

# Leveraging Mobile Games for Place-based Language Learning

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## ABSTRACT

This paper builds on the emerging body of research aimed at exploring the educational potential of mobile technologies, specifically, how to leverage place-based, augmented reality mobile games for language learning. We draw on our experiences with *Mentira* - the first place-based, augmented reality mobile game for learning Spanish in a local neighborhood in the Southwestern United States - to explore both the complexities and benefits of integrating mobile games in second and foreign language learning contexts. We first discuss relevant background issues and then describe the *Mentira* project, including an exploration of the setting, narrative, gameplay, and curriculum. This is followed by a discussion of initial findings and future goals. We address gameplay, the importance of 'place' for language learning, and the role of student buy-in. The paper concludes with future considerations for the continued use of mobile games projects for language learning as well as other disciplines.

**Keywords:** place-based mobile games, augmented reality, second language acquisition, design-based research

## INTRODUCTION

It is difficult to ignore the profound effect emerging technologies have had on social, economic, and professional practices in recent decades (Brown and Adler, 2008; Chinnery, 2006). As noted in the 2010 Horizon Report, mobile technologies (e.g., hand-held PDAs, the iPod Touch, the iPhone, global positioning systems) represent the emerging frontier of these changes and warrant significant attention related to both research and pedagogy. While education continues to make an honorable attempt to incorporate technology in the classroom, we often fall short of innovation in implementation, perpetuating, rather than reforming, industrial models of teaching and learning (Levin et al, 2002; Warschauer, 2007). This stands in contrast to an engaged attempt at rethinking education in light of new social practices and approaches to knowledge creation and dissemination. In this spirit, we build on the emerging body of research aimed at analyzing the educational potential of mobile technologies (e.g., Horst and Miller, 2006; Klopfer, 2008; Mathews, 2010; Roschelle and Pea, 2002; Squire and Klopfer, 2007; Squire, et al., 2007; Squire, 2009), and explore areas where we can leverage place-based, augmented reality mobile games for second language learning.

In this paper, we draw on our experiences with *Mentira* - the first place-based, augmented reality mobile game for learning Spanish in a local neighborhood in the Southwestern United States - to explore both the complexities and benefits of integrating mobile games in language learning<sup>1</sup> contexts. We first discuss how *Mentira* is situated within the area of augmented reality mobile games and language learning, briefly addressing issues regarding knowledge construction as an ultimate learner goal, design-based research, and the importance of place. We then describe the basic setting, narrative, gameplay, and curriculum of *Mentira*. Next, we take a brief look at a portion of data gleaned from three rounds of design, implementation, and evaluation of *Mentira* as part of a fourth-semester college Spanish course. Specifically, we analyze the ways in which the game was played, the importance of 'place' in framing context, and the role of student buy-in and ownership for continued improvement in the design and implementation process. We conclude with future considerations for *Mentira* and other work in this area.

## RELEVANT BACKGROUND INFORMATION

Ongoing shifts in both our understanding of knowledge creation and dissemination, as well as transformational educational practice, require an intentioned look at the perspectives informing this project. Therefore, prior to considering *Mentira* itself, we briefly explore a number of important issues related to the way we conceptualize the project in light of current work in the areas of place-based, augmented reality mobile games and language learning.

## KNOWLEDGE ABOUT VS. KNOWLEDGE OF

Maintaining the relevance and purpose of any educational intervention demands that we, as educators, move beyond replication of existing practices in digitally-mediated environments towards what Hughes (2005) classifies as transformational interventions.

As a relevant example of the transformations suggested, Scardemelia and Beireter (2006) describe the need for formal learning environments to become places capable of building, rather than simply transmitting, knowledge. In both diagnosing and addressing this need, they posit a conceptual distinction between knowledge of and knowledge about as key.<sup>2</sup> This is very similar to the distinction between learning about a language (i.e., knowledge about) and being able to use a language as part of a community (i.e., knowledge of) (e.g., Kramsch, 2002, 2009; Stryker and Leaver, 1997; Thorne, Black and Sykes, 2009).<sup>3</sup> In general, there still tends to be an overemphasis on learning about a language at the expense of learning the skills necessary for intercultural competence,

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<sup>1</sup> Throughout this paper we will use the term language learning to refer to the acquisition of a language, other than one's mother tongue, in both the foreign and second language contexts. The use of this more general term is not meant to imply first language acquisition and, rather, is used to encompass complex learning environments, such as New Mexico, where acquisition functions in both foreign and second language contexts simultaneously.

<sup>2</sup> Additional details about their classification are presented by Scardemelia and Beireter (2006).

<sup>3</sup> For a full discussion of the varying perspectives of language acquisition and language socialization see Kramsch (2002).

especially at lower levels of proficiency (MLA 2007; Bardovi-Harlig, 2001; Felix-Brasdefer, 2007; Sykes, 2009<sup>4</sup>).

An empirical approach is critical if we are to develop practices that truly innovate; yet this approach cannot be blinded by a too-narrow outlook, whose epistemological background dooms it to perpetuate the status quo. Educational practices designed to prepare learners to participate in a world that simply no longer exists and methods designed to measure the ability of educational interventions to accomplish these feats are equally outdated (e.g., Warschauer, 2007). Thorne, Black and Sykes (2009) further emphasize this point in a discussion of the relevance of innovative technology-mediated practices specifically for language learning. They note,

*"The relative isolation of instructed L2 settings, although potentially very productive for learning about language, can be seen as limited in view of recent language socialization research that suggests that social and linguistic environments affect L2 learners' language use and development and, concomitantly, the semiotic resources they have available for the construction of desired social identities (e.g., Duff, 2007; Tarone, 2007)" (p. 804).*

In moving forward, it has become increasingly necessary to redefine what it means for our students to learn and do, as well as simultaneously find new ways of trying to understand when and how this transformation takes place.

