

UNDERSTANDING TECHNOLOGY'S ROLE IN LITERACY

When we speak of technology, many people automatically think of computers. While there is no question that computers offer great educational opportunities and benefits, technology can be much more broadly defined as “any tool or medium that helps people accomplish tasks or produce products more efficiently” (Healy, 1998, p. 30). Educators can also take advantage of the many other tools of technology that are widely available and useful in the classroom. These tools include digital cameras, tape recorders, portable keyboards, a wide range of graphics and multimedia programs, and more.

The National Research Council has explored ways that new technologies can be used in the classroom. Among the council’s findings are several specific ways technologies can be used to support learning. These include:

- **Providing scaffolding and tools to enhance learning and help children solve problems.** For example, “talking” word processors support young children’s experimentation as they play with language. Using word processors, children can compose and write more easily than with pencil and paper. Technology provides children with the additional support they need to be successful as they increase their skills.



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- **Providing more opportunities for feedback, reflection, and revision.** Through the ability to go back and revise earlier efforts, technology encourages reflection and improvement of work. Opportunities for feedback increase when work is made available through printed copies, electronic copies via e-mail or the Internet, or made into audio or video recordings. With access to printing in the classroom, or publishing to the Internet, children can reach a larger audience who provide motivation for writing, thus encouraging a more polished final work.
- **Building global and local communities.** Technology can promote understanding and help to build communities by linking students from across the country and around the world. Through e-mail exchanges and projects that depend on distant collaborators, children can come to see and understand the similarities among different groups and different cultures, and the relatedness of communities.

(Bulleted items paraphrased from Bransford et al., 2000)

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Technology adds to the set of tools available for children to use and adapt, to feel at home with, to make part of their repertoire, and to help express themselves, verbally, visually, and emotionally. New technologies offer teachers additional resources to use as they plan to meet a range of levels, learning styles, and the individual needs of students.

Computers and other technologies do not replace other tools or activities, but add to the teacher's complement of tools. "In teaching as in carpentry, the selection of tools depends on the task at hand

and the materials one is working with" (Bransford et al., 2000, p. 22). With experience and guidance children will develop the skills needed to choose the appropriate tools to express themselves. Consider, for example, this description of a classroom where children use a variety of tools in literacy-related learning experiences:

"In a second-grade classroom near Boston, I watched two eight-year-olds create their own classroom newspaper. They used a template from a publishing software product to create the banner, and selected the two-column format. Then they imported digital photographs of teachers and children in their school and added captions below each image. Earlier that day these same children had

listened to their teacher read a (printed) Russian folk tale aloud to the class, exchanged handwritten messages on scraps of paper, and checked their e-mail messages. They navigated seamlessly from one medium to the next without hesitation, understanding literacy in ways that were difficult to imagine 20 years ago."

(Wood, 2000, p.117)

In this classroom and others like it, young children and their teachers are blending new tools with the traditional, showing how both can be part of a rich array of literacy experiences. As we consider the role that technology can play in literacy, it is helpful to keep in mind the four interrelated areas of speaking, listening, reading, and writing, as well as the contexts for learning discussed in the previous section on early literacy. To make appropriate use of technology in the early elementary classroom, it's important to find opportunities that assist or engage children in pursuing these fundamental activities.

Social Learning and Technology

A kindergartner enters her name on a computer keyboard and then has the software program “read” it aloud. It’s so much fun to hear the machine say her name that she then types in the name of a friend who is watching her. The process continues as more children come over to participate. When a name is accidentally spelled wrong, the children hear the error and quickly correct it. Then they begin to play with the language deliberately, changing the first letter of a name to hear how it sounds. They are rewarded with a rhyming word, which inspires more experimenting with names and sounds.

Technology is sometimes perceived as being at the opposite end of the spectrum from social interaction and personal engagement. Yet, we know that social interaction early in life is critically important for language development. No wonder, then, that researchers have paid particular attention to technology’s effect on the social interaction of children.

