# Alternate reality games: a realistic approach to gaming on campus?

Elizabeth A. Evans   University of North Carolina-Chapel Hill, Chapel Hill, NC, USA
Laura Christopherson   University of North Carolina-Chapel Hill, Chapel Hill, NC, USA
Brian Sturm   University of North Carolina-Chapel Hill, Chapel Hill, NC, USA
Emily King   University of North Carolina-Chapel Hill, Chapel Hill, NC, USA
Chad Haefele   University of North Carolina-Chapel Hill, Chapel Hill, NC, USA

## ABSTRACT

In January and February 2010, a project team at the University of North Carolina at Chapel Hill ran the University's first alternate reality game (ARG) designed for learning. This paper describes the design of the ARG and offers suggestions for creating, marketing, and running an educational ARG.

## Categories and Subject Descriptors

K.3.1 [**Computers and Education**]: Computer Uses in Education – c*ollaborative learning.*

K.8.0 [**Personal Computing**]: General – *games.*

## General Terms

Management, Design

## Keywords

alternate reality games, ARG, games for learning, games and education

## 1. INTRODUCTION

The application of games in education might improve learning and increase engagement for college students entering our schools now and over the coming years. If you believe that, you are part of a large and rapidly growing group who want to harness the power of the "gaming generation" to support our teaching and learning mission.

How to start integrating games into education can be paralyzing for faculty and for IT support groups, though. Options include re-purposing games designed for entertainment, identifying appropriate educational games written by others, and designing and developing games locally. Faculty may feel intimidated at the thought of learning a complex game like World of Warcraft with its own culture, language, and time-intensive character development in order to design an educationally appropriate assignment. They may not be able to find an existing educational game that fits their learning objectives and that has a satisfying level of engagement. They may find the funding and technical hurdles to local design and development impossible. *Is* there a realistic way to create and use games during the college experience? A project team at the University of North Carolina at Chapel Hill (UNC) believes alternate reality games (ARGs) might be a viable approach.

## 2. ALTERNATE REALITY GAMES
## 2.1 Definitions and History

An alternate reality game or ARG is a story with clues to follow and puzzles that must be solved along the way. It involves both the real (physical) world and online spaces such as Wikis, email sites, and blogs. Collaborating to solve puzzles and follow the clues is an important aspect of ARGs. Clues and puzzles are revealed sequentially during an ARG as the story unfolds [7].

One of the earliest (and perhaps the first widely successful) ARGs was "I Love Bees," a marketing ploy for the Halo 2 videogame [5]. ARGs have also been used to publicize movies (e.g. "AI"/The Beast and "The Dark Knight"/Why So Serious) and other videogames (Bioshock 2/Something in the Sea) [1].

A serious game is a game designed for a purpose other than entertainment. Serious games are used in training, education, health, and to effect social change. [2, 11] Serious games may use any format entertainment games use. For example, they might be board games, online games, or ARGs.

In 2007, an ARG called "World Without Oil" was introduced [12]. "World Without Oil" was designed to challenge players to consider what the world would be like without oil and to make game decisions about oil consumption. It was a combination of an ARG and a "serious game."

## 2.2 Potential for Learning

The potential of using games for education is rooted in the heavy engagement that today's students have in playing games [10] and the belief of many (including many gamers) that learning can take place even in games that are not designed for education. Conferences, journals, summits, and national initiatives have been created to help identify design considerations, research needs, and educational potential of games [3]. A role-playing game to teach the history, culture, and language of an early Hawaiian village has been developed and used by the University of Hawaii. The immersion of players' avatars (game characters) in the world leads to a better understanding of the culture, "even if there are no explicitly 'educational' elements" in the game [6].

Using ARGs for learning is an extension of the work that continues in video gaming. But whereas many universities lack resources for in-house development of a video game, they may possess the skills necessary to create an ARG: storytelling, project management, information structuring, asset creation, and Web development [8].