We have designed *Mentira* in hopes of producing an experience which recruits a broader type of participation from students, as well as functioning as a first step in a reorientation of curricula towards knowledge building. Furthermore, its placement in a fourth semester Spanish class is intentional as a way to move learners towards a more in-depth language learning experience at lower proficiency levels and, as a result, encourage them to move on to higher levels of study. Ultimately the goal is to start earlier in building skills that produce "translingual and transcultural" speakers with the ability to "function as informed and capable interlocutors with educated native speakers in the target language" (MLA, 2007, pp. 3-4). It is our intention that by implementing this type of experiences prior to advanced language study, and in many cases prior to learners' study abroad experience, students will be better prepared to demand a continued focus on the skills and behaviors learned.

## **DESIGN-BASED RESEARCH**

We have thus entered into design-based research (DBR). Characterized by an iterative methodology, development of interventions *in situ*, and a commitment to the fundamental complexities of learning and teaching, DBR allows researchers to operate close to the ground in developing educational interventions. DBR also has assumed a tradition of seeking to develop innovative interventions that combat the passivity of knowledge often sought and produced through traditional curricula (Brown, 1992; Barab and Squire, 2004). In addition to an expectation that design experiments be capable of being read outward into novel contexts (theory building or scaling), Pappert's (1987) critique of

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<sup>4</sup> The majority of these studies specifically address pragmatic competence, a critical component of intercultural competence.

technocentrism as a false interpretive strategy for assessing the strength of a technologically rich intervention is important to remember here. Rather than trying to measure the effect the intervention produces on the existing curriculum, we need to understand how students and teachers can use the game to better achieve their extant goals of achieving language learning. Teacher and student agency is essential to this process. This is complimentary to Brown's (1992) analysis and embrace of the Hawthorne effect (Roethlisberger & Dickson, 1939) in the sense that the biggest progress stands to be obtained when the participants believe they play active and important roles in the changes to which they are subjects. This research thus has an inherent responsibility that the project transform the local context in a way that continues beyond delivery of the artifact or the end of the grant. This goal is further motivated by both a reluctance to rely solely on vertically integrated channels for education reform, as well as the specifically local aspects of this research (described below).

## **PREVIOUS WORK IN AUGMENTED REALITY AND MOBILE TECHNOLOGIES**

*Mentira* is motivated by larger trajectories present in other areas of research. The emerging field of games and learning both draws upon and creates research concerned with how to produce learning that is relevant in our quickly changing world, with educational game design playing an important, yet tenuous, role (e.g. Gee, 2003; Squire, 2006; Shaffer, 2005). Research into augmented reality at MIT and UW-Madison (Klopfer and Squire, 2008; Klopfer, 2008; Squire and Jan, 2007; Squire et al, 2007; Squire and Mathews, 2009; Mathews, 2010) has not only produced game prototypes and game authoring environments, but specifically explored many of the above issues through the design of mobile place-based games. It looks to use mobile technology to help produce learning that is personally customized, socially constructed, and which extends beyond the classroom.

These insights would seem relevant to a number of academic subject areas and educational settings, yet the above design work is limited to a few test cases in the areas of science and social studies. Broader research on mobile technology and education articulates concerns that existing educational structures are largely unprepared, unable, or unwilling to accommodate powerful learning opportunities similar to those pursued above or those afforded through consumer entertainment technology (e.g. Norris and Soloway, 2009; Rochelle and Pea, 2002; Rogers and Price, 2009; Sharples, 2002; Tinker and Krajcik, 2001; Squire, 2009). As an example, the majority of mobile assisted language learning (MALL) projects do not take full advantage of mobile devices to extended learning beyond the walls of the classroom to other areas of students' daily activities (Levin et al, 2002) nor do they provide a deeply personal learning experience. Up to this point, language educators have typically repurposed traditional forms of content for mobile devices: podcasting lectures, providing mobile flashcards, mobile glossaries, and grammar drilling (Godwin-Jones, 2008).

*Mentira* is the first to delve deeper into the potential of mobile language learning to take advantage of what Squire (2009) highlights as essential components of mobile learning in education - a deep understanding of place, ubiquity of access, and

personalization of the learning experience. Simultaneously, it explores new contexts for the use of mobile place-based games in terms of:

- target population - our learners are college students,
- disciplinary boundaries - a language class,
- game length - *Mentira* takes place over three to four weeks,
- devices - we loaned iPod Touches to all students for the entirety of the game, and
- setting - a residential neighborhood in Albuquerque and its lived history.

Each of these extensions adds insight into our overall understanding of the use of mobile technologies, and more specifically, place-based, augmented reality mobile games for educational purposes.

