A Narrative-Driven Design Approach for Casual Games with Children

Henry Been-Lirn Duh
Department of Electrical
and Computer Eng,
National University of
Singapore
eledbl@nus.edu.sg

Sharon Lynn Chu Yew Yee
Interactive and Digital Media
Institute, National University
of Singapore
sharilync@gmail.com

Yuan Xun Gu
Interactive and Digital Media
Institute, National University
of Singapore
g0900182@nus.edu.sg

Vivian Hsueh-Hua Chen
Wee Kim Wee School of
Communication and
Information, Nanyang
Technological University
chenhh@ntu.edu.sg

Abstract

This paper proposes a design approach to build casual games by children for children. Children understand game narratives with previously acquired schemata that is different from adults. Hence, integrating narrative developed by children themselves into game design may serve the children well. Using a narrative approach to game design based on informant design methods, the proposed approach aims to maximize the contribution of both children informants and adult designers. It comprises of three major phases, namely Narrative Design, Game Design and Design Moderation. A mobile phone game was developed based on this approach. User testing revealed that the children generally enjoyed the game and that the proposed approach has promising potential in empowering the child designers. Future work will focus on further evaluation of the approach for refinement.

CR Categories: D.2.10 [Software] Design – Methodologies

Keywords: Narrative game design, children, informant design

1 Introduction

Digital games nowadays play a significant role in children's lives. A recent study showed that 82% of American kids are gamers, with the largest segment being aged 9 to 11 [NPD 2009]. Game design for children has traditionally treated children users solely as testers, who give developers feedback on prototypes. However, a growing body of research looks at ways to better incorporate children's input into the design process.

Druin [2002] suggests that children's involvement in design progresses along a continuum in terms of the extent and timing of involvement: from users to testers, to informants and finally to design partners. The standpoint of treating children as informants recognizes that they have certain knowledge that adult developers do not possess. They provided developers with what is appealing or useful from their point of view [Scaife et al. 1997]. Most informant-based approaches mainly consist of requirements gathering and feedback collection. For instance, in the development of 'Talarius', a software tool to create and play educational games, children provided information on previous experiences with board games, interface drawings and application functionality at the beginning. At the end, they provide feedback during the testing of prototypes and mock-ups [Nousiainen 2009].

However, adults still dominate the design. This consequently leads to the "black box" phenomenon, where children see their ideas as going into a black box and coming out as unrecognizable full-fledged design solutions [Nousiainen 2009]. Despite being involved in the design process, children do not see their contribution as being incorporated into the final product. Another problem with informant design, as found by Scaife and Rogers [1999], is that "many of the kids' ideas are completely unworkable in computational terms". They do not possess the necessary knowledge to keep their creativity within the boundaries permitted by technology and design.

Conversely, positioning children as 'design partners' falls in line with the newer approaches of 'participatory design'(PD) and cooperative inquiry. PD asks that children be treated on equal terms as 'co-designers', who are continually present and involved in the design process every step of the way. While this makes up for children's lack of specialized design knowledge, it also makes PD a very resource-intensive approach. For instance, attempts to find a satisfactory balance of power during discussions between the design partners, adults and children, can considerably lengthen the development process [Druin 2002]. Moreover, PD requires children and adults to meet frequently and consistently throughout the whole process. Extra efforts are needed to schedule design meetings around children's school timetable. Informant design, which is less intensive in terms of time, manpower and effort, is hence more applicable for casual game design.

With an understanding of the aforementioned limitations of current design approaches, this paper proposes a method for game design that can enhance the strengths and reduce the weaknesses of informant design through its focus on narrative development.

2 A Narrative-based Methodology

Drawing mainly from informant design, the proposed method aims to produce games that are not only contextually relevant for kids but also empower child designers, while being flexible in terms of time, space and resources needed.

The way children process game narratives is different from the mental structure adults traditionally use to make sense of them [Madej 2008]. Borrowing Gee's [2003] term, children are conversant in their own 'semiotic domain', defined by particular modalities and grammar, which adults are not necessarily familiar with. It is indeed often a requirement in game heuristics that "the game must have a challenging story and an attractive, credible fantasy level" for the target audience [Zaman 2005]. The proposed method addresses this by approaching game design through children's construction and development of their own narratives. Children are

already knowledgeable in this dimension of game design. From a very early age, they possess the mental model to comprehend narrative structure [Dickenson and Tabors 1991]. Allowing children to create their own narratives can thus ensure that games are contextually, temporally and culturally relevant to their life experiences.

