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Comments on Greenhow, Robelia, and Hughes

Digital Immersion, Teacher Learning, and Games

Ronald D. Owston

In this comment article, the author elaborates on three significant issues that Greenhow, Robelia, and Hughes (2009) identified but did not explore. First, the author discusses the need for research on the impact that youth's immersion in a digital world may have on meta-cognitive and social skill development. Then teacher learning with the Web is considered, and the author identifies research questions related to improving the design of professional learning experiences. The author concludes with a discussion of digital games for learning and points to several key areas that need further research.

Keywords: computers in education; technology; World Wide Web

In 1997, I published in *Educational Researcher* the article "The World Wide Web: A New Technology to Enhance Teaching and Learning?" (Owston, 1997). It is difficult to believe that this was only 12 years ago, because the Web is now so deeply rooted in our society. However, this was the first article in a journal sponsored by the American Educational Research Association to deal specifically with the Web for teaching and learning.¹ In the article, I argued that before educators rushed to jump onto what appeared to be another educational bandwagon, we needed to be able to demonstrate that the Web (a) can increase access to learning, (b) need not result in higher costs for learning, and (c) can lead to improved learning. These criteria seemed appropriate at the time as educators began to consider seriously the educational potential of the Web and the required investment in the new technology. The following year, Mark Windschitl (1998), also writing in *Educational Researcher*, urged researchers "to reflect more critically on the kinds of questions being asked about the Web and its influence on teaching and learning in K–12 classrooms" (p. 32). He proposed a research agenda to examine Web use for student inquiry and communication and advocated for the use of qualitative methods to illuminate Web-based classroom learning. Three years later, Hartley and Bendixen (2001) recommended, again in *Educational Researcher*, that researchers focus on Web use as it relates to two individual learner characteristics—epistemological beliefs and self-regulatory skills.

Continuing this tradition of providing researchers with guiding questions, Greenhow, Robelia, and Hughes, in "Web 2.0 and Classroom Research: What Path Should We Take Now?" (this issue of *Educational Researcher*, pp. 246–259.), ask what research we should pursue next in light of recent significant changes in access to the Web, the nature of the Web, the ways classrooms can be conceptualized, and expectations for technological competencies of learners and educators. From an analysis of these changes, they identified two key themes that warrant further research: learner participation and creativity, and online identity formation. These two themes provide excellent guideposts to researchers interested in pursuing work in this field, as they encompass most of the key challenges with regard to youth, teaching, learning, and Web 2.0 technologies. The authors' use of Barron's (2006) ecological framework, which encourages researchers to look beyond the narrow confines of the classroom into youth's lives outside of school, makes eminent sense because of young people's extensive personal and social use of digital technologies. Nevertheless, there are three subthemes that Greenhow et al. (2009) raised but left underexplored in their article that I would like to address: (a) the implications for teaching and learning arising from youth's being continually immersed in a digital world, (b) teachers' use of the Web to enhance their own professional learning, and (c) educational games and learning in the classroom.

Implications of Youth's Immersion in a Digital World

Greenhow et al. (2009) cite several surveys indicating that more than one half of young people in the United States are spending 9 hours a week on Web 2.0 activities. That statistic in itself seems fairly innocuous; however, when time spent on these activities is combined with use of other media, such as text or instant messaging, downloading songs and listening to MP3 players, watching television, and playing video console games, a different picture emerges. In a Kaiser Family Foundation study, researchers found that youth are spending, on average, 6.5 hours per day exposed to all forms of new media, which across 7 days amounts to the time typically spent on a full-time job (Rideout, Roberts, & Foehr, 2005). Prensky (2006) goes as far as to suggest that young people actually *think differently*, a conclusion based on his observation of their use of digital

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devices and on what recent research says about the brain continually reorganizing itself in response to various kinds of stimuli, a process known as brain plasticity (Kolb, Gibb, & Robinson, 2003). Others have reported the same phenomenon in youth (e.g., Seely Brown, 2002; Tapscott, 2009).

Recent neurological research using functional magnetic resonance imaging provides some basis of support for these informal observations that youth are thinking differently. According to Blakemore (2007), during adolescence, the frontal lobes of the brain change dramatically. This brain area controls many high-level cognitive abilities, including executive functions, such as planning and inhibiting inappropriate behavior, and social understanding, such as perspective taking and self-awareness. Throughout adolescence, those neural connections available in the early years that are not used tend to wither away, and those that are used become strengthened. This pruning process accounts for the reason, for example, that young children learn languages so readily, whereas adolescents and adults find it much more difficult. Neural research shows that when youth are interacting with digital media, they tend to use their temporal lobes, strengthening this area but not solidifying vital connections in the frontal lobes (Small & Vorgan, 2008). The result may be that youth are impairing development of their reasoning and social abilities and they may never catch up (Small & Vorgan, 2008). Indeed, Small and Vorgan (2008) suggest that digital technologies are altering how youth function so profoundly that what is occurring now in a single generation "may represent one of the most unexpected yet pivotal advances in human history . . . since Early Man first discovered how to use a tool" (p. 2).

