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Campus Mysteries: Serious Walking Around

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Abstract

The *Campus Mysteries* project co-developed an Augmented Reality Serious Game (ARSG) platform called *fAR-Play* and tested it with a ghost-hunt learning-experiment. A/B testing on the learning experiment was performed with a smart phone enabled with *fAR-Play's* Layar enhanced GPS interface and a smart phone enabled with Bee-Tagg's Quick Response Code (QR) application; a paper-analogue acted as a control. This paper reports on the development of the *fAR-Play* game and provides an assessment of *Campus Mysteries'* experiment. It concludes with the assertion that like their well-tested paper based scavenger-hunts, ARSGs, especially when played as locative games, can enhance on-site learning engagement. Moreover, the very process of developing mobile learning platforms encourages cross-faculty collaboration and asks developers to consider how usability, enjoyment, and learning are wed to environment and platform.

Keywords

Augmented reality; serious games; locative learning; collaborative learning

Introduction

Can locative augmented reality games encourage explorative learning? *Campus Mysteries* was an Augmented Reality (AR) learning experiment developed and played at the University of Alberta to test this inquiry.[1] During the summer of 2010, four teams of school children raced across the campus chasing the ghost of a man who died of the Spanish Influenza when the pandemic hit Edmonton during World War One. When arriving at the correct GPS location (usually an important bit of university architecture), students unveiled a blurb about the University's rich history embedded with the necessary clue to the next phase of the ghost-hunt.

This paper describes the academic and technical collaborations that led to the *Campus Mysteries* experiment. The project as a whole developed out of a course run in Fall 2009 that brought together students and faculty[2] from humanities computing and computing science interested in potential pedagogical uses of Alternate/Augmented Reality Serious Games (ARSGs).[3] Beginning with the structure of the traditional scavenger-hunt, the team developed an AR game called *Pico Safari*, a game that later evolved into *fAR-Play*. *fAR-Play* served as part of the technical underpinnings of the ARSG ghost-hunt experiment run during *Campus Mysteries*. The paper will then report the students' enjoyment of the game and formal qualitative and quantitative evaluative process undertaken by researchers from education, humanities computing, and computing science. Finally, the paper will assert that the *Campus Mysteries* experiment is the story of an explorative and locative ghostly ARSG and emphasize the benefit of leveraging interdisciplinary collaboration in game design and game studies.

Background

Serious games – games designed for purposes other than simply enjoyment – are used in industry and as teaching tools in engineering, health care, military, city planning, crisis response, and production.[4] A great deal of academic research has been done in the last decade investigating how to use current game technology to teach, to bridge work and entertainment, and to alter the image of the game from a toy to a tool,[5] exploiting the possibilities inherent in leveraging 'edutainment' to engage. The combination of game and entertainment is an apt area of exploration; now more than ever students are coming to the classroom having grown up playing digital games. However, gaming offers more than a familiar platform from which to begin learning. Games can be used to bring students into the immediacy of the learning moment. Brigitte Sørensen and Brente Meyer (2008) assert that serious games, "understood as significant models for the design of educational material," focus on a performance of skills "within a specific system of thinking and acting" (p. 312). As such, serious games are not about passive play; they often involve physical and environmental engagement. This blend of physical and virtual worlds, Billinghurst and Hirokazu Kato (2002) argue, when used for "co-located collaboration," encourages interaction by using "three-dimensional digital content to increase shared understanding" (p. 64). They can, as Jenkins, Purushotma, Weigel, Clinton, & Robison (2006) suggest, serve as an "application of distributed intelligence to the learning process" (p. 38). This kind of thinking, according to Kaufmann (2003), promotes collaboration and social interaction: "natural means of communication (speech, gestures etc.)" are enabled when users share a physical space (p. 1). This was the kind of collaboration we wanted to promote in development and gameplay. Since learning, as Lamanauskas, Pribeanu, Vilkonis, Balog, Iordache, Klangauskas (2007) argue, "involves making sense of experience, thought, or phenomenon in context," we saw ARSGs as an obvious platform for teaching and learning (p. 86).

