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Enhancing adolescent literacy achievement through integration of technology in the classroom

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Adolescent literacy achievement across the United States is in crisis. More than eight million students in grades 4 to 12 are identified as struggling readers (Grigg, Daane, Jin, & Campbell, 2003). These students, who perform below grade level in reading and writing, are at high risk for failure in all content subjects and ultimately for dropping out of school. Educators and policymakers across the nation are working to address these concerns. Our state of Connecticut, for example, is expanding its focus from literacy in prekindergarten through third grade to the examination of empirical research that addresses today's literacy concerns for students in grades 4 to 12. To this end, Connecticut is seeking sound research to inform the preparation of adolescents for success in further education and training, as participants in a highly skilled workforce, and as productive and responsible citizens.

Connecticut continues to explore key elements in programs designed to improve adolescent literacy achievement in middle and high schools, such as those outlined by the Alliance for Excellent Education, the National Council of Teachers of English, the International Reading Association, and the National Association of Secondary School Principals. While it is clear that no single intervention will ever meet the needs of all struggling readers and writers, these professional organizations speak to the need for technology to be part of any effective adolescent literacy program. "Professionals and lay people are increasingly voicing support for inclusion of this element in a literacy program, because technology plays an increasingly central role in our society" (Biancarosa & Snow, 2004, p. 19).

Today's students are living in a time when technological innovations are increasing at a pace never before seen. Technology is readily available to most of Connecticut's adolescents in the form of cell phones, Internet-connected computers, portable music and video players, and more. Likewise, most Connecticut schools are well equipped with a variety of technologies for use by students; however, these technologies may not always be used in ways that significantly benefit learning. Recognizing that important research has already been completed in the area of educational technology, this article suggests seven areas for further research that are of interest to state policymakers, focusing particularly on enhancing adolescent literacy achievement through the integration of technology across all content areas. Empirical research in these areas can be used to inform future practice in Connecticut and across the nation: (1) state-offered virtual courses and delivery systems, (2) communication tools, (3) artificial intelligence, (4) word processors, (5) new literacies practices, (6) professional development, and (7) technology for parents.

State-offered virtual courses and delivery systems

Since the late 1990s, tremendous progress has been made toward achieving the U.S. Department of Education's goal of building a national technology infrastructure to support its vision for effective technology use in schools. Significant increases in investments by states in their technology infrastructures

have helped many educators and students begin to use a variety of powerful new online learning tools.

In 2006, nearly half of all states had “virtual schools” (Swanson, 2006, p. 52). The Florida State Department of Education was among the first to move forward with virtual learning when it created and provided Internet-based courses for its high school students in 1997. Today, Florida Virtual School (FLVS) is an accredited Internet-based program serving more than 30,000 students in grades 7 to 12. FLVS offers more than 80 National Collegiate Athletic Association–approved courses, including standard, advanced placement, and honors sections. Students earn high school credit or General Educational Development (GED) equivalents for successful completion of FLVS courses. All FLVS teachers hold valid Florida teaching certificates, and teachers communicate with students and parents regularly via telephone, e-mail, online chats, instant messaging, and discussion forums.

Providing courses online offers many benefits, including improved student access to an increased range and volume of courses and teachers as well as flexibility in scheduling, pacing, location, and teaching and learning approaches. This holds great potential for differentiated instruction that targets students’ individual needs, styles, and strengths.

In Connecticut, a small pilot program of online instruction is underway for students who have dropped out of high school, offering courses they need to complete their GEDs. Participants have had great success with their online coursework, finishing courses they were unable to complete in a traditional environment. Though the number of students in the pilot is small, the experience to date indicates that online learning may be one way to better meet needs of students who are not achieving in a traditional learning setting.

Further research, however, is needed to determine which virtual teaching and learning approaches maximize student literacy achievement. What are the factors and supports that lead to successful literacy achievement in an online course? How does an online environment affect reading comprehension or writing achievement? Are there certain online instructional strategies that provide for greater student success in literacy achievement than others? How does literacy achievement in a virtual course differ from that in a traditional course? Connecticut seeks answers to these questions as it continues to explore online learning options in an effort to meet underlying goals of equalizing disparity in educational opportunities and increasing adolescent literacy performance.

Communication tools

Throughout much of the world, the cellular telephone has become an integral communications tool. E-mailing and instant messaging (IM) on cell phones and computers have become commonplace. These communications tools are readily accessible and used almost everywhere by Connecticut’s adolescents—everywhere, that is, but in schools.