Previous works have developed special applications or visual languages for children to create narratives for digital games (e.g. Narrative Talarius [Tikka et al. 2008], and Script Cards [Howland et al. 2007]). However, those require children to undergo a certain amount of training beforehand and the creation of narratives is restricted by the application. In the proposed methods, in contrast, children use low-tech prototyping design tools such as paper and colored pencils [Druin 1999], that require no developmental costs.

The proposed method attempts to find a balance between the contribution of children informants and adult designers. It addresses the aforementioned 'black box' problem highlighted by Scaife and Rogers [1999] through children's participation in the game design. Children's terminology and conceptualizations are retained in the game design, but adult designers are also allowed to moderate children's inputs without infringing on them. The methodology thus manages the tension between children's need to see their contributions concretely to feel empowered and their lack of expertise.

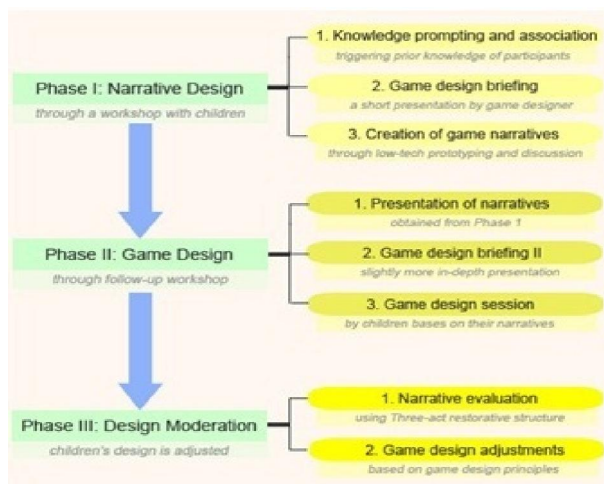The proposed method for children's casual game design consists of three major phases (Figure 1).

Figure 1: *Narrative-driven game design process*

3 Development of a Mobile Game

The method was used to develop a mobile casual game, with the overall theme of 'weather', targeting lower secondary school children, aged from 10 to 15.

Phase I: Narrative Design

Phase I was conducted in a one-day workshop session with 23 male students, aged 13 years old, from a local boy's secondary school. All activities were audio- and video-taped for later analysis.

Step 1: Prompting and association of knowledge
The initial step consisted of brainstorming sessions, aimed at triggering prior knowledge via visual aids. To avoid the problem of cognitive tuning, in which participants begin to "tune into each others' mindset" for ideas [Fern 2001], an individual brainstorming session was initialized. Participants were shown a series of images (Figure 2), based on 'weather' content in the school syllabus. However, the images were collected from various external sources and none were taken directly from textbooks to prevent children's possible resistance to "school work". Images were shown using a projector at a rough pace of about 30 seconds each and were displayed again as requested. Participants were instructed to write down their thoughts, associations and feelings on sticky notes, upon seeing the presented images. They were encouraged to write down as many ideas as they can, keeping one idea on one sticky note. Subsequently, participants were asked to categorize their sticky notes on large sheets of paper, whereby they placed seemingly related sticky notes together. Children could create a new category/column if the idea on the sticky note was different from those already posted.
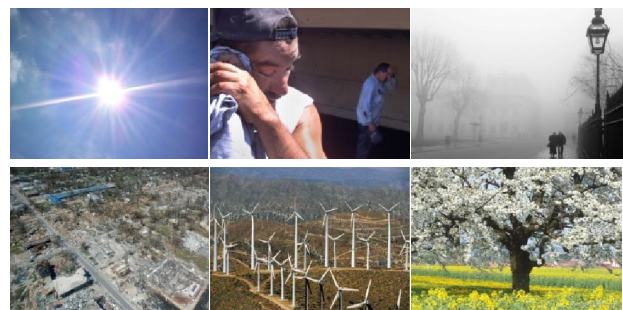

Figure 2: *Sample images shown during the brainstorming session*

After all sticky notes had been transferred to the wall (Figure 3) a quick scan was done to identify the most frequently repeated theme, similar to the process of 'post-it notes surveying' used by Druin et al. [2009]. In the session conducted, 'global warming' was the most outstanding and was thus designated as the guiding topic for the remainder of the workshop. Following the principle that focus groups with children are best done with a maximum of five kids [Hennesy et al. 2004], participants were then divided into groups of four or five for a group brainstorming session, resulting in a total of four groups. Participants were requested to jot down any of their thoughts/ associations/ feelings on the topic of 'global warming' again on sticky notes.