In the fall of 2009, two faculty members from the Faculty of Arts Humanities Computing MA program (HUCO) and one from Computing Science recruited three graduate students from Humanities Computing and three from Computing Science for a joint Directed Reading course exploring alternate and augmented reality serious games. We used the independent study paradigm to facilitate process-oriented collaborative learning focused on the potential pedagogical benefits of ARSGs. We believe, as Anuradha A. Gokhale (1995) does, that effective collaboration happens when instructors create and manage meaningful "learning experiences and stimulat[e] students' thinking through real world problems" and through that process develop and enhance the ability *to learn* (p. 30). We met weekly to collaborate, report, course correct, direct process, and evaluate reasonable deliverables. Successful collaborations like this one, Janssen, Kirschner, Erkens, Kirschner, & Paas, (2010) contend, happen when "group members are interdependent, and therefore they have to discuss collaboration strategies, monitor collaboration processes, and evaluate and reflect on the manner in which they collaborated" (p. 143). Students were tasked with a number of independent goals: a) writing and continually updating a literature review on alternate and augmented reality scholarship; b) planning and developing a game platform; and c) building and refining a simple game with it. Each presentation/stage then provided a critical context for discussion about serious games, augmented reality and alternative reality. The learning process interwove analysis with production; the documentation, like the game itself, was the course deliverable. We use this laboratory-model extensively in the University of Alberta HUCO Program as it enables a dynamic, mutually beneficial, and ever-changing teaching, learning, and production environment. It also ensures that the experiments and projects we choose to work on, regardless of how close they come to proving our original thesis, reaffirm how to collaborate and communicate across interdisciplinary divides.

The deliverable for this course was *Pico Safari*, a smartphone-based augmented reality take on geocaching that demonstrated to us the potential benefits of developing locative games as learning and teaching tools. After the course, some of the technologies used in *Pico Safari* were reconsidered, repurposed, and redeveloped as *fAR-Play*, an augmented reality game platform that has been redeveloped to support ongoing research[6] like *Campus Mysteries*.

Pico Safari* and *fAR-Play

Pico Safari players use GPS and compass enabled smartphones to find real world coordinates corresponding to the location of numerous unique virtual creatures called Picos.[7] Picos are displayed through Layar, a commercial iPhone/Android augmented reality app that allows icons at specific GPS points to be overlaid on live video feed from a smartphone's camera, making it appear that the icons are actually present hovering in space even as the player moves.

The website keeps track of player profiles, progress, and all the Picos for the game; the bestiary is a detailed list of all the Picos, including the location and the adventure to which that Pico belongs[8] Players can jump to the map to see the Pico's location,[9] use advanced search to find a specific Pico, or look in the 'collection' to see a 'trophy room' of captured Picos. Although *Pico Safari* was fully implemented, it lacked development tools and functionality, leading to the development of a second iteration entitled *fAR-Play*.

Unlike *Pico Safari,* where users are free to capture Picos and collect points in any order, *fAR-Play* allows for a linear-structured or a multiple-choice order to capture Bits (this game's version of Picos), embedding narrative possibilities in gameplay. Although the authoring environment is still in development and new features are still being added, *fAR-Play's* technical specifications are already more robust and secure. An authoring environment was added and an adventure designer can now use a web-based interface to create and edit adventures. In its early stages, development for *fAR-Play* was concurrent with the development of *Campus Mysteries*,[10] allowing us to design and run the following experiment.

