Gaius' day game

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1. Excursion-game on a mobile device

By exploiting mobile technology, we aim at improving the student's whole experience of playing a game in an archaeological site as well as its learning effectiveness. In Italy, use of cellular phones by middle school students is very popular. This lead us to consider using games on handled devices to achieve educational goals.

The system we are developing implements the electronic version of the excursion-game proposed by Historia Ludens to support students during a visit of archaeological sites. Historia Ludens is an association, set up by researchers in the field of Teaching History at the University of Bari, Italy. The association has developed the excursion-game as a learning technique exploited by middle school students during didactic excursions to visit historical sites. Excursion-games have been designed by Historia Ludens for several archaeological sites in Southern Italy. The experience with these excursion-games has been replicated hundreds of times with different classes and teachers, who appreciated a lot how much students were stimulated by the game to know more about the site and overall how they enjoyed the visit. Among the excursion-games designed by Historia Ludens, in the rest of this paper we refer to "Una giornata di Gaio ad Egnathia" (Gaius' Day in Egnathia), which is designed for a visit to the archaeological site of Egnathia, an ancient city in the Apulia region. It is only an example, since the system is designed to be easily adopted to excursion-games that refer to the different archaeological sites. The excursion-game is structured like a treasure hunt to be played by a class of students: it combines the excitement of both chase and solving the case with the joy of freely exploring a place and discovering its hidden secrets. This type of game is perfectly suited to the archaeological site context, with wide spaces where students can move about freely and use their intelligence and imagination to conjure up how life used to be there, by observing the site and memorizing places, names and functions.

To develop a system conforming to the usability criteria, the Learner-Centered methodology has been adopted. It prescribes involving domain experts and educational experts in the system development. Thus, teachers and Historia Ludens associates contributed to the development of the digital excursion-game. We exploited the contextual inquiry technique to collect data about users' own activities. We participated in an actual excursion-game performed at Egnathia by students (11-12 years old) of the middle school "Michelangelo" in Bari, Italy. Figure 1 is a picture of that visit, during which students played the traditional paper-based game.

The whole excursion-game lasts two hours. The game is presented by the game master (i.e., teacher or Historia Ludens associate), whose main tasks are to check that the rules are correctly observed, encourage the group if they run into difficulties, and push them in the right direction towards a successful solution by giving small, suitable hints.

The game consists of three main phases: 1) the introduction phase, in which the game master explains the game (i.e. its phases, its rules) and the place in which the game is played; 2) the game phase, in which the players play the game; 3) the debriefing phase, in which reflections on the game experience are made.

In the following, we describe the digital version of the game we have implemented. It consists of the same three main phases.

Figure 1. The game master explains the game.

2.1. The introduction phase

After children arrive at the archaeological site, the game master gives a brief introduction about place and period being studied. Then, she explains the game, the various phases and the rules. Groups of 4/5 players are formed: each group has a navigator (group leader) and impersonates a Roman family that has just arrived in Egnathia, having received a plot of land and a house.

Each group is given a cellular phone, a sheet of paper with the mission description, and the map of the site. The mission description refers to a typical day in the life of a person of that ancient time and the missions the group has to carry out. During the game, the cellular phone screen visualizes the mission description using the same words as in the mission description. In this way, the students can match the state of the game on the cellular phone and the mission description.

The map allows the players to find their way around and follow the right pathway; it also has a teaching function, because players have to mark places in the site, it fosters conceptualization and organization of the information.

Initially, we had planned that, in the electronic version of the game, each group would receive information about the missions on the cellular phone. After observing students really playing the game in an archaeological park, we realized that, in order to highlight the collaboration aspect, it is best to give each group a mission description. In this way, each student in a group performs complementary activities: reads the mission description, searches on the map, uses the phone. Moreover, the mission description is too long to be comfortably read on the cellular phone.

2.2. The game phase

At the beginning of the game, the system tells the players that they are members of a family from Egnathia who have to carry out some activities, we call missions. The system invites them to start playing as soon as they are ready. Figure 2 shows the Game Player Application start screen on the phone. A memory card hosting the game is also shown.

Figure 2. Gaius' Day start screen.

The game starts. A sound attracts players' attention while the first mission to be executed appears on the phone screen. An exciting sentence asks Gaius to find a place by exploring Egnathia. For example, Gaius has to search for the Furnace, where Tizio, the potter, always needs assistants and could employ one of Gaius' sons.