This first step produced a valuable vocabulary set from the children regarding 'global warming', and 'weather'. Phrases and words obtained ranged from 'tsunami', and 'hot' to 'artificial' and 'photoshop'.

Figure 3: *Categorized Sticky notes*

Step 2: Game design briefing
To make sure all the children have a basic understanding of game design, an experienced game designer gave a short presentation on common types of games (e.g. action, puzzle) and the basic elements of a game (e.g. health bar, score, props) (Figure 4).

Figure 4: *Sample of slides used for game design presentation*

Step 3: Creation of game narratives
Children remained in the same groups to create game narratives based on prior group brainstorming discussions and using low-tech prototyping materials (Figure 5). Each group was facilitated by an experienced game designer whose role was to only provide feedback on the technicality of the actual game design and to keep the discussion focused on the topic. Instructions were given that each narrative had to include basic components such as title, plot points, premises, and characters. Each group was then asked to present its game narrative to the entire workshop. Figure 6 shows samples of the children's drawings for their narratives.

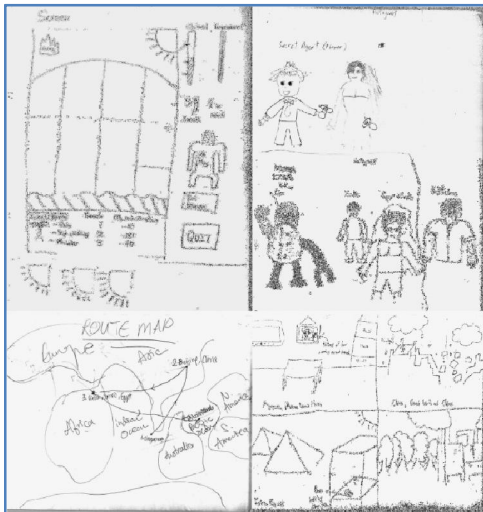Figure 5: *Children designing their game narrative*

Figure 6: *Illustrations drawn by the children*

Phase II: Game Design

A few weeks after the first workshop, a follow-up session was held with the same group of children. One group withdrew, leaving only 3 groups of 5 children.

Step 1: Presentation of narratives
As an introduction, summaries of children's game narratives were presented. This served two purposes: to allow the children to see their narrative from an external point-of-view and to make sure adult designers understood the children's narratives correctly.

Step 2: Game design briefing II
An experienced game designer briefly presented on the basics of game design again, this time with slightly more details (e.g. game views, game "modes") (Figure 7).

Figure 7: *Sample of slides used for game design presentation II*

Step 3: Game design session
Children were divided into the same group as during Phase I and developed a game design framework based on their own narrative. Low-tech prototyping tools were again used in the presence of game designers whose interference was minimal. The children started with an outline of their narrative and constructed game design elements, including a game genre, game view and mode, characters, props, gameplay, rewards/penalties, level design/map, win/lose conditions, controls, scoring and user interface, around it (Figure 8). A number of arguments exist against planning the story of a game before the game design [Robertson and Good 2004]. The children were therefore allowed to modify their narrative, or other elements that they have previously designed, as they saw fit during this second workshop. While the narrative concept stayed basically the same, most of the groups made substantial adjustments to their story details or progression.

Figure 8: *Children working on their game design*

Phase III: Design Moderation

Since one group of children did not participate in the second workshop, only three game narratives were used. All the three game designs generated by the children were found to be relatively 'workable', with the potential to be fully developed into a game. At the end of both workshops, each child was given a questionnaire asking to identify his or her favorite game narrative/design. Based on the kids' popular votes and with several criteria the adult game designers came up with, one group's game design was chosen. The criteria considered included:-
- the depth and scope of design
- conciseness and completeness of details given
- extent of narrative integration into game design

- creativity of ideas
- time needed for game development

Step 1: Narrative enhancement
The narrative of the selected children's design tells the story of an orangutan who wants to save the world from the problems of 'Global Warming'. It is summarized below:-

An orangutan named Ah Meng lives on an island covered with trees, including coconut and banana trees. Because of humans illegally cutting down trees on the island, the world's climate is getting hotter and carbon dioxide levels are increasing, causing the island to be affected by rising sea levels. Ah Meng cannot stand the heat and decides to counter the illegal tree loggers in an effort to initiate a decrease of sea levels and CO2 concentration and a cooling down of temperature. The more tree loggers he successfully attacks, the more rewards he gets from the government of the island who recognizes his hard work. He gets rewards in the form of seeds to plant trees and fruits that he likes to eat.

