

## Making Video Games in the Woods: An Unlikely Partnership Connects Kids to Their Environment<sup>1</sup>

**Abstract:** Video games and computers have been derided as "inside" technologies that pull kids away from the outdoors. They are said to cause kids to connect less with, and value less, their outdoor environments. Rather than fight the pull of these inside technologies and their attraction to kids, we have developed a handheld outdoor GPS-enabled video game platform that attempts to build in the lure of video games and online social spaces, and connect them with real places. Kids play a place-based hiking video game, and then help redesign it for their peers. This paper examines the successes and failures of a three-year case study of incorporating place-based Augmented Reality games at a deep woods camp for boys.

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### ***Paper Objectives***

This paper examines the successes and failures of a three-year case study of incorporating place-based Augmented Reality (AR) games at Flying Moose Lodge, a deep woods camp for boys. It is part of a larger study that investigates how the use of locative technologies, specifically Augmented Reality Games on Handhelds (ARGHs), can bolster a connection to lived environments -- a *sense of place* -- through an immersive deep woods hiking game. The general idea of an AR game, as the *Local Games Lab* (2007) uses it, is built on the constraints and affordances of the AR game system, merging physical space with handheld computers with Global Positioning System (GPS) units. For players, game space is real space, tracked by GPS and plotted onto a handheld computer (Klopfer & Squire in press). The space that they move through is somewhat familiar -- they know it as a place with recognizable and culturally familiar

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features -- but the game reveals added or augmented content that is meaningful within its frame. In the activity of *playing* an augmented reality game, players move their own bodies (instead of digital avatars) through culturally significant real-world environments collecting data to solve problems and attain goals. Over the past few years University of Wisconsin, Harvard, and MIT researchers have demonstrated effective learning in ARGH experiences (Squire & Jan, 2007; Klopfer & Squire, 2003).

### ***Project Objectives***

The game was implemented at the camp for a number of reasons that appealed to both the camp owners and to the author. Foremost, it was a way to tie my interest in using the computer as a learning tool to my passion for informal outdoor education. Bridging seemingly disparate cultures (those of gamers and outdoors people) sounded like an interesting challenge, and for the camp there were multiple reasons to combine the two. First, because the appeal of good video games is very high among the population represented by the campers (boys, aged 10-16); second, because the camp is always looking for ways to engage campers in the outdoors more; and third, because the rising cost of vehicle fuel raised the need for more trips to be closer to camp. This also fits in with a burgeoning environmental campaign to focus more on meeting needs with *local* goods, which, with the flattening of the world (Friedman, 2006), raises the importance of highlighting the local.

### ***Theoretical Framework***

There is a connection between sociocultural learning and place-based activity, (Vygotsky, 1978; Leon'tev, 1978; Engeström, 1990; Wertsch, 1998; Suchman, 1987; Lave 1988; Flor and Hutchins, 1991; Pea 1993; Dewey, 1910; Lave & Wenger, 1991), and communities often take into account elements of place. Lave & Wenger (1991) look at communities of practice and assert that identity construction is closely tied to activities people are engaged in, bounded by the cultures of their communities. What we like and dislike, our opinions and deepest heartfelt values, are based to a large extent on the activities and practices of those who came before us and those who currently live and interact with us. Jerome Bruner (1996) notes that we share those values, as "All viable cultures make provisions for conserving and passing on their 'works,'" (p. 24). Using *culturalism*, Bruner emphasizes the informal interchange between institutions and individuals in the transmission and modification of culture. One such medium is place.

Places hold meaningful embodied stories. Gruenewald (2003) calls for a reinvestment in place-placed pedagogies "so that the education of citizens might have some direct bearing on the wellbeing of the social and ecological places people actually inhabit" (p. 3). Ellsworth (2005) examines pedagogically charged environments outside classrooms that open our aesthetic to teaching and learning in ways "largely unexplored by the official literature of educational research" (p. 9), spaces that "speak to and about pedagogy indirectly through design -- a means that reaches beyond the limiting scope of language" (p. 10). The "processural paths" through environments offer new pedagogies of

sensation in our experiences -- not "as having bodies" but "*as bodies* whose movements and sensations are crucial to our understandings" (p. 27 emphasis original).

