



# ***Implications of Ubiquitous Computing for the Social Studies Curriculum***

Stephanie D. van Hover, Michael J. Berson, Cheryl Mason Bolick, and Kathleen Owings Swan

## **Abstract**

*In March 2002, members of the National Technology Leadership Initiative (NTLI) met in Charlottesville, Virginia to discuss the potential effects of ubiquitous computing on the field of education. Ubiquitous computing, or “on-demand availability of task-necessary computing power,” involves providing every student with a handheld computer—a situation with enormous repercussions for education and teacher education. Over a two-day period, participants engaged in intensive discussion of the issue of ubiquitous computing and developed seven conclusions. This paper, written by the representatives from social studies organizations, seeks to examine the specific implications of these seven conclusions for the field of social studies education. The paper discusses the concept of ubiquitous computing and the impact this technology shift may have on social studies curricula, teacher preparation, software development, and research agendas.*

In March 2002, members of the National Technology Leadership Initiative (NTLI) met in Charlottesville, Virginia to discuss the potential effects of ubiquitous computing on the field of education. NTLI is sponsored by the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT<sup>3</sup>) catalyst grant program and includes representatives from the following teacher educator associations: the Association for Education of Teachers in Science (AETS), the Association of Mathematics Teacher Educators (AMTE), the College and University Faculty Assembly (CUFA) of the National Council for the Social Studies (NCSS), the Conference on English Education (CEE) of the National Council of Teachers of English (NCTE), the Society for Information Technology and Teacher Education (SITE), and the International Society for Technology in Education (ISTE) (Bell, 2001).

The NTLI seeks to explore approaches to effectively prepare teachers to use technology as well as to engage in discussion and collaboration regarding cross-curricular best practice. To this end, the NTLI meets annually in order to collaborate, discuss, and examine key issues in technology. Thus far, the NTLI has met

three times: September 2000, March 2001, and March 2002. For more information on the NTLI, visit <http://www.citejournal.org/vol1/Iss4/currentissues/general/article1.htm>.

The most recent meeting, the National Technology Leadership Summit held in March 2002, focused on the issue of ubiquitous computing in K–12 schools. Over a two-day period, participants at the summit were organized into a task force, meeting in small content-specific groups and in large interdisciplinary groups, to engage in intensive discussion over the issue of ubiquitous computing. The task force developed seven conclusions pertaining to ubiquitous computing:

1. Ubiquitous computing will be a widespread force in schools by the end of the decade or sooner.
2. Ubiquitous computing will be a disruptive cultural force with great potential for good or ill.
3. Educators at all levels have a responsibility to articulate constructive visions for ubiquitous computing.
4. Educators must be prepared to use ubiquitous computing to advance teaching and learning.
5. Educators must work with hardware and software developers to shape pedagogically sound educational tools and evaluate them before widespread implementation in schools.
6. Small-scale pilot initiatives need to be immediately undertaken to demonstrate feasibility across a demographically-representative range of schools before ubiquitous computing takes place on a larger scale.
7. Pilot initiatives should be evaluated to ascertain the effect of ubiquitous computing on teaching and learning, and these findings should be used to guide future educators.

This paper, written by the representatives from social studies organizations (CUFA/NCSS), seeks to examine the specific implications of these seven conclusions for the field of social studies education. To do this, we will explore the meaning of each conclusion and discuss the significance and implications for social studies education.

***Ubiquitous computing will be a widespread force in schools by the end of the decade or sooner.***

Bull, Bull, Garofalo and Harris (2002) argue that the transition to ubiquitous computing will occur due to two major trends: Moore's Law and what they dub the "technological tipping point." Moore's Law originated with Gordon Moore, co-founder of Intel, who posited that computing power doubles every 18 to 24 months and, at the same time, the cost of computing is essentially halved (Moore, 1965). For example, current wireless handheld computers costing approximately \$300 today will drop to about \$150 in eighteen months and \$75 three years from now. These prices would certainly allow school systems to afford one wireless portable computing device per student by the end of the decade.

Bull et al. (2002) also argue that when the transition to ubiquitous use of handheld computers in schools occurs, it will take place in a relatively short period of time, rather than in a linear progression. Malcom Gladwell (2002), in his book *The Tipping Point: How Little Things Can Make a Big Difference*, argues that many innovations reach critical mass in an almost epidemic form; he refers to this period of rapid proliferation as the "tipping point." For Gladwell, a relatively small group of people can create enormous and rapid change. Bull et al. (2002) assert that at some point before the end of the decade, widespread access to portable wireless computing devices will represent a tipping point in American education.

