Proceedings of the 2nd Fascinate Conference **27-31 August, 2014**
Thoughtful Technology & Beautiful Interfaces **Falmouth University, Cornwall, UK**

‘GAMES IN THE PARK’: STORIES AND GPS BASED FUN TO ENCOURAGE INTERACTION WITH NATURE

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ABSTRACT
The ‘games in the park’ project investigates how technological interventions can encourage outdoor play for children aged 8 to 12. A series of location-based games have been created via a co-design process in response to a real world design problem highlighted by a local wildlife trust. The trust had found that 8 to 12 year olds are less inclined to voluntarily attend countryside events to learn about nature than younger children. The focus for the work was to develop games that make use of Global Positioning System (GPS) data to encourage interaction with nature by older children. A key challenge in this design problem is achieving a balance between the user engaging with the physical environment whilst maintaining awareness of the game directives through mobile technology. In particular, to investigate how the flow of activity through the game could be maintained, comparing the use of rewards for tasks in contrast to the use of characters and stronger narrative elements. The children helped to co-design and create a series of games to inform the project. Both the reward focused and character/ narrative game types were enjoyed equally in this experiment. A series of other observations helped to refine the complex ‘wicked problem’ being investigated and extended the development of design guidelines for games of this type.
KEYWORDS: Location Based Game, Co-Design, Design for Children, Outdoor Play

Fig 1: Playing a Location Based Game in the Park

1. INTRODUCTION
There is evidence that spending time in the countryside during the formative pre-teen years will encourage visits during adulthood and also promote environmental awareness (Rawles, 2009) (England, 2009b). Sussex Wildlife Trust, a nature conservation organization in the South East of England, run a series of wildlife clubs during school holidays to allow children to experience and learn about natural environments. They have identified a need to encourage older children to participate in the events, which are more frequently and willingly attended by their younger counterparts. This is an example of a complex, issue, often classified as a ‘real world problem’ (Wisker, , 2007). This provides the context for a wider research project, addressing the question of how mobile technology can be best used to increase enthusiasm in older children for outdoor activities, which is the subject of doctoral research at the University of Brighton. This paper discusses a particular design experiment for this project. These experiments have also received support through the University of Sussex as part of a widening participation scheme. The broader research question posed is:

• How can a location based game be optimized to maintain engagement and interaction with the physical landscape for older children during outdoor play?

Given the aims of this project, investigating motivation and enjoyment takes priority above measuring learning outcomes. The context is not a formal classroom activity, and the emphasis is on fun, engagement during interaction with both the landscape and technology and continued motivation towards the activity over time. This points towards research and design methods that include affective and emotional responses, related to Experience Based Design (Shedroff, 2001). Putting together the motivational effect of games and a mobile/contextual learning scenario leads to the conclusion that Location Based Games based on GPS technology could provide an avenue for investigation. As a preview to the experiments described here, an ethnographic observation of the wildlife holiday clubs, with SWT as a volunteer, provided a ‘fly on the wall’ perspective on the activities presented and the children’s reaction; this was in the same location as the proposed game development, Stanmer Park, in Brighton. The park has indigenous natural species. In total there was participation in 6 holiday club days with the SWT for ages 6-13. This helped to identify the activities that could possibly be adapted for location based games and which were less interesting for the older age group. Paper based co-design processes used at the beginning of this project were also developed as a result of earlier work with this age group; these elements are discussed in a previous paper (Grundy, 2014a). This phase of the project is an exploration into how different game structures and methods of sequencing information might influence engagement with the activity. The particular question under investigation through the workshops described in this paper can be further defined as follows:

• What are the criteria for designing the interaction points, structure and interface to enable effective and enjoyable play with nature through a location based game?

