# Community Capture: Rough Draft

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## Introduction

In this report, we present Community Capture, a new historical- and community-learning game built as a smart-phone app that utilizes location-aware and augmented-reality technologies. The game seeks to engage students in learning historical and contemporary facts about their local community. Students' goal is to find and capture "territories" in their community. To do this, they must first locate hints, the accumulation of which will help solve the riddle of where a capture point in a given territory is located. The game is targeted at high-school students, though Community Capture could be adjusted to fit students both young and old.

Important to the development of this game is an assessment of its effectiveness as a learning tool. As students play the game repeatedly over the course of a semester they will be periodically tested on what they have learned. The results of those tests will be compared to a control group, engaged in more traditional learning centered on teaching through textbooks, lectures, and homework assignments.

Building on the work of other geo-location and augmented-reality games (Squire, 2007), Community Capture offers an opportunity for students to engage with modern technology while learning important information about their communities and, if we are successful, bolstering the retention of that learning by associating facts with a real-world space and, in some cases, time.

We begin with a description of the game, including tie-ins to relevant learning principles. In the subsequent section, we delve more deeply into those learning principles, exploring in greater detail how they relate to the game and why they are important. We then include a logic model that highlights the resources used to play Community Capture, the activities involved in playing, and the expected learning outcomes that will result from playing the game. Finally, we wrap up with an extensive description of our evaluation plan.

## Description of the Game

Community Capture is an educational game aimed at teaching high school students about their local communities. Students work in teams to "capture" different geographic territories in their hometowns, learning both historic and present-day topical information as they play. The goal is to encourage students to understand and interpret the information they learn with the other members of their group in order to advance in the game, taking advantage of group learning principles like Gee's (2007) Affinity Group Principle (#35) and encouraging students to think

actively and critically about the material they are learning (see Gee's Active, Critical Learning Principle, #1). Students are also encouraged to think about their roles in the team, building on Gee's (2007) Self-Knowledge Principle (#9).

To set-up the game, teachers can develop the territory mappings in their communities, the hints, and the capture points; the game thus offers an opportunity for teachers to align the in-game learning experience with classroom teachings. Introductory help videos and quick training sessions will be provided to teachers implementing the game in their classrooms, as well as for students embarking on the adventure. Teachers can additionally use pre-designed maps for their communities, though this functionality may only be possible during the testing phase as scaling this game to tens or hundreds of communities could prove too burdensome for developers. Additionally, there will be an online Community Capture forum where teachers can ask and answer questions of other teachers. The forum will also allow them to post maps and hints for examination and critique by other teachers. This provides an avenue through which good ideas can be shared and replicated in many communities, even when those communities are not geographically proximal.

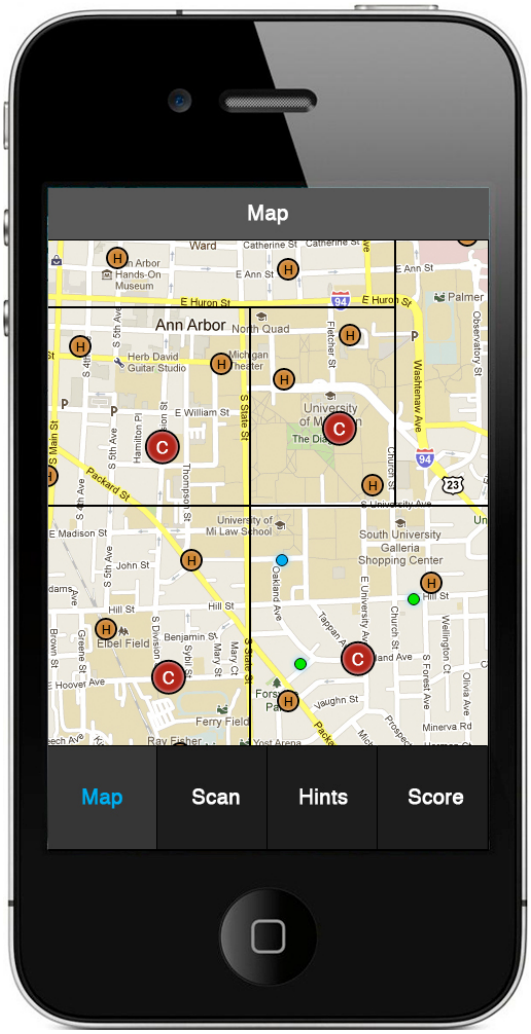


Figure 1: Mockup of game screen. The map is divided

into a series of territories where H's represent a hint, C's represents a capture point. The player's current location is marked by the blue dot.