## 3. UNC-CHAPEL HILL ARG OVERVIEW

At UNC-Chapel Hill, our efforts to create an ARG began as part of our Games4Learning Initiative [4]. One of this paper's authors (Haefele) had experience playing ARGs, and suggested we create one for our campus after an enthusiastic reception to a lecture he offered through the Initiative. Soon thereafter the Initiative's project coordinator (Christopherson), a doctoral student, met with the assistant dean of students for education and advocacy and with the staff director of the Campus Y (a student service and advocacy organization). Both expressed an interest in creating a game-based experience that would focus on learning "outside the classroom." As the Campus Y director said, "It's hard to teach this stuff by lecturing and finger-wagging!" Subsequent discussions led to a focus on relationship issues typical of undergraduate students with a secondary focus on information research skills. A project team to develop and run the ARG was created, and work began.

### 3.1 The Story

In collaboration with the Campus Y director and the assistant dean of students, the team decided on a story focus: two undergraduate students from different backgrounds started dating as first year students and are in their senior year during the game. The game was to be played around Valentine's Day to capitalize on this natural focus on relationships and dating. Because of our undergraduates' very active involvement with college basketball at that time of year, the ARG schedule was carefully developed to avoid important home games.

The main characters in the game were Brandon and Nicole. The opening event (the "rabbit hole" in ARG parlance) was a public marriage proposal in a central location on campus during a high-traffic time of day. The actors who played Brandon and Nicole were not associated with UNC-Chapel Hill because the team wanted to avoid having players meet the actors when they were out of character. The story plays out as Brandon's and Nicole's families and friends find out about, comment on, and contribute to the relationship. For example, Brandon's best friend from high school is secretly in love with Nicole, causing tension and suspicion throughout the game. Several puzzles in the game reveal that facet of the story to players. The parents involve themselves through email messages, a chat session, puzzles, and Brandon's blog. The blog is one particular source of tension in the relationship as Brandon is prone to write about the relationship in ways that Nicole would rather keep private. Tension builds until Brandon and Nicole have a fight that is made available to the players on YouTube. The end of the relationship is left in limbo. Will they get married? Will they end the engagement, but remain friends? Will they end the relationship completely? The final event of the game, a pizza party, was designed to be facilitated by Counseling and Wellness Services to explore the possible resolutions. We titled the game, "Should Brandon and Nicole Get Engaged," and used the acronym, ShBANGE throughout.

### 3.2 Design Goals

Design goals included

1. developing a believable story that was relevant to undergraduates;
2. encouraging collaboration and communication among players; and
3. developing puzzles that varied in complexity, media, and type.

ShBANGE was designed to be played over a two-week period. This was the first time any of the team had created an ARG, and we wanted a short time frame for this first effort. Two weeks were deemed to be enough time to tell the story and to incorporate interesting and challenging puzzles.

In the end, we developed seventeen puzzles including one that required players to identify the artist and composer for pieces of music, a stereogram, jigsaw puzzles combined with riddles that led to physical locations on campus, a NATO encoding puzzle, a crossword puzzle, and more. Players were led to the puzzles in a variety of ways. For example, the marriage proposal ended with game confederates handing out fortune cookies with one of three different URLs in each. One URL led to Brandon's blog. One led to the player collaboration site the team created. The third led to a photo storage site featuring Brandon and Nicole and a collection of their friends (hired models). Brandon's blog entry that day was an invitation to players to guess the romantic quote he whispered to Nicole at the end of his proposal. With very few exceptions, the puzzle formats were all different from each other. They used a combination of campus resources (Web space, physical locations) and free Internet resources (YouTube, PhotoBucket, Ning, among others).

Some puzzles could be solved by an individual player, but some were designed specifically to meet our goal of player collaboration. For example, one set of clues was distributed in helium balloons. Each balloon held one of three clues, and each clue was numbered so that players knew they had only one of the three possible clues. To solve the puzzle, players had to have all three clues.