To create the games we used **ARIS**, a game creation platform developed by researchers at Wisconsin University, which allows the addition of characters, and other media in situ playable via a phone App (ARIS, 2014). The focus was get user feedback on games created according to different models, which was achieved through asking participants to play example games created by the researchers, before creating their own games in line with the different approaches. One researcher-created game adopted a 'treasure hunt' model, with a random sequence of points to be visited and a set of in-game 'rewards', such as a golden leaf. A variation of this game was also created which had a numbered sequence rather than points to be visited at random. The 'treasure hunt' game was later contrasted with a version including characters and a storyline to script the activities. Children often find fictional characters to be engaging, according to many successful toy designers and film-makers (Del Vechio, 1997). For this reason we wanted to investigate whether the addition of characters to location aware games would increase enjoyment and levels of motivation for this age group.

2. BACKGROUND

Organizations such as Natural England (England, 2009b) and the Sustainable Development Commission, report that appreciation of nature at a key age can lead to greater enthusiasm for environmental issues and encourage people to engage more fully in a sustainable society (Sustainable, 2009)**.** Children who are too young may not understand key themes or remember the experience well and teenagers, by contrast, have often already established habits and behaviours, so this intermediate age group offers a critical window of opportunity. There is evidence that visiting the countryside while younger can lead to a lifetime habit of enjoyment (England, 2009a). This age group can present a challenge, however, as by this stage many become less interested in outdoor play than might be desired, and typical activities organized by the trust, e.g. den building or digging for bugs have been perceived as appropriate for younger children. Interest in games and digital media, by contrast, is relatively common and could provide a key channel to access learning about the environment and biodiversity with careful introduction and appropriately designed interactions. Outdoor learning has seen increased interest during the last few decades (Fagerstam, 2012). Experiential Learning, where the participant interacts with an environment or situation related to the learning outcomes, has long been considered a valid approach with early proponents including Piaget (Piaget, 1983) and Dewey (Alexander, 1998). Further theories following this movement include Situated Learning Theory (Jean Lave, 1991) based on principles introduced by Vygotsky (Seeley Brown, 2003). In this case the definition is that the 'Construction of meaning is tied to specific contexts and purposes' (Wilson, 1999).

Lately with advances in mobile technology, there has been increased opportunity to take learning out into the field and allow direct experience of phenomena with appropriate educational prompts. Frohberg, et. al. (Frohberg, 2009) studied 102 mobile learning projects and discovered that one third of mobile learning projects strive to move learning away from the class to natural environments. Technologies developed to support the exploration of natural settings include, for example, learning about woodland ecology (Bahtijar Vogel, 2010) and helping with data collection or recording the environment, for example bird watching e.g. Chen, Kao, Yu & Sheu, 2004 (Chen, 2004). Successful introduction of mobile technology to supplement formal classroom education has also been facilitated by children's fascination with the technology itself and consequent motivation towards the learning activities presented through it (Rogers, 2010). Much of the later work on situated mobile learning stresses the need for studies that consider how users will switch from the technology being in the foreground to the physical environment being at the fore (Elliasson, 2013). Informal uses of mobile learning in a natural context have also started to emerge. There are a series of subcategories of activity in this area, for example digital Geo-cashing, where the player tries to find artefacts in a particular place that have been left by fellow players; Treasure Hunts where players look for information or carry out tasks in a given place, and more social gaming versions where proximity to other players is automatically registered and interactions are also a game feature. Though promoting the use of technology in a natural place is possibly a controversial step, if adequate emphasis is given to guiding the player/user through a series of experiences and interactions with the countryside, and such experiences subsequently appear more inviting, the outcome could be considered positive. However, a significant problem is that technology can be a distraction from engaging with the real physical world. Rogers, Connelly, Hazlewood and Tedesco (Rogers, 2010) studied the use of technology for entering data or looking up information to support scientific investigations on an ecological restoration site. They argued pupils might have difficulty switching between the mobile technology and the physical environment. Earlier investigations led to some useful conclusions about the parameters for a location-based game in this context and these formed a series of Design Guidelines (Grundy, 2014b)