A problem in creating powerful pedagogical places, Jay Lemke (2005) notes, is expense; he looks instead to video games and digital space. Game designers do what Ellsworth is talking about through the creation of teaching and learning spaces. Jenkins and Squire (2002) note:

Game worlds are totally constructed environments. Everything there was put on the screen for some purpose -- shaping the gameplay or contributing to the mood and atmosphere or encouraging performance, playfulness, competition, or collaboration. If games tell stories, they do so by organizing spatial features. If games stage combat, then players learn to scan their environments for competitive advantages. Game designers create immersive worlds with embedded rules and relationships among objects that enable dynamic experiences. (Jenkins and Squire, 2002: 65)

Augmented Reality games can provide an effective structure to create such pedagogical paths of learning that is closely and, often, inexpensively tied to real places.

## **Methods**

The methods of research included observations, videotaped interviews, written journals, and software iterations of the game as it developed. A form of Discourse analysis (Gee, 1992) was employed to ascertain participants' engagement, involvement, and understanding of their social/working communities. Participants over three summers were comprised of twenty 11-15 year-old boys and five 19-30 year-old men, as five distinct groups ranging from three to six members, each including a counselor. Most were middle- to upper-middle class Caucasians, whose parents paid ~\$2500-\$5500 for their son's 2-7 week camp experience, although a few attended at steep discount through a camp scholarship fund.

In 2005, I approached a group of five experienced campers with this idea, handed them a GPS unit and notebook, and gave them the task of creating a game. They spent a four-day hiking trip mapping out potential game space, creating potential characters, and building a loose game narrative for the ARGH. In 2006, three sets of campers played and redesigned the game with GPS devices and handheld computers, including: a Bluetooth-enabled Pocket PC handheld computer (PDA), a Bluetooth GPS unit, and, due to concern with sending delicate and expensive electronics into the woods with 10-16 year-olds, a waterproof, shock-proof, dust-proof, child-proof, floating, protective case (see Figure 2). In 2007, the iPaq and GPS receiver were replaced by a Pharos Traveler handheld computer (with integrated GPS support). A standard GPS was also sent on all trips for mapping out interesting locations and routes for future games, and to avoid getting lost if the PDA/GPS system stopped working, which happened regularly.



Figure 2. Hardware used in implementations from 2005-2007.

Procedures evolved with each implementation in a series of design experiments (Brown, 1992), but essentially followed a pattern. After obtaining Human Subjects releases from parents and campers, participants were given a short tutorial on the hardware and game. They were told that they are "beta-testers" of a new and experimental game, and were asked to critique it and keep a group journal of suggestions for improvement. They then packed and embarked. Because the game takes place throughout an already-established 4-day trip, and campers already have experience with 4-day trips, the ARGH builds on prior camping and hiking skills. They followed a GPS-triggered game narrative that unfolded as they hiked to locations in a 16 square mile area (see Figure 3) mapped onto the PDA. The game employed a simple linear narrative because of high potential for wilderness and technology complications.

When 2006 and 2007 participants returned to camp after four days, they were individually interviewed, using a script of 13-26 questions, with appropriate follow up questions. Interviews were captured on video, usually isolated from others -- although at a small base camp that was not always possible or practical. Interviews ranged from 17 minutes to an hour in length, and were analyzed for emergent themes.

## Issues

The developers had promised a stable version of the game software by March 2005, but the software was not delivered until May. Initial testing revealed that it was extremely difficult to create a game using the game editor, and many bugs emerged that frequently crashed the game engine, making extended play nearly impossible. A July update to the software fixed some of the problems, but it became clear early on that the technology was not yet ripe for use at a camp where the nearest electricity and internet access was miles away. Instead, I focused on creating a camper-designed place-based story that I could port into a game when the technology matured.

As noted, five campers built the first iteration of the game in July of 2005. They came up with a number of characters and specific places to visit, but because they had not played an AR game, they did not fully understand what was possible or even what to do. Nonetheless, before the following summer, I used their story data to create *Wild Moose* (Martin, 2005).

