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Computer Game Design and the Imaginative Play of Young Children

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ABSTRACT
This paper discusses preliminary findings of the study of computer game design in relation to current understanding of imaginative play and its developmental value for young children. The crucial role of children's play in their development is well documented. A number of criteria, which are essential in building a foundation for children's cognitive development in play, were identified based on a literature review of the theoretical and empirical studies of child's play. The identified criteria were utilized to observe two young children playing various types of computer games to explore the opportunities that the games provide for imaginative play in the early childhood years.

Categories and Subject Descriptors
K.8.0 [**Personal computing**]: General – *games*.

General Terms
Documentation, Performance, Design, Human Factors, Theory.

Keywords
Imaginative play, computer games, young children, design criteria, child development

1. INTRODUCTION
In the past decade the use of computers by children in Australia has seen a significant increase. According to the Australian Bureau of Statistics in 2006, 92% of children aged 5-14 years regularly used a computer either at home or at school. While children of different ages used computers for a variety of activities, 88% of 5-8 year olds used the computer to play games [2]. In the early childhood years, the use of computers for playing games is the "most common activity", but it decreases with age, going down to 70% in 12-14 year olds [2]. This is a natural development, as engaging in play (whether on a computer or not) occupies a significant amount of a young child's life but it is replaced with other activities as children grow.

It is well documented that in the early childhood years, play proves to be mostly beneficial for children's development [7; 22]. While engaging in imaginative play, young children acquire the foundations of reflective and abstract thought, they develop complex social skills and learn to self-regulate their behavior and emotions [7; 12; 17; 23].

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Classical and modern theories of play allow us to understand the significance that play has in the development of young children (summarized in [21]). A crucial characteristic of children's play is that it is spontaneous, self-motivated and self-sustained activity which is structured and regulated by the children's own imagination [8; 16; 17].

The way that children engage in computer play is different to that of spontaneous play, as the former is largely determined by the parameters and rules of the computer game software that children use. The developmental benefits of children's computer play can be either enhanced or hindered by the game software design. Taking into account that young children increasingly engage in a variety of computer play places responsibility on researchers and designers to carefully create optimal developmental environments based on the wealth of theoretical and empirical knowledge of the significance of play in children's development.

2. THE MAIN CHARACTERISTICS OF CHILD'S DEVELOPMENTAL PLAY
Play of young children has been characterized as the spontaneous, self-initiated and self-regulated activity, which is relatively risk free and not necessarily goal-oriented. Play is intrinsically motivated: normally children have an internal desire to engage in play, they are actively involved in creating their play and they are in control of it.

The main aspect of children's play for development is the dimension of *pretend* - that is, an action and interaction in an "imagined situation", and the roles that children are playing [7]. One of the most important and powerful impacts of make-believe play on young children's cognition is the development of imagination. The pretend situation of play creates an imaginative dimension in which the child uses symbols and signs to substitute for objects and acts. Separation of the meaning from the object promotes the development of abstract ideas and abstract, verbal thinking [22]. Recently, the significance of child's imaginative play in the development of cognitive thought has been reasserted by arguing that "much of children's play, especially in its make-believe or pretending game forms, is a critical precursor to a major feature of our adult narrative consciousness" and that it "serves especially to strengthen the growing organism's cognitive mastery of their perceptual world" [16, pp. 97-98].

In pretend actions a child separates the literal meaning of the object from its imagined meaning. By pretending to be a mother, the child may explore and advance his or her understanding of the norms and rules of family functioning [23]. This is evident in a remarkable example of two sisters, aged five and seven, who said to each other, "Let's play sisters" [22, p. 94]. In real life, the girls behaved as sisters without conscious thought of what sisterhood actually meant; however, when playing "sisters" they were highly concerned to follow the rules of sisterhood: they dressed alike, talked alike and walked holding hands. Thus, they had to play out the imaginary roles of sisters to be able to appropriate the rules of sisterly behaviour. In Vygotsky's words, "what passes unnoticed by the child in real life becomes a rule of behaviour in play" [23, p. 9].

Regarding the crucial role that child's play has in further development, it is interesting to consider whether computer play can have a similar effect and what kinds of computer games in particular can provide opportunities for developmental play that is spontaneous and imaginative in nature.

3. COMPUTER TECHNOLOGY AND EARLY CHILDHOOD EDUCATION

Over the past few years, a growing amount of software has been produced with young audiences in mind. However, some early childhood educators are cautious and warn that technologically enhanced play might limit children's imagination and creativity [1; 12].

