

**Held Together by Thin Air:
Pedagogy, Technology and New Media**

Robert Kalwinsky
Assistant Professor of Electronic Media Communication
Middle Tennessee State University
Murfreesboro, TN 37129
rkalwins@mtsu.edu

“Knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other.”
—Paulo Freire, 1993

Abstract

Experiences and perspectives are presented on the use of 802.11 (Wi-Fi) enabled devices as a tool for instruction and learning in a digital media class.

I. Introduction

Those of us who are educators strive to find and create landscapes for inquiry within and beyond the classroom. At the surface, our disciplines contain information and perspectives; these inform and enrich each other, and with active learning, shared world experience, observation, collaboration, and reflection, they become the knowledge and culture of critical thought.

Each innovation in technology brings a new opportunity to education. Some, like the Internet, are proven and widely used; others, like educational software, have had less success.

Still others are new and just beginning to see their first use.

In this article, experiences and perspectives are presented on the use of one relatively new technology, wireless, specifically 802.11 (Wi-Fi) enabled devices, as a tool for instruction and learning in a digital media class.

II. Overview

During the spring and fall semesters of 2003, the author taught a section of EMC 2500, “Survey of New Media Communication,” a course in the Middle Tennessee State University’s Department of Electronic Media Communication. For this year’s offerings, he developed and implemented a new course format, where students could create digital productions by applying learned theory, with a substantial wireless technology component. Three factors motivated the project: a strong belief, founded in the theories of education, communication, and cultural studies, that wireless technology would benefit the learning process in several important ways; the ability to incorporate sufficient time to study and learn the technology within the existing goals of the course, to prepare students for the intensive use of a technology with which they had no prior

exposure; and the suitability of the project as a whole to institutional resources, experiential opportunities, and departmental priorities.

The project succeeded on many levels.

III. Theory

In western culture, the confinement of the body for learning began in the Middle Ages (Foucault, 1997). In order to prevent loss, the text forms of the era, rare and expensive illuminated manuscripts, were chained to desks to prevent theft. Although technological advances like the printing press and xerography, as well as societal changes, including the democratization of education, have improved the culture of learning, practices related to confinement and surveillance permeated social processes and are still visible in modern classrooms, passive and strictly guarded institutional forms based largely on linear, one-thing-at-a-time cognitive approaches (Nunberg and Eco, 1996). Educational theory and practice strongly support breaking free of this culture and promoting collaborative and experiential learning environments, to supplement the linear with multifocal modes. Conditions conducive to deep learning¹ revolve around principles such as encouraging student-faculty contact and cooperation among students (Chickering and Gamson, 1987); supplying opportunities for cognitive apprenticeships (Bransford, Brown and Cocking, 2000); and emphasizing higher-order thinking involving real-world tasks (Chickering and Gamson, 1987). In this framework learning is not a matter of passively collecting concepts, but of constructing

¹ Deep learning: learning that promotes the development of conditionalized knowledge and metacognition through communities of inquiry.

conceptual forms that integrate and link learning to one's entire life experience. For 'deep learning', students should be able to apply and generalize what they have learned. And collaborative learning is the gold standard for developing the deep learning and critical thinking skills that are the focus of many second generation new-media e-learning environments: in a University of Minnesota analysis of over 160 studies, collaborative learning was consistently superior to competitive or individual learning, in terms of achievement and higher-level thinking skills (www.clcrc.com/pages/cl-methods.html).

Experiential learning in higher education generally follows one of two models: group experiential learning and individual experiential learning. Each has advantages and disadvantages. For example, group experience benefits from the potential for collaboration, but risks intruding on the environment and is not aligned with our cultural norms. Individual experiential learning provides a more tailored experience, but with less potential for collaborative or didactic adjuncts. Wireless technology may have the potential to support experiences with the advantages of both experiential approaches and none of the disadvantages. It encourages reasoned approaches that are relatively autonomous yet also incorporates group dynamics, while offering the buffer of quick connection to the professor in case of problems. It fosters the shift from individual to group cultural forms. And by definition, wireless technology allows us to communicate as a group without restricting our physical location and by offering temporal flexibility. As noted earlier, a group of learners and their new media learning tools constitute a distributed system which self-organizes in a different way than a group of learners

face to face. Among other aspects, putting students into groups "...compels them to explain their thoughts to one another with several advantages: on the one hand, verbalization requires reflection (upon one's own thoughts as well as upon what the others are saying) and, on the other, students tend to listen more openly and with more interest to their fellow students than to the teacher (Ernst von Glasersfeld, 2001)."