The design moderation phase aims to improve the narrative provided by the children while keeping its essence intact. The three-act restorative structure, a narrative structure very commonly used in digital games [Lindley 2005], was used to clarify and give coherence to the children's story (Table 1).

Three-act restorative structure		Children's narrative
Beginning (first act)	Central protagonist	Ah-Meng, the monkey, cannot stand heat
	Conflict established	He starts a fight against humans illegally cutting down trees on Tropic Isle
Second act	Implications of conflict played out	• Rising temperatures of world's climate • Increasing carbon dioxide levels • Rising sea levels
End (third act)	Final resolution of conflict	Ah-Meng gets rewards in the form of seeds to plant trees and fruits that he likes to eat.

Table 1: *Children's narrative from workshop set in a three-act restorative structure*

Minor changes were made to improve the narrative. The most important change was to provide a more impactful ending to the narrative, which required steering the focus of the storyline towards a bigger scale, (e.g. in terms of global warming effects) from its narrower scope towards self-interest set by the children (e.g. personal rewards for Ah-Meng in terms of feeling less hot and fruits to eat).

Step 2: Game design adjustments
The gameplay determined by the children was a variation of the tower-defense game type, in which the player basically has to build different kinds of upgradable structures to destroy enemies coming in waves. The children's game design was not comprehensive, but it gave adult game designers enough details to build the framework of a complete game. The adult designer team checked the children's game design against typical game design principles [Crawford 2003; Fullerton 2008; Allmer 2009], and evaluated it based on their experience. Some problems that were found included 1) design inconsistencies, 2) unsuitability for platform requirements, 3) cramming of features, 4) usability issues. Table 2 shows examples of design adjustments that were made. The final design is an action-based game with elements of strategy and resource management. Tree loggers come in waves with

Element	In Children's Design	Problem	Designers' Adjustments
Point-of-view	Bird's eye view and First person	Unsuitable for mobile platform	Only bird's eye view kept
Winning conditions	Survival; Keep sea levels, CO2, temperature down; Keep hunger level down	Too many winning conditions	Hunger variable removed
Skills/ Abilities	Punch, karate chop, spinning kick, Pistol, Mustang, Katana, Morningstar...	Overloading	Physical and weapon attacks set in a progression as player's skill improves

Table 2: A*djustments of children's game design*

higher movement and logging speed, and health points. Players, playing as Ah-Meng, need to manage tree planting and weapons purchasing to protect trees by defeating all tree loggers. The overarching goal is to maintain an acceptable amount of carbon dioxide in the atmosphere to prevent flooding of the island. We built the first level of the game, titled *I'm going Bananas* (Figure 9), on the Android platform before going back to the children for feedback.
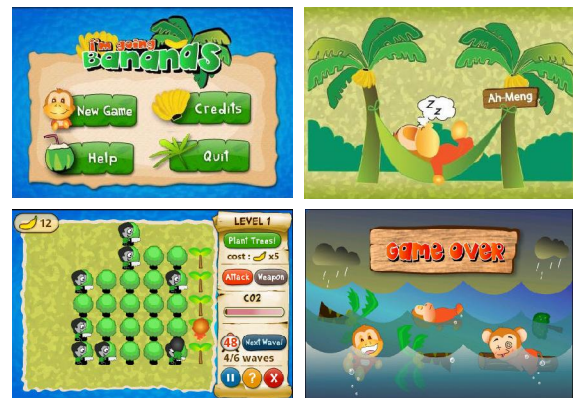

Figure 9: *Screenshots of I'm going Bananas*

4 User Study

The game was tested with 15 children (mean age = 14.13; see Table 3 for complete age breakdown) at the same boys' school where the design workshops were held. Five of the boys participated in the workshops, and the rest were not involved. The children filled out background information before playing. They were asked to play the game until they either won or failed the level. They were then given a post-questionnaire which evaluated their enjoyment level. Additionally, the 5 from the design team answered questions about their sense of empowerment vis-à-vis the game.