Researchers consistently report high levels of spoken communication and cooperation as children interact at computers (Clements, Nastasi, & Swaminathan, 1993). Young children are able to and even prefer working with one or two partners at the computer. Young children initiate interactions more frequently and in different ways at computers, and primary students collaborate more while working on the computer than they do when using pencil and paper. Computers can also contribute to the social interaction of young children with disabilities; involving, interactive software programs become a topic for conversations and communication, even for children who tend not to communicate (Hutinger, 1996).

“Computers, like crayons or blocks, are tools for learning and problem solving.”

Both research and teacher anecdotes point to the positive effects of computers and other forms of technology on social interaction, when the environment and activities are designed to encourage communication. In a busy classroom, conversations about activities lead to improvement in language skills and development of vocabulary.

The teacher plays a central role in the process of using technology, encouraging collaboration among students and independence in activities. “Computers, like

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crayons or blocks, are tools for learning and problem solving. Teachers play a critical role in determining the manner in which these are used” (Clements & Nastasi, 1993, p. 254). Just like books or any other resources, technology is used within a social environment, and mediated by interaction with peers and teachers (Bransford et al., 2000). Learning is never solely a matter of hardware and software.

► **CLASSROOM STRATEGIES:**

- As children learn how to use a digital camera or scanner, have them teach others how to do it. When they explain the process to someone else, it reinforces the task for them, and strengthens verbal communication skills.
- To create opportunities for language and collaboration, plan tasks that require peer interaction and arrange the space so that two or more children can sit and work together at a computer.
- Coach adults to talk with the children about what they are doing, and to ask open-ended questions to build language and social skills.

Play, Technology, and Literacy

Children gather around a portable, handheld microscope. They use it to explore their skin, strands of hair, and their clothing. When the magnified images appear on a computer screen, students reveal their fascination with the way everyday objects appear under 50-power magnification. Conversation flows. The teacher guides them to examine a leaf and offers the proper terms when the children attempt to describe what they see. In the context of shared exploration, children are introduced to scientific vocabulary. This is particularly beneficial for students who learn best from experiential learning, including many English language learners.

Play and literacy activities using technology serve educational objectives within the broader curricular and program goals. Children have traditionally made meaning using blocks, crayons, pencils, and art materials, as well as through pretend play and oral storytelling. Now, the tools of technology—

including computers, software, and items such as the handheld microscope in the example above—can become sophisticated tools of play and learning in early childhood education settings. Young children are increasingly using authoring programs, such as KidPix or HyperStudio, to tell stories in pictures and words. Such programs allow children to enhance their projects and



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writing with graphic images, sound, speech, motion, color, and scanned images that engage the senses and enhance the learning experience (Liang & Johnson, 1999).

As discussed earlier, children learn through multi-sensory experiences, using their bodies and their minds in tandem to learn through play. The playful exploration of early years is the original version of the experiential learning that is so effective in engaging students. Children's play is open-ended. There is no fixed sequence or final destination in the play as children use their imaginations and try out new roles and ideas. Both play and experiential learning lead to deeper understanding for the same reasons—children have experienced the learning with their senses as well as with their minds.

Play does not cease to be a useful activity; as children grow older it continues to be an important part of literacy development and experiential learning. The rich environments of preschools and kindergartens that allow for student exploration and experimentation can be models to also include in higher grades, as we take responsibility for reaching diverse learners. There is much evidence that students learn in a variety of ways, and that traditional, uniform teaching practices cannot reach all students. Expanded avenues for learning—through interactions, simulations, student choice, arts, and much more—can address different learning styles, provide meaningful, engaging experiences, and allow students to use and build on their strengths, and so to perform well (Green, 1999; Sprague & Dede, 1999).

