EAI Endorsed Transactions
on Serious Games
Research Article EAI.EU

Children Designing Serious Games for Children from other Cultures

G. Sim[1]*, J. C. Read[2] and M. Horton[3]

[1]ChiCI Group, University of Central Lancashire, Preston, UK.
[2]ChiCI Group, University of Central Lancashire, Preston, UK.
[3]ChiCI Group, University of Central Lancashire, Preston, 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 aged 7. 8. and 9 from a UK primary participated in three design activities. The first session was intended to inform (sensitize) the children about life in rural China. The second session briefly taught the children about aspects of food hygiene and then the third session required the children to design a serious 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 six related this to food hygiene, with three of these having only a single element of food hygiene present. The other nineteen children created games that were unrelated to food hygiene. In addition, only one design showed any evidence of thinking about the cultural differences of the target users, those being children in rural China. 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, Culture, Sensitizing. Design.

Received on 22 December 2016, accepted on 23 November 2017, published on 8 December 2017

doi: 10.4108/eai.8-12-2017.153398

1. Introduction

The digital games industry is a multi-billion dollar industry, with games being developed for a variety of platforms, devices and emerging technologies. As an example, within the UK, in 2013, according to Games Investor Consulting, video games studios in the UK invested £458 million in the development of digital games [1]. The size of this market places financial pressures on companies to ensure rapid development of games and therefore it is critical that games go to market on time but are also differentiated from those produced by their competitors.

Serious games are games where the emphasis is on learning [2], as opposed to being primarily for entertainment [3]. The effectiveness of serious games to enhance learning in contexts where traditional learning has been found to have limited success, for instance in health [4], has been widely recognized. Serious games have been developed for workplace training, for adult self-improvement and for children. When the target audience of serious games are children, research has highlighted the importance of including children in the design process to maximize the potential success of a product [5]. This paper explores the use of sensitizing techniques to empower children to design a serious game for a context and a culture that is unfamiliar to them.

2. Related Work

In terms of approaches to involve children in game design, many studies have shown that participatory activities 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 [5]. Participatory design (PD) is a well understood and well developed form of

*Corresponding author. Email:grsim@uclan.ac.uk

collaborative working, by which groups of users influence design decisions. There are different models of running participatory design sessions in which design experts (software designers and researchers) work with 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, referred to as in a facilitated, as opposed to an informant, role, it is especially important that the participants understand the nature of the artefact they are contributing to, and are fully aware of why and how they are contributing [6]. For that end, when the participants are children it may be necessary to inform the children, in an educative way, of the detail of the context that they are designing for. For example, in a study by Read et al. [7] children were taught about how to effectively wash their hands before they attempted to develop a serious game on the subject.

Historically, participatory design is rooted in the social ideologies that workers should contribute to the design of their own work practices. For that reason, PD sessions are generally used, with adults, to capture design ideas in situations where the participants doing the design are the very same people who will ultimately use the products or services. This is sometimes also the case with children, for example children designing interactive games for museums which they would likely be visiting [8] but more often than not, PD sessions with children are positioned as children contributing design ideas for products that they may not later encounter but that may be encountered by other children who are very similar to themselves. This raises questions about the extent to which, and the means by which, one group of children, the designers can represent the ideas, feelings, thoughts and needs of another group of children, the recipients of the designed products.

Many PD papers describe studies where children design for 'other' children but it is relatively uncommon for this process to be unpicked and studied for its effectiveness. Two papers that have explicitly considered these; gaps; between designers and designed for are [7, 9]. 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.