### 3.3 Funding

Given the budget situation on campus, we needed to create a low-cost game and funding had to be identified. Our ideal budget was

just under $2800, but could be modified to accommodate the required funding. We were unsuccessful in applying for a campus-based grant for innovation in the arts that posed the ARG as participatory theater. In the end, most of our sponsoring organizations each contributed a portion of the budget, and we moved ahead as planned.

## 3.4 The Learning

### 3.4.1 Learning Objectives
An ARG designed for learning has the dual functions of entertaining players and providing educational content. The team crafted the game around issues we wanted students to address and designed the storyline to engage students by vicariously experiencing the myriad relationships (i.e., friends and family) that impact Brandon and Nicole's relationship. The puzzles we created were designed to include as many areas of the academic curriculum as possible (e.g., music, art, geography, meteorology) as well as popular culture. In particular, we designed the plot to challenge players' thinking on the following issues:

1. The benefits and drawbacks of parental intervention in student relationships;
2. The role of best friends in supporting or hindering relationships;
3. The importance of privacy and the permanence and loss of control of information made public electronically;
4. The process of compromising and negotiating decisions as a couple;
5. The process of "growing up" and the ambiguities and subtleties inherent in adult decision-making.

The structure of the ARG provided other opportunities for learning:

1. Many of the puzzles and much of the content were provided online, leading to an exploration of the role of technology in relationships and collaboration;
2. The game was designed to encourage the sharing of information among players which provided them with opportunities for collaborative learning;
3. The party at the end of the game was both a celebration and a learning opportunity, as the Office of Counseling and Wellness sent facilitators to moderate a discussion of the characters' relationships and of relationships in general.
4. Players were exposed to a wide variety of Web sites and technologies that may have been new to them.
5. Many puzzles required players to practice research skills to search for solutions (how to read semaphores or interpret Morse code, for example). One puzzle required recognizing a library call number and finding the (fake) book in the main campus library.

### 3.4.2 The Results
After much discussion, we decided not to institute a formal assessment of learning. We suspected that some players might lurk (participate passively), and we would have no way of identifying those players. Other players might participate during part of the game, but not the complete game. Players might discuss the game with non-players who would learn from the conversation, but not play the game. In short, because this was our first time running an ARG, we knew very little about how

players might participate. Research about ARGs has generally been limited to ethnographic studies because of exactly these kinds of problems [9].

In addition, an assessment would have required approval from our Institutional Review Board (IRB), the committee that approves all human subject research. Obtaining approval might have been difficult since we could not anticipate how players might participate.

Given our lack of experience with running an ARG on campus, we—with the sponsors' approval—decided to focus on designing the game experience instead of a formal assessment. With the success of ShBANGE, we anticipate being able to introduce assessment into future ARGs.

Fourteen players participated in online postings to either the player collaboration site (created by the team) or via email to one of the characters. During the very complex final puzzle, one player stated, "HAHA! My friend and I solved it tonight... because we were bored. :) Yay!!!" That final puzzle was intended to lead players to the game's concluding pizza party. Although at least that one player and her friend completed the puzzle, nobody who attended the party was a player. (Because the final puzzle did not require that the solution be posted anywhere, we do not know for sure that the player and her friend completed it correctly.)

## 4. THE DESIGN PROCESS
Our project team included the Games4Learning Initiative manager, a doctoral student in the School of Information and Library Science (SILS), a faculty member in SILS, two librarians, and a master's student in SILS. Others participated from time to time. For example, our sponsors remained actively engaged and attended team meetings as necessary to comment on the story, to help refine story elements, and to help plan a marketing strategy.

## 4.1 Getting Started
Our efforts were slow at first. After defining the focus, we spent about five months trying to move forward. At that time, a team member with extensive project management experience agreed to become project manager for the ARG. With a set of deadlines and regularly scheduled meetings, we made progress.

