what works for another and educational technologies for literacy learning are no exception.

Several dynamic perspectives of learning with technology informed our critique of evaluation practices in this chapter. One perspective emphasizes the relationship between the learner and the computer. For example, drawing upon the work of Jonassen, Peck and Wilson (1999), technology in learning should serve at least five functions including: (1) a knowledge construction tool; (2) an information vehicle; (3) an intellectual partner; (4) a context and (5) a social medium that supports learning. Similarly, Clements (1985) recommends computer experience in which the learner plays an active role in controlling the direction of both

experiential and drill environments placed in the context of authentic higher-level experiences. He also directs educators to consider children's preferences and developmental levels, while looking for materials that offer a wide variety of applications that are integrated into the curriculum for the means of achieving educational goals.

A second perspective demands that we broaden our conception of literacy instruction beyond practice in singular skill areas *and* expand our evaluation practices to consider opportunities to engage in multiple literacies of the Internet. We should consider how multiple sign systems (e.g., Kress & Van Leeuwen, 2001), multiple settings of literacy practice (e.g., Chandler-Olcott & Maher, 2003) and new forms of Internet literacies (e.g., Lankshear & Knobel, 2003; Leu et al., 2004) impact our choices of technologies with the potential to most effectively enhance these new literacies.

Our critique of evaluation practices is also influenced by the belief that opportunities for learning with technology should integrate instructional practices that are comprehensive, authentic and individualized. Green's (1988) socio-cultural conception of literacy as having "three interlocking dimensions of learning and practice - the operational, the cultural, and the critical" (Lankshear & Knobel, 2003, p. 10) effectively accounts for dimensions of language, meaning, and context simultaneously and inspires new ideas about how technology evaluation practices can achieve this as well. Furthermore, constructivist notions of the literacy learner as one who uses technology tools to construct, reflect and transform meaning into something better suitable for personal purposes (Cope & Kalantzis, 2000; Jonassen, 1996) inform our thinking as well.

Finally, and perhaps most importantly, our position is informed by the work of others who insist that the teacher plays a critical role in the successful use of computers (e.g., Balajthy,

2000; Karchmer, 2001). We consider technologies in schools as facilitating a critical interaction among multiple learners, teachers, and goals. Thus, it is imperative that valid technology evaluation practices consider the diverse purposes and perspectives that teachers bring to any computer-based learning situation when evaluating its utility in the literacy curriculum. With each of these perspectives in mind, we turn to our critical review of current and past evaluation practices of technology for literacy learning.

EVALUATING TECHNOLOGIES FOR LITERACY LEARNING:

LIMITED EVALUATION PRACTICES

The first theme we noted in our review is that many early evaluation practices of both print and electronic materials relied on evaluations made by outside reviewers having little contact with the individuals who would actually be using the materials. Before computers emerged on the scene, and even now, textbooks have been reviewed every five to eight years by representative groups composed mainly of classroom teachers, who examined the wares of publishers at the state level (in 22 states), or the district level (in 28 states), and then again at the school level. At each of those levels, the publishers provided the materials for review for free (as they stood to benefit from future large sales) and often sent sales representatives to make presentations. The general trend has been for the state or district to produce a short list of acceptable programs and then for the district or school to repeat the review process with materials on that list. Interestingly, these evaluators often relied on popular media (e.g., television, radio, newspaper) rather than on traditional research (Reutzel, Sudweeks, & Hollingsworth, 1994). These are insufficient sources for informing such high-stakes decisions as materials evaluation.

As educational computer software appeared on the market in the early 80's, most educators resorted to outside compilations of reviews to inform their decisions about effective programs (Buckleitner, 1999). "Teachers often selected software from catalogs, choosing almost any software that remotely touched on the subjects they were teaching" (Komoski, 1995). With the advent of the Internet, searchable databases grew in popularity. The first and largest evaluation database, published by Educational Products Information Exchange, or EPIE, is still accessible today (learn more at http://www.epie.org/epie_tess.htm) as are other collections of reviews by outside organizations such as SuperKids Educational Software Review (<http://www.superkids.com/>), KidsDomain (<http://www.kidsdomain.com/reviews/>), and The Learning Village (<http://www.learningvillage.com/>). However, many of these contain commercialized technical reviews of software features (Buckleitner, 1999) as opposed to more specific evaluations of how these features may be used by children in real classrooms for literacy learning.