Communication approaches derived from work by new media scholars also augmented the active learning process. As Manovich (2001) and Negroponte (1996) have noted, the generations that grew up with computers have been exposed to the gradual elimination of metaphoric tropes, by default concentrating on metonymic forms. This means that in introducing information geared toward creativity, it should be theoretically easier for this target audience to learn via linkages rather than the abstractions of metaphoric concepts. Examples of metonymic process include Steve Johnson's work tracing spatial memory from Simonides to Alan Kay's Windows. Mind maps also partially align with this linkage concept. These sorts of adaptations worked well in helping relay complex information to the class, particularly in the early, more didactic phase. Having used this form of linked learning before, it had already proven its beneficial nature; in tandem with wireless and collaborative learning, however, the results were far more impressive, reflected in terms of very positive student evaluation and feedback, greater demonstration of critical thinking skills, and vastly improved grades. (For the two classes, students improved scores 16 % and 18% over their prior scores, and approximately 30% over performances by others from prior years).

In summary, the author used technology in collaboration with elements of educational, communication, and cultural theory to enhance learning and implementation of concepts in a digital environment. Technology has often promised to benefit education, and it often has. Telephone, e-mail, photography, and xerography are a few of the technologies that support collaborative or experiential learning. The attraction of wireless technology was the prospect that it could support a digital learning environment that was at once collaborative and experiential, fostering deep learning, while including important aspects of classroom pedagogy as well.

IV. Best Practices and Cultural Modification

Best practices were an integral component in designing and implementing the collaborative process, but with some modifications. Best practices are to a certain extent monolithic, and situations require variations based on cultural norms.

For example, best practices encourage social learning, but it would be a mistake to simply begin with collaborative efforts. Rheingold (2003) talks of the use of wireless devices among Japanese and Finnish subpopulations, and notes a) that both are populations used to living in very close proximity to one another and b) that they have embraced PDAs to such an extent that specific forms have evolved. Japanese clothes are designed to hold PDAs, and Finns use the term 'kanni' to talk of the devices, a word that essentially means 'hand:' they are that integral to their communication forms. PDAs are presently not as vitally situated in the United States. From a cultural studies perspective, it makes sense that these

components will not be as strong in the U.S.: ours is not a sociocentric culture. Not only do we often live in suburban dwellings, largely separated from contact with others, but our cultural grounding is in the individual². So what obtains in other cultures does not necessarily translate easily into our own. The consequence is that care must be taken in developing the skills and formations requisite for best practices and use of wireless in the classroom, including creating sociocentric forms that slowly create comfort with what is essentially a group process when the individual is more sanctioned and autonomy ascendant. Gradual introduction of these forms is more attuned to students' needs, and allows them to comfortably accommodate a new learning paradigm.

V. Implementation

The first half of the course was primarily didactic and used linear models to establish the basics. We began with key topics ranging from Tufte to transistors, explored applications like Photoshop and DVD Studio Pro, and grappled with Negroponte's views concerning interface design and social change. From the start, however, student use of wireless devices was woven into the lecture format, in part for its value as an educational tool, but also to give students practical experience with the technology in preparation for the

² Uses will also vary structurally: while the Finns use PDAs to literally communicate with their buildings, given their appreciation and use of architecture and their concomitant comfort with it, in the U.S. we do not have that deep affinity for physical structures. Our only truly national film genre, *film noir*, is rife with examples of characters being dwarfed by the buildings that surround them: our legacy is the individual in the open spaces. Thus we concentrate on communication between individuals, which is not necessarily the sole use of this form in other countries.