## 4.2 Storyline and Puzzles
As our design process proceeded, we developed the storyline and puzzles separately. Because one of our goals was to have a variety of puzzle types using different media, we created a list of possibilities and team members were asked to create puzzles from the list. As puzzles developed, we plugged them into the story, sometimes developing story elements in order to use a puzzle. The team varies in how well they think this strategy worked. For some, developing puzzles in isolation of how they might be used in the story was difficult. Others found the flow more natural. A flow chart of story elements, puzzles, and written content (blog postings, email messages, etc.) helped ensure the puzzles were placed in the correct context and also helped us keep track of blog postings, email messages, and other game content that needed to be written (Figure 1).

All content for the ARG was written in advance and stored in a password-protected repository to be posted at the appropriate time in the story. Each item was labeled with the posting date and the location where it should be posted (Figure 2). Notice the

misspelling in the blog posting. Occasional errors in spelling and grammar were introduced to make the text more realistic. One member of our team wrote all communications from a single character so that the writing style was consistent.
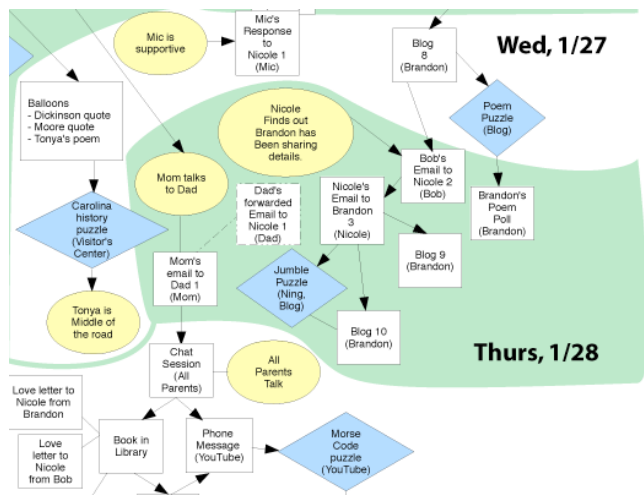


**Figure 1: Extract of Flow Chart**

*Blog 10: Brandon posts poem poll (TBP 1/28 1:00 PM)*

I'm bummed. That puzzle Nicole sent me? Not so good after all. She's really upset because she thinks I'm talking about the wedding to other people too much. (Mostly this blog, I think, but she's gotten some email from people that she says make it sound liek I'm making decisions without consulting her. So, I'm going to try not to do so much of it. Talking about the wedding here, I mean.

But there is one thing I promised, and I'm still going to do it. We're going to vote on a wedding poem! OK, *you're* going to vote on a wedding poem from the ones friends have written. Check out the poll on this page and vote before 11:30 tomorrow morning. I'll announce the winner here, and the winner will get a prize at our engagement party.

I'm going to go text Nicole to apologize again.

**Figure 2: Example Content Entry**

## 4.3 Marketing

Our marketing goal was to attract a large number of people to the rabbit hole. From there, we expected viral marketing by the players themselves to increase participation and interest. We attempted to keep the "fourth wall" intact (a theater term meaning the illusion that action on a stage is real), so we did not divulge that the initial event was the beginning of a game.

We relied heavily on driving players to the rabbit hole event by using posters that were placed across campus advertising the location, date, and time (Figure 3). We also created inexpensive t-shirts (using inkjet transfers) for the project team and confederates to build interest. Members of the project team posted status

updates to their Facebook profiles and to their Twitter accounts. When we realized that few students were playing, we used several of the physical puzzles to draw more attention to the game and increase emphasis on the prizes students could win. We also sent a campus-wide email (under the aegis of the Dean of Students) to all undergraduate students to try to entice more people to play.



**Figure 3: Marketing Flyer**

Flyers and bookmarks were distributed (copies of the flyers cut into pieces so they became a simple jigsaw puzzle) in classrooms and in the main campus libraries. We were not able to determine how many of the flyers and bookmarks in classrooms were seen by students and how many might have been removed by housekeeping staff. Stacks of notepads were also distributed with a similar message. Those generally were made available in the Undergraduate Library.