It can reasonably be argued that any difficulties with designing for others will relate to cultural differences. Culture is potentially a difficult phenomenon to account for, as it is socially situated. Hofstede [10] defines culture to be the collective programming of the mind which distinguishes the members of one group or society from those of another. Even within nations there exists different cultural values and beliefs. However, there appears to be agreement that culture is something relatively stable, accounting for durable differences between societies [11]. Hofstede [12] identified four cultural dimensions that he considered were useful to study groups of people and the way they thought about, and positioned, themselves in the world:

- Individualism vs Collectivism
- Large versus Small Power Distance
- Strong vs Weak Uncertainty Avoidance
- Masculinity vs Femininity

Within the context of games design, these dimensions can be useful to determine whether or not a group of children from one culture might be able to design for a group from another culture and they can also be used to highlight differences that might need to be addressed where designer of, and designed for, are culturally distant. Individualism vs Collectivism might impact on whether the game is designed for the benefit of the many or the benefit of the few, Large vs Small Power Distance can impact on the way children might explore or play with the game as opposed to be rule followers, Strong vs Weak Uncertainty Avoidance will impact on risk taking play within a game and Masculinity vs Femininity describes an approach which is to either be the carer of the weak or the hero and the winner. For a games designer, it is important to understand these dimensions and how they fit within the societal values and beliefs of the target audience when developing software. The software design community has embraced this idea in a concept referred to as value centred design (VCD) has been studied within the domain of Human Computer Interaction (HCI) [13] and Child Computer Interaction (CCI) [14]; this approach derives from the belief that a national culture is best embodied in the values its people hold [15].

When designing for a new context, or designing for a group from a culture some distance from one's own, there is some work needed. One approach, which does not apply especially to PD, is the use of cultural probes. Typically used by expert design teams (that is people who are trained in design), cultural probes are designed objects, or physical packets containing open-ended, provocative and implicit tasks to support engagement with the design process. They have many uses in HCI and design where they can be used to gain contextually sensitive information in order to inform and inspire design [16]. Another expert design method is to observe a culture by observation, interviews and diary techniques; an example is work done by a design team to understand the lives of residents in a care home [17]. Cultural probes and observations can be used to 'sensitize designers about other cultures. In participatory design approaches, this idea of sensitizing a group to the needs and lives of another group, would be to inform the designers of

aspects of the lives and needs of others prior to a PD session. Sensitization can involve a process in which the participants are encouraged to reflect on past experiences to help facilitate envisioning future experiences. For example, one of the tasks that children were asked to perform in a study by Wyeth and Diercke [18] was to draw a picture of a classroom of the future and it was found to be effective as a tool to inspire designs.

This paper explores sensitizing as a means to empower children to design for a context and a culture that both were slightly unfamiliar to them. The examination is on the extent to which children could be sensitized and on the effect of sensitization on the children's eventual designs. Given the poor cultural associations seen in [9], the overarching research question was, would children sensitized to the learning needs and the needs of culturally distanced others be better able to design a serious game for that group.

2. Study

The participants were 25 school children from a UK primary school and the children were all aged between 7-9 years old. The children took part in this study within their own school, following established guidelines for running PD activities within school from a practical and ethical perspective [19, 20].

As outlined above, there were three separate sessions depicted in Figure 1 below.

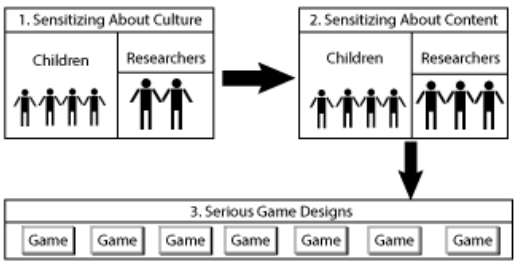

Figure 1. The Study Design: Cultural sensitizing, content sensitizing, design

In the first session two researchers and the class teacher were present, but the teacher did not get involved and simply stayed in the classroom attending to some other work. It was anticipated that the knowledge gained from this session would feed into the second session that involved sensitization to the content. For the second and third session three researchers were present (including the two from session 1). All the researchers had experience of running participatory design sessions with children and had also worked with these children on other projects so were familiar to them. In all the sessions the researchers were on hand to encourage the children in their work, but they were careful not to influence their design ideas. At the end of the third session the children had produced storyboards of their games.

2.1 Materials

In preparation for the first session about culture a set of booklets were produced to give to the children. This booklet would be completed individually to establish their knowledge of the subject and to enable the children to think about the target audience. These booklets were printed and taken to school for the children to complete individually. In addition, approximately 30 images were download from the internet and printed out on A4 sheets, with 6 images per sheet. These images would be used by the children to produce storyboards.

