

Designing for Emergent Play

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ABSTRACT

This paper describes the PhD research on designing for open-ended play environments for children aged 6-8 years old. I discuss my research topic in more detail, as well as the developed design prototype and a first explorative study with this prototype. The focus of this study was on supporting playful experiences in different stages of play. Results show that playful experiences are supported by (different) design elements throughout the three stages of play. For the doctoral consortium, I also propose my research agenda for future work as point of discussion.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces - *Interaction styles* (e.g., commands, menus, forms, direct manipulation), *User-centered design*.

General Terms

Design, Experimentation, Human Factors.

Keywords

Open-ended Play, Playful Experiences, Stages of Play, Design Research.

1. INTRODUCTION

In the lives of children, play is a central activity which changes along with their development. Young children mostly play individual or in parallel with other children. This changes at around the age of six or seven, when children become involved in social play, for instance playing together with one friend or a larger group of children [1]. At this age, children also move from fantasy-oriented play towards more competition-minded play [1]. These changes in play make the age group of 6-8 years old an interesting and challenging group to design for.

The PhD research described in this paper is part of the Intelligent Play Environments (i-PE) project. This four-year research project focuses on developing intelligent play environments that stimulate social and physical play. Instead of offering children pre-defined games with goals and rules, this PhD research focuses on open-ended play solutions that provide children with the opportunity to come up with their own games [2]. In this way, play is a result of

the dialogue between the player(s) and the design. Within this PhD research, I am interested to explore what contributes to design for play that is not defined beforehand, but that evolves as a result of interaction. In other words: how to design for emergent play?

In order to explore this research question, I have identified two key aspects: playful experiences and three stages of play. Korhonen et al [3] identified twenty playful experiences based on videogames research that can enrich playful designs. A next step is to apply (some of) these experiences in the design process. A selection of experiences can be made based on the context of the design, for instance intelligent play environments. In his work on interactivity and the theory of play, Polaine [4] describes several stages of the total experience of interaction. This can be translated into three stages of play: invitation, exploration and immersion. In the invitation stage, a potential player is attracted to the design. In the exploration stage, this player starts to interact with the design in order to understand its rules and boundaries. This leads to the final stage of immersion, in which the player actually plays with the design.

These two aspects form the basis of my PhD research. I am interested how to design for these playful experiences for the three stages of play. As a designer I cannot simply design an experience, but I can make certain design decisions that can support the appearance (emergence) of these experiences. By taking into account the three stages of play, I expect to be able to better support the playful experiences for the total interaction experience as these experiences (or the design elements that support them) might change for the different stages.

2. PREVIOUS WORK

In this PhD project, a research through design approach is followed: an iterative process of creating and evaluating prototypes. Every iteration provides new knowledge and insights that can influence the next prototype.

2.1 Design

Through a user-centered design process, consisting of playground observations, brainstorming and early try-outs with colleagues and students, the initial concept "FlowSteps" was developed.

FlowSteps consists of multiple, interactive mats that respond to player's behavior by light feedback in two different colors (red and blue). The mats are flexible objects which can be placed on the floor in any position, supporting the current play situation. Together with a fellow PhD student, working on another i-PE subproject, I developed an interactive prototype of the FlowSteps. This prototype exists of six interactive mats, each containing one pressure sensor and three red LEDs and three blue LEDs

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controlled by an Arduino. The two different colors behave differently. When a player steps on a mat with red light, another mat will automatically light up in red. The red light is guiding as it constantly asks a response from the players. The blue light is also guiding at the start. But as soon as a player stands on a mat with blue light, the behavior of the blue light changes to a responding interaction set, allowing players to choose which mat will turn blue by stepping on another (inactive) mat.



Figure 1. The FlowSteps prototype: a mat with blue light feedback.

During the design process, the playful experiences and three stages of play were taken into account. A selection of playful experiences has been incorporated into the FlowSteps: curiosity, exploration, challenge, fellowship and competition. The experience of interacting with the FlowSteps goes through the three stages. When no-one is playing, one of the mats lights up in red or blue to attract potential players (invitation stage). The mats give direct feedback when a player starts interacting (exploration stage) and provides the player with options to create games (immersion stage). In each stage, at least one playful experience was supported.

2.2 Evaluation

In a first study I explored how to design for a selection of playful experiences within the three stages of open-ended play. The prototype of FlowSteps was evaluated with twenty children aged 7-8 years old at a primary school in The Netherlands. The children played in pairs with the design which was not explained to them beforehand. Video recordings were made and analyzed afterwards. In this study the playful experiences of curiosity, exploration, challenge, fellowship and competition were explored for three stages of play: invitation, exploration and immersion.