Campus Mysteries

Campus Mysteries was a smart phone enabled learning experiment played by teams of students aged 10 to 14 during the University of Alberta's Computer Science day (Summer 2010). Four separate sessions of the game were played on different days, with between four and six teams of one to four players, depending on the size of the camp group participating each day. The purpose of this experiment was to compare the efficacy and enjoyability of three versions of a locative learning exercise enabled through three different technologies. Two versions of the game utilized smartphones as the gameplay device: one version used *fAR-Play's* GPS-dependent, Layer augmented reality browser, while the second used the Quick Response (QR) code tool BeeTagg.[11] The third version was paper-based, and the team did not use a smartphone for the gameplay. Each team was randomly assigned one of the three versions of the *Campus Mysteries* ghost-hunt (at least one team played each of the versions every time the game ran), was given one Android smartphone to play the game with, and was accompanied by a university or senior high school student team leader involved with the summer camp program. In the case of the paper version team, the team leader only used a smart phone to document and communicate on the progress of the other teams, encouraging competition and updating the game app with their progress. All three teams had their progress in the game tracked through a leaderboard visible in the game app as well as a *Campus Mysteries* Twitter feed that was updated automatically as each team progressed though the six locations by finding the clues at each building and answering multiple choice questions about the locations correctly.

Collaborative game play and narrative consistency appeared across the three versions of *Campus Mysteries* (the combination of a compelling storyline with collaborative game play is, according to Kim, Allen & Lee (2008), what makes for the most successful alternate reality games (p. 38, 41)). To fulfill the pedagogical purpose of the game—to teach the students about the history of the University of Alberta campus—the design team created a series of questions about the history of the people, buildings, and events that happened on the campus. To make the exercise collaborative, these questions were answered when the groups of students visited different locations, working together to discover the clues and answers aligned within those spaces. To make the game histories themselves more compelling, the student groups hunted the ghost of a victim of the 1918-1919 influenza pandemic, or the infamous Spanish flu, through the experiment.

The pandemic hit the world hard; it is estimated to have caused the death of twenty to forty million people worldwide and is considered the worst epidemic in human history.[12] The Spanish flu hit Canada in July 1918.[13] It arrived in Edmonton on October 11; seven days later, the city's Board of Health ordered the closure of all schools, churches, theaters, and public meetings.[14] According to Whitelaw (1919), the provincial Board of Health passed a resolution on October 25th ordering "every person in the Province of Alberta to wear a mask outside of his or her house or residence, except when necessary to partially remove the mask for the purpose of eating" (p. 1070). Classes at the University of Alberta were cancelled for two months[15] and Pembina Hall was converted into an emergency hospital.[16] The hospital almost immediately filled its three hundred bed capacity and by November, seventy eight patients perished from the flu, including the well-respected W. Muir Edwards, one of the university's first assistant professors and a hospital volunteer.[17] At end count, thirty eight thousand Albertans were sick with the Spanish

Influenza and over four thousand died.[18] In our experiment, it is the ghost of one of these above victims who haunts the campus and directs the game-play, hoping he will be recognized.

The portrait of the ghost started out very faint with the early questions and became more clear and 'solid' when the questions were answered correctly, though alternately the ghostly portrait became increasingly blurry with each wrong guess.[19] As with most scavenger hunts, correctly answering the question at one location provided students with guidance in locating their next question. The winning team was determined through a points system that rewarded those who most speedily completed the challenges and most accurately answered the queries: the winning team had the clearest picture of the ghost as a trophy.

Although the narrative and basic scavenger-hunt style game play is consistent across the three groups, the technical game play mechanics differed for each version, which helped inform research questions regarding usability, learning outcomes, and student enjoyment.

Playing Campus Mysteries with fAR-Play: the GPS Version

The team using *fAR-Play*'s Layar-enhanced GPS smartphone interface (aka the Layar team) began by viewing an introductory video that outlined the purpose of the game, introduced the ghost character, and directed the team to their first location. The team then navigated to the first building using the game map which, as part of the *Campus Mysteries* app, displays each building as a unique icon. Outside of the building the players used the app, which utilizes GPS, the smartphone camera and screen display to locate the augmented reality ghost hovering above the building and catch him by tapping on the ghost image on the screen.