For the design session another booklet was produced that consisted of 3 pages for the children to design their games. This was judged to be suitable, as it would enable the initial entry screen to be drawn and allow two pages to depict game play. The researchers felt that this was adequate based upon time constraints and prior experience of running similar sessions.

2.2 Procedure

The first session (cultural sensitization) aimed to introduce the children to the culture of, and life in, rural China. Taking a value centred approach, Fan [15] identified 71 values within Chinese Society and that Confucianism is the most influential thought, which forms the foundations of Chinese culture. The decision was made to focus more on rural life rather than discuss culture dimensions and values, as culture has been shown to be a difficult phenomenon to articulate. It is important to engage the children, so the decision was made to use a wide range of media and imagery to highlight life in rural china, and incorporate the values and culture in some of the discussion. This first session took place one week before the second and third sessions, 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 [21]. 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 2.

- Reflection: Write down three things they had learnt from the session.

Figure 2. Example of a storyboard created by the children about the day in the life

The second and third session took place one week after the first session. The aim of the second session was to have the children to understand 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 rural China. The session began with the children gathered around a white board for a 15 minute 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 final session commenced. 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 [22]. 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 [23]:

- 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.

Hofstede's four dimensions [12] were also used as described in section 1 above to analyses the drawings. For example whether a hero was evident within the game for masculinity or whether the game narrative focused on an individual. Drawing could be categorised to 4 dimensions. Thus the maximum any category could receive is 25.

Finally 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

In the first design session all the children managed to create a storyboard individually or in pairs, see Figure 2 for an example. 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.

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

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.

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)

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 drawing. For example one storyboard had Chinese characters on the first screen, but it was still largely culturally un-situated, see Figure 3.

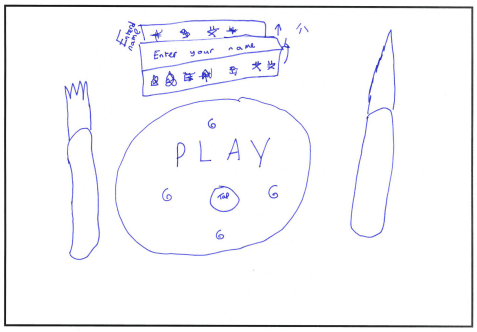

Figure 3. Example of an introduction screen

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). Another game required the player to pop healthy food items and these items were influenced by foods they were familiar with for example pizza and apples, see Figure 4.

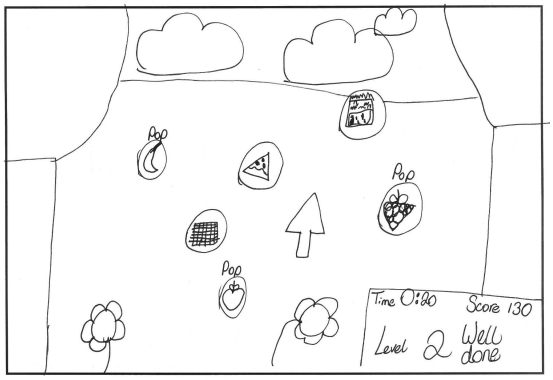

Figure 4. Example of a food pop game

The results of the coding of the drawings based on Hofstede's dimensions are presented in table 4 below.

Table 4. The number of children's drawings matching the Hofstede's Dimension.

Hofstede's Dimensions	Number of Drawings
Individualism	4
Collectivism	4
Large Power Distance	8
Small Power Distance	3
Strong Uncertainty Avoidance	5
Weak Uncertainty Avoidance	2
Masculinity	2
Femininity	1

There were no drawings that accounted for all of the 4 dimensions. Examining the Individualism vs Collectivism dimensions, there were an equal number of drawings that depicted both categories, these included making a meal for you, compared to a group of friends, see Figure 5.