To get a feeling of what happened during the sample, I now give some examples of the observed behavior. For instance, children immediately started with exploring the mats. They used their feet or hands to hit the mats or picked the mats up to inspect them closely. Children moved the mats around, further away to improve the challenge of the game play and closer together to make it easier. They also divided the mats, both implicit (quite natural, without discussion) and explicit (clearly expressing this action). Interacting with the mats led to some understanding of the interaction behavior of the light feedback. Children used this understanding to create game play. They played together, helping each other by pointing at active mats and working towards a mutual goal, for instance: keeping the blue light “alive”. Besides this collaborative play, the recordings also show large amounts of competitive play. Children tried to reach a (red) light before the other child, sometimes even giving points to each other or exclaiming that (s)he won the game.



Figure 2. Children playing with the FlowSteps during the evaluation study. Clock-wise from the upper left corner: children competing with each other to reach an active mat first; division of the mats; actively moving around; pointing at lights during invitation stage

The observations resulted in three main conclusions. Firstly, this was a first exercise with designing for playful experiences. As it turned out, these experiences were useful to apply in the design process of developing an interactive play design. Secondly, the results of the study show initial evidence of relations between playful experiences and design decisions. For instance, exploration was supported by direct light feedback and the flexibility of moving the mats around. Thirdly, the design elements and playful experiences turned out to differ for the three stages of play. Not all experiences were supported in each stage: curiosity was present in the invitation stage, exploration and competition in the exploration and immersion stage and challenge and fellowship in all three stages. For some experiences, different design elements supported them in one stage than in the other.

3. RESEARCH AGENDA

Insights of the first study will lead to an improved design and a focused approach towards a second study.

The current prototype of the FlowSteps has some points of improvement. In a next iteration, the mats will be wireless and the amount of mats will be increased. The sensors and actuators will be reconsidered; for instance making sure the pressure sensors are robust enough and adding more output modalities as sound.

An interesting result of the first study is the importance of the three stages of play when designing for playful experiences. As a key aspect of my PhD research, I feel the need to get a better grip on these three stages. By increasing awareness and understanding of these stages, this can eventually lead to applying them better in the design process. Opportunities for further investigation can be the transition between the different stages. Is it possible to skip one stage? How does this affect the playful experiences? The total process of these stages is also relevant. Is this an iterative process with a fixed order or a non-linear process going back and forth? When the improved design consists of an increased number of mats, more than two children can play with the mats at the same time. How does this social play influence the three stages? Is the

design than supporting the experiences in the invitation stage, or are the other children responsible for that? The first study only explored the short-term effect. If children play with the mats for the second, third or tenth time, this might change their interaction behavior. How do the three stages change over time?

In the first study, I looked at the behavior of the children and what design elements supported that behavior. Less attention was given to the intentions of the children: what is their psychological need for displaying such behavior? The framework of Rozendaal [5] (also working on the i-PE project) nicely shows the relations between psychological needs and bodily interaction and how the system design can support this. Currently, we are already discussing how our frameworks can come together in a joint study.

In a second study I propose to address several of the questions mentioned above related to the three stages of play and user intentions. Insights from this second study can support the design process in future iterations. I propose to explore long-term play in one of these future iterations. As the main goal is to understand how to design for play, it is necessary to also include an understanding of how play changes in time. Eventually, I expect several outcomes of the PhD research as final results: innovative design process and tools, proof-of-concepts and design guidelines.

Another part of this PhD research focuses on the grounding of the theoretical basis of the project. A first version of the theoretical framework has been developed. This framework covers design properties and their relationship with fundamental and applied theories. Currently, this framework consists of three levels. A literature study on related work provided input for the framework, both for the theoretical and the design related part. The three levels are illustrated by the schematic overview of Figure 3. On the top level are the fundamental theories that can inspire and steer designers, but that are very generic. These theories need to be translated into design principles in order to be able to integrate them in a tangible design. Examples are theories of child development, learning, storytelling, motivation, construction of meaning and forms of play. The middle level consists of more applied theories that already give designers handles for design. These theories are less generic than the fundamental theories of the top level and can be easily translated towards design aspects. Examples are fantasy, social and physical play, open-ended play, playful persuasion, virtual environments and guidance versus responsiveness. The lowest level represents the actual elements a designer can influence directly. This level focuses on the design details. It includes properties as modalities, ambiguity, affordances, shared versus personal, shape and size, and communicating/influencing objects.