***Ubiquitous computing will be a disruptive cultural force with great potential for good or ill.***

The impact of this technology shift on social studies curricula should prove transformative (Saye & Brush, 1999, Whitworth, Swan, & Berson, 2002). Social studies classrooms equipped with wireless computing devices will have more efficient, less cumbersome access to primary sources through the Internet. This access helps in equalizing educational opportunities, allowing students, regardless of socioeconomic background, to utilize the myriad of sources available on the Net. Moreover, this access has the potential for connecting students with other youth from around the world or experts in the field of study. In the Electronic Emissary project based in Austin, Texas ([emissary.ots.utexas.edu/emissary/](http://emissary.ots.utexas.edu/emissary/)), one social studies classroom in San Angelo, Texas studying the civil rights movement connected over e-mail with a professor at California State University who assisted the students as an "electronic expert." The professor provided supplementary materials to their study, probing questions for their research, and personal experiences for depth of understanding. This technology trend offers great promise in adding dimensions to traditional social studies curriculum.

Even as ubiquitous computing has the potential for moving social studies forward, this technology could also become a means for micro-managing school districts, teachers, students and curricula. As high-stakes testing grows stronger and teacher shortages mount, administrative forces could see technology as a means to script curriculum, to track assessment, and to keep teachers ac-

countable. Another danger to the social studies classroom is that the technology would become relegated to use as a fancy worksheet or textbook, where students engage in another one-dimensional task. It will be important for educators to anticipate this scenario and begin to visualize how ubiquitous computing can actually move pedagogy forward.

Additionally, we will need to pay closer attention to the sociological and cultural components that accompany pervasive computing. For example, students able to access global information will need stronger global understandings. Furthermore, Internet safety will need to become a priority not only in the social studies curriculum but across disciplines as students encounter global information. Reliance on technological resources and expansive communication networks contributes to emerging social issues and public problems with repercussions for peoples and nations. Educators in the social studies can promote safer use of the Internet through competencies and attitudes targeted toward children in cyberspace. The Internet has provided an expansive environment that enhances many existing teaching and learning approaches while facilitating new activities that are free of traditional constraints. As a result of the potential for instantaneous interaction without regard for geographic, political, racial, social, and gendered borders, an increased amount of activity is taking place online.

In the social studies, the ethical, cultural, and societal issues related to technology implementation are an extension of participatory citizenship. While fostering informed and active participation in the global community, teachers must promote safe and responsible use of technology resources. The Internet serves as a powerful medium for education, entertainment, information retrieval, and communication; however, cyberspace also may transform the nature of social interactions among youth. Whether these changes are beneficial or problematic may depend on the influence of parents, teachers, and peers whose guidance may assist students in making informed decisions and allow them to demonstrate an ability to apply online critical thinking skills and productive social participation. Issues of accountability, responsibility, tolerance, and respect—topics that are often addressed in the social studies curriculum—are critical to counter exposure to hate, violence, misinformation, consumer exploitation, and sexual predators in cyberspace. Cyberliteracy, online ethics, and safety will need to become a priority not only within the social studies curriculum, but also across disciplines as students encounter information and experience interactions in an expansive, global medium.

It is important to see the coming technological trend as a tool and not an end. With this perspective, we will begin to construct the classroom we want rather than inherit the classroom we observe.

***Educators at all levels have a responsibility to articulate constructive visions for ubiquitous computing***

Social studies educators at all levels need to collaboratively establish a clear vision for what social studies education will look like using handheld computers. Research in educational technol-

ogy consistently reveals that teachers and teacher educators experience difficulty conceptualizing the nature of meaningful technological integration and struggle to incorporate technology into their teaching (e.g., Berson, 1996). If ubiquitous computing is the wave of the future, it becomes imperative for social studies educators to engage in dialogue over how ubiquitous computing models can enrich teaching and learning in the social studies classroom. Historically, social studies educators tend to utilize the same pedagogical approaches—textbook and lecture—regardless of the technology (Anderson & Becker, 2001). We, as a field, need to consider ways in which we can alter our pedagogical approach in order to maximize the educational uses of this new technology.