The game will start with each group downloading the app and examining a map of their community (see Figure 1). The community will be divided into several different territories, each containing a series of hints (represented as H's in Figure 1) and a single capture point (represented as a C). Initially only hints will be shown. Teams can then split up and have one member go to each hint or travel together to as many of the hints as they deem necessary, allowing for students to learn using Gee's (2007) Multiple Routes Principle (#16) to progress during the game. At each hint location the team (or team member) will scan a specific object at the hint location using the augmented-reality capabilities of their phones (see Figure 2).[1] That scanning will reveal a piece of information relevant to their location and the history of the community and provide a hint of the location of the capture point. The hint can come in the form of text, an image, or a video. Multiple hints from a territory can be combined to help teams solve the riddle of where that territory's capture point is located. Once a hint is revealed, it is stored in the users' phones for later reference. Each hint will also have links to additional information on the topic, reviewable by students later on if they are interested in learning more. Hints stored in real-world objects take advantage of Gee's (2007) Material Intelligence (#21) and Distributed Principle (#33). This technique also allows hints to be stored in different modalities (Gee's Multimodal Principle, #20). Very important to this learning process is that the facts represented as hints are contained in the real world, taking advantage of Gee's (2007) Situated Learning Principle (#17). These concepts are discussed in greater detail later in this paper. The Hint screen can be seen in Figure 3.

[1] A potentially less technologically burdensome approach would be to use GPS location-aware technology to check in at a location rather than scanning a specific object. This would require less coordination with community locales—something that would likely be necessary to ensure the app can adequately scan objects using the augmented-reality approach.


Figure 2: This screen shows the scan feature. The screen would show the real-time camera feed. Viewing objects that contain hints would show hints on-screen. The popup seen above would only appear the first time a user entered the Scan section.

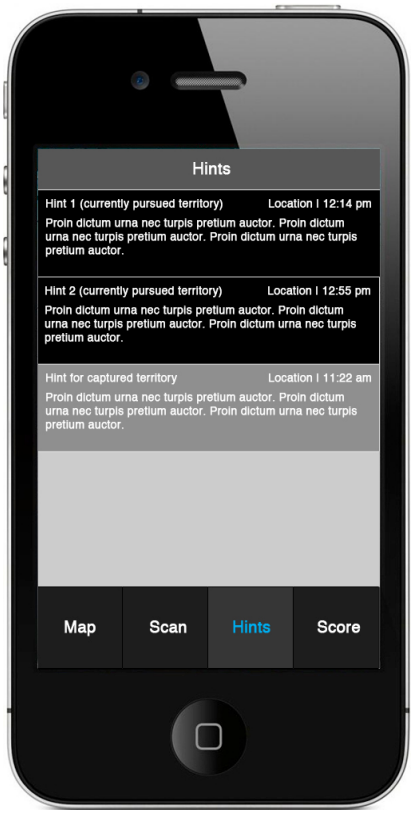



Figure 3: This screen shows hints that users have collected. When a team captures a territory, hints associated with that territory become grayed-out.

When enough hints have been gathered, as determined by the expertise and judgment of team members, the team can choose to discuss the various pieces of information they have gathered in order to determine the location of the capture point. Once they think they have solved the puzzle of where the capture point is located, they can proceed to that location and capture the territory by again scanning an object at the capture location. The point at which each team believes it has enough information to find the capture point will vary. Team members' prior expertise and the relevance and clarity of the uncovered hints will need to be taken into account when determining where a capture point might be located and in deciding when it is best to set out to attempt to capture a particular territory. Here too, students are encouraged to examine their roles on the team, perhaps pursuing work at which they are particularly skilled, again calling forth Gee's (2007) Self-Knowledge Principle.

