Drawing up the rules: Encouraging children's rule creation in interactive open-ended play

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ABSTRACT

When children play games like tag or jump rope, they often combine generally accepted predefined rules with their own invented and negotiated rules. These rules also occur in play with interactive play objects. In this field, we research children's interactions with open-ended play designs that offer interaction opportunities to which children can attach their own meaning. In this paper, we focus on the different types of rules that are important in open-ended play: the interaction behavior rules developed by the designer and the created game rules invented by the users (children aged 4–8). We identify two relevant steps in between the intentions of the designers and the users: interpretation and improvisation. This knowledge extends existing communication-based models of design. Moreover, we present two design cases that illustrate how these steps lead to freedom and diversity in children's interaction with open-ended play objects and we discuss relevant implications for design.

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1. Introduction

In the scenario below (see Fig. 1), two girls are involved in open-ended play with an interactive design. In this paper, we focus on *digital* or *interactive* open-ended play, i.e. designed objects that integrate interactive technology such as sensors and actuators. We refer to open-ended play as a form of play that does not include predefined rules but that offers interaction opportunities to which players can attach meaning while playing [1,2]. Children can play with an interactive open-ended design in different ways. In the scenario Anna uses the interactive properties of the open-ended design as a drawing tool whilst Jane is involved in dramatic play when she creates a fantasy around the design involving a princess. The design intention of open-ended play is to offer this diversity in play behaviors by designing interactive objects that can be interpreted in various ways. This relates closely to the concept of ambiguity in interaction, which can be considered a property of the interpretative relationship between users and products. Ambiguity asks from users to make decisions on "meaning making" [3] as it provides products with multiple possible meanings. Usually, designers attempt to eliminate most ambiguity in order to control the user's interpretation of a product [3]. But actually, embracing a level of ambiguity in an interactive design opens up some

important benefits. Instead of constraining user's responds or imposing solutions, ambiguity allows users to find their own interpretations in interaction with a design and offers them the opportunity to appropriate designs into their daily lives [3].

Designing for open-ended play differs from designing games or other child computer interactions. For instance, most interactive games have strictly defined action–reaction patterns limiting a child's imagination [4,5]. On the contrary, designs for open-ended play offer diverse opportunities and fewer restrictions as design aspects are deliberately left open for the interpretation of the children and give them the freedom to create their own play [2]. For instance, with the open-ended play design ColorFlare (handhelds that changes their colored light output when being rolled or shaken) children created rolling and tag games as well as role playing [1]. The interactive technology added novel possibilities to the children's play behavior. They incorporated the interactive technology in their play which allowed them to customize their play [6] and play in diverse ways with the design. This implies that the design intention has to be communicated in such a way that it provides children with some direction and triggers for interaction, but does not determine which rules children should follow to achieve predefined goals.

At first sight, it may seem a contradiction that this paper discusses designing for rules in open-ended play as open-ended play does not predefine any (game) rules. Most traditional open-ended toys, such as blocks and crayons, are tools that do not incorporate a set of rules, such as games. When interactive technology is added to

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Anna and Jane are playing with a new interactive design. When Anna touches the design, it lights up in different colors. "It looks like a rainbow!" she says. "You have to move your hand," says Jane. "Then you can draw a real rainbow." Anna waves her hand over the object and the light follows her movement. Anna starts to draw, making circles and triangles of light. "Now I want everything to be blue!" she says and she moves her hand over the object until it emits mostly blue light. "Can I play with it now?" asks Jane. Anna hands the design over to Jane. Jane start to interact with the objects telling a story: "In a land far away, there was a princess..."

Fig. 1. Scenario of two girls playing with an interactive, open-ended design. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

open-ended play designs, an extra layer is created that causes an interesting field of tension. The interactivity in such open-ended play designs is programmed according to a set of rules as the scenario at the start of this paper also illustrates (e.g. touching the design makes it light up). On the other hand, children also invent their own goals and rules (e.g. making the design light up in blue). This demonstrates that an interesting process occurs in interactive open-ended play in which children create their own rules while integrating the interaction opportunities of the design into the game play as it unfolds. The challenge in designing for open-ended play is to facilitate this dynamic process of rule creation in an engaging way. Therefore, a better understanding of this process is essential. There is a need for a model that illustrates and clarifies the different types of rules and corresponding user actions.