In most schools, e-mailing, IM, text messaging, and cell-phone talking by students are against board of education policies and procedures. Their use is often seen as a waste of time—or even dangerous—and an interference with the work of teaching and learning. But what if these technologies and students’ skills in using them could safely enhance their literacy? Because e-mailing, IM, text messaging, and cell-phone talking require skills in reading, writing, listening, and speaking, we must explore the ways they can assist adolescents in the development of these literacy abilities. Can specific uses of e-mailing, IM, text messaging, or cell-phone talking in academic courses have a positive effect on students’ literacy skills? Are there specific strategies or activities that maximize their usefulness as educational tools for literacy?

Opponents of the use of IM and text messaging in schools have argued that with these communication modes, students often use nonstandard English (e.g., “C U L8R” instead of “See you later”) and that this interferes with development of abilities to write in standard forms when required to do so for school-based writing assignments, for higher education courses, or in the workforce. Conversely, proponents of these technology uses in schools believe that they provide a motivating way to engage students and can be beneficial in a teaching and learning environment. They also argue that combining instant and text messaging with other technologies can maximize students’ learning potential and creativity, and that linguistic behaviors in communication modes such as IM show how skilled students are with the English language (Tagliamonte & Derek, 2006). If this is the case, how can technology uses such as instant and text messaging maximize students’ reading and writing potential?

E-mail is another controversial technology when it is used in schools. Some schools provide all educators and students with e-mail accounts, while others do not provide any access or limit use to specific educational purposes. Some educators and community members worry about students interacting through e-mail with inappropriate users or even with Internet predators. Yet e-mail is among the most common forms of communication in adolescents’ daily lives and can be used by students to collaborate

on projects with classmates or with peers in other states or countries. E-mail correspondence with peers or writing experts could provide a highly motivating and effective way for students to receive feedback on their writing and write for varied audiences.

Additional research needs to be conducted to determine which educational uses of e-mail can best enhance students' literacy skills. Does e-mailing in or out of English language arts classes have an effect on literacy skills of reading, writing, listening, speaking, viewing, or presenting? Are there specific strategies or activities that maximize this technology's usefulness as an educational tool? Are there other outcomes that occur as a result of using communications technologies in schools (e.g., increased participation, improved behavior, etc.)? Should states develop policies to encourage or even require their use?

Artificial intelligence

One of the most exciting technologies to hit education in the last several years involves artificial intelligence (AI). In the area of literacy in particular, AI tools hold great potential, especially for developing students' writing proficiency. These products require students to respond to writing prompts at their computers and to click to submit their work; within seconds they receive targeted, specific feedback. Students can then revise their work and submit it for more feedback, repeating the process until the work is optimized. In using one of these AI writing products in a typical middle or high school class, for example, each student could receive feedback on his or her writing several times in a given period—much more frequently than would be humanly possible from the classroom teacher. During the time students are engaged with their own writing on the computer, the classroom teacher is freed to concentrate efforts on individual student needs. Because these tools provide teachers with electronically collected and organized information about student-submitted work, they can be extremely useful for individualizing instruction.

Though the companies that offer these AI tools claim impressive results from their use, independent research would provide objective evidence about achievement differences between students who use AI writing tools and those who do not. This research could also discover which tools are most effective, and what qualities of these tools promote the greatest literacy achievement.

A Connecticut pilot program provides laptops and Internet-based AI writing tools to high schools for the teaching of writing. Preliminary results have

been promising. National commercial studies of the use of these tools indicate they are most valuable for students who are underachieving and for English learners. Still, additional independent research on the effectiveness of these tools is needed to more fully understand their use and determine their benefits for increasing adolescent literacy achievement.

Word processors

A growing body of research supports the use of word-processing software in the teaching and learning of writing. Most people who use a word processor on a regular basis know that this tool is a great asset and allows them to be more efficient, organized, accurate, and thoughtful in their writing.

Some educators are concerned, however, about the use of features built into today's word processors, such as spelling and grammar checker, dictionaries, and thesauruses. They fear students will become too reliant on these tools and be unable to spell, acquire sufficient vocabulary, or construct grammatically correct sentences without them. Proponents, however, believe these tools only increase students' written language skills. They believe students achieve more success in their writing when they have the opportunity to write with a word processor. Who is correct? Are students who regularly use word processors more accurate in their spelling and grammar even when they are not using a word processor—that is, do the skills transfer to students' own knowledge base? Does the word processor benefit the writing process steps of prewriting, writing, revising, editing, and publishing? Answers to these questions may be helpful in informing the implementation of statewide curriculum standards and initiatives.

New literacies practices

For students to be fully literate in today's world they must become proficient in the new literacies practices of information and communication technologies (ICTs). In Connecticut, the leading researchers in the area of literacy and technology are Donald J. Leu and the members of the New Literacies Research Team at the University of Connecticut, whose work is focused on examining what new practices are required for students to access successfully, evaluate critically, and use optimally today's electronically available information. Their current research and theories support traditional and new literacies practices, as well as development of

classroom resources and approaches that can enhance literacy for students at all grade levels. Connecticut educational policymakers want to expand on the New Literacies Research Team's work to identify the most beneficial practices for enhancing adolescent students' skills in reading, writing, listening, speaking, viewing, and presenting. Where do traditional practices join new practices?