The first group in 2006 started their trip following the *Wild Moose* game narrative, but on the first day it rained heavily, and although the handheld computer was in

protective case, the Bluetooth GPS unit shorted out in the unprotected pocket of a soggy eleven year old. It did not recover, and a replacement that arrived the following week was ordered, but the remainder of the four day game had to be played in manual mode (without GPS triggering of events). Fortunately, the trip was lead by an enthusiastic Australian counselor, and with his lead, the campers wrote a completely new game narrative called *Mitchville: Where the War Began*, based loosely on the ideas behind the 1984 movie *Red Dawn*, and John Marsden's (1995) *Tomorrow, When The War Began*. By the time the replacement GPS arrived, I had ported the new narrative into a game, and successfully tested the initial entry trigger of the game.

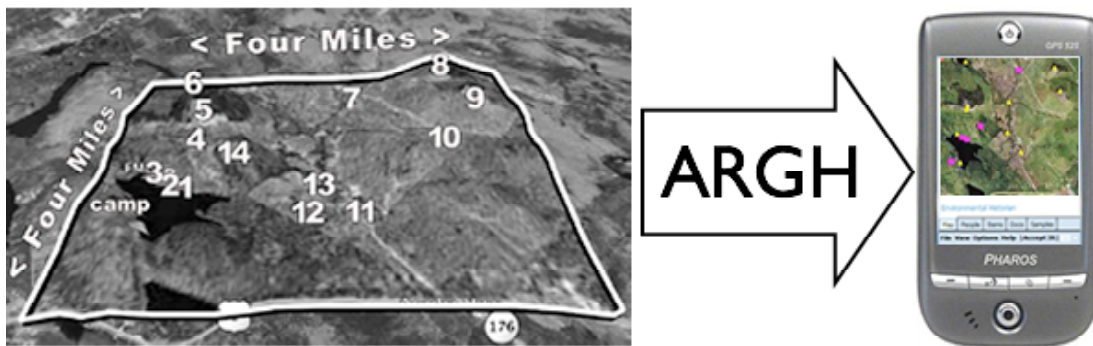


Figure 3. The ARGH *Mitchville: Where the War Began* took place in a 16 square mile area of mountains and woods mapped onto a GPS-enabled PDA. Players hiked to subsequently numbered locations that triggered bits of the game narrative.

The starting point was familiar to participants -- at the base of a trail that they had all hiked. The game narrative unfolded message by message throughout the trip. At the first trigger spot, the handheld computer became a Star Trek style communicator and displayed an urgent "live message" from the assistant director of the camp (this paper's first author) announcing that camp had been taken over, and instructing them to get to the top of the mountain and await further contact. In order to get around the fact that the handheld computer is not a communication device, the narrative cleverly framed that the assistant director's communicator was reportedly damaged in the melee, so one-way communication is the only option. As the trip progresses, they got more clues that helped them reconstruct the "real-time" story of what happened at camp -- and better understood how they could help.

The narrative reveals that a rival camp for rich kids took over camp to use the lake's "crystal clear water" for a Grey Poupon mustard factory so they can have tastier mustard on their sandwiches. The spring-fed lake is a big source of pride, so participants enjoyed and joked about the plot. "Saving" the camp and thwarting the invaders' plans involves climbing three mountains to triangulate and decode a radio signal from a transmitter that they are using to communicate with their minions. (The logic of how triangulation of a radio signal helps in decoding it is unclear, and provided humorous conversational fodder among participants.)

The second group in 2006 was able to play the game for two days, but the morning of the third day encountered a software crash that disabled the computer. The counselor had run through the game in manual mode, and was able to lead the group through the basic ideas of the game for the rest of the trip.

I was set to personally lead the third group in 2006, but was called away for a camp emergency, and missed the first six hours of the trip. In that time, the handheld computer was repacked too tightly into its protective case with the backlight button pressed, effectively draining most of the battery. Because I knew the narrative well, we also used the handheld computer sparingly, relying on the sturdier standard GPS.

In 2007, a new model of handheld computer with integrated GPS solved the problem of protecting the hardware from the elements, and initial tests of the battery life promised good performance. However, heavy usage of the handheld computer (backlight on) by the counselor on the night before the first trip, and by the campers the first night again depleted the battery half way through the trip.

On the second trip, the counselor was given three fully charged handheld computers with the game loaded, and was trained beforehand on how to swap them out in case they died. The first lasted two and a half days before the battery died. The second lasted six hours before the game engine crashed and corrupted itself. And the third was able to guide them through to the end of the trip.

