Interaction Patterns of Children while Playing Computer Games

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Abstract: Children have great accessibility to computers. This affects the preferences of children in terms of spending their free times. Playing computer games is one of the most popular activities for them. It is important to deeply investigate children's electronic game playing activities. The purpose of this case study was to identify interaction patterns of children while playing computer games. 10 students (4 girls and 6 boys) from a private elementary school were observed throughout 12 weeks of the Spring-2005 semester. They were mixed of 1st and 2nd grade students. Students played computer games in one course hour (40 minutes) per week, and data were collected during these self-play hours through observations and interviews. The results of the study reveal that students' interaction with other students starts most of the time when they want to learn something new about the computer game which they want to discover deeply. The successful students in terms of achieving the games' goals were more popular kids than others.

Introduction

Computer games are gaining more popularity every day. This may be because playing computer games are one of the most entertaining activities not only for adults but also for children. In other words, people regard computer games as a source of fun; they spend money on purchasing those games for being able to spend their free time on an enjoyable activity.

According to Inkpen (1997), the general tendency that HCI researchers have stressed is that users do not have to become accustomed to technology (both hardware and software). Rather, technology should be developed according to the requirements and characteristics of the users. Therefore, to produce user-friendly technological applications, investigating target group deeply to elicit their characteristics and needs is a vital process. In this respect, it is important to examine users within the context while they are using computers to make detailed examination.

Although, children are an important user group of computer games, Human Computer Interaction (HCI) researchers have mostly been interested in adults as computer users in their studies. Nevertheless, being an important user group, children have some characteristics which differentiates them from adults. Therefore, while designing applications children's characteristics should be considered well in order to meet the needs of them as computer users (Bruckman & Bandlow, 2003). The expectations of children, what they like and dislike, and gender issues are all critical factors to study.

Playing Computer Games as a Leisure Time Activity

It is obvious that children have great accessibility to computers at their homes, childcare centers, schools and Internet cafes. Such a wide use of computers also affects the preferences of children in terms of spending their free times. Playing computer games is one of the most popular activities for them. Some researchers claim that such games contribute to children's cognitive and motor skills development. Therefore, it is of value to deeply investigate children's electronic game playing activities and their preferences. The results of such studies can provide valuable information for educators, computer game developers and researchers. Using particular items that make games appealing for children, educational games can be made more attractive and interesting.

Most of the time children select the game to play as their leisure time activities depending on their likes and dislikes. Additionally, since children want to spend their time on an enjoying activity, computer games should not only be attractive enough to take their attention but also should provide with sources of fun to make them continue playing. Inkpen (1997) claims "for computers to be effective for children at school they must be fun" (p.522). Unless their pleasure increases while playing, children stop doing it.

Rieber (1996) identifies four characteristics of playing games as "1- It is usually voluntary; 2- It is intrinsically motivating, that is, it is pleasurable for its own sake and is not dependent on external rewards; 3- It involves some level of active, often physical, engagement, and 4- It is distinct from other behavior by having a make-believe quality" (p.43). What Rieber claims indicates that it is players' own decisions to play the game or not. Therefore, playing computer games should be attractive enough to make users play them.

Gender Factor in Playing Computer Games

Studies conducted on gender differences in terms of computer game playing show that boys play computer games more than girls do. To put it another way, mostly boys prefer to play computer games as their leisure time activities (Subrahmanyam & Greenfield, 1998). Additionally, girls see playing games as an activity type that is more appropriate for boys (Inal & Cagiltay, 2005). The difference between girls and boys towards playing computer game may be because of the characteristics of existing computer games. Since most game developers are male, the games include more components suitable with their likes. In addition, according to Lucas and Sherry (2004) the reason why girls and boys approach playing games in a quite different manner may be because of having own computer and/or having the opportunity to use a computer. In fact, although a variety of reasons to this difference are pointed out by researchers, Lucas and Sherry (2004) claim that "regardless of the source of differences in game ownership and use, girls simply are not enjoying the advantages that boys do in terms of early socialization to computer technology" (p.500).