Capturing a territory earns the team one point. Once a territory is captured, it is still available for other teams to capture. Should another team capture the territory, the first team does not lose the territory or the point. In this way, teams compete against each other to earn the most points, but are still encouraged to explore the entire community. The game will continue in this manner until a team has earned a pre-determined number of points (set by the instructor). This will allow teams to pick what information is important to them and, ultimately, "choose their own adventure." Points offer a simple means of extrinsic motivation (Malone & Leper, 1987). The opportunity to choose a path bolsters intrinsic motivation (Malone & Lepper, 1987). Again, more on these motivational concepts can be found in the next section of the paper.

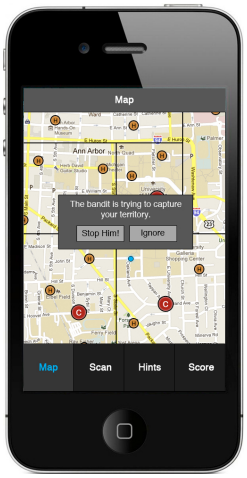



Figure 4: When the bandit tries to steal a territory, the team receives this popup notification offering them a chance to fend off the bandit and keep their territory.


Figure 5: This screen shows the quiz that users must complete to fend off the bandit. Answering three out of five questions correctly stops the bandit and saves the territory.

Another mechanic of Community Capture focuses on teacher involvement. The teacher will play the roll of a “bandit,” a unique character who is able to steal teams’ territories. Teams will receive notifications (see Figure 4) that the bandit is trying to steal one of their territories. By accepting the challenge of warding off the bandit, they will be given a series of five questions about the information they have gathered related to the territory in question (see Figure 5). If

the team can correctly answer three of the five questions, the bandit is scared away and the territory is defended. If they fail to answer three questions the bandit steals the territory and the team must then return to the capture point in order to recapture the territory. This will encourage the team to remember the information presented to them when encountering hints and capture points. Students are also able to recontextualize the information they learn, transferring knowledge from hints to this question-answering task (see Gee's (2007) Transfer Principle, #29). This recontextualization should foster intrinsic motivation (Malone & Lepper, 1987). The mechanic also empowers the teacher to balance the game if one group is getting too far ahead; he could, for example, more aggressively attempt to steal the leading team's territories, giving struggling teams an opportunity to catch up.

If one team seems to be performing and solving captures particularly easily, the teacher can also customize that team's hints to make them more challenging. In this manner, it is assumed that the teams will be able to learn something new throughout the game rather than just relying on knowledge their members already possess. This can also apply if a team seems to be struggling to capture a particular territory. If needed, the teacher could simply alter hints for a struggling team, providing a simpler clue. In this manner, Community Capture can be customized to challenge the more advanced students as well as to help all the participants to stay motivated throughout the game.

The game also contains important communication features designed to aid in capturing territories. One such feature is an in-game chat students can use to contact each other while seeking hints. This will allow students to communicate knowledge each obtains and arrange meet ups if team members are in separate locations. Students can also use the chat to contact the instructor directly to pose questions. A live map will show the location of other team members (denoted by green dots in Figure 1).

## Learning Goals and the Theories and Principles Behind Them

Community Capture has several important learning goals. The teaching of historical facts and contemporary information have merit in and of themselves. That learning is further augmented by situating students in the real-world thereby strengthening associations between facts presented and an embodied space and, in some cases, time. The work of two key pieces on learning, Malone and Lepper (1987) and Gee (2007), guided much of our game design. The theories and principles associated with those pieces, and their relation to Community Capture game mechanics, are described in greater detail below.

### Seeking Intrinsic Motivation

Earning points for capturing territories offers extrinsic motivation for students (Malone & Lepper, 1987). As Malone and Lepper (1987) noted, such exogenous extrinsic motivation, by itself, is unlikely to engage students as fully as desired. However, Community Capture also offers intrinsic motivation through several means.