The Campus Y owns a large wooden structure on campus that can be painted to advertise their events. As one of the sponsors, they allowed us to paint a copy of the flyer on the structure the week before ShBANGE started (Figure 4).



**Figure 4: Marketing on Campus**

The rabbit hole event took place during lunch in a location where students congregate year-round. Although we had contingency plans for snow, ice, or rain, the weather was perfect. For our purposes, that meant that in addition to any students who attended because they were attracted by the marketing, there was also a large number of students who just happened to be hanging out during lunch on a beautiful day.

## 4.4 Testing

Because we had never designed an ARG, testing as much as possible was important. We were most concerned that the puzzles were not too difficult, were interesting and fun, and fit the story line. We developed a testing plan during fall 2009 and solicited undergraduate students from a class taught by the doctoral student on our team. Four students volunteered, and three showed up for the testing day. Each of them signed a non-disclosure agreement to help ensure the secrecy of puzzle solutions. Two team members met with the undergraduates to lead them through the four-hour testing session. Our original plan was to divide the students into pairs. Since only three of them showed up, however, we gave each of them a copy of the testing packets and told them they could work on the puzzles individually or together. The students started out working alone. That did not last long, however! Soon, they were all sitting in one row of seats working together. As they solved each puzzle, we asked, "Would you do anything next?" The question was carefully crafted to avoid suggesting a specific action they should take. (Some puzzles simply provided information for the story while others suggested or required action.)

Several things happened during the testing session that seemed astounding and promising. One puzzle, early in the game, required players to pick up envelopes containing fragments of Brandon's whispered proposal quotation from three buildings around campus. Each envelope contained a set of quotation fragments, and all three envelopes were required to piece together the quotation. For the testing session, each student received one set of quote fragments once they solved the building location puzzle. The students started out with each person trying to make a quotation out of their own fragments. Quickly, they started to put all their pieces together instead. Before they did, however, one student suggested that they each label their own fragments so that if combining them was the wrong approach, they could easily separate them again! One of the first words they pieced together was the quotation author: Dr. Seuss. As soon as they had that information, one student started searching on the Web for Dr. Seuss quotations. As many people know, quotations are often misquoted or said multiple times in slightly different ways by the author. The students found a quotation that was almost right, and quickly determined their puzzle was simply a variation of what they found on the Web. Watching the dynamics of collaboration in this specific instance was fascinating.

A second astounding event during testing occurred when the students were testing the crossword puzzle consisting of a collection of clues about UNC-Chapel Hill. All answers could be found by searching the University's Web space. The crossword grid had certain blocks highlighted. Those blocks were to be used for a word jumble that, when solved, would add to the story background. The students started out searching the Web as a whole. They quickly added searches of the University Web space to their strategy. While they were working on this puzzle, we

passed the halfway mark of the four-hour testing period. We told the students that working on the puzzles during the testing period was much like it would be in the real world. If they wanted to take a break, they should. None of the three students broke stride. They continued working on that puzzle (and subsequent ones) without once leaving the room. (We did provide snacks, but were still surprised that their engagement with the puzzles led them to sit in a windowless room for four straight hours.)

During the testing session, we recorded the time it took the students to complete each puzzle. At the end of the session, we asked several general questions: Which puzzles did you enjoy and why? Which puzzles did you find hardest? Do you have any other comments about the puzzles? Did any puzzles seem unnecessary or frustrating? Recall that one of our goals was to have different types of puzzles. Generally, we met that goal, but there were two word jumble puzzles, and the students noted that the second one was the least interesting puzzle because they had already worked one like it. They especially liked the puzzles that were very different including the ones that used Morse code and semaphores. With the students' permission, the entire testing session was recorded.

The results of testing were very encouraging. The students were engaged, said they enjoyed the puzzles, were able to solve most of them in the time allowed, correctly identified subsequent action (or inaction), and collaborated extremely well.