Age	Number
13	4 (27%)
14	6 (40%)
15	4 (27%)
16	1 (6%)
Total	15

Table 3: *Children's age breakdown*

Empowerment

Typical informant design with children faces the "black-box" problem, whereby children lose their sense of empowerment with regards to the product they helped design. With the proposed method, this sense of empowerment was observed from children who participated in the workshops. Two questions, on 5-point Likert scales, asked the child designers to evaluate the extent to which they perceived that they were able to influence the design of the game. The first question (Table 4) resulted in an average score of 3.40 (SD = 1.342). Two of the five child designers saw the game as deviating only a little from their original design, two others saw it as having some similarities, and the last child perceived the game as being very similar. The second question had a mean score of 3.20 (SD = .447). Four of the child designers felt that they 'somewhat' helped in the design process, and the fifth child indicated that he saw himself as having helped 'very much'.

Enjoyment

To produce a game that enables users to experience fun is an objective of any game design. Hence, how much the children enjoyed the game was measured with 5-point Likert scales, taken from the smileyometer [Read and MacFarlane 2006]. Both enjoyment questions presented to the 15 children testers resulted in generally positive results, the first obtaining a mean score of 3.27 (SD = .594) and the second, a mean of 3.40 (SD = .737). Table 4 details the results. For the third question, opinions on the game narrative were more divergent among the children. Nevertheless, the children had an overall positive feeling with regards to the game, as echoed by results of the last Likert scale.

5 Discussion

In the case of the mobile game *I'm going Bananas*, the targeted users reported to enjoy the game and the user-informants reported feeling empowered. Most importantly, the process was able to overcome the shortcomings of informant and participatory design described at the beginning of the paper. Children designers were instilled with a certain sense of empowerment. Although it is true that the children's design in its original form was challenging (but not completely 'unworkable') in terms of feasibility, Phase 3 'Design Moderation' in our method compensated for children's lack of game design knowledge and successfully made adjustments. Adult game developers were able to concretely implement the children's design into a fully playable game. Furthermore, contrary to the resource-intensiveness of participatory design methods, the proposed method does not demand excessive time from the children, it does not require a dedicated space or extra manpower, and it involves minimal costs.

One limitation of the current study is we evaluated the game only with 15 young male students. Future studies should look at testing with a larger sample size of children from both genders. Also, further user testing should include the collection of observational data in addition to self-reported questionnaire data.

6 Conclusion

This paper introduced a method that enables children to be involved in the design of casual games through the adoption of a narrative approach. The proposed method is much less resource-intensive that participatory design, making it practical for the industry, and maximizes the contribution of both children and adult designers. Children's evaluation of a mobile game produced with the method demonstrates that it has promising potential to develop relevant and enjoyable casual games for the intended audience, while instilling a sense of empowerment in the child designers. Future work will involve expanding the game with more levels, followed by further improved user testing. Refinement of the method is the next step of research.

Table 4: *Results of user testing with children*

S/N	Question/Statement	Number of children				
Empowerment						
		Very different	A little different	Not sure	A little similar	Very similar
1	How different is the game from what you designed?		2		2	1
		Very much	Somewhat	Not sure	Very little	Not at all
2	How much do you feel you helped in the game design?	4	1			
Enjoyment						
		Awful	Not very good	Good	Really good	Brilliant
1	How do you find the game in general?			12	2	1
2	How do you find the gameplay?			9	5	1
3	How do you find the gameplay?		3	9	3	
		Strongly agree	Agree	Not sure	Disagree	Strongly disagree
4	I really enjoyed the playing experience.	5	8	1	1	

References

ALLMER, M. 2009. *The 13 basic principles of gameplay design*. Retrieved 2010-1-15 from Gamasutra at http://www.gamasutra.com/view/feature/3949/the_13_basic_principles_of_.php?page=4

BEKKER, M., BEUSMANS, J., KEYSON, D., AND LLOYD, P. 2003. Kidreporter: a user requirements gathering technique for designing with children. *Interacting with Computers, The interdisciplinary Journal of Human-Computer Interaction*, 15(3), 187-202.

CRAWFORD, C. 2003. *Chris Crawford on game design*. Indianapolis: New Riders Publishing.