► CLASSROOM STRATEGIES

- Make available opportunities for children to role-play what they know from their own environment and experiences: “writing” a note or list on paper, typing on the computer in imitation of a parent at work, using an adding machine to total purchases at the post office. These types of play provide experiences with the materials of writing and literacy.
- Include technology, such as a computer and printer, within centers rather than placing it in a separate area away from art, drama, or other play centers. This conveys to children that the technology is integrated into activities throughout the classroom. Centers can be rearranged from time to time, or carts can move the technology to different centers to encourage other uses.

Print-Rich Environments and Technology

Brightly colored banners hang in the grocery store corner of the classroom. Children “write” shopping lists on pads of paper available in the shopping area. Signs hang from shelves and mark areas of the store, and an adding machine sits on a table to total purchases. A computer and printer are nearby, along with crayons and paper, so children can make new signs when they want. As they play, children pick up boxes to look at the words on the labels and engage in conversations about their choices.

Children in this example are playing at shopping, and playing with language. Just as classroom signs, charts, and labels immerse children in a



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print-rich environment, technology can also serve as an excellent exposure to print. When children have access to resources including computers and other technology during the day, they can choose to draw and write with paper and crayons, or use software programs that let them experiment with language, create stories, or type words to accompany photos or pictures.

As children share their connections to the text when they listen to a story or read to themselves, teachers can list the ideas on a large sheet of paper, or enter children's comments into a computer and display the text on a large monitor to the whole class. The chart can then be printed and a copy given to each child with a record of the vocabulary and ideas generated by the entire class. The benefit is the same regardless of the technology used: Seeing their spoken words turn into words on a page helps children make the connection between sound and print.

► CLASSROOM STRATEGIES:

- Word walls or word banks surround learners with words that can be incorporated into a variety of activities to support literacy development. Use technology as one of the ways to build the bank—type and print words from the computer, or make prints of digital photos that include new vocabulary, or words important to the children.
- Use a computer and printer in the classroom to help children make signs, banners, and other props for pretend play. The props add interest and basic literacy skills to children's play, and decisions involved in making them—what size, what color, what words—give children more opportunities to use language. Making and displaying signs helps create an atmosphere that surrounds children with print that has meaning to them.

Literacy Development and Technology

The Head Start program in Portland Public Schools serves students of diverse cultures and languages. Teachers often send home digital photos of activities such as zoo visits and open houses. Captions are deliberately omitted, so that when the children share the pictures with their families they use their home language. When children share their activities and excitement at home, it reinforces both the learning from the activity and their native language, an important background for literacy development for those whose second language is English. The program also uses the digital cameras to document experiences with the community, such as field trips and guest artists, further enriching children's connection to the world outside school.

Technology offers a variety of ways for children to weave together words and pictures.

Educators use many tools and activities as stimulants for language, to provide opportunities for discussions and allow introduction of academic and content area vocabulary. When technology encourages conversations, as in the Head Start example above, children learn that they can use language to ask questions, make comparisons, and tell stories about their own experiences.

Children learn a language best, whether a first or a second language, by using it to communicate rather than studying it in isolation (Garcia, 2000). To encourage children to use their emerging language skills, teachers frequently send home photographs of children and their school activities. With digital cameras and printers commonly available, it is even easier for teachers to print

and send home photos or newsletters with pictures from a field trip. The photos provide opportunities and great motivation for young students to discuss school activities with their families, and so expand their oral communication skills and build vocabulary.

Young children make up stories as they play, and frequently tell stories that go along with pictures they create. Technology offers a variety of ways for children to weave together words and pictures. Children who are not yet writing may dictate words that others type for them or, using a child-friendly authoring tool, they may record their voices telling the story. Either of these records can be printed out, or saved electronically as a part of their portfolio, as a record of achievement. Children may also be videotaped as they tell the story and show the picture.