projects to come. For example, students used wireless devices to look up unfamiliar concepts during class, which served to solidify baseline knowledge and gave students assurance with key concepts while simultaneously allowing them to become familiar with the technology. Wireless technology also provided a good interface to just-in-time Internet information, where ideas can be rapidly situated and explored. This often meant adding depth to pedagogical efforts as interested students delved into topics. Digital media in general, and the Internet in particular, creates a significantly different context for student-faculty communication than the traditional classroom, one with significantly less power differential (McCain, Maxwell, 2003). There were many occasions where the students were the teachers. Wireless use for rapid information retrieval in the classroom also brought to life an important issue related to electronic media: the surfeit of information and questions of validity. This informed many small group conversations and research, and fostered critical thinking skills.

As technical skills improved, a more Socratic approach developed, leading to full use of the 802.11b and PDAs within the context of an active, engaged learner using critical thinking and self-directed learning strategies. The work group paradigm, and later the formation of virtual teams, began the process of decentering the instructor. Because student-faculty contact was fostered initially, beneficial aspects remained throughout the process.

The first half of the course fulfilled several objectives. At the course midpoint, students had a good basic understanding of electronic/digital media, they were very comfortable using technology, and the group work paradigm was firmly in place.

Wireless contributed significantly to the realization of these objectives. The development of groups necessitated a careful, step-wise progression, and wireless itself assisted with this transformation, since it ensured the development of good interpersonal and group skills in its utilization. Given our cultural constraints, the difficulty in sustaining heterogeneous, short-lived groups seemed daunting, and wireless was also significant in sustaining the groups. Another tool fostering collaborative work was an emphasis on critical thinking. As an inductive process it leads to an emphasis on wider concerns, leading from the individual to the whole. Again, wireless projects are tailored for this dynamic as they necessitate conceptualizing beyond one's immediate task to larger, interactive responsibilities and problem solving situations.

Later efforts also benefited from wireless as well as other techniques. For example, in terms of time on task, most projects required significant scheduling, interaction with important contacts, and production deadlines that necessitated effective time management and production efficiency; wireless helped provide that and added some flexibility to scheduling. Group formations also ensured that any laggards were quickly confronted and pressured to become task oriented. To develop skills in articulating, reflecting, and exploring, students were required to keep a journal. Along the way, accidents were encouraged, and people were deliberately reassigned to different positions to foster meaningful growth and exploration of talents. These all interwove into the best practices of active learning and fostering respect for diverse abilities as well as diverse ways of learning.

VI. Projects

Students in Survey of New Media have a various career goals and interests, including journalism, education, administration, television, and information technology; within this context, students were able to participate in a course project related to their particular interests. The instructor drew on experience from previous offerings of ECM 2500 to ensure that projects were demanding, but attainable.

Project 1. Mock Newscast.

In this project, students created a mock newscast. Goals were for students to understand the technical requirements of broadcast news and to confront the difficult question of objectivity in reporting.

Using 802.11b allowed students to provide alternate commentaries within the news program. Wireless laptops, PDAs, and cameras allowed synchronous coverage of the news from several locations. The feeds were sent back to the classroom and edited for broadcast. The experience of negotiating spatial and temporal concepts in a real life situation was an epiphany for many students: they saw first-hand how perspectives differ across time and space. For example, wireless technology enabled something difficult to include in standard news broadcasts: multiple points of view, through interactive thumbnail interviews of people with different perspectives and different spatio-temporal relationships to the news event.

Project 2. Mapping the wireless campus: war chalk and webpages.

The goal of this project was to map wireless access in two ways: as a standard map delivered on a developed website (using code as well as Dreamweaver), and directly at the access locations, with chalk markings. The term “war chalk” is an allusion to the Depression era practice of placing chalk icons on sidewalks near houses to designate homeowners who were likely to offer free food, exchange food for work, or be hostile to strangers, and so on. Similar marks were already used in Nashville to characterize wireless access points and hotspots near businesses

Web development and coding were readily accomplished – the students who joined this group tended to have sophisticated skills in web coding, if not design. Applying ideas from experts such as Tufte to design was one collaborative effort that had interesting results, and in terms of production was the area that offered the greatest creative development. On a practical level, students expected this project to be straightforward and mechanical, and they were surprised at the cultural clashes and varied negotiations that arose. Conversations took place with the campus Macintosh users group, the Instructional Technology department, and administrators; compromises had to be made, particularly surrounding war chalk. Among other valuable experiences, students came to understand the need for sound, professional, and diplomatic communications when dealing with administrators and others in positions of power. It also provided a critical forum for feedback, active learning, and an implicit high expectation in performance, for they were not interacting with other students but powerful administrators, and

communications had to be sound, professional and diplomatic.