To date, technology has not transformed schools to the extent that many reformers believe it has the potential to do. The highest use of computers by classroom teachers is word processing and e-mail for administrative duties (Cuban, 2001). We've yet to see technology transform teaching methods in the majority of our classrooms. One rationale for this is access. Today's classroom has one Internet-connected computer per 6.8 students (Skinner, 2002). Ubiquitous computing scenarios will significantly reduce this number to allow each student access in the classroom and at home.

Recognizing the power of one computer for every student, the field must now concentrate on the second rationale for the lack of transformation of pedagogy: teacher training. Berson, Mason, Heinecke, & Coutts (2001) reported that among social studies teacher educators, computer use in methods instruction was relatively low and that when they did use technology, it was primarily to conduct administrative details (i.e. to prepare lesson plans or to communicate with others through e-mail). Classroom teachers and teacher educators must be involved in professional development opportunities that teach them not only how to use the technology, but allow them to explore how technology can transform their teaching.

### ***Educators must be prepared to use ubiquitous computing to advance teaching and learning***

Ubiquitous computing has enormous implications for social studies pedagogy, and consequently, teachers will need to transform traditional approaches to curriculum to exercise their full potential. For example, teachers will become facilitators of knowledge, helping students construct meaning from the multitude of perspectives that the World Wide Web introduces. Additionally, teachers will need to encourage safe and responsible student involvement through the interactive tools of e-mail and discussion forums. For this to happen, educators will need to be trained in instructional technology, as the use of technology on this scale will not likely be intuitive.

The training format will embrace the power of the handheld computer, while also causing teachers to rethink their traditional teaching methods and to consider how handheld computers can help develop the skills and knowledge required for participation in a democracy. Professional development opportunities must allow teachers to see how handheld computers can be used to support specific social studies ac-

tivities and projects that together center on the development of children's (a) "personal civic beliefs," (b) "capacity for social and public action," (c) "ties to their localities and the world outside," and (d) "awareness of past present and future" (Cogan, Grossman, & Lei, 2000, p. 50). Engaging teachers in inquiry-based activities that allow perspective taking and higher order thinking will lead to students engaging their own students in these lessons.

### ***Educators must work with hardware and software developers to shape pedagogically sound educational tools and evaluate them before widespread implementation in schools***

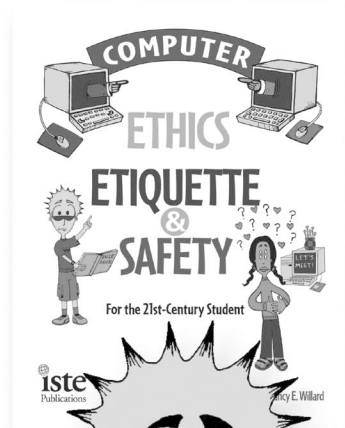
The social studies field tends to react to the latest technological trend. This conclusion, however, sends a powerful message urging educators to take a proactive stance towards emerging technology and to become integrally involved in the development and evaluation of pedagogically sound educational tools. The software and hardware included on these computers should reflect social studies research and best practice. For this to occur, however, it is vitally important for the development of authentic, multilateral partnerships that include schools, businesses, communities, universities, professional organizations, teachers, and students. By becoming involved early in the process, there is a greater chance that the hardware and software can meaningfully improve social studies teaching and learning.

Initiatives on the part of corporations such as Texas Instruments (TI) to work with social studies educators and their professional organizations exemplify collaborative efforts between educators and hardware/software developers to infuse handheld technology into the classroom and shape pedagogically sound practice. Given the pervasiveness of TI's handhelds, the company has made an effort to create Handheld Software Applications (Apps) for use in social studies classrooms so that teachers can take advantage of the technology that students already own and like to use. These Apps can be used on TI's Flash-based handhelds, and include electronic flashcards that can be customized for classroom content.

Beyond promoting hardware, companies such as TI have actively engaged social studies educators in developing supporting resources to facilitate the incorporation of the technology into teachers' lesson plans. Educator feedback is systematically infused into the development process through piloting programs, focus groups, and ongoing relationships with individual teachers using the technology, subsequently transforming handheld technology into a cross-curricular toolkit. The resulting activity books, materials correlated with popular textbooks and other resources increase successful implementation in the classroom, decrease lesson planning time, and promulgate the dissemination of technological innovation throughout schools.