The second recognizable theme in early evaluation practices involves the process of categorizing instructional resources by technology type as a means of understanding how computer-assisted programs can support instruction. Evaluators typically reviewed a piece of courseware by identifying the category to which it belonged and then compared a list of available technical features to those deemed important within that category (Duchastel, 1987). We suppose this practice grew out of a need to develop operational definitions of the newly emerging technological learning opportunities of the time, while also finding manageable commonalities between the growing numbers of software programs in the 1980's. Taylor (1980), for example, grouped computer resources according to three functions: tutor, tool, or tutee; others (e.g., Spenser, 1986; Robyler, 1997) grouped them according to their design structure:

drill and practice, tutorial, instructional game or simulation. In both cases, emphasis was placed on what a particular program could do and the types of technical features it offered.

Early guidelines for evaluating Internet resources, although developed almost 20 years later, proposed similar categorization schemes that emphasize website functions over individual learner or curriculum considerations. Some framed the evaluation process of websites on functional dimensions such as information dissemination; education and training; commerce and advertising; or entertainment and communication (e.g., Trochin, 1996) while Payton (1998) evaluated websites based solely on the categories of design, content, technical elements and credibility. This emphasis on the functions and categories of technology tools is certainly an important consideration in the evaluation process, and in fact, these categories can help structure the type of support each tool requires. However, technology function should not be the only focus as it often draws attention away from the different ways that students might interact with the technology and how these materials might actually mesh with classroom literacy instruction.

Another shortcoming of early evaluation practices that emerged in our review is that most evaluations of textbooks, software and even Internet websites were limited to filling out a short checklist or rating sheet. Typically, this checklist included a set of predetermined criteria that the evaluator deemed to be present or absent during the review process. Generally, however, this checklist approach encouraged a simplistic and monolithic approach to evaluation and did not reflect the true nature of a material's use for instruction or the individual influences of teachers (Balajthy, 2000) and students (e.g., Sturm, Rankin, Beukelman, & Schutz-Muehling, 1997). With regards to software and website checklists, most included short and simple yes/no questions about technical features (e.g., Scott & Barker, 1987) while only a few revealed an underlying assumption that technology evaluation is multi-dimensional and complex (e.g., Ellsworth &

Hedley, 1993; Wepner, 1989). Although traditional checklist-type approaches can be helpful in weeding out materials in the initial phases of evaluation, they do not sufficiently capture the multiple dimensions of effective evaluation in light of what we know about literacy learning today.

A fourth concern we have with early evaluation practices is that they tended to focus attention primarily on physical attributes and technical features and less on actual student learning potential and application in the literacy classroom (McDougall & Squires, 1995). This is clearly evident in Scott and Barker's (1987) guidelines for selecting and evaluating reading software. Although these authors discuss the importance of making certain "that the courseware is founded on sound pedagogical assumptions...[and that it]...matches with the skills and objectives in the reading curriculum" (p. 884), the sample checklist they provide includes 12 yes/no items about technical issues such as access to the correct hardware and peripherals to run the software, quality of the documentation, cost efficiency issues, preview policies, and backup disk management, and only two items dealing with instructional issues such as matching objectives to the general curriculum or to a specific literacy lesson.

Website evaluation practices also tend to emphasize design features over quality of content. Most sets of guidelines incorporated what The Children's Partnership (2003), a nonprofit children's advocacy organization, calls *baseline requirements*. These include things such as organization name, contact information, professional design, ease of navigation, updated content and use of advertisements. A recent study by The Stanford University Persuasive Technology Lab (2002) surveyed 1,410 web users asking what they felt were the components of a valid web site. Participants reported that sites including a physical address, employees' names and photographs were the most credible. On the other hand, sites with typographical errors,

advertisements and broken links were the least credible. We found very few website evaluation practices that move beyond a consideration of technical features to examine student literacy learning potential in these new environments.

The overemphasis on the technical features of literacy materials continues even today in some circles. Robyler (2003), for example, includes criteria like categorical design features, user flexibility and technical soundness as “essential” to the technology evaluation process, while considerations like educational significance, ease of integration, and adaptability are deemed “optional” (p. 110), implying that they are less important in the overall decision making process. As a result, many technology evaluation practices lack attention to the potential match (or mismatch) of the curriculum materials to the context in which they will be used and they ignore the knowledge and skills of the teachers and children who will be using the materials. In effect, they employ a cursory survey of whether the proposed technology will be operational in the target setting rather than whether it will be effective for teaching and learning. Such a compatibility survey is perhaps necessary but certainly not sufficient.