Fig 2: Focus on the Technology

3. APPROACH

The nature of 'real world' research can be considered to present a 'wicked' problem', i.e. one with complex questions with regard to the activity and systemic impact on the individual, their social sphere and the environment. A worthwhile design research contribution can, therefore, involve a series of variables, whose relationship to the design may be difficult to fully determine at the beginning. Design research therefore usually calls for a flexible methodology and methods that are participatory and inclusive to gain evidence to support decisions. The approach is analogous to Design Based Research, a methodology frequently applied to learning tools, in that it follows an iterative process where the research problem and solution are continually refined until the wicked problem can be 'tamed'. Examples of this iterative approach through a practical design application include Concept Driven Design by Stolterman and Wiberg (Wiberg, 2010) and the Design experiment Cycle by Mor (Mor, 2010); this was later interpreted by Elliasson (Elliasson, 2013). More flexible models have been proposed for situations that are less empirically based and have more emphasis on a particular context with associated social or cultural requirements, under the general philosophy of 'Research through Design.

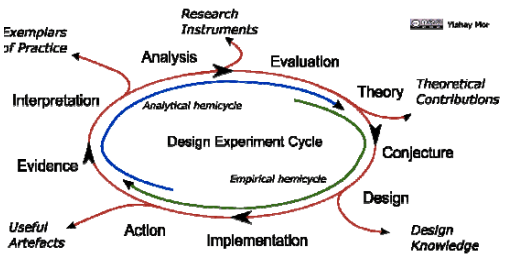

Fig 3: Design Experiment Cycle

The requirement to understand the experience for a target audience plays a more significant role here than effective learning. The 'Research Through Design' approach followed for this project therefore emphasizes a participatory design approach with the children, with the intent to address their preferences and emotional needs, rather than learning projects where the view of the teacher may be foremost in the hierarchy of stakeholders (Elliasson, 2013). A significant part of the literature review for this project has therefore focused on finding appropriate techniques to investigate requirements of this group with interrogations that are age appropriate and can be 'triangulated' to get valid data, including Co-Design methods. A method for doing this is proposed by Sanders; she suggests listening to what people Say, look at what they Do and watch what they Make, the Say, Do, Make model (Sanders, 2001) One of the more obvious reasons why some tools are impractical for younger children is their relative inability to verbalize responses. 'Say' methods that rely on description and memory are less likely to yield fruitful results. Observation tools are based on the perspective of the design researcher and therefore a certain amount of interpretation is required. This may be fine when addressing an adult audience, where a similar level of cognition occurs. However, a child's world seen through adult eyes is open to misinterpretation. As an adult it is almost impossible to second-guess the preferences of an 8-12 year old child (Naranjo-Bock, 2011). The work of Alison Druin (Druin, 1999) and others illustrates the significance of including children in a design process at all stages, i.e. 'Make' methods. However, gathering *useful* information for innovation can be more difficult than for adults. Not only do children have different behaviours and motivations, they also communicate in a different fashion. In other words, the difference in perception and culture between children and adults can lead to errors in interpretation. This led to the development of a process where the children created their own sketched characters and stories to illustrate a scenario. During this method they discuss with the researcher their creations and the reasoning behind it.

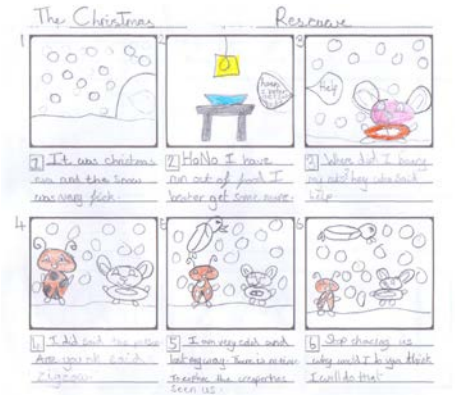

Fig 4: Character Design and story for a 'Make' activity

This was shown to reveal their preferences and in some cases their emotional needs. This is the subject of a previous paper, by Grundy, C., Pemberton, L., and Morris, R. (Grundy, 2012) and the method was also employed during this work.