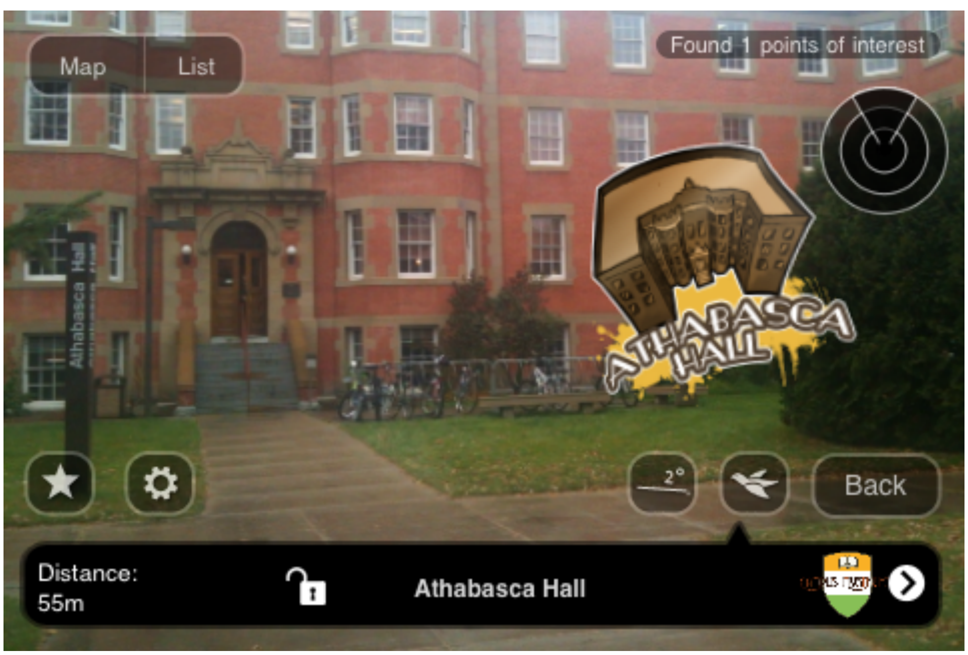

Figure 1: Catching a Ghost

Catching the ghost caused the phone to load a website that presented multiple-choice questions, the answer to which was found inside the building on a sign marked with the *Campus Mysteries* game logo. Once the sign was located and the question answered correctly, the team received their first glimpse of the ghost's portrait and directions to the next building through the smartphone app. This gameplay cycle repeated until the team had visited all six locations and answered the questions correctly to receive the final, solid ghost portrait.

Playing Campus Mysteries with fAR-Play: the QR Tag Version
The QR tag version began with the same video, but players were given directions to a different first building so there was less chance the teams would be working on the same question simultaneously or cross paths and share information during the game. The QR code directed team used the smartphone map function to navigate to their first building and locate the QR tag posted outside of the building. The team scanned the QR code, loaded the same webpage that presented a multiple choice question form, and then entered the building to locate the *Campus Mysteries* logo to find the answer. Once the team found the answer and entered it into the form using the smartphone, they earned the same ghost image reward and were given their next location.

Playing Campus Mysteries with Paper: the Low Tech Version
The traditional paper-based scavenger-hunt model used the same locations, clues, and informational content as above. This team received a large map (16”X20”) of the campus with the six buildings indicated by name and unique icons. They were given an introductory letter that described the ghost story, the history of the campus, which building to start at, and were provided paper clues throughout game play. Once they answered correctly (as determined by the team leader) the team took one of four envelopes posted at the *Campus Mysteries* sign that contained a ghost puzzle piece (a solid image if they answered correctly the first time, increasingly transparent if it took two, three or four tries) and the name of their next building.

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Following the gameplay the teams' scores were calculated based on speed and accuracy. The players were asked to fill out a questionnaire where they rated gameplay, enjoyment, comprehensibility, narrative pleasure, teamwork, technological difficulties, and playability.