NAEYC [12] makes a statement about "developmentally appropriate technology" which "should be integrated into the regular learning environment and used as one of many options to support it".

Early childhood educators talk about developmentally appropriate use of computer technologies [9; 5]. They suggest that to be effective, computer software should be designed in a pedagogical manner suitable for young children, that is, create an environment where children can explore, look things up, solve problems, and do activities which promote communication, interaction, discovery and problem solving [5].

Researchers suggest that the use of computers should be incorporated into children's traditional play, thus using computer programs in a "meaningful context and for real purposes" [18, p.16]. For example, children might use computer programs to make invitations to a "birthday party" that they have in their dramatic-play area. Another interesting example is an after-school "New Information Technology and Literacy Program", designed for five to twelve year olds and known as the *5th Dimension* [3].

Yelland [24] provides an overview of numerous studies that examine the use of computers in early childhood education, but the majority of considered studies were focused on a particular curriculum area, not in play.

3.1 The Features of Computer Games that Promote Children's Development through Play

On the basis of the literature review and analysis of research into play and computer games, a list of design characteristics associated with developmental impact of computer games on children was created and used to guide the study (see [13] for a more detailed description).

It was determined that developmentally beneficial computer games allow to engage young children's curiosity and provide motivation to play [10; 19]; they relate to real life of children and include sounds and objects that they can recognize [6; 9; 11]; they are discovery-oriented and allow for free exploration in an open-ended, non-linear and self-paced manner [4; 5]; they provide the facility to engage collaboratively with peers or more experienced players [4; 5; 15]. Additionally, some researchers assert that to be developmentally effective computer games should be embedded in the wider context of children's make-believe play [3; 12; 18].

4. THE STUDY

This paper presents an integrated analysis of the data in relation to children's engagement in imaginary, make-believe play while playing computer games (the description of the broader overall study is presented elsewhere [20]).

4.1 Approach and Participants

Two siblings, Bronte, 7 and Joshua, 5 (pseudonyms are used), were observed playing a variety of computer games during 12 sessions. Sometimes their older sister Lizzy, 11 joined them. The first three sessions were conducted in a laboratory room, and after that a further nine in the children's home, as it was more comfortable and natural for them. All the sessions were videotaped for later analysis. Additionally, field notes were taken by the researchers when it was necessary to capture the episodes, which related to computer play, but were not videotaped. The outlined criteria guided the game selection, observations and the analysis of the data.

4.1.1. Selected games

The games were selected on the basis of meeting the criteria outlined above and: be explorative and non-linear; provide an imaginative situation; present, and allow playing out, situations familiar to children; allow for collaboration. The games that are discussed in this paper include a mystery adventure game *Pajama Sam, No Need to Hide When It's Dark Outside* (Humongous Entertainment), as well as simulation games such as *Dogz* (Ubisoft); *At the Vet's* (Granada Learning) and *Sim City* (Maxis).

4.2 Findings and Discussion

The data analysis allowed researchers to identify a number of episodes of make-believe play which included: pretend actions; undertaking the roles of others; referring to a pretend situation; pretend labeling of situations and objects; and interactions with peers about, or within, an imaginary situation. The game features that allowed (or did not allow) children to engage in make-believe play are analysed and discussed below.

4.2.1 Freedom to explore

Regardless of the design, the children approached the games in an explorative manner: they were not worrying about achieving a goal but were quite happy just trying a variety of options. For example, they were checking the items in the shop in *Dogz* or just moving socks from one place to the other in *Pajama Sam*. However, undertaking a non-linear pathway in Pajama Sam was somewhat limited: there was a choice of two options, but both needed to be completed before advancing in the game. There were subtle but obvious hints as to the timing expected at certain points in the game. On the contrary, the enjoyment and creativity

involved in creating the worlds in *SimCity* mostly was not limited and in itself rewarding to the children. However, at certain points the game itself controlled the action, such as, if the child created an airport, a plane would appear.

4.2.2 Episodes of pretend

There was a number of episodes of pretend observed across all the games. For example, in *Pajama Sam*, there were odd socks in various places throughout the game that were meant to be collected and taken back to the laundry for sorting. The children enjoyed playing this just for the fun, repeating it again and again (while their older sister Lizzy only tried this once). Similarly, in *Dogz*, Joshua was stroking the dog and looking at the red hearts that appeared on screen as an indication of the dog receiving *loving care*. He came back again and again to doing this during the observed session. Such repetitive *simple acts of pretend* are characteristic for children's natural play, which indicate children practising their mental schemas [14] and contributes to their cognitive development.