Interaction

Brouwer-Janse et al. (1995) state that "with the rapid growth of computer systems in home environments we need to expand our focus to ensure that interactions with computers have a positive impact on child development" (p.187). In addition to this, interaction among children during computer usage and/or game playing must be considered as well. It is possible to see children gathered together playing games around us. This seems as the nature of their playing habits. When they want, they immediately come together and arrange a traditional game to play. However, when the issue is playing computer games, the situation changes a little bit. Computers' having one mouse and one keyboard limit children's playing game together with friends. Scott, Mandryk, and Inkpen (2002) claim that "when technology supports concurrent input to an application, children appreciate and take advantage of this feature. Furthermore, forcing children to share one input device contributes to off-task behavior and boredom with an application" (p.227). Although it is not always possible to arrange such a concurrent use environment for students "many researchers have noted positive benefits from small group interactions around computers in the classroom" (Inkpen et al., 1995, p.177). Therefore, it is not valuable to judge computer games as a factor making children asocial.

The Study
Methodology

To produce user-friendly technological applications, investigating target group deeply to elicit their characteristics and needs is a vital process. Therefore, to make a detailed examination it is important to examine users within the context while they are using computers. Therefore, a research study was employed in order to better understand the nature of children's game playing. In this respect, qualitative research methodology was employed. The researchers aimed to respond following questions:
- Whether the interaction among children is the determinant factor for electronic game preferences or not?
- Whether the gender issue is a critical factor for electronic game preferences or not?

Procedure

This study took place at a private elementary school during the Spring semester of 2004/2005 academic year. Observations were conducted in a computer laboratory environment, where the computers are placed in a U-Shaped manner. In all computers, there were electronic games installed by the school administration. These were: Super Mario, Frizbi Math Adventure, Bumpy's Arcade Fantasy, Supaplex, Daves, Math Blaster, Thinking Things 2, and Zango (Library of the Ages).

The students were observed throughout their extra-curricular activity hours for 12 weeks, which included one course hour (40 minutes) for each week. During each observation notes were taken, and the findings were interpreted by the authors together. The aim of observations was to determine the types and characteristics of computer games that students play most and also to determine interaction patterns among students. In addition to observations, formal and informal interviews were conducted to collect information about students' personal characteristics and about their opinions on playing computer games.

In the study, the children were observed without any interference. The children were allowed to do whatever they want with computers under the supervision of the classroom teacher. All students preferred to play computer games during these hours. The children were not allowed to play computer games on the Internet due to the regulations of the school. Therefore, the types of games were limited with the ones installed by the school administration. Only for a few weeks, the children connected to the Internet by the permission of their teacher.

Participants

The subjects were 10 primary school students (4 girls 6 boys) between the ages of 7 and 8. In fact, there were more children in the classroom but only those 10 included in the study because they were the ones attended the class regularly. Children who included in this study were the members of an after-school class. In the class, students were allowed to do whatever they want but they were not allowed to connect to the Internet.

Results and Discussion

Based on the interviews, we found out that all of the students have their own computers at home except one. However, most of the children stated that they could only use computers (playing games, connecting the Internet etc.) when their parents allowed them. Some children stated that they were supposed to finish their homework before play games, whereas some stated that they were only allowed to play during the weekends, and some for a limited time. The children's characteristics are given in Table-1.

Additionally, some children stated that having a sister/brother affect their game playing hours negatively. The children having a sister or brother claimed that they are interrupted by their sister/brother while they are playing games, which is something irritating for them.

	Grade	Having own Computer	Having sisters/ brothers	Time of Playing	Games that he/she likes	Other information
B1	2	Yes (for 2 months)	No	Every day for 30 minutes	Action games, games including 'skateboard'	Like playing games that he has already finished; playing games do not affect his success of the school; he realizes the value of winning when he looses the game
B2	1	Yes	No	Every day	-	He can talk his father via MSN Messenger; likes playing computer games
B3	2	Yes	No	Every day	-	He likes playing computer games
B4	1	In past he had a computer, but not now	A younger brother	At weekends	Sonic, Super Mario	-
B5	2	Yes – for about 4 years	No	Not every day	Chess, Zoo Tycoon	He has Play Station and likes both playing computer games and Play Station
B6	2	Yes	No	Not every day, only when he wants to play	-	-

G1	2	Yes but it was broken by her brother	2-year-old brother	Do not play every day	Super Mario	She thinks playing computer games for every day affects her success negatively;
G2	2	Yes, but her father uses it more	A younger brother	-	-	She does not like playing computer games much, she likes watching her friends playing and helping them
G3	2	Yes	No	Not every day	Super Mario	She likes playing computer games
G4	1	Yes	No	At weekends after finishing her homework	Super Mario and a ball game (did not remember the name of the game)	-

Table-1: Children's demographics (B: boy; G: girl)

The games that the students played during the 12 weeks period were Super Mario, Frizbi Math Adventure, Bumpy's Arcade Fantasy, Supaplex, Daves, Math Blaster, Loudless, Thinkig Things 2, Zango (Library of the Ages). For a few weeks, they connected to the Internet by the permission of their teacher. The web-sites that they connected were miniclip.com, kraloyun.com, playdo.com, everythinggirl.com, and myscene.com.