A fifth trend we observed is that early evaluation methodologies primarily consisted of one-dimensional treatment and control group comparisons of traditional tasks completed on and off the computer screen (e.g., Keene & Davey, 1987; Gambrell, Bradley, & McLaughlin, 1987) or comparisons of main effects of computer instruction with those resulting from traditional teacher instruction (e.g., Nicolson, Fawcett, & Nicolson, 2000). These studies emphasized the effectiveness of drill-and-practice treatments as a substitute for human instruction. In addition, these studies rarely considered the impact of the teacher’s role, how new technologies were implemented into the curriculum and other variables that we now know impact the effectiveness

of technology use in the classroom (Cope & Kalantzis, 2000; Labbo & Reinking, 1999; Paterson et al., 2003).

Next, we found that early research focused on the effects of technology on distinct skill-based literacies while little attention was paid to more holistic or multiple conceptions of literacy. Karchmer, Mallette and Leu (2002) report most of the published research that measures the effectiveness of technologies on literacy learning emphasizes the effects of singular dimensions of literacy such as phonological awareness, word recognition, expressive writing, or fluency. While studies of this type may be important to guide selection of resources to meet very specific curriculum needs, it is important to broaden our conception to include how technology can support multiple literacy skills in a range of electronic environments.

A seventh theme we observed in most early evaluation processes is that almost all thoughtful evaluations of a particular material took place *prior* to its selection and its actual use in the classroom. Evaluation tended to, therefore, focus on a material's potential for learning rather than on actual student learning. Rarely is time spent directly examining a material's impact on literacy learning outcomes or gathering teachers' perceptions of a material's utility once it is integrated into classroom instruction. Similarly, within these limited evaluation formats, there is little consideration of children's own conversations about a particular software program or Internet resource as they interact with these materials for their own literacy learning purposes (Wilson, 1998). Case and Truscott (1999) stress the importance of previewing software while students interact with the program to get a more comprehensive picture of a certain resource's strengths and weaknesses.

Fortunately, however, the seven themes outlined above provide only one side of a larger story for those seeking to more effectively evaluate the potential for technology in today's

classrooms. In our review, we discovered a small, yet growing body of work slowly emerging since the mid-80’s that reflects an intellectual shift from earlier thinking about what characterizes effective evaluation of technology materials for literacy learning. These evaluation practices are more closely aligned with theories of technology integration in the 1990’s and beyond. In this next section, we present a series of promising practices that we feel may extend the limited ones discussed previously (see Table 1).

Table 1: Trends in the literature on evaluation practices of technology for literacy-learning

Limited Evaluation Practices	Promising Evaluation Practices
Rely on evaluations developed by outside reviewers removed from the specific context and untrained in literacy instruction	Involve local students and teachers in the development of evaluation criteria and subsequent selection and review of technology materials
Classify materials by technology design that aligns with technology-based outcomes	Classify materials by authentic literacy practices that aligns with research-based comprehensive literacy learning outcomes
Utilize yes/no checklists in a simplistic and often commercialized review process	Utilize multidimensional leveled rubrics and open-ended formats that consider the dynamic nature of evaluation
Focus on similar technical and physical aspects inherent within the text, software program or website	Focus on diverse human aspects of the learner and the teacher
Emphasize quantitative, simplistic comparisons that replace the teacher and/or traditional instruction	Emphasize quantitative and qualitative aspects of social interactions between students, teachers and the instructional materials
Focus only on distinct singular skill-based literacies	Consider the impact of new literacies as multi-modal and multicultural experiences that require a more global critical stance
Involve a static evaluation of potential before technology is used with minimal follow-up in evaluating student literacy outcomes as a result of using these technologies	Involve dynamic evaluation of interactions before, during and after technology is used and directly measure its impact on student literacy outcomes

EVALUATING TECHNOLOGY MATERIALS: PROMISING PRACTICES

The first promising practice we found in the literature on evaluating educational technologies is the move toward a more systematic consideration of interactions before, during and after use in a process that directly relates back to student literacy outcomes. Current research applauds evaluation practices that do not end when the material is selected, but rather those that continue to evaluate the quality and utility of a certain resource both during and after instruction. Draper (1996) recommends a method of *illuminative evaluation* during instruction, when students can be observed within their daily classroom literacy practices with technology to get a clearer picture of how they think and feel about the experience and what they consider to be important issues. Evaluation practices can also involve gathering post-use feedback (Komoski, 1995) from students and teachers that compares the material's stated learning objectives with actual student performance or gathering evidence of student processes and products as a result of engaging with literacy learning technologies (Wepner, Valmont, & Thurlow, 2000). Such practices more effectively situate new technologies selection within the real-life classroom contexts of teaching and learning – the places where they matter most.