4. METHOD

Workshop 1: A study was undertaken in June 2013, with a series of one and a half hour workshops held over a 5-week period with a small primary school in Brighton. The character design activity was conducted with these pupils as a preface to the next stage of implementing their ideas in a game using ARIS. The pupils worked in groups of three. The initial phase required them to take photographs of natural objects they liked and Geo Tag them to identify locations for their game. One member of their team would hold the iPad while playing the game and another was given a video camera and the other was asked to observe and help the others. They were told to swap roles at regular intervals. They then used their content and character/game designs in ARIS with these points to create their location based game. The pupils made animated videos of their drawings using an app called MORFO to add content to the game. The pupils subsequently played their own game and a team member videoed their progress. At the end of the final session pupils were asked to fill out a short questionnaire which asked them to rate their experiences on simple Likert scales.

Figure 4: A Character animated in MORFO

Workshop 2: For the 2014 experimental phase, a two-day workshop was conducted with 12 different pupils from Fairlight primary school (in June again). The pupils again worked in groups of three. For the first day, they were asked to play an example Treasure Hunt game to start with that led them to a series of 5 points and presented different possible activities. This was to illustrate some of the capability of the ARIS game. Some points simply gave information, for example one suggested they observe the swallows and their swooping action to catch bugs; another involved collecting objects with different attributes and photographing them. The activities corresponded to typical SWT activities. They were rewarded with a golden object after successfully completing each mission. One version of the game had numbered points on the interface, with directions embedded in the game from one point to the other, the other did not label the points but still had the embedded instructions. They then used ARIS to create their own Treasure Hunt style game.

The second day, they started by playing their own game to see any issues that had arisen with it. Then they played a version of the game with Characters and Stories in. This included videos created in an App called MORFO which can animate a photograph, including children's drawings. These were already created and helped to direct pupils to the next point. There was a conclusion to the story with a point appearing after they had visited all the other points and done the experiments. The points were similar to the first group. They then, similarly created their own MORFO videos to tell their particular story and made their own version of the Character and Story game.

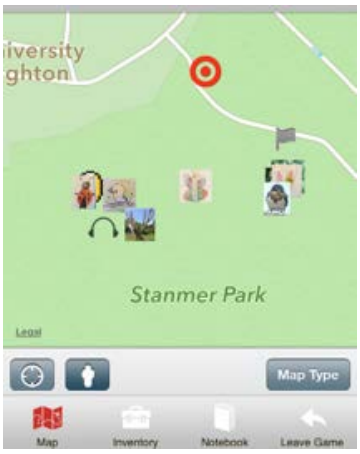

Fig 5: Character Design game version

5. RESULTS

Workshop 1: The first workshops in 2013 helped to provide general guidelines for the game parameters for this age group. The pupils all managed to successfully create a location based game and all but one pupil enjoyed both making and playing the game, according to the questionnaire responses. This may have been due to an issue with group dynamics. Though others have noted the children spending too much time on the technology, this phase also flagged up contrasting issues of the children forgetting the game and getting carried away with climbing trees or other environmental features. While this may be desirable in terms of physical engagement with the location, it is also ideal to maintain a flow of activity in order to encourage the visitation other features or for the player to be motivated to return on other occasions. A balance of focus needs to be created and a flow of meaning through the whole activity considered. A significant observation was that many pupils found it difficult to read the map to locate themselves and a lag on the GPS system meant that some walking was necessary before it could be established if they were travelling in the right direction. This could effect engagement in the game and led to the conclusion that more emphasis on the consideration of way-finding, and locating the next point with relative ease, might help with continuity and a desire to carry on to the next activity. It was decided to further experiment with contrasting different clues to the next location , for example: numbering, written descriptions and a storyline to create a sequence. The distance between points and having an accessible location also influenced enjoyment. For further research, it was concluded that if enjoyment is to be evaluated, the following game parameters should be fixed: Distance (total and between objects) should be less than 30m; the number of objects between 5-10; the same locations should be compared across experiments and the same level of difficulty; compare results in the same weather conditions (and season); keep consistency of graphical style and the interface as far as possible. Another observation was that ARIS is a trying interface for some young people to develop games at times, with a few non-intuitive aspects to its use. It may have influenced the progress made towards game completion, though they all created something, they were not necessarily as finished as the children might have liked. It is, however, the most appropriate medium for adding characters and stories discovered so far. A more concentrated period of use might therefore be preferable to get to grips with using it. As this is a mechanism for co-designing rather than part of the game to be evaluated it was decided to persevere with it. Some pupils were still wondering when they were going to play ‘a computer game’ at the end. It may be that they didn’t make sufficient progress to have a fully implemented game level, or that they did not accept that their own drawings and MORFO videos were acceptable as a finished ‘game’.