Figure 5. Example of Collectivism within a game

The Large Power Distance had the highest presence within the drawings with clear evidence of rules within the game mechanics, compared to a small number of games that allowed for free play. The second highest frequency was related to Strong Uncertainty Avoidance as 5 of the games had clear punishments in the form of loosing lives. There was very little evidence of Masculinity vs Femininity only a few drawings depicted a hero character and only one drawing showed evidence of caring for a household.

4. Discussion

Developing a serious game is complex which is probably why so many frameworks have been developed to aid this process [24]. This study aimed to explore sensitizing as a means to empower children to design for a culture and a context that both were slightly unfamiliar to them.

4.1 Sensitizing About Culture

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.

The use of Hofstede's dimensions to understand the culture depicted within the drawings proved to be problematic. The children were not aware of these dimensions and post task analysis revealed a number of images that could not be classified to any of the dimensions and no drawings evidenced all four dimensions.

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. In particular a more detailed discussion within the context of Hofstede's dimensions [12] may have helped the children understand the differences between their values and beliefs, compared to children in China. More varied activities may be required incorporating online material, discussions and videos to enhance their understanding of the culture. After the end of the 1st session there was evidence that children had learnt something new about China, for example 15 children discussed long journeys to school and it may well have been they had forgotten this information by the time they game to design the game.

4.2 Sensitizing About Content

In this study the children could not describe a serious game solution for the context, which contrasts with the earlier work described in [10] and [25] 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 amount of time dedicated to the sensitizing about the content may simply have been too short. Given the broad nature of the subject, the children may simply have been overwhelmed by the diversity within the topic (although this was not evident within the discussion) and struggled to articulate this knowledge within their game. The majority of games related to food or they incorporated food into the game mechanics but did not relate this to the topic of food hygiene. If a new subject is presented to the children then incorporating a post-test to ascertain their knowledge may be beneficial to ensure sufficient understand of the domain. Without this knowledge it is unlikely that children will be able to transfer this into a game idea. In addition 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.

4.3 Serious Game Designs

Although all the children managed to produce ideas for a game, 19 out of 25 children did not relate their game to the topic of food hygiene. 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. It may be that this process could be reframed, to be iterative, with cultural and content being added incrementally. Participatory design sessions can span several weeks and months [26] to explore concepts with children and this can yield useful design insights. In contrast design sessions can include children at one momentary instance of the process to gather data to inform the design of a game, as used within the hand-washing game [7] and a DataPet game [27]. Consultation with the teacher to establish the children's prior knowledge on the subject may aid in making a decision of how many sessions would be required to enable adequate exploration of ideas.

5. Conclusions

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 showed very little evidence of the culture of the target audience.

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.

It may well be that for the sensitizing to be effective the children need greater exposure to both the culture and content in order to design a suitable game. 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. Furthermore, it may be that children who are brought up within a multi-cultured household may be more adapt at appreciating and designing for different cultures, and the fact that this study used predominately white Caucasians impacted on the results. Further work may be required to understand the cultural background of the children and how this impacts their designs.

Acknowledgements.

We would like to thank all the children and teachers from the Primary School who participated in the research and contributed their ideas.