## 4.5 TOOLS

### 4.5.1 Project management
We used a variety of tools for project management. The most important tool was GoogleSites, our central repository for documents such as our budget, to do list, pre-written content items, flow chart, and testing plan. Some items were written within GoogleSites and others were uploaded as files.

### 4.5.2 Puzzles
We used many tools and information resources to create puzzles. One member of the team reviewed several printed books of puzzles and then searched on the Web for sites that let us create some of those puzzle types. Team members used this resource list as a starting point for puzzle creation.

## 5. OUTCOMES
The game began on a Monday at lunchtime with the kickoff event, the rabbit hole. The actor playing Nicole appeared, obviously waiting for someone. Brandon danced in a few minutes later, dressed in a tuxedo with red tennis shoes and a red umbrella. The event was videotaped by a professional videographer who volunteered his services for the project. Brandon sang a song written by a team member for the event, knelt, proposed to Nicole, whispered the quotation that created the first puzzle, and then waited for her answer. There was a scattering of applause. A game confederate yelled to ask Brandon what he had whispered to her. Brandon replied, "You might be able to figure it out if you get a fortune cookie." At that point, several confederates began handing out the fortune cookies that led to the three Web sites described earlier: Brandon's blog, a photograph collection, and the players' collaboration site.

For the next two weeks, team members monitored sites to keep an eye on what players were doing and saying. As needed, team members posed as players to help move action along, usually by

sharing a hint. Midway through the game, we saw that we had fewer players than we had hoped to have. The team developed a slightly revised time schedule to give more time for marketing. Unfortunately, our best opportunity for getting people into the game (the original rabbit hole) had passed.

The final puzzle was complex and long, and was the one puzzle we did not have time to test with the undergraduate student panel. Solving the puzzle gave players information they needed to attend the grand finale: a pizza party in the Student Union. During the last day or two before the party, team members shared hints on the players' site, and finally decided to reveal the solution as the clock wound down to the party. Nevertheless, attendance at the party consisted of passersby who were drawn in by the "Free pizza" signs.

## 5.1  What Worked
Based on our testing process with undergraduates and a post-mortem review undertaken by the project team, the storyline and the flow of puzzles was solid and the puzzles were interesting and engaging. The project team worked very well together and had skills that were useful (storytelling, project management, Web site development, graphics design, writing, and puzzle creation). Although none of us had ever created an ARG, one member had played several commercial ARGs and drew on that experience repeatedly. Sponsors were creative, innovative, and supportive. They provided help when it was needed and never impeded our work. Other units on campus were enthusiastic when asked to help make a physical location available to players. Hiring actors and models from off-campus was a good decision to help keep the fourth wall in place. Although there were not many players, those who posted solutions, hints, or questions seemed enthusiastic.

## 5.2  What Didn't Work
The biggest failure was our marketing strategy. Trying to maintain the mystery during the initial marketing phase was probably a mistake. Since an ARG had never been run on campus, students had no context in which to place an event like the rabbit hole. Students simply did not recognize the opportunity to play the game.

## 6.  LESSONS LEARNED
### 6.1  Marketing Strategy
Next time, we will try explicit marketing of the game. We offered prizes to players, but did not advertise them in the beginning. A large prize, budget permitting, could be a marketing feature, and might attract more players. The large prize could be given to one player through a random drawing from all registered players. A player might lurk, but he or she would not be eligible for the prize.

We would also involve our student government and our student newspaper staff early in the process. We contacted both as the game progressed, but by then it was too late to obtain their help with marketing the game.

We would depend less on distributing flyers to classrooms and more on social media. Although we discussed buying Facebook ads, we did not do so. In retrospect, buying ads might have had a positive effect. We would also use social networks in other ways. For example, we would asking students to post updates to their profiles, and we would create a hashtag for Twitter.

The university has a way to send mass email to all students. We used the system, but not until just before the game began. Although many undergraduates do not read their email regularly, it *is* one more way of marketing.