### **THE IMPORTANCE OF PLACE**

The synchronicity of place and mobile technology is natural, if perhaps unexpected. The earliest wireless phone commercials sold the idea that mobile technology could unchain us from the places we would rather not be; this has been the promise of the industry ever since. But rather than making place arbitrary, its relation to our lives has become fractal. Since these devices can go with us wherever we go, and to an ever-increasing extent, be aware of where we are, the proliferation of, for example, mapping and restaurant finding applications is no surprise. These devices regularly provide us with information customized to our histories, interests, and locations. We have more access to knowledge about the places in which we find ourselves and can bring more of ourselves with us when we go somewhere. Mobile technology allows users to remediate their experience of place (Squire, 2009). Place has thus become a central theme in the above cited augmented reality mobile games research, as well as in *Mentira*. The designs seek to leverage place for academic learning by providing meaningful access to a relevant context for the knowledge in question. More than that, we ascribe to the fundamental ecological notion that place is not a mere particularity, an application for academic knowledge, but has a profound influence on what and how we learn, and is itself generative.

At the same time, formal educational environments are typically profoundly place agnostic, both physically, where classrooms isolate the learners from the outside world, and in discourse, where textbooks, syllabi, and instruction are ideally standardized across courses with respect to location, and thus make little reference to the actual lived contexts of their subjects. In the foreign language classroom, place is an especially abstract concept where language is often isolated from the communities, cultures, and places in which it is spoken (e.g., Kramsch, 2002; Thorne, 2009). Critics warn that this industrial age mindset of one-size-fits-all content abstracted from context, rather than providing students a general preparation that is applicable across many contexts, ends up having little impact on students' perceptions and actions in the communities in which they live. When it comes to language learning, we prepare students very well for tests, papers, and formal academic exercises, what Thorne, Black, and Sykes (2009) deem learning *about* language. Yet, it does not develop the necessary intercultural competence (e.g., Byram, 1997; Kramsch, 2009) to create productive, multilingual members of society.

When it comes to learning Spanish, Albuquerque is certainly a relevant locale. It has a history entwined with the Spanish language for hundreds of years and is a place

where the language remains in wide use, offering something in the way of context that is not available just anywhere. Yet such opportunities to leverage this context are in short supply, and not typically afforded to college students in formalized courses below the 300 level.<sup>5</sup> While we recognize the uniqueness of the linguistic context in which we work, we maintain that the principles and lessons learned here can also be applied to other foreign and second language communities. For this reason, as game designers and educators, we continue to strive to create a deep connection to 'place' as a central component of both the mobile game and integration in the language learning curriculum, while also encouraging others to do the same.

We have briefly touched on a number of issues we find relevant for situating the *Mentira* project within the scope of various related fields. An in-depth discussion of each of these issues is beyond the scope of this piece; however, it is essential to point out the relevance of knowledge construction, DBR, and place as foundational motivations and perspectives propelling this work. In the remainder of the article, we draw on these perspectives to describe the specifics of *Mentira* and discuss findings and insights from three rounds of implementation.

## **DESCRIPTION OF *MENTIRA***

In this section, we describe the setting of *Mentira*, narrative structure, gameplay experience, and curricular integration, as well as the various points of data collection throughout the process.

### **THE PLACE – LOS GRIEGOS**

*Mentira* is set in Los Griegos, a neighborhood in Albuquerque with a unique history going back approximately 300 years, a natural context outside the classroom for the study of Spanish, as well as the development of materials for use in that context. We chose the Los Griegos neighborhood for its connection to the Spanish language, documented history, diverse use and architecture, and walkability. Once a village of its own, the neighborhood is currently a diverse residential district. We used information collected from neighborhood contacts, documentary archives, a current-day community blog, and a thesis written about the area (Bruce, 1982), as well as multiple site visits,<sup>6</sup> from which to build the story and setting for our game.

While in the neighborhood, the game takes students to six specific places in Los Griegos.<sup>7</sup> Each of these places has importance in terms of history, present day life, and the narrative of the game. The six formal sites included in *Mentira* are presented in Table 1 with a description of their historical and/or local importance.

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<sup>5</sup> In fact, these opportunities are also rare in many 300-level courses where the majority of courses focus on abstract places and contexts outside of the local community.

<sup>6</sup> Spending time in the local context is an important step in building community relationships, getting and authentic feel for the neighborhood, and learning local folklore and history.

<sup>7</sup> Informal participation in other spaces through implicit observation or accidental (mis)navigation is also typical.

Place	Historical/Local Significance
La Iglesia San Isidro - Church	The original village church, built in the 1700s. It is currently occupied by a local resident who was very helpful in adding to our knowledge of local history and culture.
Joe's Café	A fictional café at an actual food cart and retail shop where Joe, the proprietor, prepares fresh sausages and ravioli daily. He is very friendly and spends time talking with the students. <sup>8</sup> This site is the most modern space in the game.
El salón de baile - Converted Dance Hall	Currently a local residence, this building once functioned as a community dance hall and serves as an important historical site in the game.
La tienda - Converted Store	Currently a local residence, this building once functioned as a local trade store in the neighborhood. It was one of the only places in the neighborhood selling liquor during prohibition, the period during which <i>Mentira's</i> fictional murder took place.
The Acequia	A drainage and irrigation ditch that is (and was) fundamental to the survival of the neighborhood. Folklore, water rights, land use patterns, and politics all stem from these acequias. In the game, this is the site of the fictional murder.
A local garden	A local resident's garden filled with native plants and flowers. It is a place to connect with the natural ecological context of the geographical region and agricultural roots of the neighborhood.