There is controversy about whether these changes in the way young people's brains function because of digital immersion are cause for concern. Tapscott (2009) optimistically declares that "the kids are alright" (p. 117) and that they are not turning into zombies. On the other hand, Bauerlein (2008) argues that youth today are headed on a path with "consistent and perilous momentum downward" (p. 7). There are no clear answers to this debate; however, Greenhow et al. (2009) do not address it and propose looking only at issues of what learners do with Web 2.0 technologies and issues of equity and access. We need not only to examine what learners do with these new technologies, as the authors suggest, but also to understand what the implications are for teaching and learning when youth are immersed in a digital world. Common thinking today is to bring into schools the tools youth are using outside of school in an effort to make schools "more personally meaningful, collaborative, and socially relevant" (Greenhow et al., 2009, p. 249). Although this is a laudable goal, one might question whether bringing more Web 2.0 tools into the classroom is necessarily a wise strategy in light of what the brain research cited earlier is telling us. Are we on the right path by encouraging more Web 2.0 technology use in schools? Will bringing new digital technologies into school serve just to exacerbate these potentially deleterious developmental patterns? Do we need to place significantly greater emphasis in school curricula on metacognitive and basic social skills to compensate for lack of sufficient frontal lobe development outside of school? These are just several of the questions researchers now need to examine in light of youth's immersion in a digital world.

Teachers' Use of the Web

Greenhow et al. (2009) bring up the issue of the need for teachers to develop their professional knowledge through Web 2.0 practices and for them to model these practices in the classroom. I believe this is a significant topic. I would like to first elaborate on how professional learning with Web 2.0 tools can take place and then point the way to areas that need more research.

The literature is clear on the criteria necessary for effective professional learning that can affect student achievement: It should be long-term, collaborative, school based, focused on the learning of all students, and linked to the curricula that teachers have to teach (Garet, Porter, Desimone, Birman, & Yoon, 2001; Hiebert, Gallimore, & Stigler, 2002; Wenglinsky, 2000). Online learning through professional communities, many of which now use Web 2.0 technologies, is an increasingly popular way for teachers to improve their knowledge and skills (Dede, 2006). Benefits of online professional learning include the following: anytime-anywhere learning (Vrasidas & Zembylas, 2004), instant access to a network of professionals with useful skills and knowledge (Charalambos, Michalinos, & Chamberlain, 2004), and the fostering of a professional learning community (Chapman, Ramondt, & Smiley, 2005). Perhaps the most significant challenges that developers of online communities face is fostering among participants a sense of belonging, trust, and support, all of which are necessary for effective learning in a community (Charalambos et al., 2004). One of the ways of addressing this problem is to create professional learning experiences that combine online and face-to-face sessions, an instructional model known as blended or hybrid learning (Bonk & Graham, 2006). This model allows for the possibility that professional learning programs can include periodic face-to-face sessions throughout the school year or in summer workshops and use the online component as the "glue" connecting the sessions and allowing opportunities for teachers to share and reflect on their practices as they implement new approaches in their classrooms. Blended learning is a relatively new approach for teacher professional development, although the method first appeared in undergraduate education 12 years ago (Dziuban, Hartman, & Moskal, 2004). My colleagues and I recently completed a synthesis of formative evaluations that we undertook of three blended learning programs for practicing teachers from a perspective of the principles of effective professional development cited earlier (Owston, Wideman, Murphy, & Lupshenyuk, 2008). A brief overview of the programs and findings will serve to illustrate how educators can use the Web for professional learning and point the way to areas in need of additional research.

The three teacher professional learning programs that we evaluated took place at different times, devoted different amounts of time to face-to-face sessions, and involved different teachers. The programs focused on the improvement of mathematics and science teaching at the high school, middle school, and upper elementary levels, respectively, and shared the common goal of promoting continuous professional learning on the job through collaboration and sharing with colleagues. In addition, they emphasized teachers' use of student-centered, inquiry-based approaches in their classrooms that involved all students regardless of ability. All made use of Web 2.0 technologies, such as blogs, webcasting, podcasting, and live video sessions. And in all

three cases, teachers tried out in their classrooms new pedagogical approaches discussed in face-to-face or online sessions and shared their experiences with the new strategies online.