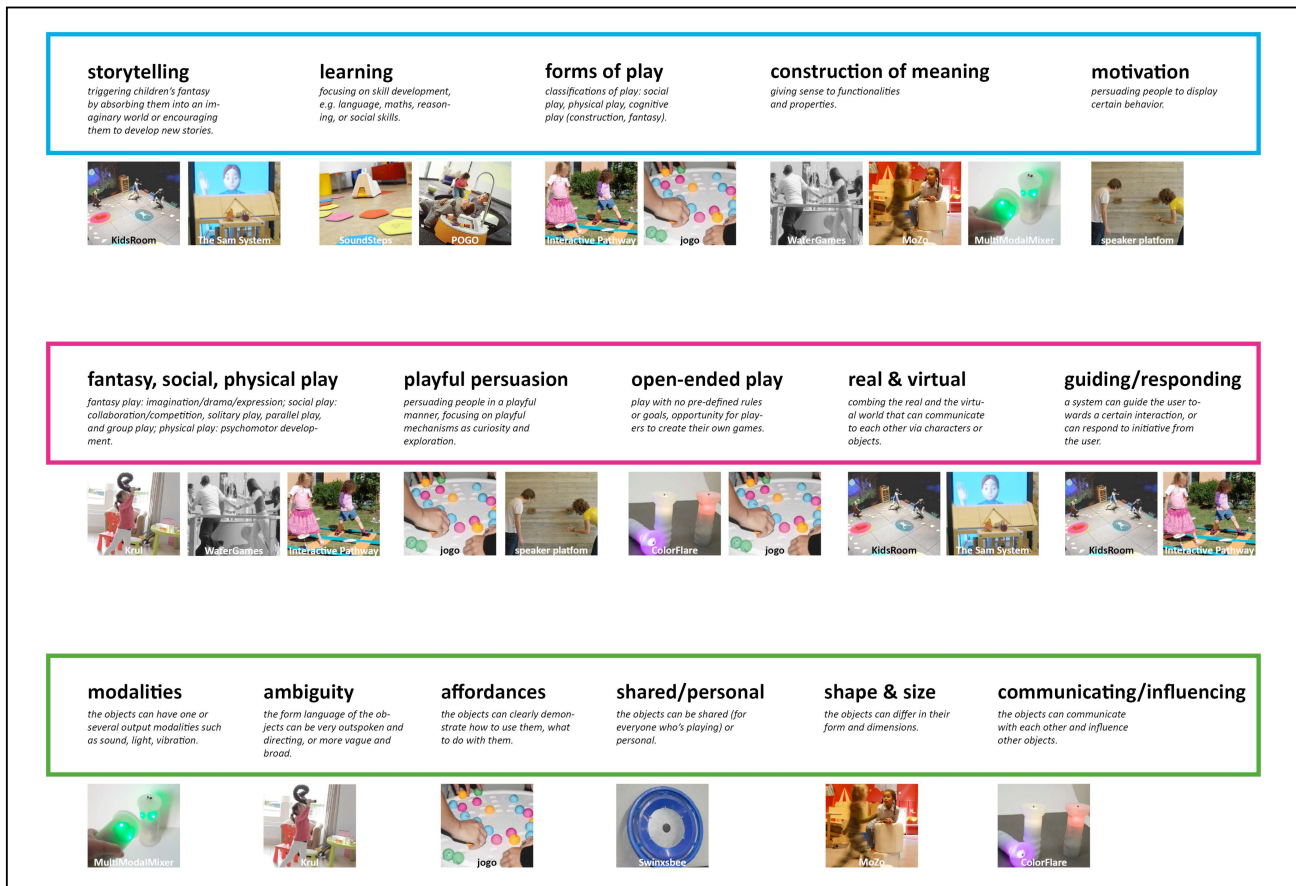


Figure 3. Early schematic overview of the theoretical framework with short descriptions and example projects, with reference to both theoretical and design-related papers. The descriptions are the author's own interpretations.

This framework needs to be further worked out based on the results of the first study. Insights from this study can change the content or inspire new relationships between the different levels. Besides that, an extensive literature review is planned in the near future. This literature review exists of around thirty journal and conference papers about play, children and design and/or theory. From these papers, the following elements will be derived: Intentions (What do the researchers say they want to analyze and/or improve?), Method (Within which context and age group and with what methodology do the researchers perform a study?), Results (What do the researchers conclude and/or present?), Design opportunities (What do the researchers present related to design?) and Theories (What do the researchers present related to theory?). This information will then be used to improve the framework and mark relationship between children's behavior and design decisions or elements from theory.

4. CONCLUSIONS

So far, after almost one year of this PhD project, the design and evaluation of the initial concept FlowSteps has resulted in valuable insights concerning designing for open-ended, emergent play that can contribute to the IDC community. Firstly, it goes a step further within the area of open-ended play, shaping a renewed design approach for designing interactive objects for open-ended play. Secondly, it provides valuable insights on how to design for playful experiences by making certain design decisions. Thirdly, it shows that by applying the three stages of play in the development and evaluation of play designs, designers can enrich their play designs for the total experience of interaction. This can be very valuable for designers and researchers desiring to develop interactive play objects for children, designs for open-ended play or designs for physical and social play. The research agenda proposes a prolongation of the aspects of playful experiences and three stages of play towards an extension of knowledge and insights.

5. ACKNOWLEDGMENTS

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