For children writing their own stories, word processors help them to get their words onto paper and to match them with pictures. Using existing technology, pictures can include photographs, digital images, videos, or drawings that are scanned into the computer, and can even be animated. With computer graphics children often write and tell more detailed, elaborate stories than they do about static pictures (Clements & Nastasi, 1993). Young students can present or represent various aspects of their learning using computers and software to generate stories, pictures, graphs, and other materials (Murphy & Thuente, 1995). Technology makes it easy for children to “tell” their stories in ways that make sense to them, and then display them on the screen and print them.

Research points to several areas where technology helps to develop literacy skills in early childhood by promoting the activities of speaking, listening, reading, and writing. These interconnected activities are illustrated by the following classroom description:

Mrs. T introduced her first-graders to the “talking” word processor by showing them a few commands on the keyboard. The technology permits playful exploration with writing and spoken words, which is especially helpful for students who have special learning needs. She prompted children to help one another rather than the teacher being the expert at all times. As she encouraged children to use the computer for editing, they began to think of the text as flexible and something they could alter. The screen made the writing seem more public, and sharing seemed natural. The children took increasing responsibility for problems and decisions and over time took on more complex tasks, such as publishing a class newspaper. Mrs. T considers the program a success and would not be without computers in her classroom today.

*(paraphrased from
Clements, 1994, pp. 44, 46)*

► **CLASSROOM STRATEGIES:**

- Model the writing process using an overhead projector or a computer attached to a multimedia projector. First, write a rough draft on a transparency or the computer. Then, mark revisions as you think out loud what to write. This lets students hear you “think through” your writing. Students can refer back to the example on the screen as they do their own writing—using pencil and paper or word processors.
- Print out photos and send them home, with or without captions. Photos without captions encourage oral language; those with captions develop written language skills.
- Encourage children to write by including a real audience. Simple class newsletters, e-mail exchanges, and collaborative online projects provide motivation as they write for an audience they know and care about. (See “Working With Words,” Page 34, for more information.)

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As teachers grow more comfortable and competent with the use of technology in their classrooms, they are discovering a variety of ways to promote development of students' literacy skills. Technology offers different approaches and new opportunities for learners, giving them options and a voice in their learning and an expression of their learning styles. Educators comfortable with these new tools can link technology use to broader goals that foster development of language and literacy skills. Technology can enhance the development of literacy by:

- **Opening opportunities for students to read and write for real purposes.** This might involve connecting students with people outside the classroom, with students involved in collaborative projects with other children on the Internet. Classes may write and send e-mail correspondence as well as send letters

through the postal service to pen pals across the city or across the world.

- **Building a learning community.** Bringing students and teachers into contact with the broader community can raise cultural awareness, provide opportunities for families and community members to share their stories, promote intergenerational exchanges, and enhance self-esteem for children who are culturally and linguistically diverse. Modern technologies can help make connections between in-school and out-of-school activities. E-mail, for example, can make it easier for adults to share family stories (see the final section, Page 45, for examples of such sharing).
- **Giving students opportunities to tell their own stories.** Technology makes it easier to record these stories in a variety of formats. Children can dictate their stories to adults



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or older students, who transcribe them on the spot at a computer, a portable keyboard, or typewriter. Similarly, they can tell their stories into a tape recorder or on videotape for later transcription. (See Page 42 for further discussion of audio and video recordings.)

- **Demonstrating the value of lifelong learning.** When teachers are willing to take risks and venture into new areas, they create opportunities to demonstrate as well as talk about lifelong learning. They also allow children opportunities to provide real expertise as they teach new skills to peers. As teachers learn to use new technologies they often learn along-

side their students. By showing their own skill development they model the learning process and can discuss it with their students, blurring the distinction between teachers and learners. Being the learner gives teachers permission to experiment and tinker, and stimulates their own thinking about the processes of learning. They gain new insights into teaching by watching their students learn (Bransford et al., 2000).

These benefits extend to all students. Next, we'll examine some of the ways technology can help to reach diverse learners.