*Table 1. Local Sites in Mentira*

A benefit of working in Los Griegos has been meeting residents who are well-versed and profoundly interested in local history and the preservation of the neighborhood. This makes it an ideal setting for *Mentira* because the residents are also excited about the students learning about the neighborhood and being there to play the game. This connection between classroom learning and local lived contexts is not only

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<sup>8</sup> Joe even gave sausages to waiting students when there was a time miscommunication.

important for the academic development of our students, but also as a way to connect the university to its surrounding communities.<sup>9</sup>

## THE NARRATIVE

Narrative is a key element in the creation of any successful game (e.g., Gee, 2003; Juul, 2005; Klopfer, 2008). It catches the attention of the players and structures much of the gameplay experience.<sup>10</sup> In *Mentira*, the players must solve the prohibition-era murder of Dionisio Silva in order to clear their family's name and absolve the family of any guilt. Their journey consists of current and prohibition-era fictional events based on incidents and family stories from the Los Griegos neighborhood and broader themes from local history and folklore. The first part of the game (homework) introduces them to the setting, the murder, and their role in solving it as one of the four families implicated. They then meet a family member who sends them to the neighborhood (i.e., Los Griegos) to investigate clues and learn more about the murder. While in Los Griegos, players explore the various locations to collect clues and try to solve the murder. Each player receives different clues and information based on their family and, in traditional jigsaw task style, must share clues to determine the real killer. Players encounter the historical, the new, and the supernatural in an attempt to figure out who really killed Dionisio Silva.

## ARIS – AUGMENTED REALITY FOR INTERACTIVE STORYTELLING

Critical to the development and implementation of any educational game is the underlying architecture related to content delivery and the overall gameplay experience. Therefore, before moving on to the mechanics of *Mentira* itself, we briefly explore the affordances of the chosen game authoring and delivery platform. One of the main aims of our research has been to find tools to explore the strengths of game design as a pedagogical tool, particularly using mobile technology and connecting it to local context. This includes an avenue so that the future use of these tools would be as capable of widespread adoption in similar educational contexts as possible. We wanted to find a platform that would be useable with a minimal overhead in local infrastructure (i.e., wi-fi), capital outlay (i.e., devices, service contracts, software licenses, etc.), and that could be used effectively by persons from a variety of backgrounds and expertise.

A viable and practical solution to the design of mobile games is the Augmented Reality for Interactive Storytelling (ARIS) platform, an open-source game editor and engine developed at UW-Madison. Several aspects of ARIS make it a very useful tool. First, the software enables the design of place-based games on mobile devices without the necessity of an on-site programmer. ARIS is free and open source. Third, it has very low technical requirements in terms of both specialized skill, and additional hardware and software. Despite this initial simplicity in use, ARIS is also capable of much more intricate design of player interaction; this is essential to designing a game, not merely a

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<sup>9</sup> As we move forward with the project, we look forward to continued collaboration with the local community to further foster the university/community relationship. This includes expanding *Mentira* by developing new content to encompass parts of Los Griegos and adjacent areas which we have not yet incorporated.

<sup>10</sup> Despite a strong narrative, players also help to co-construct their own play narrative. Thus, the game must be both engaging and flexible.

tour or scavenger hunt. ARIS has thus been an extremely valuable tool for the development of *Mentira*.

## GAMEPLAY

The basic mechanic of the game is illustrated, text-based, Spanish-language conversations between the player and fictional characters (Non Playing Characters or NPCs) concerning the murder and its solution. These interactions are in the form of branching dialogue where the player selects what he or she would like to say as part of the conversation. It is similar to the main mechanic in the Carmen Sandiego series of games. Also similar, the conversations are a portion of a partly-fictional, geographically situated narrative. Each choice of where to go, what to say, or what to do can trigger an event (e.g., joining a family) or give the player an item or asset (e.g., a prize or an artifact).

*Mentira* is split into two major sections, different with respect to how in-game locomotion is accomplished and when players are expected to play. In part 1, the players use the iPod Touch individually when and wherever they see fit, as homework. In-game locomotion is accomplished by making choices and then entering a code given based on a specific choice. Part 1 contains three smaller parts (levels). In part 2, they play on-location in Los Griegos in small groups. Players follow directions and clues to specific locations. Observations of details present in these locations provide players with the codes they need.<sup>11</sup> This separation of the game into simulated and actual locative parts is novel for this type of augmented reality game. It demands more study, but the principal motivation is a response to observations of student game play in earlier augmented reality games (e.g. see Squire et al, 2007). Specifically, when students only had the devices and software for the relatively short timeframe of the field trip, it was not possible for them to make use of them for review and recall, important affordances of mobile technology. Our idea is to produce a software-enabled experience of considerable length under the constraint that the on-location part of the game would only be feasible if its length was tightly controlled, about an hour or two.

## THE CURRICULUM

Similar to the augmented reality games referenced above, not all of the game *Mentira* takes place within the software. The software is surrounded by a classroom curriculum and the whole game takes place over a three to four week timeframe. In addition to carrying out parts of *Mentira* not feasible within or suited to software, this game curriculum is how the game connects to Spanish curriculum and overall fourth-semester (in this case, Spanish 202) experience. Successful integration of *Mentira* in the Spanish 202 classroom is crucial to our goals for the classroom as well as the research process; To be transformative, innovations, especially technologically-enabled ones, must seek to become a part of the classroom experience, as opposed to a disconnected add-on. In this section, we describe the role of *Mentira* in the curriculum and the data collection process throughout the project.