Quantitative analysis

Questionnaire Data
Forty-eight out of the total sample of 50 participants in the study completed a sixteen-item Likert Scale Questionnaire and answered thirteen open-ended interview questions (see Appendix A). A quantitative data analysis was conducted on the items in the questionnaire, with the questions divided into two categories: enjoyment and usability. The descriptive statistics for each group and category appear in *Table 1*. An analysis of variance (ANOVA) between the three conditions (Paper, Layar, and QR Tags) indicated no differences between the three conditions on the enjoyment dimension, $F(2, 45) = .07$, $p = .934 > .05$. Additionally, there was no difference between the three conditions on the usability dimension, $F(2, 45) = 1.02$, $p = .284 > .05$.

		Usability		Enjoyment	
	n = number of participants	M = Mean (Out of a possible 25)	SD	M = Mean (Out of a possible 40)	SD
Layar	17	19.00	2.12	28.06	7.57
QR Tags	20	17.90	3.35	27.25	9.05
Paper	11	17.64	2.62	28.36	9.2

Table 1: Descriptive Statistics for the Three Groups Categorized by Enjoyment and Usability

Time Data

An analysis was conducted to determine if any of the conditions completed the task faster than any other. Each mystery challenge (there were four in total) was divided into two subtasks; Finding the location and answering the question. The means and standard deviations for each subtask appear in Table 2 and Table 3. In both tables, the 'n' represents the number of tasks completed under each condition. Because there was an uneven number of participants/groups in each of the three conditions (e.g., the QR tag condition had more groups of players playing) the number of completed tasks are not equal.

	n (number of completed tasks)	M	SD
Layar	30	12.81	14.47
QR Tags	53	13.63	28.27
Paper	24	8.38	7.37

Table 2: Descriptive Statistics for Time (minutes) for Each of the Three Groups by Subtask of "Finding the Location."

Although the QR Tag condition led to the longest time to complete the "Finding the Location" task, an ANOVA determined that there was no statistically significant difference between the three groups, $F(1, 2) = .50$, $p = .61 > .05$. At first glance there may appear to be a qualitative difference between the means (e.g., 13.63 minutes vs. 8.38 minutes), however, the range (as indicated by the Standard Deviation (SD)) of minutes taken to complete the task was very wide, demonstrating that there was a lot of variety in the length of time it took for the participants to complete the tasks even within each of the three conditions. Therefore, the analysis did not detect any statistically significant difference between the conditions.

	n (number of completed tasks)	**M**	**SD**
Layar	29	11.35	21.96
QR Tags	52	7.22	6.02
Paper	23	3.94	3.60

Table 3: Descriptive Statistics for Time (in Minutes) for Each of the Three Groups by Subtask of "Answering the Question"

Although the Layar condition led to the longest time to complete the "answering the question" task, an ANOVA again determined that there was no significant difference between the three conditions, $F(1, 2) = 2.37$, $p = .102 > .05$.

Qualitative Analysis

The qualitative analysis consisted of a content analysis of open-ended comments organized by group. For each of the three groups, we looked at the overall percentage of positive versus negative comments. We then determined percentages of overall positive and negative comments associated with gameplay (navigating the campus, the story narratives, and the teamwork) versus the device used (paper, phone or QR tags). Finally, we divided these two categories into enjoyment and usability.

1. Positive vs. negative by group overall – who had good experience?
2. Gameplay by group – overall –
    a. Enjoyment and usability
3. Device by group – overall
    a. Enjoyment and usability

Development of Specific Codes

The codes that were applied, as well as some examples of items that were tagged with these codes, include:

- Gameplay
  - *Campus Mysteries Infrastructure* – For anything related to the technological elements of the game or that were common to the gameplay regardless of the technology used.
    - i.e. Movies, score boards, web pages, Twitter feeds etc.
  - *Competition* – For references to competition within the context of the game.
    - i.e. Winning, losing, "beating the other team", competing, etc.
  - *Instructors* – Referring to the camp counsellors.
    - i.e. Instructors, counsellors, team leaders, etc.
  - *Mystery Solving* – Related to the question and answer portion of gameplay, as well as the infrastructure there in.
    - i.e. Solving the mysteries, question boxes, finding clues, etc.
  - *Narrative* – For references to the narrative elements of campus mysteries. The story and its characters.
    - i.e. The ghost, the story of the haunting, the plot elements of the mystery, etc.
  - *Navigating Campus* – Referring to the portion of the game related to moving about the campus of the University of Alberta
    - i.e. Exploring campus, finding buildings, searching for the destinations, etc.
  - *Physical Activity* – Relating to references to the physical activity involved with playing the game.
    - i.e. Running around, being outside, cardio activity, etc.
  - *Teamwork* – For references to being part of a team.
    - i.e. Co-operating, working with the team, teammates, etc.
- Smartphone Device/Technology
  - Device – Refers to anything related to the smart phone assigned to the group for gameplay.
    - i.e. The smartphone, the Android phone, I-phone [error], etc.
  - Internet – For references to the Internet connection used by the smartphones for connecting to the webpage where the game elements and instructions were stored.
    - i.e. Internet connections, wireless connection, phone connection, wifi, etc.
  - Navigation Program – Refers to any comments relating to the program that was used by that team to play campus mysteries (Layar, QR Tag/Google Maps).
    - i.e. The program, maps on the phone, the grid with waypoints, etc.

These codes were then paired with qualitative adjective-style codes relating to experience with the previous elements. This was used to determine if the experience with the element was either positive or negative when a statement was made. These codes included:

- Positive
  - *Enjoyment* – For descriptions of enjoyment or having fun, though not necessarily being successful.
    - i.e. Having fun, enjoying the game, liking something, etc.
  - *Successful* – Referring to the element being successful, or working as intended, though not necessarily enjoying the experience.

        - i.e. This worked, using the phone, the program helped, finding the clues, etc.

- Negative
    - *Dislike* – For references that were opposite to enjoyment
        - i.e. Didn't like, hated, did not enjoy, wanted to stop, etc.
    - *Unsuccessful* – For descriptions of elements not working as intended, or not being used.
        - i.e. Unable to get it to work, didn't use, ignored, didn't help, etc.

These codes were used in pairs to describe the provided answers to the questions, as well as the additional comments, and grouped according to the type of program assigned (Layar, QrTags/Google, or the Paper Map). For instance, a response to the question 'What part of campus mysteries did you like the most?' ("Smartphone/Grid Thing [Layar] was cool") would be coded with 'enjoyment - navigation program,' and 'enjoyment – device,' since two references are made within the context of enjoyment (established by the question). Additionally, the statement does not imply whether or not the device was used successfully to play the game at all, only that the subject liked using it.

Additionally, a response to the question 'did the device help meet the goal? In what way?' ("Not really, it would point in one direction, but we would actually have to go in the opposite direction") would be coded as 'unsuccessful – navigation program,' since the reference was not to the phone directly, but instead to the navigational software leading the subject astray. Also the statement does not refer to liking, nor disliking, the phone or the navigational program directly.

Once all of the statements were coded, they were 'quantified' by totalling the responses for a particular outcome, and enabling a comparison with the two other forms of gameplay. To determine whether the subjects in the group using the Layar navigational program found the experience playing Campus Mysteries to be enjoyable, all the items coded as enjoyment relating to gameplay elements were totalled, and then divided by the total number of items coded as either enjoyment <u>or</u> dislike, to create a percentage. In this example, those numbers would have been:

23 – Statements coded as enjoyment within the Layar group

36 – Statements coded as either Enjoyment or Dislike within the Layar group

We determined that 64% of the subjects using Layar to play *Campus Mysteries* made statements that indicated they enjoyed the gameplay elements of the experience.

This was then done for the technology/smartphone statements as well, again collected within a certain group. Summary tables appear below (*Table 4* and *Table 5*).