### **Results: Successes and Failures**

Regardless of the technical and implementation problems, participants reported that they enjoyed the game experience, and all but one felt it should be continued at the camp. The main findings of the project, discussed in more depth in another paper (Martin, 2008), indicate that the augmented reality game gave trips an unfolding narrative that motivated players' movement off-trail, while the GPS-tracking reassured them of safety. As a result, the off-trail movement reframed participants' perspective of place and their understandings of self -- both as individuals and in relation to the camp culture.

### **Locative Device Elements**

Although the game hardware failed frequently, the GPS units performed reliably. Most participants explicitly praised the ability to track one's movement, especially on trails that are not well established or marked. Follow well-demarcated trails or city blocks is easy, but moving through deep woods on primitive trails that are not accurately mapped out is often frustrating for campers, leading to common questions: "When will we get there? What time is it? How far have we gone? Are we there yet?" The GPS provides these answers as well as "How *fast* are we going?" and "How *high* are we?" -- this was mentioned as a fun element on each of the trips.

Another attitude and skill that locative technology encourages, and provided immediate rewarding feedback for, is exploration. By more closely charting the movement of the hikers, it added value and meaning to the map. Instead of being *somewhere* on the trail between start and finish, kids could immediately locate themselves on the map, and more quickly identify real world landmarks on the map. This

caused campers to gather together over the map sharing their opinions and reflecting on their hike. Because the land had been clear-cut six years previous, and the old topographical map indicated trails long decimated and planted over by logging, many portions of the 'marked trails' were thick with 5-7 foot tall Spruce trees -- making landmark reading difficult, and travel tough. The reassurance that the GPS provided here was invaluable.

## Game Elements

One of the biggest challenges in the research was working with the game hardware and software. In the original vision of the research, the game was to be revised somewhat each trip, so an evolving and constantly 'fresh' game could be played. The harsh realities of the research conditions continued to fight against that idea. From issues of buggy software to the difficulty of getting to town to download new versions, drivers, and work-around ideas, to simply having time to update, troubleshoot, and solve problems -- it was clear early on that goals would need to be more modest.

Additionally, other than the first revision, it was difficult to get the players to come up with, and write down, new ideas for the game. Counselors and campers both reported that they talked about ideas as they played the game, but what they recorded and reported back were most often ideas on the user interface and content type (e.g. more video, make it 3-D, etc.) rather than suggestions to drive the narrative forward. This could be because the first group did such a good job, as the following comments suggest.

Camper 1: I liked the espionage. Actually that was really fun. ... we have no evidence to actually disprove the game, so because of that, it was kind of fun.

Camper 2: you actually have imagination because it says things that are going on that aren't really going on, so it's just kind of neat like that. So you can imagine what's happening in the game instead of just hiking.

Camper 3: On a regular trip you just want to get to the next campsite, but on this you have to get to this mountain to stop the radio signals then you have to go to this one and that one. ... so you could finish the game and see what happens next.

Alternatively it could be because the campers did not want to challenge the authors of the first revision.

Counselor 1: [The first 2006] group came up with that whole story and that was really good. That was pretty impressive, I don't know if I could top that.

It could also very easily be because writing is a school activity, and they were at camp -- not school. Regardless of the reasons for not coming up with as many new ideas as I had expected, the technological realities of the camp environment also would not have supported a weekly or even bi-weekly game revision.

However, as an interesting side note, multiple members of every trip reported diligently adding waypoints to the GPS device in order to further map out the land for future trips. Perhaps if the games were able to be revised and edited on the trip like a mobile Wikipedia page, the engagement in redesign would be enhanced. The next version of the game software will begin to explore this possibility.

## Cultural Elements

The game narrative offered cultural points for the participants to develop, using their experiences as roots of jokes and cultural norms they taught others in camp. As campers learn these narratives, they become further acculturated into the camp. Its culture follows them on their trips, and influences both dialogues and activities. Naturally then, it shows up in game designs.

Camper 1: we kind of felt like we need to hike this because, you know, camp's in trouble, [rival campers] are taking over, "Oh My God!" you know, it's kind of fun that way.

Camper 5: During the last day we looked at it as a sort of battlefield.

Counselor 1: I think it works well at Flying Moose because we have all this material to go with it. Everyone's already bought into, oh you know, [the rival camp] is bad, and stuff like that.