Project 3. Club Write!, a production for Nashville Public Television Educational Services

Everyone took part in this month-long project. We were fortunate to have an invitation from Nashville Public Television to produce an edition of Club Write!, an instructional program for grade school students distributed by DVD through NPT Educational Services. This gave us the rare opportunity to create a substantive product, and carried with it genuine responsibilities and challenges. We used wireless devices to help with logistics before and during the filming for the DVD. This allowed students at potential filming locations to communicate with each other and gather quickly when conditions at one location were right for shooting. Wireless thus provided what would have been more cumbersome and expensive with older technologies such as two-way radio and satellite phone communications, and the underlying connectivity of the internet made distance a less critical factor.

This project focused on cognitive apprenticeships, where thinking was more important than skill sets. While the students had a textbook-based knowledge of the technology, they quickly learned that this was not enough. Content transfer did not always work as explained in the product literature, and textbook understanding of production requirements such as the lighting of talent, while helpful, did not carry over to practice smoothly. There were a substantive number of condition-action pairs to solve (Weigel, 2002) that helped create a complex knowledge ecology, again highlighting active learning, time on task, collaboration, and diverse talents.

The interest in a nonacademic production was deliberate. The prior class attempted to make a DVD for the University, a DVD that is still in progress -because a university is a far different cultural entity than public television, even though we had the same technological access. As Wenger, McDermott and Snyder (2002) have noted, universities are culturally based on collegial relationships, not reporting relationships. And thus there is simply less immediate, task-based synergy at a university. At public television, units cooperated to ensure product delivery. At the university, there was less structure, which allowed for discovery and research but minimized short-term, task related activity. The disconnect is not something to be broached, however; a university is a place where we can imagine what can be, important in negotiating theory and policy. But it does create very different environments for production.

V. Salient features and outcomes in terms of pedagogy:

Anonymity is an important aspect of wireless technologies. Many students have problems with self-esteem. Anonymity permits an ease in donning power-based positions, unthinkable with some student's standard persona. One student used her facility with Sim City and her avatar to direct a wireless news production. Normally self-effacing to an extreme, her directorial debut was met with enormous success and encouragement from a team that was unaware of her participation. This event fostered her self-confidence in an overt fashion. Likewise, students whose appearance played a positive part in their social ease and assumption of leadership roles often found less accommodation when these attributes were not evident. Most individuals found the use of anonymity significant in gauging untested

abilities and interests, aligning with the best practice of engaging students not otherwise engaged (cte.udel.edu/ccl.html). Further, as with other aspects of the collaborative effort, anonymity's partial safety net helped foment the trust that is so essential for collaborative work as well as identifying new forms of diverse talent that were heretofore concealed.

There is a problematic aspect of wireless anonymity, however, that emerged. Feedback can be brutally honest when it is anonymous; group formations also lend themselves to development of multiple peer assessments that can be harder to handle than individual interchanges. Many students are not prepared for the extensive feedback, neither in level nor volume; (interestingly, the foreign students were generally more adept at negotiating this with self-assurance, again indicating cultural influences). The best practice of student-faculty contact takes on unforeseen dimensions here. This is one arena that requires careful negotiation and often therapeutic interaction on the part of the instructor, but one that is enormously fruitful given the necessity of this level of engagement as one enters adult relationships and learns to step outside of oneself. Lastly, it is also an example of some new best practices that pertain to wireless even more than e-mail or discussion groups: rules need to be set limiting offensive language and emotionally destructive interactions, and discussions need to ensue exploring the need for these forms, so that they aren't simply another set of faculty commandments but concepts negotiated between students and faculty.

