Sensitizing: Helping Children Design Serious Games for a Surrogate Population

Gavin Sim(✉), Matthew Horton, and Janet C. Read

ChiCI Group, University of Central Lancashire, Preston, UK
{grsim,mplhorton,jcread}@uclan.ac.uk

Abstract. This paper describes a study to investigate to what extent the use of sensitizing techniques can help children design a serious game for a surrogate population. In total 25 children from a UK primary school aged between 8–9 participated in two design sessions. The first session was designed to inform the children about life in rural China. The second session briefly taught the children about aspects of food hygiene and then required them to design a game on this subject, for children in rural China. The outputs from the children were analysed and although all the children managed to design a game, only 6 related this at all to food hygiene, with three of these having only a single element of food hygiene present. The other 19 created games were unrelated to food hygiene. In addition, only 1 drawing showed any evidence of thinking about the target users. More work is required to understand what children can contribute to the general development of serious games and to the specifics of thinking about other populations.

Keywords: Children · Serious games · Sensitizing · Participatory design

1 Introduction

Serious games are designed with an emphasis on learning [1], as opposed to being purely for entertainment [2]. The effectiveness of serious games to enhance learning in contexts where traditional learning has been found to have limited success, for instance in health [3], has been widely recognized. When the target audience of the games are children research has highlighted the importance of including children in the design process to maximize the potential success of a product.

In terms of design, many studies have shown that participatory approaches with children both at the ideation stage and at the pre-build stage, can be beneficial, although there are concerns about the extent of, and the abilities associated with, children's participation [4].

At root, participatory design is a form of collaborative working, by which groups of users can influence design decisions. Participatory design sessions are generally used to capture design ideas in which the participants are the target user group, for example children designing interactive games for museums [5]. Typical participatory design sessions involve end-users working with designers to propose and work through potential design ideas for a specific system. There are different models of running participatory design sessions in which design experts (software designers and researchers) work with

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domain experts (the end-users, children) to produce designs. It is acknowledged that depending on the way in which participatory sessions are set up, end-users' ideas will have varying impact on the final design. When participants contribute directly to a design, as in a facilitated, as opposed to an informant role, it is especially important that they understand the nature of the artefact they are contributing to, and are aware of why and how they are contributing [6].

The games industry is a global business; with games being developed for a global audience and serious games are situated within this business model. Merritt and Stolterman argue that attention to culture is critical in today's global digital economy but this has been absent from participatory design approaches [7]. Research has been performed to try and improve participatory design practices in developing nations [8]. However, it may not be practical for developers to use participatory design techniques with children from a number of continents, so for this reason, explorations with participatory design for surrogate users may be worth examining.

Children as designers of products for other children is a theme that has been studied [9, 10]. In the first of these two studies, children were actually designing for themselves but were 'informed' that they were designing for another. The use of scenarios that masked the design and the use of practices that diverted the real purpose of the game which was being designed from the participating children had the children believing they were designing for a third party but a third party that was almost identical to themselves. In the second study children were asked to develop a serious game for children in Uganda relating to hand washing. All the children were able to contribute design ideas for a game relating to hand washing but the ideas were mostly aligned to western cultures and artifacts. To overcome this shortcoming sensitization to the culture and beliefs of the target audience may be required.

Sensitization can involve a process in which the participants are encouraged to reflect on past experiences to help facilitate envisioning future experiences. This could be achieved through the use of cultural probes which have been used to gain contextually sensitive information in order to inform and inspire design [11]. Cultural probes are designed objects, or physical packets containing open-ended, provocative and implicit tasks to support engagement with the design process. For example, one of the tasks that children were asked to perform in a study by Wyeth and Diercke [12] was to draw a picture of a classroom of the future and it was found to be effective as a tool to inspire designs. Other methods that have been used to understand the target users include observation, interviews and diary techniques in an attempt to understand the lives of residents in a care home [13].

This paper explores the area of participatory design with children in the UK designing a serious game for children from another culture. The aim of the study presented here was to focus on the design aspects of this experience, by investigating to what extent sensitizing can aid children's designs within participatory design session. Given the poor cultural associations seen in [9], the overarching research question was, would children sensitized to the needs of similar others be better able to design a serious game for that group.