One counselor reflected that the game could further draw on the camp's role in the culture of the area over the past hundred twenty years:

Counselor 2: So we're part of the history of this area, and I feel like the game would be a really good venue to make the campers feel a part of that, because they already feel that way about [the camp], with the pictures up in the dining hall -- but to feel that way about the land around it, and that they're part of an even longer history than just FML. There were people here before doing different things and there will be people here afterwards who will be interested in what the kids are doing right now. They are part of it.

Camp culture was also touched with the introduction of this technology to an 'unplugged' woods camp that promoted traditional camping skills -- such as the use of an axe, map, compass, and the building of its own wood/canvas canoes. A number of campers mentioned this in their responses, but framed it as an indication that the culture of the camp is changing. One was apologetic for the GPS and game technology, comparing it to a flashlight as 'not really' technology because it was battery-operated. One camper, however, strongly felt that it was intrusive and counter to the mission of the camp, taking away from learning more important skills. When asked if the AR game should be continued, he responded carefully:

Camper 8: For your thesis?

Interviewer: Not for my thesis; for camp here.

Camper 8: Well, no, like I said, I don't think the GPS has its place at this camp. Like [on two other trips], it's just normal hiking on trails, and off trails, but somehow it seems more fun without a GPS. Having a compass and a map does add a challenge too. It gives you a lot more skill. A GPS could solve the problem right now but if you were caught in a situation in which you didn't have a GPS you couldn't use a compass.

This exchange is interesting to unpack and examine against others' responses, which largely indicated both enjoyment of the game, and appreciation of its motivating elements in expanding the boundaries of their comfort level. The conflict is especially notable because earlier in his interview, he indicated that he both enjoyed the game, and felt it made the trip tougher:

Camper 8: It was little more -- I guess you could say 'hard-core.'

His counselor on the trip summed up the group's exploration with this:

Counselor 2: At that point, we'd bushwhacked that whole thing, walked along ATV trails and bushwhacked, and found our own way, and they were completely comfortable with it. [They'd say] "I think I see some blue!" and we walk over there and it wouldn't be the pond, it would be somebody's truck. But there's that willingness to say "here's a path that we know will eventually curve around and somehow get to the lake -- let's \*not\* walk on that. Let's go this way and try it out, and even if it's not the right thing, it's still fun and they still had that get-up-and-go.

## **Conclusion**

Space and place shape learning. As Clifford Geertz comments, "no one lives in the world in general" (1996: 262). Place-based technologies like *GPS*, *Google Earth*, *Google Maps*, and *Google Local* feed the need to better understand our relations to space and place, and usher in a world of technologies that further situate us in *our places* as well as presenting places of others. Playing AR games offer opportunities to interact and connect with place. But learning requires more than content; it requires active participation in the practice of content. In "Pedagogical Praxis," Shaffer (2004) suggests new technologies offer opportunities of Deweyian-type laboratories where "the focus is on learning and the conditions and processes that facilitate learning in technology-rich contexts writ large" (p. 1402).

Cultural, Technical, and Environmental issues plagued this study. A lack of technological familiarity, insufficiently weatherproofed hardware, beta software, and supervision matters during multiple four-day research sessions forced significant changes from what was originally envisioned. Despite these issues, a number of interesting and significant conclusions can be drawn.

When one considers video games as learning environments (Gee, 2003; Kafai; 1995; Shaffer, Squire, Halverson, Gee, 2005; Turkle, 1995), it becomes clear that *designing* games, especially AR games, can be an exceptionally powerful learning experience. Designing an AR game not only situates a person more deeply in a place through the embodied understanding that is needed to design a good game, but also offers the agency that Maxine Greene (1978) argues is necessary in learning -- the ability to "see, shape and transform" one's world at a tangible level (p. 193).

Just as the entry point for participation in online worlds has become increasingly attainable -- evolving from the early days of command-line interfaces and online bulletin boards to the point where hundreds of millions have personal, customized online identities on MySpace, FaceBook, and elsewhere. Mobile place-based gaming will become as reliable and accessible as the mobile phone. Research experiences like this one that examine the design of AR games (Martin, J., Jan, M., Mathews, J. Holden, C., 2008; Squire et al, 2007) has, and will continue to, propel the technology forward.

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