	Gameplay	Smartphone (Device)
Layar	70%	64%
QR Tags	70%	80%
Paper	76%	n/a

Table 4: Percentages Across the Three Groups for Overall Positive Comments about Gameplay and the Device Used.

	Gameplay		Smartphone (device)	
	Enjoyment	Success	Enjoyment	Success
Layar	64%	70%	64%	63%
QR Tags	44%	75%	38%	82%
Paper	67%	88%	n/a	n/a

Table 5: Percentages across the three groups for comments representing specifically "Enjoyment" and "Success"

Conclusions

Our conclusions are of two orders. First, we believe that the *Campus Mysteries* experiment demonstrated the viability of ARSGs for locative learning. Second, we believe our learning and development process illustrates how interdisciplinary graduate student and professorial collaboration is a useful way to simultaneously consider, critique, and develop game design.

Viability

The *Campus Mysteries* experiment did not demonstrate that ARSGs are superior to other types of learning games or other types of learning activities. We sometimes assume that digital natives prefer using computers and mobile devices, but nothing in this study suggests that is true. Similarly, students' familiarity with digital gaming does not guarantee they will welcome new platforms when familiar ones are available. The paper version of the *Campus Mysteries* ghost-hunt game was as (or more) enjoyable as the smartphone versions. Therefore, instructional designers should use the medium appropriate to the occasion. Design and user choice may come down to issues like the distribution of the game and the accessibility and learning curve of the technology. Participants were occasionally frustrated by Layar and our game; ARSG players need be conversant with the paradigm and the technology must be more robust.

These results might be classified as a 'productive failure,' a normative part of the digital humanities experiment.[20] However, because this project was as much about process as it was about product, developing and playing the *Campus Mysteries* ghost-hunt game taught us to consider the interconnection of usability, enjoyment, and learning, but also prompted us to reconsider familiarity in terms of platform. AR, although not yet the front-runner in terms of 'enjoyability,' is a viable option for the instructional developer looking to leverage familiarity with smart phones to encourage locative learning. Where the learning has to do with locations and knowledge about a neighbourhood-sized space, ARSGs could be very effective. We believe the *Campus Mysteries* project showed the viability of the technology and model; now we need to experiment more.

Process

The process of developing AR game platforms was itself an experiment in developing interdisciplinary capacity. The initial reading course brought together faculty and graduate students from humanities computing and computing science at the University of Alberta. The idea was to leverage a reading course as an occasion to use process-oriented collaborative learning to explore ARSGs. Finally, since our research and learning laid the foundation for further development of the two games, we hypothesize that the design and development of games is in itself a promising form of process-oriented collaborative learning appropriate to universities.

Can locative ARSGs encourage explorative learning? They can. But so can a list of instructions on a piece of paper and a map in hand. What encourages us at the end of this experiment is ultimately how easily and quickly students adapted to a new affordance offered by ARSG and how much we learned from one another in the process of building one.

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Appendix A: Questionnaire

Name of child:________________________ **Game version played:__________________**

Questionnaire for Campus Mysteries Participants

On a scale of 1-5, 1 being "strongly disagree" and 5 being "strongly agree", please rank each of the following statements:

General	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In general, Campus Mysteries was very easy to play.	1	2	3	4	5
I understood how to use the Smart Phone features I needed to play the game.	1	2	3	4	5
I enjoyed playing Campus Mysteries.	1	2	3	4	5
I didn't enjoy playing Campus Mysteries.					
The Smart Phone map was very easy to use.	1	2	3	4	5
I used the Twitter feed frequently.	1	2	3	4	5
I liked the Campus Mystery stories.	1	2	3	4	5
I didn't like the Campus Mystery stories.	1	2	3	4	5
My team worked well together.	1	2	3	4	5
My team was disorganized.	1	2	3	4	5
The instructors explained to me how to play the game.	1	2	3	4	5
I didn't know how to play the game.	1	2	3	4	5
I would play this game again.	1	2	3	4	5
I would not want to play this game again.	1	2	3	4	5
I had a lot of fun playing this game.	1	2	3	4	5
After playing this game, I know more about the University of Alberta.	1	2	3	4	5
I would invite my friends to play this game.	1	2	3	4	5

What part of Campus Mysteries did you like the most?