2 Study

The aim of the study was to investigate to what extent the use of sensitizing techniques could aid children to design a serious game for children in rural China. The study firstly required sensitizing children to how life in China differed from their own lives and then a follow on design session in which the children would design a serious game for that population.

2.1 Participants

The participants were 25 school children from a UK primary school; the children were aged 7–8 years old. The children took part in this study within their own school.

As outlined above, there were two separate sessions and two researchers and the teachers were present for both, with an additional researcher being present for the design session only. All the researchers had experience of running participatory design sessions with children and had also worked with the children on other projects so were familiar to them. Teachers and researchers were on hand to encourage the children in their work, but were careful not to influence their design ideas.

2.2 Procedure

The first session aimed to introduce the children to the culture and life in rural China. This took place one week before the second session, which was the design activity. The children had already been learning about China in school and had been reading in class the book 'Secret Agent Jack Stalwart The Puzzle of the Missing Panda: China' as part of their studies [14]. Thus the sensitizing session aimed to build on their existing knowledge, focusing on children in rural China and considering how their lives were similar to and different from those of UK children.

Each child completed activities to elicit information about their existing knowledge and to then explore further life in rural China. There were four activities, which were:

- Knowledge: Write three things already known about China.
- Imagination: Describe a child's Saturday in rural China. This was broken down into three sections; morning, afternoon and evening.
- Learning: After seeing some videos of life in rural China, and a brief discussion of the content of the videos. The children were provided with a set of three pages of images in a montage consisting of images of people and life in rural China. They were required to produce a storyboard using these images telling of a day in rural China. For this activity children were given an A1 piece of paper and worked in groups of either two or three. An example can be seen in Fig. 1.
- Reflection: Write down three things they had learnt from the session.

The second session took place one week after the first session. The aim of this session was to have the children design a serious game to teach children in rural China about food hygiene. This subject was judged to be suitable for the children, as they had covered some of this subject in school but additionally it was relevant to them and to children in

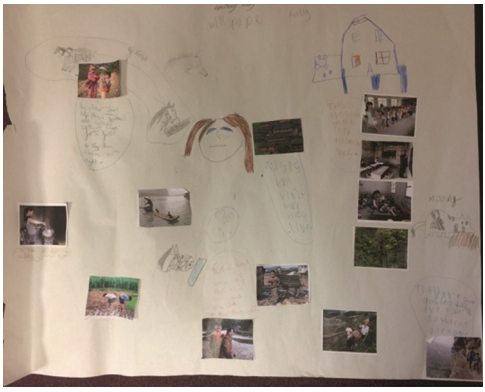

Fig. 1. Example of a storyboard created by the children about the day in the life

rural China. The session began with the children gathered around a white board for a 15 min interactive discussion about aspects of food safety including, preparation, cooking and storage. The children contributed to the discussion by sharing their understanding of the subject, whilst the researcher captured these points on the white board and discussed other points. Once this initial discussion about food safety was completed, the children had the design activity explained to them including details about the future possible use of their designs [4]. The children were given a booklet made up of three blank interfaces for them to complete. The children were asked to create a game for children in rural China teaching them about food safety. They were informed to design their game based upon the knowledge from the previous week and from the information on the white board; they were given their own storyboards from session 1 activity 3 to look at for ideas. Some of the children opted to work in pairs although the majority worked individually. During this process the researchers went round the tables asking the children about their design and encouraging them if they were having problems.

2.3 Analysis

Analysing children's drawings is an established method within child computer interaction [15]. A set of criteria to measure to what extent the participants understood the culture of the target users were applied for the purpose of this analysis of drawings. These criteria were initially based upon the definition of culture proposed by Porter and Samovar [16]:

- Culturally Situated: These designs were firmly grounded in the designer's own culture, requiring understanding of this culture in order to understand and interpret the design unambiguously.
- Culturally Un-situated: These designs assumed no understanding related to the participants' own culture, explaining or including instructions for any element in the design that may be unfamiliar to the target user.

- Experientially Situated: These designs made use of experiences with which the target users was assumed to be familiar based upon the information in the first design session and their work in class.

The drawings were also analysed to determine whether the game was related to the topic of food hygiene and also as to whether any of the knowledge gained from the sensitizing session had been incorporated into the designs.