*Mentira's* three iteration and implementation cycles, since the summer of 2009, have resulted in ongoing improvements based on students' input and gameplay

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<sup>11</sup> ARIS is designed to be location-aware, but the lack of GPS positioning on the current generation ipod touch necessitates this workaround for locative gameplay.

experiences. The semester, number of classes, and number of students who participated in the *Mentira* project as part of their Spanish 202 class are listed in Table 2.

Semester	Number of Classes	Number of Students
Summer 2009: Iteration 1	1	16
Fall 2009: Iteration 2	1	22
Spring 2009: Iteration 3	2	30

Table 2 – Classes and Participants

*Mentira* takes place over a four-week period, with approximately one hour per week of class time dedicated specifically to the game. Participation in the game takes the place of one of two required oral presentations. During Week 1, the researchers explained the project to the students, had them fill out consent forms, and discussed ideas about language education and mobile devices. The students were then asked to complete an out-of-class pre-survey about their experience with technology, in particular their use of mobile technology and their habits with social media.

During the second week, we met with the students, distributed iPod Touches and had the students login and start the first level of the game.<sup>12</sup> This session was intended to orient students to the devices and software user interface (UI) in an environment where we and other students were available to help with potential technical difficulties. We also discussed strategies students could use to get help when they were not sure what to do (e.g., collaborate with peers, email the research team, post on a discussion forum).

Students were assigned to play through the next three levels of the game prior to class the following week. Gameplay data was collected through the ARIS engine for future analysis. While all details are not available, it adds to the creation of a comprehensive understanding of how *Mentira* was used by the learners when not in the presence of the research team. This is noteworthy because such a determination, especially in the case of unsupervised play, has been beyond the capabilities of earlier handheld game projects.

The third week of class centered on an in-class discussion (in Spanish) focusing on what students had learned from the game through the previous three levels played at home. Rather than being a straightforward review of the content, this discussion used the in-game content as a lever to talk about design issues. Students convened in small groups and each considered the first level of the game from the point of view of a particular aspect of game design - setting, story, NPCs, or the player's character. Their goal was to imagine themselves as the designers of this game for other students, and revisit the existing design as a controlled experience to unravel its purposes and motives. They were then asked to either rethink how the designers' introductory aims were accomplished or devise similar structures to convey stories or meanings of their own. This session was observed, and student work was collected for analysis.

Between the class sessions of Weeks 3 and 4, students visited Los Griegos in groups of 3-5 with the research team. They each selected their group and a convenient

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<sup>12</sup> In the Summer 2009 implementation, the ipods were not given out until the third week due to logistical constraints. Therefore, all students completed the first part of the game in the lab on the iPhone simulator as opposed to their own personal iPods. This session was recorded to follow students' movements throughout the initial levels of the game.

time and then all met in the neighborhood. Upon arrival, students were given a start code for beginning part two of *Mentira* and then had as much time as needed to gather clues and explore various places. Video and audio recordings were made of student play in the neighborhood.

The Week 4 session involved solving the murder in class. Students further reviewed their clues (all different based on their specific family) and were asked to select one murderer and one person they were sure was innocent and to defend those decisions for the rest of the class. A vote was taken by the class, followed by further discussion of relevant clues among the groups who visited the neighborhood together. The solution was then discussed based on evidence collected by different groups and revealed to the class. To close, we collected the iPod Touches and scheduled out-of-class, one-on-one interviews for willing participants. These interviews lasted between 15 and 60 minutes<sup>13</sup> and were recorded for future analysis.

## FINDINGS AND DISCUSSION

Analysis of each of the data components (i.e., participant observation, gameplay data, classroom products, surveys, and one-on-one interviews) allows for a comprehensive picture of the overall implementation cycle that has been extremely valuable in improving various iterations of *Mentira*. Here we focus on initial findings from the gameplay data and one-on-one interviews, supplemented by classroom and field observations. We specifically examine how *Mentira* was played, the role that place played in players' Spanish experience, and student buy-in.

### MENTIRA IS ACTUALLY PLAYED

Our first finding, although seemingly obvious, is that *Mentira* was actually played by the students. This is important in light of how tenuous the identity of educator or education researcher as game designer is, especially in the minds of the game's target audience. Often, the general impression of students is that the worst kind of game is an educational game, and that educators have the worst ideas about what makes good games good. Students might simply go through the motions, finishing as quickly as possible, or possibly worse, not even bother or be able to get through any of the content; we would hope that 'playing' the game could mean more. Even with earlier augmented reality games that were generally successful, it was previously suspected but not confirmed that a certain percentage of participants were not actually progressing through the game.

However, basic playability of researcher-designed game experiments is infrequently treated in the relevant literature, save when bashing educational games en masse. Learning to design and create better games would seem to be somewhat removed from the agenda of this writing, and so one wonders how educators might begin to improve their skills and reputations. As a partial corrective, we have sought to document at least the existence and extent of *Mentira's* gameplay as closely as possible, given the constraints of the situation. As mentioned above, observations and interviews have been combined with remote monitoring of students' gameplay via the game software itself. We can at least demonstrate that the excitement and engagement reported by players is

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<sup>13</sup> The variation in interview times is due to the sometimes extensive generation of ideas in an open-format part of the interview.

concomitant with the fact that they have bothered to play the game. This triangulation would seem to be most valuable for looking at part one of *Mentira*, when students played far away from our eyes and ears, but is even novel and useful for part two. This data is not as complete as would be ideal, but sufficient for determining some particulars about how and when the game is in fact actually being played by students.