DICKENSON, D., AND TABORS, P. 1991. Early literacy: Linkages between home, school, and literacy achievement at age five. *Journal of Research in Childhood Education*, 6, 30–46.

DRUIN, A. 1999. Cooperative inquiry: Developing new

technologies for children with children. *Proceedings of Conference on Human Factors in Computing Systems, CHI '99,* Pittsburg, PA, 223-230.

DRUIN, A. 2002. The role of children in the design of new technology. *Behaviour and Information Technology (BIT),* 21,1, 1-25.

DRUIN, A., BEDERSON, B., ROSE, A., AND WEEKS, A. 2009. From New Zealand to Mongolia: Co-designing and deploying a digital library for the world's children. In *Special issue of Children, Youth and Environments: Children in Technological Environments: Interaction, Development, and Design,* University of Colorado at Boulder.

ZASFERN, E.F. 2001. *Advanced focus group research.* Thousand Oaks, CA: SAGA.

FULLERTON, T., SWAIN, C., AND HOFFMAN, S. 2004. *Game design workshop: Designing, prototyping, and playtesting games.* CMP Books.

GEE, J. P. 2003. *What Video Games Have to Teach Us About Learning and Literacy.* New York: Palgrave/Macmillan.

HENNESY, E. AND HEARY, C. 2004. Exploring children's views through focus groups, In: Green, S.M. & Hogan, D.M. (Eds). *Researching Children's Experiences: Approaches and Methods,* SAGA, 13, 236-252.

HOWLAND, K., GOOD, J. AND ROBERTSON, J. 2007. A learner-centred design approach to developing a visual language for interactive storytelling. In *Proceedings of the 6th International Conference on Interaction Design and Children, IDC '07,* Aalborg, Germany, 45-52.

LINDLEY, A. 2005. Story and narrative structures in computer games. In *Developing interactive narrative Content* (ed. Bushof, B.), High Text Verlag: München.

MADEJ, K. 2008. Early narrative experience: positive segue to narrative gameplay. *Proceedings of the 2006 ACM SIGCHI International Conference on Advances in Computer Entertainment Technology. ACE' 06,* Hollywood, California.

NOUSIAINEN, T. 2009. Children's involvement in the design of game-based learning environments: Cases Talarius and Virtual

Peatland. In Kankaanranta, M. & Neittaanmaki, P. (Eds.), *Design and Use of Serious Game,* Netherlands: Springer, 49-66.

NPD GROUP. 2009. *Among American kids ages 2-17, 82 percent report they are gamers.* Press Release (December 2), Port Washington, New York.

READ, J. C. AND MACFARLANE, S. 2006. Using the fun toolkit and other survey methods to gather opinions in child computer interaction. *Proceedings of the 5th International Conference on Interaction Design and Children, IDC'06,* Tampere, Finland, 84-88.

ROBERTSON, J. AND GOOD, J. 2004. Children's narrative development through computer game authoring. *Proceedings of the 2004 conference on Interaction Design and Children: Building a Community,* Maryland, USA, 57-64

SCAIFE, M., ROGERS, Y., ALDRICH, F. AND DAVIES, M. 1997. Designing for or designing with? Informant design for interactive learning environments. *Proceedings of Conference on Human Factors in Computing Systems, CHI'97,* San Jose, CA, 343-350.

SCAIFE, M. AND ROGERS, Y. 1999. Kids as Informants: Telling us what we didn't know or confirming what we knew already. In Druin, A. (Ed.), *The design of children's technology,* San Francisco, CA: Morgan Kaufmann, 27-50.

TIKKA, S., NOUSIAINEN, T. AND KANKAANRANTA, M. 2006. Creative learning by designing digital board games: Practicisng deep reading skills through game creation process. In *Proceedings of the 8th International Workshop on Narrative and Interactive Learning Environments,* Edinburgh, Scotland, 58- 63.

WALSH, G., DRUIN, A., GUHA, M. L., FOSS, B., GOLUB, E., HATLEY, L., BONSIGNORE, B. AND FRANCKEL, S. 2009. Layered elaboration: A new technique for co-design with children. *Proceedings of Conference on Human Factors in Computing Systems, CHI'09,* Boston, Massachusetts, USA.

ZAMAN, B. 2005. Evaluating games with children. *Proceedings of Interact 2005 Workshop on Child-computer Interaction: Methodological Research,* Rome, Ita