Overall, our findings suggest that blended learning can have a positive impact on teacher classroom practice, and we found encouraging evidence that blended learning can also have an impact on student attitudes toward learning and achievement. Despite these promising findings, more research needs to be conducted in at least three key areas. First, teacher participation in the online component of blended learning programs can be problematic. We found that there appeared to be a relationship between program structure and participation: The more structure that a program imposed in terms of teachers meeting expectations, timelines, and deadlines for projects and activities, the greater was the online participation. On the other hand, we found that rigid timelines allowed teachers less flexibility for experimenting with new teaching strategies in their classrooms because they had to try them out when the program required this rather than when they fit best into the teachers' curricula. Research is needed to determine if this relationship between program structure and online participation holds across other kinds of programs and settings and, if so, how the issue may be addressed.

Second, we found that a shorter period between face-to-face sessions resulted in a stronger sense of community. That is, a blended program that has regular face-to-face sessions interspersed throughout the school year is likely to function as a more collegial, supportive community than one with the same number of days concentrated into a summer institute or similar intensive session. As summer sessions are generally a more convenient time to hold teacher workshops, research is needed to determine how often face-to-face sessions are needed during the school year and the nature of the sessions required to maintain a strong ongoing sense of community.

Third, further investigation is warranted concerning the design of programs so that they have a significant impact on teacher practice. Although all three blended learning programs that we studied had some impact on teachers changing from a traditional pedagogical orientation to an inquiry-based, student-centered approach, the most successful were the two programs that most directly related to the curriculum that teachers were teaching. This outcome raises the question of how programs can be designed to include a mixture of teachers—at different grade levels, in different subject areas, and teaching different curricula—and, at the same time, remain relevant enough to influence teachers to change their practices.

Educational Games and Learning in the Classroom

The third area that I believe warrants further comment is the need for research on digital games in schools. Greenhow et al. (2009) acknowledge how youth experiment outside of school with online identities and multimedia tools in virtual worlds; however, they do not address the burgeoning movement for serious games that is attempting to harness for educational purposes the motivation, engagement, and enthusiasm that young people exhibit toward digital game playing (de Castell & Jenson, 2003).

Although much is being written about the deep learning that stems from playing digital games recreationally (e.g., Gee, 2003; Mitchell & Savill-Smith, 2004; Prensky, 2006), empirical

evidence of such games' effectiveness in classroom settings is lacking (Bonk & Dennen, 2004; Squire, 2006). Generally speaking, the empirical research shows that game playing in classrooms can contribute to increasing student motivation and engagement in learning (Cordova & Lepper, 1996). Games can engage students in deductive reasoning, collaborative problem solving, cooperative learning, and peer tutoring (McFarlane, Sparrowhawk, & Heald, 2002). In addition, they can effectively promote learning by combining high interactivity with an appealing and novel narrative context (Becta, 2001), which leads to significant conceptual understanding (Squire, Barnett, Grant, & Higgenbotham, 2004). More recently, my colleagues and I studied elementary students who created—rather than just played—their own curriculum-related Web-based games (Owston, Wideman, Lotherington, Sinitskaya Rhonda, & Brown, 2007). We compared these students to a control group who studied the same unit but did not play or develop games. Students in the game group increased significantly their ability to create logical sentences, one of several traditional literacy skills that we assessed. These students also improved their digital literacy skills, increased content knowledge, and developed collaborative skills.

Not all educational games employ the Web; however, the educational use of Web games is common enough to warrant investigation. The Federation of American Scientists (2006) developed a comprehensive road map for research that provides helpful guidance on key research questions, including the following: How can stories and scenarios contribute to motivation and learning? What are the features of game playing that contribute to development of higher level thinking skills? How can we integrate games into classrooms and formal learning environments to support learning goals? Finally, what is the degree of authenticity and fidelity needed to support learning?

Summary and Conclusion

Greenhow et al.'s (2009) update on key questions to guide research related to Web-based teaching and learning is timely. Web technology is advancing rapidly and creating new possibilities for communication, participation, product knowledge and creation, and research—youth are drawn to these possibilities whether they encounter them within or outside of school. I discussed three areas raised by the authors that need further elaboration: the implications of youth's digital immersion, teachers' use of the Web, and game-based learning. The research questions I proposed in these areas, together with Greenhow et al.'s questions, should provide a comprehensive overview of key research directions in the field for the near future.

NOTE

¹An earlier article by Burbules and Bruce (1995) discussed publishing on the Web, and another, by Blumenfeld, Marx, Soloway, and Krajcik (1996), mentioned the Web as a tool to support collaborative communities.

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