The mission text is also acoustically reproduced, allowing all participants in the group to be more involved. The group has to explore Egnathia by collecting information about the furnace and identifying the place. An item in the Menu list allows the players to ask the "oracle" for help. The oracle gives them some hints that help discovering the right place. In the ancient Roman culture, the oracle ("oraculum" in latin) was a divine communication delivered in response to a petitioner's request. Hints, provided by the oracle, support both game-play and students' learning of the underlying educational content. Rather than simply giving the right answer, they lead the students in the right direction to help them discover the right answer for themselves.

When the group believes to have identified the target place of the mission, the navigator digits the place code on the cellular phone or photographs the place's visual tag, if the phone has a camera (Figure 3). Place codes and visual tags are assumed to be distributed across the site. Another component of the group notes the place down on a map of the site.

Figure 3. In order to give the answer, the navigator a) inserts the code or b) uses the in-built camera to photograph the visual tag.

The system signals acoustically that the current mission is concluded and that the next mission starts. It visualizes the text of the new mission and reads it out aloud. So, the game continues.

The students can select the "Can't find" option when they are undertaking the ghost mission, whose target is not available on the archaeological site, for example, identifying the harbour that is not visible anymore, or the civil basilica, which is assumed to exist but has not yet been dug out. The system explains

why the target is not to be found and shows a 3D model of that portion of the site.

After completing the last mission, the group receives "God's gifts". This means they actually can see the site map on their cellular phone and the 3D reconstructions of the ancient monuments. Specifically, when they arrive in front of the place of a target mission they have identified, a red point indicates the right position of that target on the map (Figure 4).

The students have the possibility to explore the 3D reconstruction of the identified places on the phone and compare their original look with the existing remains (Figure 5).

Figure 4. The map of the site on the cellular phone.

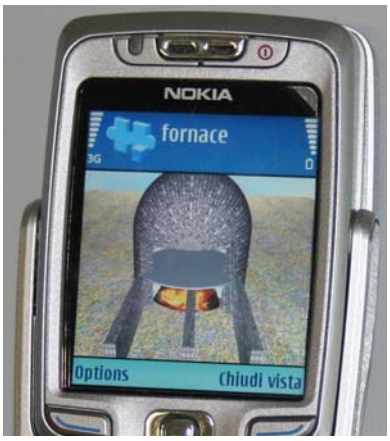

Figure 5. The 3D reconstruction of the furnace.

The proposed 3D models are scientifically correct, because they have been designed in collaboration with archaeologists of the Ancient History Department at the University of Bari, who are studying archaeological parks in Southern Italy. Although cellular phones do not have high performances of 3D rendering, the quality of the visualized scenes is adequate to support the immersion experiences.

2.3. The debriefing phase

When the game is over, game master meets students for debriefing, to reflect upon their experience. This phase can be carried out in a lecture room in the museum or on return to the classroom. The debriefing is presented as a pleasant end to their day, and the experience they have had. In this phase, the acquired knowledge is revised and shared among students. The game master gives a complete overview of the various notions they learned during the day and encourages them to ask questions, make hypotheses and satisfy their curiosity. The debriefing phase is fundamental in didactic game-play because it fosters generalization and conceptualization of the information acquired during the game.

By making use of the current technology, the debriefing phase is greatly improved. During the game some information has been recorded in an XML logfile: inserted code or photographed visual tag, missions execution time, and if the oracle was invoked. The game master, using a card reader or a Bluetooth connection, collects logfiles from each group as they come in with their concluded missions. The Game Master Application, residing on the notebook of the game master, analyzes the logfiles and proclaims the winning group. The application may replay activities of an arbitrary group, based on the corresponding logfile and using higher-definition 3D reconstruction of the archaeological site than the ones on the mobile memory cards handed in by the student groups. The game master is recommended to replay the winning group's performance on a projector at the debriefing phase in front of the whole school class, as a reward to the winners but also to recapture some of the things learned throughout the visit.

The Game Master Application also offers the chance to play a "collective memory game" where monuments and archaeological objects (previously encountered by the students as part of the game) are to be placed in the "right" place and the whole school class is encouraged to participate and collaborate.