First, the challenge of the game can be altered to fit individual team's learning levels. This is accomplished through the role of the bandit. The instructor can seek to capture territories of the teams that are performing the best in the class. This provides those teams with the additional challenge of recalling and recontextualizing the information they uncovered while capturing the territory in the first place. Future iterations of the game could additionally include mechanisms for automatically presenting more challenging riddles with potentially more hints to more advanced teams, thus offering another means by which the level of challenge can be appropriately set for each team.

Second, the game provides students with a fair amount of choice in terms of how they play the game. Teams can decide which territories to attempt to capture first, which hints should be uncovered and in what order they should be uncovered, whether the team should travel together or split up, whether there is greater strategic advantage in defending a territory from the bandit or ignoring the bandit in favor of capturing a new territory, and so on. With this design, choices should be reasonably constrained such that teams do not feel overwhelmed by having to make too many decisions, which could lead to frustration, devaluing the power such choices might offer (Malone & Lepper, 1987).

Finally, Community Capture offers endogenous cooperation by allowing players to divide the task of seeking hints among team members and ultimately reuniting, combining individually found hints to solve the puzzle of where the capture point is located.

**Gee's Principles**

In addition to the work of Malone and Lepper, Gee (2007) presents several principles that are embodied in Community Capture. The first is the Active, Critical Learning Principle (#1). Community Capture encourages active learning by requiring students to actually move around the physical space of their community, building associations between factual material contained in hints and the real-world environment. This surpasses the more passive learning typical of reading a text book or listening to a lecture. The game also encourages critical learning by asking students to solve puzzles regarding where a capture point is located. This leads to combining facts obtained from hints, thinking about how those facts are related and what they mean in the larger context of the currently pursued territory.

Gee's (2007) Self-Knowledge Principle (#9) is also found in Community Capture. By working in teams, students can discover roles at which they excel. For example, one member may discover she is effective at leading the team while another may discover he is better at solving riddles. Additionally, the variety of types of hints (text, image, video) lends itself to teaching students about which types of material each member is most effective at evaluating. One member may excel at deciphering video hints that focus on spatial recognition, while another may work better with more narrative text hints.

The Multiple Routes Principle (#16) (Gee, 2007) is also in play in Community Capture. As was discussed above, students have choice in determining the most effective way to play the game.

Again, teams can decide to divide the work or move together; they can choose the order of tasks, thereby constructing an overall plan of attack. Teams may alter their approach over the course of the semester should they find their first technique fails. When teams consider splitting up, this principle pairs well with Principle 9 in that students can determine which players to send where based on the types of hints that play to each other's strengths.

The Situated Meaning Principle (#17) (Gee, 2007) is especially clear here. Hints, being positioned in the real-world, can meaningfully tie the factual information of the hint with the location in which the hint is uncovered. Hints are further combined in uncovering a capture point, thus providing greater context by connecting hints not just as a means of solving a riddle but by further contextualizing the *information* contained in each individual hint.

The presence of the Multimodal Principle (#20) (Gee, 2007) is likely obvious at this point. Hints are necessarily contained in different modalities based on the particular object that needs to be scanned to reveal the hint. One object might be a statue at the town square. Another might be a painting at a museum. Hints also contain different modalities (in the form of text, images, and videos), as has been discussed previously. This should offer students an opportunity to engage in examining and interpreting information in multiple forms, strengthening their connection to the material.

Material Intelligence (#21) (Gee, 2007) also comes in to play given that hints are literally stored in real-world material objects. After a hint is revealed, it is kept on the users' phones, providing a place to continuously and repeatedly examine the hints, allowing students to focus on the cognitively intensive effort of deciphering the puzzle rather than on remembering the hints themselves. This notion also relates directly to the Distributed Principle (#33) (Gee, 2007), whereby information is distributed across the real-world, the phone, the students' memories and thinking, and the chat logs.

The bandit's questions give students reason to transfer knowledge gained when capturing territories to answering the questions in order to defend those territories. This transfer takes advantage of Gee's (2007) Transfer Principle (#29). The questions can be made to require thinking about the information in a new way, avoiding the problem of asking students to simply recite the hints from memory—an approach that is likely to be tedious and demotivational.