Another encouraging practice we observed in our review is a combined effort to first, classify technology materials by authentic literacy practices (e.g., reading, writing, and thinking practices) instead of by technology type, and second, to connect these practices with theory-informed frameworks and local learning outcomes within a comprehensive literacy curriculum instead of just using technology for its motivational value or as a break from real instruction. Several researchers direct our attention to using computers for meaningful and authentic reading and writing purposes (Case & Truscott, 1999; Hickey, 1995; Simic, 1999) for which learners are viewed as active, social designers of new literacy forms (Cope & Kalantzis, 2000). Although we

were unable to locate specific evaluations that addressed all of the literacy-learning issues in one cohesive format, we found evidence that thinking is moving forward in this area.

For instance, instead of directing educators to identify which technology function a certain material addresses (e.g., skill reinforcement, tutorial or simulation), more recent evaluation systems point us to literacy-related categorization schemes. Important aspects of software for teaching phonics, word recognition, comprehension and reading appreciation are highlighted in recent evaluation guidelines (e.g., Walpole & McKenna, 2004, Meyer & Rose, 1998), while others propose that we assess the potential of technology as it relates more holistically to major categories of real-world reading and writing connections (e.g., Wepner, 1989).

Internet classification systems have similarly evolved to reflect authentic literacy practices. Judi Harris (1998) highlights the educational value of certain web-based activities by categorizing them into three structures that address social literacy practices including interpersonal exchanges, information collection and analysis, and problem solving while the popular Blue Web'n portal website (<http://www.kn.pacbell.com/wired/bluewebn/contentarea.cfm?cid=5>) sorts web resources by potential literacy outcomes in reading, speaking, writing and literature. Literacy-based evaluation categories such as these assist educators in seeing the potential connections between literacy learning and technology use.

We also found literature to support the notion that once material has been observed to encourage authentic literacy practices, further consideration needs to be paid to how well these practices correspond to school-based student learning objectives (e.g., Balajthy, 2000; Wepner et al., 2000). Yet, researchers are quick to remind educators to not fall into the trap of “a technology solution looking for a problem” (Norton & Sprague, 2001, p. 27). Rather, when

evaluating the utility of technology materials, we should first carefully rethink how instruction is designed and, second, examine how technology may most significantly impact these instructional and social literacy practices.

A third practice emphasized in recent literature about technology evaluation shows a progression from the simple yes/no checklist toward more open-ended formats such as rubric-based observations (McVee & Dickson, 2002), tables with scores to indicate leveled degrees of usefulness (Hall & Martin, 1999), and space for anecdotal preferences, individualized options and application ideas (Sturm et al., 1997). Furthermore, evaluations should prompt teachers to identify their own approach to learning (e.g., skills-based vs. strategic application, objectivist vs. constructivist) and then evaluate the compatibility of this approach with a certain literacy learning technology (McVee & Dickson, 2002; Leu & Kinzer, 2003).

Efforts to develop evaluation systems for print-based literacy materials have similarly responded to the need for more in-depth evaluation practices that extend beyond one-dimensional checklists. Simmons and Kame'enui's *Consumer's guide to evaluating a core reading program* (2003), for example, expanded their older checklist analysis of critical reading elements addressed by a potential instructional material by providing space for more open-ended reflection of these criteria. This forces a more thorough analysis than the earlier version and directs evaluators both inside and across the lessons. However, the checklist format still encourages reviewers to "find" evidence in the print that discreet bits of content are included; the program as a whole is not really considered for its holistic match to models of literacy teaching and learning. Thus, in our review, many evaluation formats seem to encourage this type of open-ended reflection, but few researchers appropriately define the crucial considerations that should be guiding the direction of these reflections.