Professional development

Ongoing, embedded professional development is essential for all educators in creating a successful school literacy culture. Effective professional development makes connections to curriculum, instruction, and assessment. There are several ways teachers' professional development can be enhanced through the use of technology, including offering online workshops, access to literacy coaches, and online professional learning communities. Such technology-enhanced professional development can offer online threaded discussions with colleagues, consultants, and professors; assistance with classroom issues around curriculum, pedagogy, and assessments; grade-level and content area study groups to enhance student learning through best teaching practices; and resources to enhance instruction and extend understanding—all at the convenience (in time, location, and pace) of each individual administrator, classroom teacher, or other staff member.

Providing professional development for teachers via the Internet facilitates consistent content and delivery to all, and allows for coverage over a wide geographical area. Both of these advantages are of particular interest to state leaders. Teachers can access these materials at any time—evenings, weekends, during daily breaks, or in the summer. It also provides a way for professional development to continue over a sustained period of time, which research has shown to be most effective (Snow-Renner & Lauer, 2005). Offerings can include video clips of effective practices that can be viewed repeatedly as needed by each teacher. Online professional development courses can also be made available in a large range of subjects and grade levels, providing something for every teacher—which most school districts do not have the ability to do on their own, either in terms of expertise or resources. In Connecticut, we are interested in knowing what professional development is most appropriate and successful in a virtual environment, particularly in core content areas such as English language arts.

Online environments may help provide middle and high school content area teachers with access to literacy coaches. As empirical research begins to answer the questions posed by the International Reading Association (2006) in its *Standards for Middle and High School Literacy Coaches*, the role of the middle and high school literacy coach will become better defined and “virtual” literacy coaches may become a viable option. But, before implementing statewide policy and funding programs, we must better understand the ways in which technology can assist in the deployment of literacy coaches. Can a virtual literacy coach be just as effective as an in-person coach who works face to face with a content area teacher? Are virtual literacy coaches more cost effective than in-person coaches?

Professional learning communities, where teachers can interact with colleagues to discuss ideas, share strategies, voice concerns, provide mentoring, and support one another, can be provided and promoted online. An online environment allows for greater numbers of people to participate in discussions and add to the richness of the bank of ideas and resources. We must explore and discover the best ways to involve teachers in technology-assisted professional learning communities.

Technology for parents

Most would agree that the Internet is the greatest information-sharing vehicle of our time. Schools across Connecticut and the nation use the Internet to enhance home-school communication. These schools may post class content and homework, supply links to extend learning into the after-school hours, offer secure access to attendance information and grades, and provide easy access to teachers through e-mail. Some schools are even experimenting with providing resources to parents/guardians to help them develop their own literacy skills. These resources include information on adult education programs, links to interactive Internet-based activities, and access to support for adult learners.

But before Internet-based parent communication is promoted on the state level, it is essential to know if these programs are worth the time and effort. Does their use with parents assist children in enhancing literacy skills? What are the specific resources parents access through the use of technology that assist them in developing their own literacy skills and those of their children?

Final remarks

The National Council of Teachers of English and the International Reading Association's (1996) *Standards for the English Language Arts* states that secondary students should be able to conduct research using "a variety of technological and information resources." The Alliance for Excellent Education (Biancarosa & Snow, 2004) and the National Association of Secondary School Principals (2005) also call for technological communication and information resources to be embedded in effective adolescent literacy programs. These technologies are seen both as a facilitator and a medium of literacy teaching and learning. "Effective adolescent literacy programs therefore should use technology as both an instructional tool and an instructional topic" (Biancarosa & Snow, p. 19).

We know we must move forward with these technologies in preparing Connecticut's students; however, from the perspective of policymakers, too little research has been conducted about how technologies foster adolescent literacy growth. Further, the research that is conducted poses challenges in that changes in technology will continue to alter the ways in which we use language to communicate and to think. Professionals in the field must pursue additional research around technology integration to enhance adolescent literacy achievement so that states across the nation can best create and promote the necessary programs to reverse the adolescent literacy achievement crisis.

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"Where am I?" A call for "connectedness" in literacy

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Shel Silverstein includes a wonderful poem in *Where the Sidewalk Ends* in which a little girl is so enamored with Band-Aids that she covers her body with them.

She places them on her chin, wrist, ankle, thigh, and several other body parts. She even carries a box of 35 more just in case she might need them. Of course,