## 6.2  Storyline and Puzzle Interaction
Although our team members do not agree on whether story and puzzles can be easily developed independently, we would discuss this process up front next time. Having gone through the process once, we know that diagramming the story, the puzzles, and the content helps everyone keep track of where elements are missing. Figure 1 shows an extract from one of the most useful planning tools we used. We would also consider from the beginning how the storyline and timeframe would mesh. We developed the story independently and then placed it into the two-week period. Sometimes that meant scheduling story elements and puzzles in short time spans in order to keep the story moving.

## 6.3  Player Collaboration Site
We debated about what tool to use for the player collaboration site or, in fact, whether one should even be created. In many popular games (ARGs and others), players create their own sites to share information. In the interest of time, we decided to create the player site for the game. We debated whether to use a Facebook group, to use Ning (free at the time), or to create a site using campus tools. In the end, we chose Ning for its flexibility. In retrospect, we do not know if Ning was the best choice. It did allow the project team to create multiple personas so that we could pose as players when necessary to keep the action going, but next time we will work with students early in the process to determine the best tool and whether the players or the project team should create the site.

## 7.  CONCLUSION
In short, the first ARG to run at UNC-Chapel Hill had mixed results. Based on student testing, the story and puzzles were engaging, fun, and appropriately challenging. Sponsors were pleased to participate in the creation of non-didactic learning on a topic that many undergraduates find difficult to discuss. Our marketing strategy was not sufficient, and that led to the limited number of players observed. However, with this experience, we understand the process much better and understand more about ways in which marketing could be strengthened. ARGs *are* a reasonable way for colleges and universities to incorporate games into learning, and the team looks forward to the next opportunity!

## 8.  ACKNOWLEDGMENTS

# 9. REFERENCES

[1] Alternate reality game. http://en.wikipedia.org/wiki/Alternate_reality_game

[2] Derryberry, A. 2007. Serious games: Online games for learning. White Paper, http://www.adobe.com/resources/elearning/pdfs/serious_games_wp.pdf

[3] Ferdig, R.E. 2007. Learning and teaching with electronic games. *J of Educ Multimedia and Hypermedia* 16, 3 (Fall 2007), 217.

[4] Games4Learning Initiative, UNC-Chapel Hill, http://Games4Learning.unc.edu/

[5] "I Love Bees." http://en.wikipedia.org/wiki/I_Love_Bees.

[6] Kardan, K. 2006. Computer role-playing games as a vehicle for teaching history, culture, and language. In *Proceedings of the 2006 ACM SIGGRAPH Symposium on Videogames* (Boston, Massachusetts, July 30 - 31, 2006). Sandbox '06. ACM, New York, NY, 91-93. DOI= http://doi.acm.org/10.1145/1183316.1183328

[7] Kim, J.Y., Allen, J.P., and Lee, E. 2008. Alternate reality gaming. *Commun. ACM* 52, 2 (Feb. 2008), 36-42. DOI= http://doi.acm.org/10.1145/1314215.1314222.

[8] Lee, T. (2006) This is not a game: Alternate reality gaming and its potential for learning. Futurelab Report: http://www.futurelab.org.uk/resources/publications-reports-articles/web-articles/Web-Article477

[9] O'Hara, K., Grian, H., and Williams, J. 2008. Participation, collaboration and spectatorship in an alternate reality game. In *Proceedings of the 20th Australasian Conference on Computer-Human Interaction: Designing for Habitus and Habitat* (Cairns, Australia, December 08 - 12, 2008). OZCHI '08, vol. 287. ACM, New York, NY, 130-139. DOI= http://doi.acm.org/10.1145/1517744.1517787

[10] Pew Internet and American Life Project (2008) Teens Video Games, and Civics. http://www.macfound.org/atf/cf/%7BB0386CE3-8B29-4162-8098-E466FB856794%7D/PEW_DML_REPORT_080916.PDF

[11] Serious game. http://en.wikipedia.org/wiki/Serious_game

[12] World Without Oil, http://www.worldwithoutoil.org/