Not only this feature was supported in the games, but in *Dogz* it provided with a visual support to the *abstract* idea of loving care (the appearance of red hearts linked to the child patting the dog) thus taking play to a new level of abstraction. Such visualization might assist the child's internalization of this complex abstract idea [22] and we can talk here about *affordances* of this design.

Joshua was able to manipulate and use objects symbolically. For example, he would try to use lightning bolts as weapons to shoot robots but this function was not supported in the game (*Pajama Sam*). In *SimCity* he managed to create and to use trains more like racing cars than a vehicle for mass transit, which resulted in many train crashes. It is natural that Joshua attempted to use game objects in a variety of ways as young children usually do in a spontaneous imaginative play! However, the game design did not support the use of the objects in a way other than intended, which is somewhat restrictive, as it does not allow for a free flow of imagination in the child.

Symbolic play—the use of objects to substitute for other things in play—is an important developmental feature of traditional pretend play, and it would be essential to support it. As a future direction of research, it would be interesting to investigate how this can be incorporated in the design of computer games.

4.2.3 Imaginative play

Children took the play from the games *beyond the screen.* Joshua, in particular, carried the character of Pajama Sam into his everyday play. Sam's hair and dress style were mimicked by Joshua, he arranged his room to look like Pajama Sam's room and he modeled many of the character's behaviors, such as running and jumping off stairs, and using a torch in dark spaces.

Joshua, Bronte and their sister Lizzy created a make-believe environment, perhaps best described as a *community of dog owners*: each of the children had their own pet-dog, which they named and looked after. They seemed to engage in make-believe episodes on a regular basis, coming back to it in everyday conversations with each other. They even included in this on-going make believe play characters that they created in the Nintendo version of *Dogz* thus owning a number of dogs each. They were communicating to each other and trying to manage their relationships through this play during sibling disagreements, for example saying, "I will take Ruby [the sibling's virtual dog] for a walk until she is tired and hungry and then I won't give her any food!"

Similarly, the make-believe play that the children engaged in after playing SimCity was very strong. For example, multiple instances of talk involving the game were observed, such as asking each other about what they had created "when they were God" (i.e., in the design mode where players create and arrange a world to inhabit). However, they did not continue make-believe role playing beyond the computer game itself, that is, they did not pretend to be any of the characters they invented.

Interestingly, when the children were given the game *At the Vet's* to play, Bronte, who wanted to be a vet, was really disappointed when the restriction of the game did not allow her to become the character herself, and she could participate only vicariously. For example, Bronte wanted to select her own course of treatment for the sick cat that had a sore foot. The restrictive setup of the game, however, would not afford her such opportunities; she was expected to give an injection and some medicine followed by the bill. Bronte was frustrated by not being able to play out the role of a veterinarian properly, as she knew it from real visits to a doctor or vet. This is consistent with observations of traditional play, where young children were found to be sensitive to following the rules of their character correctly according to the rules learned from real-life situations [22].

Playing out the roles of real people or fictional characters that they observe, children acquire and internalize the rules and norms of functioning in society. Undertaking the role of a doctor, mother or salesperson in a grocery store, they need to follow the rules of real behavior appropriate for the role [23]. Children borrow the rules from real life but to acquire them they have to put them at the centre of their attention. The design of a computer game, which represents such rules in an inaccurate way, is most likely to be restrictive for children's spontaneous engagement in play and alienate them. To maximize engagement in make-believe and to avoid restricting and frustrating children, game design and activities need to be realistic in their depiction of real life. For example, the *Dogz* game could have allowed a variety of more realistic possibilities for feeding the dog, not just putting the food in his mouth, but putting it in front of him on the floor, or feeding him outside at his kennel rather than anywhere and anytime.

5. CONCLUSION AND FUTURE RESEARCH

This study has demonstrated that computer games selected according to theoretically sound criteria can provide children with opportunities for play that are spontaneous and imaginative in nature. The young children in the study eagerly engaged in exploration of the features of the games and did so freely when the design allowed. However, sometimes the rules and parameters of the games were restrictive, which prevented or discouraged further exploration. Children made several attempts to use the objects in the games in creative and symbolic ways. However, such possibilities were not fully supported by the designs of any of the games, which is an interesting area of investigation for further research.

The study highlighted the need for computer games to present the world in a realistic manner in order to afford the opportunities for children to explore the roles and rules of functioning in society. Additionally, the study provided an insight into possible

affordances of computer games in supporting the development of abstract thinking.

6. ACKNOWLEDGMENTS

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