### ***Small-scale pilot initiatives need to be immediately undertaken to demonstrate feasibility across a demographically-representative range of schools before ubiquitous computing takes place on a larger scale.***

# The World is Wired



For more information  
or to order online:  
[www.iste.org/bookstore](http://www.iste.org/bookstore).

**Phone**

1.800.336.5191 (U.S. & Canada)  
1.541.302.3777 (International)

**Fax** 1.541.302.3778

**E-mail** [orders@iste.org](mailto:orders@iste.org)



It is imperative that small test beds are created for educators to construct models of instruction and the training that will need to accompany its use. Already companies such as Palm, Apple, and Mindsurf Networks are equipping pockets of schools across the country with portable, and sometimes, wireless devices. For example, in Henrico County, Virginia this year, the superintendent reapportioned the county education budget to eliminate textbook purchases and to introduce wireless Apple laptops into the curriculum throughout the county ([www.scholastic.com/administrator/article\\_forum.asp](http://www.scholastic.com/administrator/article_forum.asp)). In Clarksville, Maryland, River Hill High School has equipped their entire ninth-grade class with wireless Ipaq handhelds, and in partnership with their corporate sponsor, Mindsurf Networks, they have been working furiously to explore the applications of these devices within a school curriculum ([www.mindsurfnetworks.com](http://www.mindsurfnetworks.com)). Palm, Inc. has initiated their own Palm Education Pioneers program (PEP), granting Palm computers to over 100 classrooms across the United States. In addition, the PEP program has supported the work of other researchers investigating handhelds in education, offering grants of up to 15 classroom sets to nine research organizations and school districts that will conduct independent studies on teaching and learning with handheld computers ([www.palmgrants.sri.com](http://www.palmgrants.sri.com)). Small-scale studies such as these need to continue and educators need to watch closely to understand the implications of ubiquitous computing and its potential pitfalls. Social studies, in particular, needs to originate its own set of studies identifying uses of wireless computing devices specific to the discipline.

***Pilot initiatives should be evaluated to ascertain the effect of ubiquitous computing on learning and teaching, and these findings should be used to guide future actions***

Prior to the full-scale implementation of wireless portable devices within schools, and before their use truly becomes ubiquitous, it is vital for educators to conduct research on the effects of handheld computers in the social studies classroom. Researchers often lament the gap between research and practice; in this instance, however, it is important for research to inform practice. Pilot studies examining the use of handheld computers or laptops can provide important information on the potential and pitfalls of ubiquitous computing in the classroom. The research studies should be specific to social studies, examining pedagogical approaches and effects on student learning, as well as other issues, including behavior management, technological support, and curriculum development. Case studies and/or ethnographies of classrooms and schools utilizing pervasive technology models could provide an in-depth look at how this new trend influences teaching and learning, the culture of classrooms, and the school climate. Interviews of students, teachers, and administrators could provide important information on lessons learned, problems faced, and the barriers and benefits of the new technology. Examining lesson plans, curricula, test results, and other components of teaching and learning could provide insight and concrete evidence of whether handheld computers influence teaching and learning. This research data can assist educators when wide-spread infusion of handheld computers occurs; the transition may be smoother if informed by research.

## Discussion

The concept of ubiquitous computing provokes numerous questions for social studies educators to consider: In terms of instruction, how will the potential of technology drive the pedagogy? Or conversely, will existing pedagogy drive the technology? This is important, because most educators feel that social studies teachers have not fully acquired newer, constructivist teaching strategies that emphasize a student-centered approach and use of multiple perspectives and critical thinking skills. Will equal access to resources change the status quo in social studies? Will technology force a change in the approach social studies teachers take? Also, how do we advocate for teaching historical thinking through the use of handhelds? As important, what issues will arise with the use of technology in terms of classroom management? What cultural factors need to be addressed, such as Internet safety? How do we help students understand the role of technology?

These seven conclusions emerged from a collaborative cross-content dialogue about the future of ubiquitous computing. Although the social studies representatives agreed generally with the conclusions, we assert that these seven points hold major implications specific to the social studies. These implications need to be discussed, reflected upon, and further explored. What was the central message that emerged from these seven conclusions? Ubiquitous computing does appear to represent the future of educational technology and it is vital that the social studies field is prepared for the potential these tools offer to education. As social studies educators, we must recognize and embrace the unique goal of our discipline: to foster the development of the skills, knowledge, and participation necessary for students to become good citizens in a democratic society. Beyond this, we must encourage teachers and students to study relationships among new technologies and society.

