International Journal of Human - Computer Studies 101 (2017) 45–61

Contents lists available at ScienceDirect

Int. J. Human–Computer Studies

journal homepage: www.elsevier.com/locate/ijhcs

Children's emotions and quality of products in participatory game design

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ARTICLE INFO

Keywords:
Game design
Participatory design
Gamification
Cooperative learning
Quality of product
Performance
Emotions
Engagement
Children

ABSTRACT

The paper presents an empirical study centred on a participatory game design activity with 8–10 years old primary-school children, split in different sessions. The study assesses how children perform in game design and whether they are engaged in design tasks. To this end, the study gathers data concerning the quality of children's game design products, regarded as indicators of children's performance in game design. It collects data concerning children's emotions, which are taken as indicators of their engagement in game design. The paper statistically analyses and discusses how emotions and quality of products evolve across the game design experience, and how emotions are related to children's quality of products. Results of this work can help researchers, educators and practitioners manage a complex design experience with and for children, and identify key emotions for promoting quality of design work.

1. Introduction

Participatory Design originated in the Scandinavian labour movement of the 70's for engaging people. The motivation for it was not only to gain users' expectations about new technology products for them, but also to sustain their democratic right to participate in design decisions affecting them (Bjerknes et al., 1987). Therefore, in participatory design, potential users of a product move from the role of design informant to that of design participant or partner, in potentially different design stages. Researchers embark on a design "journey" or "experience" with potential users, and create a shared language, so as to understand the product from different viewpoints. In recent years, participatory design has been used with children for designing games with them (e.g., Andres et al., 2015). *Participatory game design* with children is also the focus of this paper.

All participatory approaches with children aim to actively engage these during a design activity. Children's engagement is in fact considered a crucial factor for the success of participatory design and a potential benefit for children (e.g., Dodero et al., 2014a; Garzotto, 2008; Hamari et al., 2016; Mazzone et al., 2011). Moreover, participatory design should become a *competence-relevant activity* for children: it should enable children to perform well in design tasks. The importance of children's performance in design tasks has been recently recognised by several designers, e.g., if children can contribute to the creation of "early design concepts in a meaningful way this may have a positive impact on the entire design process" (Fitton and Read, 2016).

Thereby, in theory, engagement and performance of children in a participatory game design activity should be planned for, and their achievement should be assessed carefully. In practice, it is not straightforward to organise participatory game design so that the design activity effectively engages all children and enables them to perform well in design, and it is not clear how to assess children's engagement and performance in game design tasks (e.g., Moser et al., 2014b). Different issues can affect children's performance and engagement in game design. Games are products that are complex to design; tasks of a game design activity have to be adapted to all participating children's knowledge and skills. Games are products that are lengthy to design; thus a game design activity may have to be split into different sessions taking different days (especially in formal learning contexts, e.g., because of rigid timetables), in such a way that it forms a meaningful continuum for children. Otherwise, if the activity is perceived complex or fragmented by children, decrease in interest and lack of concentration can be easily experienced by children, with potential consequences on their performance and engagement in the activity (Schmidt, 2011).

This paper presents an empirical study concerning the organisation of a participatory game design activity with 8–10 years old children, split across different weeks. The study considers the unfolding of children's engagement over time and the evolution of children's

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http://dx.doi.org/10.1016/j.ijhcs.2017.01.006
Received 14 April 2016; Received in revised form 15 December 2016; Accepted 31 January 2017
Available online 02 February 2017

performance in design. The study shows how children's engagement and performance in participatory game design can be operationalised and assessed.

A preliminary overview of the participatory game design study was published in (Brondino et al., 2015), which presented an analysis of the interrelation between social and emotional dimensions of engagement. In this paper, the presentation of the design study is by far more detailed and it is different in scope: it is concentrated on engagement and children's performance in participatory game design, as unfolding over time.

The paper is organised as follows. Section 2 overviews the relevant background literature. Starting from this, Section 3 presents the participatory game design approach used in this paper: its founding research theories; its guidelines for organising design so as to sustain children's engagement and performance in design. Section 4 overviews the participatory game design study, run in 2014: its research goals and questions; its participants and their roles; its pre-activity, participatory game design activity, and post-activity. The participatory game design activity is the core of the study; the entire Section 5 details its protocol and material, thereby showing an application of the participatory game design approach and its guidelines, presented in Section 3. Section 6 explains how data concerning performance and engagement of children were gathered in the study. Section 7 explains how such data were analysed. The paper concludes by discussing the main findings in Section 8, and then by reflecting on the guidelines of the participatory game design approach in Section 9.