Another aspect of student-faculty contact and prompt feedback, but rarely mentioned, involves the somewhat tailored interactions required at various times based on the differential in skill level

among students. Realistic (i.e., partial and contingent) support is essential given the differential acquisition of skills, as long as it is also constructive and timely (Garrison and Anderson, 2003). With differential negotiation of stages, it was rapidly apparent that judicious and immediate support is essential to help during stressful periods. And support was not only derived from faculty-student interactions. Again, wireless fostered interactions, and on many occasions students assisted those less skilled, encouraging acquisition of skill sets for the entire group, both for practical reasons and for reasons emanating from the collaborative context.

Case-base studies proved essential. In particular, cases that challenge norms help develop critical thinking. A good example is the case of Qube and Qube II interactive television projects (Fidler, 1997), which not only requires critical thinking to illuminate the reasons for their lack of success, but also empowers students with the realization that extremely successful businesspeople and researchers were responsible for large-scale failures. Our culture, like many others, frames failure as akin to tragedy (“the thrill of victory, the agony of defeat”). However, case studies fostered the concept that while success is important, nonetheless growth generally entails some failure as part of the process. This was a significant means of empowering students as they interacted in groups, lessening the fear of failure in front of peers, modifying the stress of immediate feedback, and making high expectations important but less daunting.

Lastly, one comment about the influence of the institution itself on this process. Big-ten universities have various social outlets to enable student interaction, such as the rathskeller. At a commuter university, or at most other institutions,

financial responsibilities preclude such offerings. Yet these interactions are important in collaborative productions. You can not simply be a technophile and create inspired works³, you need the input of other perspectives. Yet students often work full-time while attending school, so that social interaction is spatially and temporally limited. With wireless, however, a form of social network evolved that overcame many of the spatial and temporal limitations of full-time workers. The ability to communicate via wireless, both synchronously and asynchronously, at convenient places and times, created a strong social bond among students, permitting both social and academic exchanges that improved skills in critical thinking and metacognition, ultimately enriching the digital productions and adding diverse components.

In terms of outcomes, the quality of the projects, which were excellent, and the improvement in general interest, understanding, abilities, and grades were the most rewarding products of this effort. A great deal was unexpected, including the many discussions involving critical thinking. As one example, the students, having read Manovich, discussed how creativity itself has changed due to the utilization of applications like Photoshop and DVD Studio Pro, and they used wireless to communicate their thoughts when not in the classroom, as well as flesh out information to support their arguments. They noted that most

³ A prime example is Rheingold's discussion of DoCoMo (of Nippon Telephone and Telegraph), the only successful 3G wireless company in Japan. They credit a large part of their success on hiring Mari Matsunaga, whose specialty was launching magazines and was not a technophile. But in concert with technophiles, she helped imbue the product with people-oriented characteristics (Rheingold: 22-23).

applications are menu based, with creativity often meaning selection, and discussed the implications of incorporating mental processes that are less their own and more a selection from someone else's sensibilities – and debated if this was truly different from past forms of creativity. They also suggested ways this new form of creativity drives media content (DVDs, iconic table of contents, thumbnails) and transforms social practices. These sorts of interested dialogues were far superior to former normative interactions during prior classes. And wireless was integral in this phenomenon. While theoretical concerns formed the bedrock for this effort, wireless technology provided the structure and the process.

Ultimately, the introduction of wireless required an evolution and adaptation to both the technology and the form of interactions required to attend to collaborative work in producing quality digital productions. It offered the deeper, tacit knowledge that comes only through acting on and with phenomena, and it challenged standard approaches and hierarchies. Cultural forms impacted when and how best practices were used and learning structured. A new form of learning emerged that engaged best practices by the system grounding that wireless necessitates. Using wireless in the creation of digital media forms serves many components of critical thinking as a matter of course: accurate assessment of conditions, the ability to efficiently apply that assessment when developing a plan of action, the technological skill to effect the action, and the ability to evaluate and reassess during the process itself. The future of wireless in this educational context will be interesting to note, as well as the effects it creates in the cultural environment and the ways the cultural

environment feed back into its metamorphosis.

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