References

1. TIGA. *The UK video game development sector is back on track*. 2014 16/12/15]; Available from: http://www.tiga.org/news/press-releases/the-uk-videogame-development-sector-is-back-on-track.
2. STONE, R. (2005) Serious games. *Defence Manangement Journal,* **31**: p. 142-144.
3. GEE, J.P. (2007) *What Video Games Have to Teach Us about Learning*. New York: Palgrave MacMillan.
4. KATO, P.M. (2010) Video games in health care: Closing the gap. *Review of General Psychology*. **14**(2): p. 113-121.
5. READ, J.C., et al. (2002) An Investigation of Participatory Design with Children - Informant, Balanced and Facilitated Design. In *Interaction Design and Children*. Eindhoven: Shaker Publishing.
6. READ, J.C., FITTON, D., and HORTON, M. (2014) Giving ideas an equal chance: inclusion and representation in participatory design with children. *In Proceedings of the 2014 conference on Interaction design and children.* ACM: Aarhus, Denmark. p. 105-114.
7. READ, J.C., et al., (2013) Children Designing Serious Games. *EAI Endorsed Trans. Serious Games,* **1**(e5).
8. DINDLER, C., et al. (2010) Participatory design at the museum: inquiring into children's everyday engagement in cultural heritage, *in OZCHI.*, ACM: Brisbane. p. 72-79.
9. MAZZONE, E., READ, J.C., and BEALE, R. (2008) Design with and for disaffected teenagers., *In 5th Nordi Conference on Human-Computer Interaction: Building Bridges.* ACM: Lund. p. 290-297.
10. HOFSTEDE, G. (1984) Cultural dimensions in management and planning. *Asia Pacific journal of management*. **1**(2): p. 81-99.
11. MINKOV, M., BLAGOEV, V. and HOFSTEDE, G. (2012) The boundaries of culture: Do questions about societal norms reveal cultural differences? *Journal of Cross-Cultural Psychology,* p. 0022022112466942.
12. HOFSTEDE, G., HOFSTEDE, G.J., and MINKOV, M. (1997) *Cultures and organizations*. McGraw Hill New York, NY.
13. COCKTON, G. (2005) A development framework for value-centred design. I*n CHI'05 extended abstracts on Human factors in computing systems.* ACM.
14. NOUWEN, M., VAN MECHELEN, M. and ZAMAN, B.. A value sensitive design approach to parental software for young children. *In Proceedings of the 14th International Conference on Interaction Design and Children. 2015.* ACM.
15. FAN, Y. (2000) A classification of Chinese culture. *Cross Cultural Management: An International Journal*. **7**(2): p. 3-10.
16. GAVER, W. and DUNNE, A. (1999). Projected realities: conceptual design for cultural effect. I*n Proceedings of the SIGCHI conference on Human Factors in Computing Systems.* ACM: Pittsburgh, Pennsylvania, USA. p. 600-607.
17. MULLER, C., et al., (2012) ICT-development in residential care settings: sensitizing design to the life circumstances of the residents of a care home *In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.* ACM: Austin, Texas, USA. p. 2639-2648.
18. WYETH, P. and DIERCKE, C. (2006) Designing cultural probes for children. *In Proceedings of the 18th Australia conference on Computer-Human*

Interaction: Design: Activities, Artefacts and Environments. ACM: Sydney, Australia. p. 385-388.
19. READ, J.C., et al., (2013) CHECk: a tool to inform and encourage ethical practice in participatory design with children. *In CHI '13 Extended Abstracts on Human Factors in Computing Systems*. ACM: Paris, France. p. 187-192.
20. HORTON, M., et al., (2012) School friendly participatory research activities with children., *In CHI 12 Extend Abstracts*. ACM: Austin Texas. p. 2099-2104.
21. HUNT, E.S. (2008) *Secret Agent Jack Stalwart: The Puzzle of teh Missing Panda: China*. 2008, New York: Weinstein Books.
22. XU, Y., et al., (2009) Children and Smart Technologies: Can Chldren's Experiences be Interpreted and Coded. *In HCI 2009 People and Computers*. British Computer Society: Cambridge. p. 224-231.
23. PORTER, R.E. and SAMOVAR, L.A. (1994) An introduction to intercultural communication. In *Intercultural communication: A reader*, L.A. SAMOVAR and R.A. PORTER, Editors. 1994, Wadsworth: Belmont, CA. p. 4-26.
24. DE FREITAS, S. and JARVIS, S. (2006) A framework for Developing Serious Games to meet Learner Needs. *In Interservice?Industry Training, Simulation and Education Conference*. Orlando, FL.
25. SIM, G., et al., (2014) From England to Uganda: Children Designing and Evaluating Serious Games. *Human–Computer Interaction,* **30**(3-4): p. 263-293.
26. GUHA, M.L., et al., (2005) Working with young children as technology design partners. *Communications of the ACM*. **48**(1): p. 39-42.
27. DICKINSON, A., LOCHRIE, M. and EGGLESTON, P. (2015) DataPet: Designing a participatory sensing data game for children. *In Proceedings of the 2015 British HCI Conference*. ACM.