When the children meet with the game for the first time, newness of the game to the children was very high in terms of game preferences. Also, it was observed that after a while some students turned back to the game they had played before.

The Games

Although it includes some violence like activities in the sense that the player typically spends a considerable amount of time destroying other creatures, Super Mario is a cartoon-like game designed for kids, and is not classified as violent by game developers. Bumpy's Arcade Fantasy is a simple puzzle game, in which you have to control a jumping ball through the levels and collect items such as ice cream, candy. After collecting all the items, the players can pass into the next level. Math Blaster provides a personalized progress report card for each user, noting the number of problems attempted in each topic area and the users' success rate. Additionally, Frizbi Sayısal Serüven is an educational game based on problem solving and mathematical concepts, and students were expected to tackle with the game by using these.

Game Preferences of Children

In the literature, the results of many studies show that there is a difference between girls' and boys' game preferences. In this study, however, the games that girls and boys played were mostly the same. This may be because the children were limited with the games installed by school administration. Super Mario, Bumpy's Arcade Fantasy and Math Blaster were the most popular games (Table-2). However, the difference appeared when students connected to the Internet. Boys preferred to connect kraloyun.com, playdo.com, miniclip.com and played action games whereas girls connected to everythinggirl.com (a web site which includes varieties of activities, especially suitable to girls, such as changing babies' clothes, playing games etc) and myscene.com where they were interested in decoration, make-up, and fashion.

Girls	*Boys*	
Super Mario, Bumpy's Arcade Fantasy, Frizbi Math Adventure, Math Blaster, Myscene.com, Everythinggirl.com	Super Mario, Bumpy's Arcade Fantasy, FrizbiMath Adventure, Math Blaster, Supaplex,	Loudless, Zango (Library of the Ages), Playdo.com, Kraloyun.com, Miniclip.com

Table-2: Game Preferences of the participants

Interaction

There was one computer available for each student. Therefore, most of the children played games individually, except for a few children who preferred playing together. There was almost no interaction among the children playing alone. The lack of interaction may be because each of them was from different classrooms. In other words, they were not the students of the same classroom. The only place that they met was this 40-minutes class sessions.

One type of interaction happen among those students was that they sometimes looked at their peers' computer screens to see what is happening around them. Their peers' selection of game influenced their game selections as well. When a student looked around and saw most of the others were playing a different game, s/he also switched to that game and started to play what others were playing. In interviews, they reported the reason as curiosity. Some students also stated that they just wanted to try the game that their friends were playing. Additionally, they sometimes helped each other to find a game and start it by the request of the teacher or sometimes to finish a task within the game.

As mentioned before, some students played together although they were able to use computers by themselves. At the beginning of the semester, there was one group including two girls and one boy. Each child played the game in his/her turn. The group dissolved a few weeks later. Another group appeared including two boys at the beginning of the term. Their playing habits were the same with the other group. This group also dispersed a few weeks later. One girl from the first group united with one boy from the second group. Their partnership lasted till the end of the term.

According to our observations, the main reason of the group formation was the game preferences and achievement in the game. When someone appeared successful in a game, a new group of children was formed immediately surrounding of him/her. The children within the groups seemed to be happy while playing together; they seemed to enjoy much more than others playing alone. One boy explained his feelings of playing with a peer as stating:

> *"Playing together is more enjoyable for us. We have more fun".*

However, the boy was more active than the girl while they were playing a game. The girl did not prefer to play as much as the boy did. She said:

> *"I like playing computer games but not that much. I help my friend and even I sometimes play the game. This is more enjoyable for us".*

When her partner did not come to the class, she sat next to another friend immediately. She never played by her own. Actually, she had some disabilities in terms of speaking. Observation results and interview with classroom teacher confirmed that she did not trust herself as much as other students did. This may be the reason why she always played with another child.