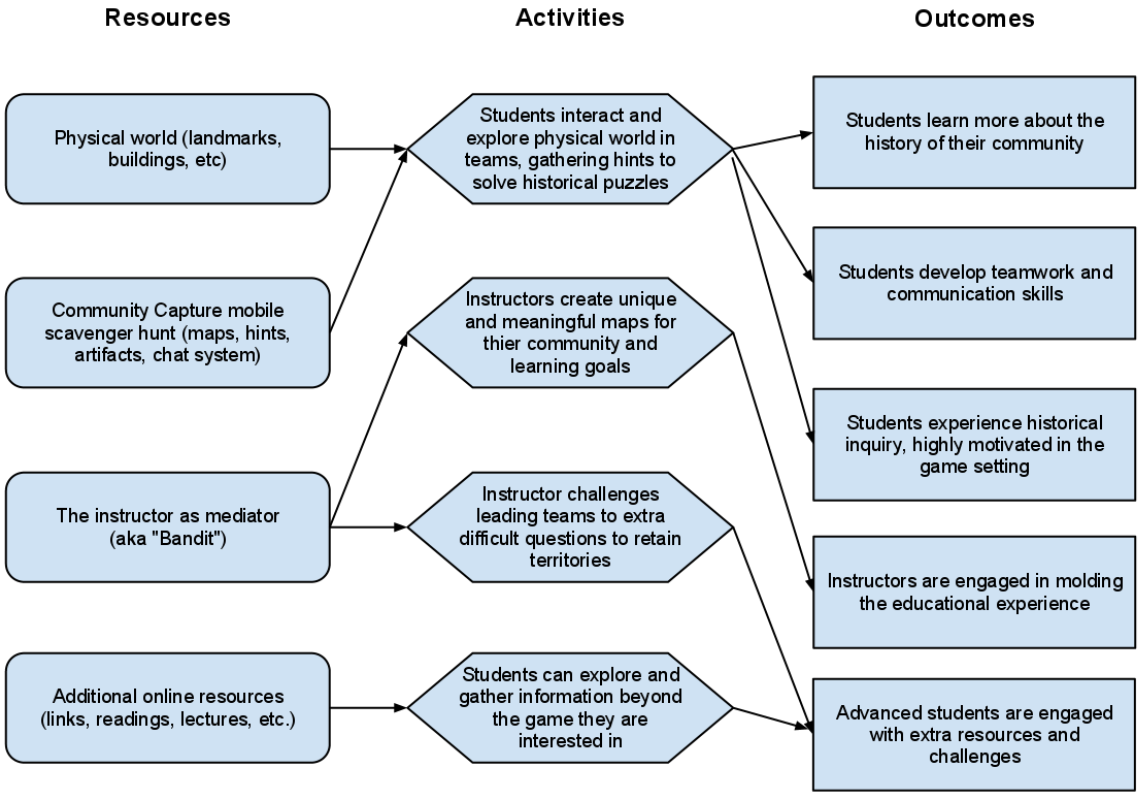
Finally, the Affinity Group Principle (#35) (Gee, 2007) is perhaps the most important principle embodied in Community Capture. One of the main thrusts of this game is its focus on team-work. In this game, teams represent what Gee calls an "affinity group." Those groups are connected through the shared tasks of uncovering hints and capturing territories. The game thus encourages teams to work together effectively in order to succeed.

## Logic Model

This logic model is a condensed view of what is involved in the game design and learning goals of the game. Essentially, the resources utilized within Community Capture are the physical

world, the scavenger hunt app, the instructor who is interacting with the students, and the additional links to help the players through the game. These resources will work together to comprise different activities such as community exploration and working together as a group to find the designated capture point.

The instructor plays a key part in helping each team meet its goal. As the students are playing through the game, the instructor may see that they are performing particularly well, and will then give them a more difficult clue, requiring them to work harder to solve each hint and find the capture point. On the flip side, if a team seems to be struggling, the instructor has the ability to help them out by furnishing simpler hints. The outcomes of this particular situation include regular instructor engagement and continually engaging students with the content throughout the course of the game. The logic model below shows more of the resources, activities, and outcomes found in Community Capture.




## Evaluation Plan

Our evaluation plan seeks to meet the learning goals explicated above: increase students' knowledge of the history of their community, develop effective teamwork and communication skills, inspire them with heightened interest in historical inquiry, give instructors a heightened sense of control over the educational experience, and finally give advanced students extra resources and challenges.