A fourth consideration that shows promise for effective evaluation practice is movement toward a greater focus on a wide range of diverse human dimensions that students and educators bring to the computer-learning situation. Sturm et al. (1997) and Bader (2000) asserted that a careful focus on a student's particular learning needs at each step in the evaluative process is crucial for supporting literacy development with technology. Specifically, evaluation practices should consider the mode of instructional delivery (Hickey, 1995), student reading level (Leu & Kinzer, 2003), the format of instructions and learning feedback (Bader, 2000) and individual learner characteristics, including self-confidence, humor and learning style (Burmark & Thornburg, 1996).

Several published guidelines for evaluating Internet websites encourage educators to consider the accessibility of a site's particular audience. The American Library Association, for example, recommends sites be compliant with the Americans with Disabilities Act as much as possible and provides a link to the World Wide Web Consortium site (W3C), an organization that promotes the accessibility of web sites to people with disabilities. The W3C site also includes evaluation guidelines and a set of criteria used to create *Bobby*, a free software tool (<http://bobby.watchfire.com/bobby/html/en/index.jsp>) that evaluates the accessibility of a web site.

As the Internet increases accessibility to the global community (The New London Group, 2000), many believe it is important to create culturally aware and representative web sites (Gorski, 1999). Gorski developed evaluation questions to specifically pinpoint diverse perspectives framed in such questions as: (1) Does the site encourage participation among users through intercultural interactive or collaborative opportunities? and (2) Does this site provide voice to other perspectives through links or other connections? Likewise, The Children's

Partnership (2003) criteria include a section on *Cultural Focus of Content* asking readers to consider if the site is maintained by members of the population reflected in its content and whether the site is specifically directed towards a certain cultural/ethnic group.

Recent literature from the last decade also calls for technology evaluators to pay greater attention to the ways that individual teachers can impact the overall effectiveness of technology. Judge (2001) noted that, “after selecting software, the success of its use with students weighs heavily on the teacher’s ability to set the environment appropriately” (p. 26). Others report that a teacher’s purpose for using technology and his/her beliefs about literacy and learning has the potential to influence student achievement (Balajthy, 2000), selection of software (Bain, McNaught, & Mills, 1997) and the use of the Internet and other new technologies for learning and instruction (Becker, 1999). The results obtained from a newly developed Technology and Reading Inventory (Christenson & Knezak, 2001) affirms the idea that teaching style, reading instruction preference and technology beliefs can differentially impact the effectiveness of technology used to develop reading, writing and thinking skills. Clearly, integrating technology into literacy instruction is a complex task, necessitating thoughtful, insightful, and knowledgeable teachers.

A fifth theme that characterizes more promising practices in technology evaluation focuses attention not only on the quantitative effects of technology on literacy learning but also on the qualitative aspects of social interactions between students, teachers and the instructional materials. Because technology creates the potential for new types of relationships among teacher, student, content and context (Frick, 1991), evaluators should carefully consider the ways in which young learners interact with the computer and with each other as active and social agents of change (Shade, 1996). Bruce and Peyton (1999), for example, explore this notion of

situated evaluation in their assessment of computerized writing tools. Their study provides a helpful model for how to examine the relationships among classroom context, computer-based innovations and particular literacy practices while evaluating certain technologies.

Socio-cultural perspectives to technology evaluation also consider the interactions between the multiple perspectives of students, teachers and designers (McDougall & Squires, 1995). In their paper, they introduce their “perspectives interaction paradigm” and argue that this new evaluation system presents a more valid and holistic review of a technology’s impact on learning. Turkle (as cited by Kelly, 1998) argues a similar point when she writes, “Too much of the time we think the computer is supposed to do it all, and we don’t really appreciate how important the people are...it’s the computer plus the human environment around the computer that matters” (p. 55).

There is also a trend for evaluation practices of print-based materials to use more situated and integrated procedures. Stein, Stuen, Carnine, and Long (2001) direct evaluators to consider depth of exposure to content, explicit strategies, opportunities for teachers to scaffold instruction, and strategic integration of skills and concepts across lessons. Walpole and McKenna (2004) ask evaluators to consider the school-wide implications of the materials, including teacher training, daily teacher preparation, and issues of differentiated instruction. Simmons, Kuykehdall, King, Cornachione, and Kame’enui (2000) embed materials evaluation within a school-wide improvement model, beginning with careful description of the school setting in which the materials would be used and the specific academic needs of the children who would use the materials. Likewise, we see considerations of the context as essential to evaluation procedures.