Workshop 2: Interestingly, the pupils did learn the basic facts ‘hidden’ in the pre constructed game and some reused the information in their own version e.g. recognizing elderflowers or added their own, e.g. one group added observed insects inside flowers, another included ivy and asked viewers to note the effect it had on the tree. The pupils also engaged in activities through this game, e.g. den building and gathering natural objects that were very similar to the original SWT holiday clubs. Thus the software was successful in directing these activities and imparting basic facts in the absence of a human director. The game version with the numbered points appeared to help to add clarity to the game sequence. When playing the second ‘characters’ version, it was noted that the pupils were already a little tired after finding their own game locations. They also were put out if they had to return to any point on their previous game, or to back track in the same game. It seems that much of the enjoyment is in moving forward into new terrain. It was difficult to evaluate the pupils’ ability to find the next point between the two game styles as the map had become more familiar to the pupils by the second day. A questionnaire revealed that, despite being asked which game they preferred, most did not wish to express a preference, with only two preferring the characters version and one the golden object treasure hunt version. The girls, on observation, seemed more interested in the natural characters than the boys. For one group of boys, their own story included survival army type games, which also concur with some of the typical activities that SWT provide. All of the groups were successful in creating the Treasure Hunt game using ARIS, though they didn’t have time to add rewards on the whole, and they also managed to design a version using the Characters, which they designed and created MORFO videos for. Unfortunately due to an issue with the Internet. they were unable to load their MORFO videos to the game, which may have influenced their final appreciation of this activity.

6. CONCLUSIONS

The results are based on an explorative approach and the workshops contain small groups of pupils, therefore the results are tentative but provide useful points for further test and experimentation. There was no significant difference in enjoyment of either game, even though a questionnaire explicitly requested a preference, pupils could not decide. In other parallel experiments, the characters and stories had been evaluated as having more appeal than a basic treasure hunt. However the addition of golden rewards might have addressed this bias and added more appeal to the treasure hunt. It may also be true that the activities and points were too similar so that the pupils felt they were just repeating actions the second time they played the game. This may have also been influenced by their relative success in making each game (and the difficulty with adding MORFO videos). In future questions about making or playing the game should be separated in future. For further experimentation, it may be necessary to contrast two different groups coming to the activity for the first time, in sufficient numbers to get a rigorous analysis. This should also be the approach to evaluating the way finding aspect of the game as familiarity with a location over a series of experiments interferes with the results. This could also be contrasted with the same group and similar activities at different location points. The game goals need more consideration and a ‘future workshop’ as a co-design activity would provide useful design guidelines for future implementation and test. The pupils enjoyed making the games for both workshop series, the use of MORFO is always particularly well received. However, they don’t necessarily seem to appreciate the results of each other’s animated drawings. In the next advancement it is planned to

prepare some more professional content with different types of appeal to evaluate their appreciation with the children.

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