In another case, two girls sitting next to each other connected to the Internet - everythinggirl.com. The activity that they selected was about decoration of Barbie-like toys' room and dressing up and also making them up. The steps that they followed were the same. The girl who was ahead with the activity waited for the other girl to follow the same steps. The girls did all the same things; they decorated the room in the same way, dressed the toy with same clothes etc. One of the girls was more dominant in the selection of items to apply.

Another interesting example happened among boys when they were connected to the Internet. One of the boys was playing an action game, which was about trying to balance a bicycle on the ropes like an acrobat. Another boy sitting next to him was watching his play and laughing at his actions. They looked so enjoyed with the game. However, although the second boy seemed that he liked the game very much, he did not change the game that he was playing. He explained the reason by stating

> *"Watching my friend is more enjoyable, I have more fun when I looking at his game".*

Conclusion

In this study, one of the main purposes was analyzing and determining the interaction patterns among the primary school students while they were playing computer games. Based on our observations we conclude that children who played computer games more than others were more capable of playing a new computer game than other students playing computer games less. Some children stated that they played computer games almost everyday. When these children met with a new game, they were more self-confident and were more capable of learning how to play the game. Additionally, those children were more influential ones over others: those were the children their game preferences affected others' preferences as well.

During the 12 weeks observations, it was seen that by helping other students who ask help about the computer games, expert students gained the leader position among the others naturally. Even if the participants of the study

were mixed of the 1st and 2nd grade level, some students played an important role of the group formation because of these reasons. The group interaction among the participants when they played computer games was fluctuated at high levels in some weeks. When they had some problem about games, or when they wanted to learn how they can learn a new game, this interaction was higher than other situations. It is also concluded that children's interaction with the others mostly started when they wanted to learn new thing about computer games which they want to discover deeply. Some students who were more inclined to gain knowledge without any help and knew more information about games than their friends in classroom were more popular than others.

Moreover, students' personal characteristics had direct relationship on their game preferences, interaction between the other students and computer games. Whereas some students preferred playing computer games with their friends together, some of them played games individually during the 12 weeks of the study. It can be said that while playing a game together, students share the tasks of the game and each student do related task given to himself or herself. For instance, one of them used some keys of the keyboard, and other use another keys of it. Or in some cases, some of the children did not played any game. Rather they watched their peer's game playing. Despite not playing the game, they were happy as much as the ones playing. It can be, therefore, concluded that computer games do not prevent interaction among children. In some situations, children like playing together with their peers.

References

Brouwer-Janse, M.D. Fulton Suri, J., Coleman, R., Edwards, S., Fozard, J.L., & Keyson, D.V. (1995). From our past to our future: User interfaces over the lifespan. *Companion Proceedings of CHI '95* (pp. 187-188). Denver, CO: ACM Press.

Bruckman, A. & Bandlow, A. (2003). Human Computer Interaction for Kids. *In* Julie A. Jacko and Andrew Sears. (Ed.) *The human computer interaction handbook: Fundamentals, evolving technologies and emerging applications*. (pp.428-440). Lawrence Erlbaum Associates.

Inal, Y. & Cagiltay, K. (2005) Turkish Elementary School Students' Computer Game Play Characteristics, BILTEK 2005 International Informatics Congress.

Inkpen, K. (1997). Three Important Research Agendas for Educational Multimedia: Learning, Children, and Gender. In *Proceedings of Educational Multimedia'07*, Calgary AB, June 1997.

Inkpen, K., Booth, K.S., Klawe, M., & Upitis, R. (1995). Playing together beats playing apart, especially for girls. *Proceedings of CSCL '95*. Lawrence Erlbaum Associates.

Lucas, K. & Sherry, J. L. (2004). Sex Differences in Video Game Play: A Communication-Based Explanation. *Communication Research* 31(5), 499-523.

Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational Technology Research and Development* 44(2), 43-58.

Scott, S., D., Mandryk, R. L., Inkpen, K. M., (2002). Understanding Children's Interactions in Synchronous Shared Environments. *Proceedings of CSCL 2002: Foundations for a CSCL Community*, ed. Stahl, G. p.333-341.(CSCL).

Subrahmanyam, K., & Greenfield, P.M. (1998). "Computer games for girls: What makes them play?" In J. Cassell, & H. Jenkins (Eds.), From Barbie to Mortal Kombat: Gender and computer games (pp. 46–71). Cambridge, MA: MIT.