According to the Oxford dictionary, rules are defined as "*a set of explicit or understood regulations or principles governing conduct or procedure within a particular area of activity*" [7]. Rules help to determine what is allowed and are for example used to regulate traffic, to control sports matches or to manage social interaction. In playing (sports) games, rules specify the aim of the game and communicate how this goal is supposed to be accomplished [8]. One plays a game by following the rules. These rules are considered mental concepts that need to be shared and understood among players [9,10]. Rules can be self-invented or bended or folded in context [11]. Rules do not precisely define each action but always leave room for players to be creative within certain boundaries [9]. From observing children playing with interactive, open-ended play designs [6,12], we have discerned two types of rules. The first type is the *interaction behavior rules*, which are the rules that a designer integrates in a play design. In interactive play, interactivity is part of the play design and sensors and actuators determine how a design reacts and behaves. With this interactivity, players invent the second type of rules: their own *created game rules*, situated in context.

This paper investigates these different types of rules in more detail and translates these insights to implications for design. In order to do this, we explore the relations between the designer's intention when developing an open-ended play design and the intention of the users (children) when interacting with the design. More specifically, we investigate connections between the rules that are part of the design's interaction behavior and the rules children invent while playing. We focus in our research on children in age group of 4–8 years old. Children in this age group are still involved in fantasy play but also start to play together in rule-based games. We think these characteristics make this age group suitable for exploring open-ended play.

In this paper we first present related work on rules in play. Next, we translate these insights from play to the domain of design. We present a new communication-based model that exemplifies

different rules and corresponding actions. This model is further illustrated by two design cases and translated to implications for design. We end this paper with a conclusion and discussion about the relevance of this work for designers in the field of open-ended play for children.

2. Rules in play

Traditional games have formal game rules by which the game is supposed to be played. But every game is played in a particular setting: in a particular context with particular people. Children can still mold the game and add or adapt rules. Several researchers have identified different sorts of rules in their investigations of play and games. We will discuss a relevant selection of previous work from the domains of ethnography and game design below.

Goldstein [13] observed two types of rules in his ethnographic work on counting out rhymes (like "eenie meenie minie moe"). The first type of rules is the *ideal rules* or official rules that characterize the rhyme. These are the rules by which children 'should play'. But when children play games, their actions cannot be fully described by only the ideal rules of the game. Secondly, there are the *real rules*: an adaptation of the rules influenced by social values and negotiation between players. These are the rules by which children 'do play'. In the case of counting out rhymes, children exposed strategies of extending a rhyme to count out a different child. This was largely accepted by the other children, who considered it to be a legitimate and clever move. In her work on rules in children's play, Hughes continues on this path by defining a model of game rules that "*allows players to mold their games to the demands of social life in particular settings*" [14]. This model incorporates three different rule systems that exist whenever games are played: game rules, social rules and gaming rules. *Game rules* are the rules of the game; the ideal or official rules [13]. *Social rules* are the rules of the social context in which a game is being played. *Gaming rules* derive from the interaction between the structure of the game and the social context. They do not only include adaptation of rules; instead the same rules can be used in a totally different way by another group of players.

From the field of game design, classifications of rules are based on analysis of (digital) games and interviews with experienced gamers. Sniderman [15] proposes the existence of unwritten or unrecorded rules next to the official or recorded rules that are usually explicitly spelled out. The unwritten rules on the other hand are "*literally unstatable*" [15] but players seem to agree on them nevertheless. Players might not be aware of all the rules that are affecting a game, but this does not mean they cannot play the game. Salen and Zimmerman [10] suggest that for any (digital) game rules exist on three related levels: operational, constitutive and implicit rules. *Operational rules* are the explicit