The gameplay data strongly suggests, in the majority of cases, students are encountering the content as planned and not simply going through the motions. The length and frequency of the play sessions indicates players actually reading through the conversations and weighing the decisions they make as they proceed. Furthermore, they go about this in a great variety of ways. There is also evidence that the game has improved as we have revised it. In the interest of space, we limit the below discussion the more homogeneous fall and spring gameplay data from part one (before the trip to Los Griegos) as it pertains to a few parameters of gameplay time and completion.

### General Gameplay Patterns

Figure 1 depicts student play during part one of *Mentira* (i.e., before going to the Los Griegos neighborhood) in the Fall of 2009. Each point, as it appears on the page, corresponds to one in-game event triggered by a student.<sup>14</sup>

[INSERT FIGURE 1 HERE] – figure-1.jpg

*Figure 1 - Mentira Fall 2009 Player Event Data*

This figure tells us about the rough features of *Mentira* gameplay. The most salient feature in this big picture as well as in the details, other than the existence of gameplay, is the great variety in the gameplay data demonstrated among different players. Sometimes players play during class, sometimes the morning before, or sometimes in the few hours after. They are also likely to play during the more typical homework times in the evening, and somewhat rarely over the weekend. Some students play through the entire pre-trip portion in one sitting, others spread play out over the two weeks, although about a third of the players don't trigger any new events after the first three days (indicating no restarts and no new progress through the game, though review is possible).

The general character of gameplay events from the spring of 2010 are somewhat similar. The main difference between the fall and spring implementations begins to be revealed when we look more closely at the details of the students' gameplay time.

### Gameplay Time and Completion

The mean number of gameplay sessions per student was 2.2 in the fall and 3.4 in the spring. The mean total time spent by a student playing the homework portion of *Mentira* in the fall was 35 minutes, with a range from 15 to 78 minutes, and the mean play session was 19 minutes. In the spring, mean total play time was 43 minutes with a range of 9 to

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<sup>14</sup> Due to the fact that the time scale for the intervention greatly dwarfs the timescale for play, several points, indicating a large play session, will show up as one point or slight streak in the figure as printed.

101 minutes. The mean play session in the spring was 16 minutes.<sup>15</sup> In addition, we see a rise in rates of game completion from fall to spring: 13 out of 22 (59%) in the fall versus 24 out of 30 (80%) in the spring.<sup>16</sup> In both the fall and the spring, all players completed the first level out of three in the homework portion of the game.

Strangely enough, the time it took players to complete the homework levels displays the opposite trend: longer in the spring than the fall. For example, the first level took on average much longer to complete in the spring than in the fall: 678 versus 443 minutes. To a large extent, these data are skewed by a substantial number of players in the spring who simply did not pick up the game again until sometime many days later. When we restrict to players who completed the first level of part one within half an hour (17 of 22 in the fall and 21 of 30 in the spring) we see more balance in the amount of time to finish the level, means of 7.2 and 5.1 minutes respectively, but the trend remains.

What could lie behind this apparent contradiction between play and completion times in the fall and spring? Since the completion rates for the first level were 100% in both implementations, it is not a matter of players having a similarly slow experience eventually finishing (spring) versus being simply being too frustrated to continue (fall), though this may have something to do with the differential completion rates for the other levels in part one. The first level in the game consists entirely of a chain of dialogue, clear of UI clutter compared to the game as a whole. Furthermore, the dialogue did not change substantially between the fall and spring. Thus, the shorter level completion times combined with roughly equal overall play times of the fall group could reflect a tightening between semesters of how the overarching game structure and players' participation is structured by the game's UI. The fact that the spring group spent less time on the game as a whole but more getting through the dialogue would seem to be a good sign. It is evidence to support the notion that students were spending more time reading and making choices in the spring.

### Late Starts

Despite the overall impression that most players are playing the game, Figure 1 also seems to indicate when that is not the case and when players get a late start. From both classroom observation and previous personal and canonical experience with technologically-rich innovations we know that this is caused typically by forgetting/refusing to play and technical or logistic problems (e.g. trouble getting reliable wi-fi, the basic iPod Touch UI, and *Mentira*'s UI). We know from our players' reports that having access to reliable wi-fi and being able to connect the iPod to a given wi-fi network were significant barriers to initial success with *Mentira*, but determining the relative proportion of blame or prioritizing management of these issues can be difficult, especially when relying only on self-reported data. We are hopeful that the gameplay data can help us not only identify but treat these problems. However, interpretation is not always simple.

Player 19 in Figure 1 is a good example, never even watching the introductory trailer until the third class session, a week after receiving the game. During the week

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<sup>15</sup> The high level of variation in this data somewhat weakens the mean as an accurate representative of it. Here then, the mean serves as a general indication of magnitude and a comparative measure. We use it only when other levels of analysis convey the same general trend.

<sup>16</sup> In the fall 2 more players finished this portion of the game during the week of the field trip.

when the game was assigned, player 19 (along with 17 and 18 who both watched the trailer and did nothing else) only really played during that one class session, never outside class. Yet even here we see some obvious inhomogeneities; player 18 did complete the three levels during that class, while the other two players did not. Also, in the following week outside class, both players 18 and 19 completed the entire three levels and racked up some of the longest play session times of the whole class (61 and 86 minutes respectively). If we concluded that a player who did not get into the game within the first week would never do so, we would be wrong in two of these three cases.