We would begin in a single community, at the start of the school year, by selecting a number of

classes from various high schools in the community to play Community Capture. For this pilot test we would create a version of Community Capture that is appropriate for the community selected, including local historical landmarks and custom hints. We also want to follow other high schools in the community not playing the game. These control groups will offer a means of assessing the effectiveness of Community Capture as a learning approach. As Clark (2007) states, prior knowledge differences are also important. To ensure students are relatively equal in abilities (and to potentially extrapolate our findings to the general student population), we would survey a large sample of students in the community, assessing demographics and skills. This allows us to obtain a balance between the classes playing Community Capture and our control classes.

Over the course of the year, we would measure student test scores, assignment scores, and in-class work centered around students' knowledge of their community, comparing the control group to the students playing Community Capture to see if there is any statistically significant differences between the two groups. While this may measure the simple acquisition of facts, it does not necessarily gauge student engagement. For this, we would also want to compare statistics such as student attendance rate, students signed up for future or advanced history courses at the semester, and overall performance in the course, against statistics for that class from the previous year. Pre- and post- surveys could be implemented with quantitative questions to gauge student engagement with history and their community and offer more qualitative questions about how students interpret their community and their classes in terms of their goals and careers. We could measure the same factors on the game itself, though this offers less direct comparison as students in the control group could not evaluate the game. Though students are often not the most reliable sources for measuring personal progress, their opinions can help form a more holistic picture of the effectiveness of the game (Clark, 2007). We could also measure less direct implications such as student involvement with community projects and volunteer hours. Students identified by instructors as advanced, or identified as such through higher than average test scores, could have their results analyzed separately as well to gauge how advanced students reacted to the game.

To gauge team building, it might be beneficial to incorporate other experiments that measure how well people work in teams from other social science experiments. Simple team challenges throughout the course (again, for both the Community Capture teams and the control teams) would help us see how teamwork and coordination improves throughout the semester. We could offer qualitative and quantitative surveys throughout the year to measure how students feel about their classmates, their teams, and the friendliness and cooperative nature of their community at large. Other statistics, such as classroom fights and infractions, might also be useful in measuring student progress.

We would develop a number of measures built right into the game to help gauge progress across these goals. First and foremost would be the chat function: we could automatically parse group chats for positive or negative words or concepts. We could inspect those chats to see how students are responding and what they are learning. The raw metrics of places explored

and captured would show how many students have engaged with the game. Where additional information not required for advancing in the game is offered, we could see which students took advantage of that information. We could track geographic location of students relative to one another. It is important to note that some of these metrics have privacy concerns, and we would thus need to be careful to explain the ways in which teachers would be using these resources to students and parents.

Even with these robust testing methodologies, we would still want to know if this experiment is repeatable and scalable. For this, it will be important to gauge how instructors receive and integrate Community Capture. We would need to gauge the teacher's ability to incorporate the game into classroom activities, the administration's willingness and ability to allow students the freedom to travel to these landmarks, and the features of towns where this game is most valuable. To the first, we would want to have deep, qualitative conversations with the teachers about their experiences setting up the game, if they would repeat the game in subsequent semesters, and what could be done to improve the game. We would repeat these conversations with school administrations. To examine the aspects of the town that make the game most valuable, we would want to scale this pilot to different towns slowly, using the same evaluation methods, and examine differences in geographic area, economic status, and school standing. At the end of the evaluation, we would want to combine our qualitative and quantitative analysis and do a full cost-benefit analysis of implementing Community Capture to help us make concrete statements about the efficacy and need for the game (Clark, 2007).

## Conclusion

While Community Capture presents many challenges, most notably creating effective hints with the cooperation of local museums, businesses, and other community stakeholders, and the above-detailed evaluations are likely too extensive for a realistic level of funding, we believe this game represents an effective advancement of community-based learning as well as geo-location and augmented-reality gaming. The learning and motivation principles outlined by Malone and Lepper (1987) and Gee (2007) provide powerful reasons for thinking Community Capture could be an effective learning tool.

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