A sixth promising practice we found in our review prompts evaluators to focus attention on the range of new and multiple literacies converging within information and communication

technologies and the need to adopt a healthy dose of informed skepticism (Lankshear & Snyder, 2000) while critically considering its impact on social interactions and literacy learning (Cope & Kalantzis, 2000). Evaluators must be able to critically examine educational technology resources in search of those that support, conceptualize and extend technology resources, and not simply those resources that add glitz and glamour in an electronic learning environment. Phillips (1996) reminds us that, during the evaluation process, we need to be more aware of critical issues such as “who created the title, what their point of view might be, and to what type of audience the program was written” (p. 16). Similarly, McVee and Dickson (2002) encourage educators to build on their practices of critically thinking about the role that children’s books have in shaping learning to consider how particular software programs impact learning and social interaction as well. Technology evaluators should apply these critical evaluation literacies when following Judge’s (2001) recommendation to rely on preexisting databases of technology reviews.

When developing procedures for evaluating informational websites for literacy learning, Coiro (2003) argues the need to critically evaluate electronic text becomes greater for several reasons. For example, the fact that there is little consistency in the multimedia formatting of information on the Internet suggests that we need to select resources that support learners in locating important ideas in the text instead of those that distract students with unrelated animations and blinking advertisements. Second, whereas the reader is, for the most part, guaranteed a traditionally printed text has been subject to a review process, there is no same guarantee with electronic text posted on the web. Thus, when selecting website materials for classroom use, educators need to consider whether or not their students are able to assume editing responsibilities such as investigating author qualifications, paying attention to website sponsors and verifying information with multiple resources.

Another area of concern is the upsurge of deception through visual imagery presented on the Internet. “Images were never tinkered with as they are today where, with computer technology, such alterations are not only easy, but also undetectable” (Center for Media Literacy, 2002). Informational websites may include images with faces that are changed, bodies that are reshaped, or objects that are inserted or resized, often with the intention of creating a good laugh. Real photos are sometimes paired with fictitious reports or doctored to match deceiving captions (see, for example, the collection compiled by library-media specialist Kathy Schrock at the end of her list beneath the heading “Sites to Use for Demonstrating Critical Evaluation” at <http://school.discovery.com/schrockguide/eval.html>). Evaluators should be attuned to strategies for detecting digital images that have been constructed to trick, persuade, or misinform students who read information on the Internet and should choose Internet resources with images that can be checked for validity. Finally, because information on Internet websites is often intertwined with hidden social, economic and political agendas (Cope & Kalantzis, 2000; Kinzer & Leander, 2003), educators need to critically evaluate the proportion of information within a website that is driven by these hidden agendas with that information which is driven by a sincere interest in the education of our children. For instance, advertisements, interactive games, search functions, informational passages, related links and consumer surveys at popular children’s websites like American Girl (<http://www.americangirl.com>) and Scholastic (<http://www.scholastic.com>) are often woven into the same web page, causing confusion about the author’s underlying intentions. Each of the dimensions of web-based informational resources described above should be considered as part of the technology evaluation process.

A final promising trend we found in recent evaluation methodologies is that evaluators are making greater attempts to involve students and educators in the development of evaluation

criteria and in the subsequent selection and review of educational technologies for literacy learning. Researchers have found that educators who construct evaluation criteria and then apply these criteria to evaluation practices are less fearful of the process and much more likely to use technology effectively in their classrooms (Hall & Martin, 1999; McVee & Dickson, 2002). McDougall & Squires (1995) also note the advantages of this generative approach to evaluation, whereby educators who were involved in this process were able to better “determine selection criteria, explain issues and structure thinking about the use of software” (p. 100).

Others posit that children can also provide new insights into a certain resource's strengths and weaknesses (e.g., Komoski, 1995; Wilson, 1998). Wepner (1989) found this to be true as well, when she observed student reactions to technology features that may be distasteful to teachers (e.g., robot speech) but motivating to students nonetheless. Some researchers even go so far to suggest that as a general rule, if there is no way to preview software with your students – avoid that software (Case & Truscott, 1999). Certainly, these are important considerations in our efforts to develop valid and reliable methods of evaluating technology resources for literacy learning.