2. Background

Participatory design activities with children have been conducted for designing with them technology products and recently games. Participatory design activities have also been conducted as design and competence-relevant activities, so that designers learn from children and children learn from design activities with them. Related work is overviewed in Sub-section 2.1, together with issues arising in participatory game design with children, and related to children's performance and engagement in participatory game design.

The psychology and education literature has studied the relevance of specific emotions for maintaining engagement in activities with children and for sustaining their performance in specific competence-relevant activities, mainly in schools. Because the readers of this journal may not be all familiar with such studies, these are briefly overviewed in Sub-section 2.2.

2.1. Participatory game design and children

Designing a game means analysing the game goal or problem, ideating solutions, conceptualising them in *game design documents*, developing them through *prototypes* (Adams, 2014). Specifically, game designers analyse the goal of the game, and conceptualise their game ideation in the so-called high-level game concept, with the player's main actions for reaching the goal. In case the game has levels, designers have to ideate the core mechanics for the rules and progression across levels, besides the aesthetics for the interface and interaction, including the feedback; in case the game requires a storyline, designers have to make it consistent with the overall game mechanics and aesthetics (Adams, 2014). Related game design documents are the *high-level concept document*, the *core mechanics document*, the *progression document* for the progression across levels (Adams, 2014). Besides documents, game designers release proof-of-concept prototypes for play-testing (e.g., Dodero et al., 2014b).

Designing a game with children means stepping through the aforementioned design stages, ranging from the game goal analysis to the game prototype development. That means planning for a prolonged experience. Moreover, designing a game requires not only creativity but also cognitive skills, ranging from working memory to logic and problem solving, the maturity of which also depends on children's age. Participatory design has been used in the recent past for planning and executing game design experiences with children (e.g., Khaled and Vasalou, 2014; Moser et al., 2014a).

Traditionally, participatory methods and studies assume that intergenerational small teams of children and adults work together, outside schools (Fails et al., 2013). However participatory design has also been cast as a competence-relevant opportunity (e.g., Li, 2010), conducted within school hours and classrooms (Iivari and Kinnula, 2016; Molin-Juustila et al., 2015; Vaajakallio et al., 2009), in line with the manifesto of (Sanders and Stappers, 2014), which foresaw that "elementary school children [will] *learn about designing and co-designing* [authors' italics] through practical and fun hands-on experiences". This paper follows the latter view on participatory design. Within this view, children's performance in design and engagement in design become values of paramount importance. The remainder of this sub-section elaborates on: (1) performance and engagement in participatory game design, (2) issues affecting them, (3) their assessment.

2.1.1. Performance in participatory game design

In participatory design, children are expected to contribute to design with their ideas, as experts of their experience, and adults to turn into reflective practitioners, so that design becomes an act of knowledge construction or negotiation of values with children, through scaffolding dialogues. Recent participatory design studies with children (e.g., Fitton and Read, 2016) aspire at yielding quality design products through children's participation, and thus improve on the development process, e.g., by considering what children's game design products adult developers can effectively implement (Corral et al., 2015). That calls attention to how to enable children to perform well in design, so that they can deliver quality design products. The concern is even more crucial in case design with children takes place in formal learning contexts, as suggested in the manifesto of Sanders and Stappers (2014): therein, it is essential that an activity with children enables all children to perform well in the activity and assesses their performance in it.

2.1.2. Engagement in participatory game design

Engagement of participants is regarded by many as important as the products to design in participatory studies with children (Mazzone et al., 2011). For instance, Vaajakallio and colleagues applied participatory design methods in studies at school (Vaajakallio et al., 2009); only two researchers were present, and children worked in small groups with researchers' scaffolding. They gathered qualitative data, i.e., participant direct observations, in relation to children's engagement in the design experience, and to the difficulty of specific tasks. Also Garzotto and Gelsomini (2015) report observations concerning children's engagement in design, and they argue that engagement represents a learning benefit per se in case of children with special needs.

2.1.3. Issues affecting children's performance and engagement in participatory game design

In spite of several success stories, participatory game design with children can face different issues that can affect children's engagement and performance in it (e.g., Moser et al., 2014b). A first issue is that game design tasks are cognitively complex and thus they can be perceived as threatening children's self-efficacy. Therefore, a game design activity and its tasks have to be carefully adapted to children's expression means, e.g., by taking care of their development stage, so as to allow them to perform well, e.g., by providing them with suitable generative toolkits. For instance, Khaled and Vasalou (2014) adapted brainstorming and story-boarding tasks for designing games with children, and created specific generative toolkits in order to support the scaffolding of children's existing knowledge, so as to make design of games an attainable goal with them. A second issue, arising in