3 Results

After the end of session 1 the children were asked to state 3 things they had learnt about China; these are displayed in Table 1 below.

Table 1. The things children claim to have learnt after the sensitizing session

Learnt	Number of children
Have long & dangerous journey to school	15
Eat different foods	7
Slept at school	2
Eat on floor	1
Help on farm	6
Poor school facilities	3
Collect water	1
Different religion	1
Use chop sticks	1

In the second session 25 game designs were created, these varied considerably in detail and quality. At one extreme a child simply described a game offering no visuals and at another level some children presented visuals, discussed the interaction and included the game mechanics.

Of the 25 designs 19 did not relate at all to the topic of food hygiene. Of these 19 games, the types of game varied considerably with 5 relating to healthy eating, 3 being platform style games in which food was collected and 4 considering making food but not covering the hygiene aspects of food preparation. Table 2 shows the style of game for all 25 games designed by the children.

Three of the games evidenced a single aspect of food hygiene by including hand washing. In addition three games were reasonably aligned to the scenario. Two of these games involved storing food in the correct location and position. For example, the meat had to go at the bottom of the fridge. Another game involved food preparation with different chopping boards and the user had to select the correct board for the item and ensure the food was washed.

The cultural dimension was analysed for the 25 drawings and the results are shown in Table 3 for the 3 criteria.

As can be seen from Table 3, the majority of the designs were culturally un-situated. The number in brackets indicates that a small element of this category was present in a

Table 2. The types of games depicted in the children's drawings.

Game style	Number of drawings
Healthy eating	5
Hiding food	2
Word search	2
Jumping game	3
Building toys	1
Making food	6
Fishing	2
Washing hands	1
Storing food	2

drawing, for example one storyboard had Chinese characters on the first screen but was still largely culturally un-situated. There was no evidence of any of the children applying the knowledge (see Table 1) from the first session to their games. The games designed were largely culturally neutral. For example one of the games was a platform game that you had to run along, jumping onto different platforms and collecting chickens, this was judged to be culturally un-situated (although it did not relate to food hygiene).

Table 3. The number of children's drawings matching the cultural criteria.

Criteria	Number of drawings
Culturally situated	8
Culturally un-situated	17 (2)
Experientially situated	(1)

4 Discussion

Developing a serious game is complex which is probably why so many frameworks have been developed to aid this process [17]. For children to be successful at designing a serious game they would need to be able to design learning, game mechanics, understand the technology and, in this instance or for any global market, design culturally appropriate content into a game. This may be challenging for children and require more support than was provided in this study.

In this study the children could not describe a serious game solution for the context, which contrasts with the earlier work described in [10, 18] in which the children successfully designed a game relating to hand washing. It may have been that the subject of food hygiene was too complex or too broad for the children to turn into a game. The children might have required more help with ideation prior to creating their games. This could be through the process of playing examples of serious games and enhancing the material that was presented to the children.

In summary, although sensitizing techniques were used prior to the game design session in an attempt to enhance the children's understanding of the target audience of the game, the resulting game designs did not recognize these cultural influences. Of the

25 designs only 1 depicted anything relating to China. Some of the drawings were clearly culturally situated having western influences including pizza, fish and chips and certain household furniture but most of the games were culturally neutral so would have been suitable for the target audience. In order to make the games more experientially situated more material, or more focus might have been needed.

Extending the duration in which the children are exposed to cultural information may help further their understanding of the cultural beliefs of the target population. More varied activities may be required incorporating online material, discussions and videos to enhance their understanding.

5 Conclusion

It is clear from the data within the study that children could propose ideas for a game but in this instance the majority of the games proposed were not related to the scenario of food hygiene and were not experientially situated.

It was anticipated that sensitizing would help children understand the culture of the target user and design a game for them. It was evident from the drawings the children came up with, that this was not the case, with many of the games appearing to show western content or were generic games that are culturally un-situated. The design of culturally un-situated games may not necessarily be a problem as the ideas may be generic enough to be playable to a global audience. It is clear that there are many dimensions that are required to develop a game and children do appear to understand some of these dimensions. More work is clearly required to understand what techniques would help facilitate children design a serious game and the relationship between time and the dimensions.

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