In the case of the late starts evidenced by a trailer-only gameplay session, we know that the physical/perceptual mechanic to proceed past the trailer video is the same as that for viewing the video. Thus we may assume a player who has watched the video and done nothing else was not overly confused by *Mentira*'s UI (at least at that point) but simply did not or could not play again. The immediacy of the next triggered event after the trailer (in the timeline of the game) suggests that if disenchantment with the game is to blame, it is with the general UI or trailer, or perhaps the idea of playing a game, but not the dialogue.

Further evidence that our use of the UI in general or students' willingness to play has improved between the fall and spring is given by the existence of sessions when a player would, beginning the game, watch the trailer and accomplish nothing else that session. In the fall and spring this happened 12 times, but as the denominator in the spring is larger, the rate went down from 54% to 40%. This corresponds to explicit changes on our part to make the simulated travel/access mechanic feel less arbitrary and more integrated into the narrative of the game.

In general, though we wish to mitigate inefficiencies in gameplay, their causes can be quite complicated. Students have a wide variety of experience and expertise levels with Spanish, games, and technology in general that affect how they first approach the game. When there are problems, they can be difficult to pin down. Students who are not keeping up are not necessarily aware what they are missing, and if so, are not always vocal about it. Moreover, the real objective of *Mentira* is not for them to get through the game, but rather to have an experience that is a site of use and improvement of their skills; we want to think carefully about streamlining gameplay. Patience and the creation of opportunities for dialogue may be more appropriate tools than bulletproof lists of objectives. This motivates our use of design-centric class activities around *Mentira* during that second class period to help students catch up while not boring those who are already up to speed.

## **PLACE AS A SETTING FOR LANGUAGE**

As discussed previously, academic study has much to gain from associated local contexts (and vice versa), especially in the case of language learning. One of the effects we would like playing *Mentira* to have on people is to produce the feeling that they have been somewhere interesting that relates to their learning objectives, and that after the experience they do not wish they had simply stayed inside. The beneficial use of place-based, augmented reality mobile games to facilitate the engagement of students of Spanish with the local context is supported by observational and interview data in our study.

Through an analysis of classroom observations, on-site gameplay observations, and participant interviews, we see a very significant, almost universal, desire on the part of students in our three trials to engage in local contexts like the Los Griegos neighborhood in the service of learning Spanish. This excitement is reflected in Excerpts (1) and (2). The emphasis is ours.

Excerpt (1)

*"I thought it was cool how it was kinda hitting home not necessarily like literally with me, but like, **in Albuquerque**, so it was a little bit easier, I guess to relate to. I knew **it wasn't a random thing story going on. This is actually based on a place.** You talk to real people, so I guess knowing the background of it. I mean, I know the story was kind of made up, but it still got me, like interested in the whole drama that was going on and with the families and stuff..." (A, Ln 13-19, Sum 2009)*

Excerpt (2)

*"Yeah, and like I feel that one of the hardest things in my classes, Spanish classes, is interaction and getting to interact with other students and um to interact with something that feels more like a real world language situation than the classroom and that **I think the game provided that real world interface where I didn't feel like I was just learning Spanish in some kind of uh four-walled room with no windows**, you know, so yeah, I think it's awesome way to learn." (A, Ln 28-33, Fall 2009)*

Students were motivated by the idea that this project focused on a local neighborhood and excited about their experience with Los Griegos. Those who went to the neighborhood (fall and spring) universally preferred the on-site portion of the game to the off-site portion, and after the game, were interested in extending their connection to that place, its history and present-day issues, as evidenced through oral presentations and written projects throughout the remainder of the semester.

This news is not only promising on its own, but more so as it stands in contrast to what one might expect from a survey of the population before the game: ignorance of the location or its relevance to Spanish (only 2 of our participants had heard of the Los Griegos neighborhood before the game), and frequently expressed resistance to the time burden of a field trip in addition to existing class responsibilities. Before their visit, the students were not hostile to the idea of the trip, but neither would we describe them as especially excited. Both the reticence and eventual excitement about the relevance of place after the trip are in keeping with observations from earlier place-based game projects.

It should be noted that the desire and excitement to engage with the local context on the part of all participants does not necessarily indicate all students interacted with the local neighborhood in the same way or connected their own Spanish experience with Los Griegos on the same level. On-site gameplay observations reveal very different interactive patterns when students combined their *Mentira* experience with the use of

Spanish in the local neighborhood. While some used Spanish only as necessary to progress through the game, other groups sought to produce a complete Spanish-only immersive experience while on-site, using English only if absolutely necessary. When asked about their extensive use of Spanish in the field, one group said they were doing this because they felt like they were supposed to as part of their participation with the neighborhood. This is initial evidence of learners using the setting of the game to move their use of Spanish beyond just the textbook and classroom to a meaningful place and context. A systematic analysis of each of these patterns is beyond the scope of this piece; however, it is, at the very least, sufficient evidence to support continued work in this area.

### **STUDENT BUY-IN**

Students typically have little opportunity during their university experience to provide input regarding how their curricula are enacted. Mandatory evaluation sheets filled out for a course near the end of the semester are not a form of agency, but are the only official form of student feedback. Without institutionally sanctioned opportunities for meaningful student input that can actually effect changes in their courses, students are often left as passive participants in their own educational journeys. One of our aims with *Mentira* is to foster a true culture of co-constructed learning in these academic environments. Though we hope in the future to leverage the game into more significant opportunities for student research and design (see below), with the game itself we have endeavored to establish shared ownership among students and a sense of participation in its development.