## References

Anderson, R. E., & Becker, H. J. (2001). *Teaching, learning, and computing: 1998 national survey. Report #8*. Irvine, CA: Center for Research on Information Technology and Organizations and Minneapolis: University of Minnesota.

Bell, L. (Ed.) (2001). Preparing tomorrow's teachers to use technology: Perspectives of the leaders of twelve national education associations. *Contemporary Issues in Technology and Teacher Education* [online serial], 1(4). Available: <http://www.citejournal.org/vol1/Iss4/currentissues/general/article1.htm>

Berson, M. J. (1996). Effectiveness of computer technology in the social studies: A review of the literature. *Journal of Research on Computing in Education*, 28(4), 486-499.

Berson, M. J., Mason, C. L., Heinecke, W.F, Coutts, C. B. (2001). Technology innovation: An examination of beliefs and practices of social studies methods faculty. *The International Social Studies Forum*, 1(2).

Bull, G., Bull, G., Garofalo, J., & Harris, J. (2002). Grand challenges: Preparing for the technological tipping point. *Learning and Leading with Technology*, 29(8), 6-12.

Cogan, J. J., Grossman, D., & Lei, M. (2000). Citizenship: The democratic imagination in a global context. *Social Education*, 64(1), 48-52.

Cuban, L. (2001). *Oversold & underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.

Gladwell, M. (2002). *The tipping point: How little things make a big difference*. Boston: Little, Brown and Company.

Moore, G. E. (1965, April 19) Cramming more components onto integrated circuits. *Electronics*, 38(8). Available: <http://www.intel.com/research/silicon/mooreslaw.htm>.

Saye, J. W., & Brush, T. (1999). Student engagement with social issues in a multimedia-supported learning environment. *Theory and Research in Social Education*, 27(4), 472-504.

Skinner, R. (2002). Tracking tech trends. *Education Week*, 21(35), 53-56. Retrieved from the Web June 25, 2002: <http://www.edweek.com/sreports/tc02/chart.cfm?slug=35tracking-c1.h21>.

Swan, K. O., Swan, G. M., van Hover, S. D., & Bell, R. L. (2002). A novice's guide to handheld computing. *Learning and Leading with Technology*, 29(8), 22-27.

Whitworth, S. A., Swan, K. O., & Berson, M. J. (2002). Handheld computing in the social studies. *Social Education*, 66(3), 174-179.

---

*Stephanie van Hover is an assistant professor of social studies education at the Curry School of Education of the University of Virginia. She serves as the faculty advisor and program coordinator of the social studies program. Her research focuses on the teaching and learning of history.*

*Stephanie van Hover, PhD  
Assistant Professor, Social Studies Education  
Department of Curriculum, Instruction and Special Education  
Curry School of Education  
University of Virginia  
405 Emmet Street South, PO Box 400273  
Charlottesville, VA 22904  
434.924.0841  
svanhover@virginia.edu*

*Michael J. Berson is an associate professor in the Department of Secondary Education at the University of South Florida, Tampa. He served as the 2002-2003 chair of the College and University Faculty Assembly (CUFA) of National Council for the Social Studies, and conducts research on global child advocacy and technology in social studies education.*

*Michael J. Berson  
Associate Professor  
University of South Florida  
813.974.7917  
Berson@tempest.coedu.usf.edu*

*Cheryl Mason Bolick is an assistant professor in the School of Education at The University of North Carolina at Chapel Hill. She teaches courses in social studies education and education technology. Her research focuses on teaching and learning with digital primary sources and distributed learning environments in teacher education.*

*Cheryl Mason Bolick  
Assistant Professor  
School of Education  
University of North Carolina at Chapel Hill  
919.962.9890  
cbolick@unc.edu*

*Kathleen Owings Swan is a doctoral student at the Curry School of Education at the University of Virginia. She is a graduate fellow at the Center for Technology and Teacher Education of the University of Virginia. Her research focuses on technology and the teaching and learning of history.*

*Kathleen Owings Swan  
Doctoral Student  
Curry School of Education  
University of Virginia  
kso3g@cms.mail.virginia.edu*