RECOMMENDATIONS

In our analysis thus far, we've traveled down two divergent paths in the literature on evaluating technologies for literacy learning; one that we believe is limited in its utility and the other that we argue more accurately addresses the dynamic and multidimensional potential of integrating technology and literacy learning. Based on the lessons that each body of knowledge teaches us, we end by proposing the following recommendations to the process of critically evaluating educational technologies for literacy learning:

- The technology evaluation process should begin with individual student needs and a specific school, classroom, and curricular context. Technology resources should link learning objectives to authentic reading, writing and thinking situations.
- The technology evaluation process should target meaningful knowledge construction using multiple media formats.
- The technology evaluation process should consider technology-based social interactions.
- The technology evaluation process should be informed by (rather than constrained by) reviews and evaluations conducted by individuals outside the local teaching and learning situation.
- The technology evaluation process should follow a before, during and after format; identifying potentially useful technologies before using them with students, tracking their usefulness with students during literacy work, and examining the real effects that the technologies have on student learning after using the technology.
- The technology evaluation process should encourage expanded, mixed methods research methodologies that can be shared within the literacy community.
- The technology evaluation process must include the role of the teacher in implementing the technology.

SUMMARY AND CONCLUSIONS

It is clear that one practical technology evaluation format does not exist. In fact, we would argue that one format would limit the flexibility needed to evaluate technology use from the multiple and complex dimensions we describe in this chapter. However, findings from recent independent effectiveness studies (e.g., Marlette, Henk, & Melnick, 2004; Paterson et al., 2003;

Slavin, 1990) coupled with the current evaluation models available (e.g., Bitter & Pierson, 2002; McVee & Dickson, 2002) may inform the development of our future evaluation practices. For instance, Marlette et al (2004) examined the influence of a reading incentive software program on the affective literacy orientations of intermediate grade students. Understanding that often, not all students respond to a certain technology in the same way, the researchers used several two and three-factor experimental designs to investigate the differential effects of the software. Their assumptions led to important findings including the notion that “when paired with levels of gender and ability, this program differentially influenced reader self-perceptions” (p. 82). Differential considerations such as these that go beyond the one-sided issue of whether or not a certain software program is effective are crucial for both researchers and classroom teachers involved in the evaluation process.

In another example, Paterson et al. (2003) examined the effects of an integrated learning system on literacy learning, behavior, and attitudinal changes towards literacy learning, and eventual transfer to classroom literacy learning. The researchers selected a mixed methods approach, since “experimental designs may miss results of the use of technology that go beyond what is traditionally measured” (p. 176), and they used rigorously triangulated qualitative data to further inform them of any “pertinent classroom factors that might influence the programs’ success or failure in supporting early reading learning” (p. 183). These methodological choices allowed for broad reflection on the impact of the technology situated in the complex environment of the classroom and provided crucial insights into how different variables beyond the program itself impact its potential utility for literacy learning. Though a study of this breadth may not be realistic from a classroom teacher’s perspective, on a smaller scale, the methods of Paterson and

her colleagues provides a thoughtful model of what classroom factors are important to consider beyond the technology as playing a role in the overall impact of a certain software program.

Much is also to be learned from the evaluation models currently available. Each reflects some of the positive trends outlined in this chapter and may be quite helpful in helping teachers make critical decisions about appropriate technology implementation in their classrooms. These models include:

- a comprehensive list of guidelines for review of educational software and educational websites by Bitter & Pierson (2002);
- an open-ended rubric evaluation for software activities that could easily be extended to Internet resources (McVee & Dickson, 2002);
- a list of questions for evaluating reading and writing instructional software that links back to one's own theoretical orientation (Leu & Kinzer, 2003);
- a list of criteria for software selection that considers curricular, pedagogical and individual learner dimensions (Burmark & Thornburg, 1996); and, finally,
- a generative and situated approach that considers a holistic awareness across the perspectives of classroom culture, teaching style and student needs (McDougall & Squires, 1995).

When we consider the practical application of evaluation processes informed by the resources above, we realize that we have placed a tall order. We invite teachers to join us by specifying their teaching and learning purposes before selecting technologies. We ask that teachers first, consider the factors within their classrooms and the technologies themselves which either support or prevent those purposes from being realized and then, to reflect on the effects of specific technologies on their literacy teaching and learning. Similarly, we invite researchers to

develop and conduct studies that employ dynamic methodologies and multiple lenses to examine the effects of literacy learning with technology. As we plunge ahead into a future where literacy learning undoubtedly involves software and Internet technologies, these recommendations may be useful for framing new paradigms in technology evaluation.

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