What part of Campus Mysteries did you like the least?

How did the group decide where to go next?

How did the group use the device to find their next location?

Did the device help meet that goal? In what way?

How did you handle disagreements amongst your team members as to where to go?

Were the movies visible by the entire group?

Did the Twitter feed prompt competition between groups?

Did the Twitter feed make the game more fun?

How could the game be made more fun?

What would you like to have been able to do with the device that you couldn't?

Would a paper map have been easier to use?

Please write any further comments you may have about your experiences playing Campus Mysteries

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[1] *Campus Mysteries* is a project of the Grand Network for Centers of Excellence, online at <http://grand-nce.ca>

[2] For more on the MA in Humanities Computing see <http://huco.ualberta.ca>.
[3] The directed reading course was run by professors Sean Gouglas, Eleni Stroulia and Geoffrey Rockwell. The students included Calen Henry, Peter Organisciak, Koosha Golmohammadi, Himanshu Vashishtha, Garry Wong and Lucio Gutierrez. This group developed an initial game platform named *Pico Safari.*
[4] See Minhua, Oikonomou, Jain. (2011) for how a fuller consideration of how serious games are being used.
[5] For a review on the development of 'serious games,' Liarokapis and de Freitas's (2010). This kind of work is also the basis of great deal of graduate work; see Karen L. Schrier's "Revolutionizing History Education: Using Augmented Reality Games to Teach Histories" Master's Thesis. MIT. 2006 and Brett E. Shelton's PhD thesis, "How Augmented Reality Helps Students Learn Dynamic Spatial Relationships, University of Washington, 2003.
[6] For more about *fAR-Play* see <http://hypatia.cs.ualberta.ca/aarg_project/far-play/> or "fAR-PLAY: a framework to develop Augmented/Alternate Reality Games."
[7] Adventures can be created with specific sets of Picos; adventure creators can change the look of the website; adventure designers can develop and add Picos.
[8] The Map showed nearby Picos and linked to the individual description page for that Pico.
[9] When starting Pico Safari, a player signed up on the website, giving them access to the game. Signing up allowed the system to keep track of the player's profile, the Picos they had recently captured and the aggregate score from capturing those Picos. Upon signing into the website players were taken to the profile page. This page showed the Picos captured by that player, current score, any achievements gained and basic profile information like name and a profile picture.
[10] Development for *fAR-Play* still continues. For more information on *fAR-Play*, please see the project website at http://interactives.tapor.ualberta.ca/?cat=7
[11] For more on the BeeTagg QR Generator see the company website at http://www.beetagg.com/
[12] For more on the influenza as a pandemic, see Billings, M. The Influenza Pandemic of 1918. Human Virology: Stanford University. Online. Retrieved from http://virus.stanford.edu/uda/.
[13] For more on the influenza outbreak as a whole see Humphries (2005).
[14] For more on the influenza outbreak in Edmonton see Whitelaw, T. H. (1919).
[15] See information on how the war hit home, see Wartime. University of Alberta Centennial History. Retrieved from http://www.ualbertacentennial.ca/history/growth/wartime.html
[16] For more on how the University of Alberta was affected by the influenza outbreak, see Johns (1981).
[17] *ibid.* 19, 58-59.
[18] For the whole death toll, see Dickins (2004).
[19] Answering correctly on the first attempt displays a sharp image of the ghost, while a correct answer on the third or fourth guess displays a fuzzy and transparent image.
[20] This term is borrowed from Burdick, A. Drucker, J, Luenfeld, P., Presner, T., & Schnapp (2012).