In both our observational and interview data there is evidence of a strong interest in being a genuine part of the game design and development process, that this game can grow in a way that supports their educational aims. As can be seen in Excerpt (3), students are aware of the distinction between active and passive participation in the process and express the desire to be part of the active process.

#### Excerpt (3)

*“I mean, the whole thing is that you don’t wanna be passively learning Spanish, you wanna feel like you’re taking part in it somehow by learning the language, so I think it’s a good thing to feel like you can make choices in the game setting or you know something else I think that that’s just, you know, **empowering for a student.**” (R, lines 21-24, Sum09)*

In addition to this general desire to be part of the project, students had very clear, thoughtful ideas about how the game could improve from iteration to iteration both as a game and as something to help them learn Spanish. Many of these suggestions resulted in changes to *Mentira*, including UI design modifications, narrative revisions, and specific classroom integration suggestions. While we do not explore the specifics due to space constraints, this is an indication we have achieved at least some level of student buy-in and participation in the development process.

The findings discussed here are representative the types of issues that are especially relevant to the research of place-based, augmented reality mobile games in

language learning. By focusing our initial analyses on three issues we assert as critical in any similar project (i.e., the gameplay experience of the learners, the role of 'place' in the learning experience, and student buy-in) we hope to provide a more comprehensive picture of the complexities of this type of work, as well as suggestions for others wishing to work in this area.

### **FUTURE DIRECTIONS**

As with any DBR project, ongoing assessment and analysis is critical to future iterations and implementations. Therefore, based on our findings and observations, we are working to make informed decisions for the future. In this section, we highlight the future direction of the *Mentira* project with the intention of presenting specific changes in conjunction with more general ideas for others working in different contexts or disciplines. We see the *Mentira* project progressing in several main directions:

- further development of the game,
- tighter integration of the game into the university's fourth semester Spanish curriculum, and
- opportunities for student design and local research.

### **GAME DEVELOPMENT**

The game, though playable, is both capable of doing much more and is unfinished in its current design. A newly released version of ARIS allows for simpler creation of complex interactions, and in addition to other improvements, the inclusion of in-line audio in the simulated conversations. Being able to design for the aural dimension of language would be an obvious improvement in game quality and language use, not to mention an additional tool to differentiate and scaffold language use among different players in the game. Audio interaction and greater complexity of interaction have also been often recommended by our players. We expect this will increase play times from those seen in the data above, multimodal access to game material, and an improved learning experience.

*Mentira* is unfinished in the sense that the dissection of clues to solve the mystery is done as an in-class discussion, not as part of the narrative of the game. Although we would like to have in-class discussions revolve around the content of the game, players would likely find it more meaningful to do more of the sleuthing within the game, after they have collected the clues on the trip. This would also provide more reasons for students to review the mystery's content as they get farther into the narrative. Our findings related to perception of 'place' suggest this as an important step in the revision process to engage students further with the game and the neighborhood. With additional interaction after their visit to Los Griegos, we would expect to see a heightened involvement with the activities and further exploration of Los Griegos itself.

### **CURRICULAR INTEGRATION**

Currently, *Mentira* fills a small hole in the fourth-semester Spanish curriculum. Even in this limited sense, the game provides students with new experiences and activities in which they are using Spanish. However, a more profound effect could be obtained through additional integration with other classroom activities. In addition to subject matter and activity alignment, we seek active input from teachers of this course to give

them ownership in the process of curricular innovation. Our current plans for this are modest in scope, meeting weekly with two instructors who have allowed us to run *Mentira* in their classes in the past year to develop plans for the integration of the game and the class. This resembles co-design procedures that have been successful in previous local game projects (Squire et al, 2007). Slow development also has the benefit of allowing time for significant logistical issues (e.g., legal ramifications of field trips across all sections) to be negotiated.

### **STUDENT OPPORTUNITIES**

We are also hoping to create situations where students themselves gather and reflect upon information about these communities within communities as part of their overall design efforts in the project. User-driven game design has long been a goal of the augmented reality on handhelds projects at both MIT and UW-Madison. Both the MITAR and ARIS software have been developed to allow game design with a minimum of equipment and expertise. Earlier projects (e.g. Squire et al, 2007; Mathews, 2010) have made some progress in developing a pedagogy for teachers and students around local game design, while other research points to the promise, in general, of student design work in a number of areas as a means of constructing high-quality educational experiences for the students involved that naturally incorporate 21st century skills, particularly knowledge creation, collaboration, and technical skills. To provide extensive opportunities for local research and design, we will likely have to look outside Spanish 202.

### **CONCLUSION**

The design and use of augmented reality games on handhelds as a means of motivating place-based instruction is still nascent. *Mentira* has begun to explore some new contexts of use for these ideas, but the surface of possibility has barely been scratched. Much more than a game that will enjoy wide use and popularity, *Mentira* serves as an example of what might be done, and some of the costs and benefits associated with development. Hence, it is very important to organize workshops and classes around local game design in broader formal and informal educational contexts. This work is being done at an increasing number of sites, but in particular has a shared history at MIT and UW-Madison. As tools like ARIS become easier to obtain and use, perhaps we can find more ways to enlarge the scope of learning opportunities afforded within formal educational settings. But the design of innovative, meaningful learning opportunities requires more than new tools or artifacts. It entails a concerted effort on the part of researchers and educators to look beyond the confines of the traditional classroom. Ultimately, the goal is to create experiences for students that do more than provide them with inert or passive knowledge about the world. One way to do this is to enlist them in the reconnection of place and content.

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