

Flow experiences of children in an interactive social game environment

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Abstract

This study examines children's flow experiences in an interactive social game environment. A total of 33 children aged from 7 to 9 years participated in the study for 6 weeks. Data were collected through observations and interviews. In order to measure the flow experiences of the children, items of a flow scale were administered to the children through interviews. Results revealed that flow experiences occur more among boys than girls during gameplay. While ludology had more effect on the flow experiences of boys when compared with the narratology of computer games, narratology had more effect among girls. Challenge and complexity elements of games had more effect on the flow experiences of the children than clear feedback.

Introduction

New information and communication technologies are used not only for scientific and administrative purposes, but also for entertainment. Many people prefer using the media for enjoyment and to escape from the difficulties of social life (Sherry, 2004). People play computer games because they have fun while playing (Kiili, 2005a; Sweetser & Wyeth, 2005). Besides their fantasy and fun characteristics, games have potential to foster children's ability to communicate and interact with others during gameplay. Thus, game-based learning applications have been implemented and integrated into classrooms to enhance students' learning. Results of the studies focusing on the influences of computer games on students' learning revealed that playing computer games may have a positive impact on children's learning, because games have a huge influence in terms of constructing a connection between virtual life and real life and encouraging critical thinking (Lim, Nonis & Hedberg, 2006; Mitchell & Savill-Smith, 2004; Turvey, 2006).

Roussou, (2004) stated that playing computer games is one of the most favourite activities of children, so an environment that includes elements such as fun and

entertainment might have a positive impact on their learning occurrence. In addition, computer games have several motivational and fun elements, and children prefer playing games more than other instructional materials. Therefore, according to Squire (2003), educators can use motivational elements of computer games while designing and developing interactive game-like learning environments. Students mostly prefer interacting during gameplay events, and the interaction patterns of children might lead to some motivational outcomes. Among them are children's optimal flow experiences, which have a direct relationship with their motivation. Like individual flow experiences of children, their social flow experiences might be influenced by computer games fostering or encouraging them to interact with each other.

Csikszentmihalyi (1997) emphasised the balance between an individual's skills and difficulties of tasks. He theorised that the occurrence of flow experiences depends on this balance, and that if balance does not exist between the individual's skills and the task, flow experiences cannot occur. Csikszentmihalyi (1991) described flow experience as a situation of complete absorption or engagement in an activity (Csikszentmihalyi, 1991). Finneran and Zhang (2005) stated that it represents a state of consciousness and that during that consciousness people are so absorbed in an activity that they show high performance without being aware of their environment. According to Csikszentmihalyi (1993), activities that create more flow than other activities are those that '(1) have concrete goals with manageable rules; (2) make it possible to adjust opportunities for action to our capabilities, (3) provide clear information on how we (activity participants) are doing; and (4) screen out distraction and make concentration possible' (p. xiv). People are in a psychological state while they are under the optimal flow experience. In this state, they are so involved with the activity that during the activity, they do not care about their environment, so 'nothing else seems to matter' (Kiili, 2005a).

In order to facilitate flow experiences, computer games should have some characteristics. Sweetser and Wyeth (2005) stated that players' perceived skills are very important and they should match the challenge supported by the game. Both of them should be in balance in order to facilitate and maintain flow during gameplay. Sweetser and Wyeth (2005) also stated that challenge is a very important aspect of good games; they should adequately provide appropriate challenges so that the player's skill level can be easily matched by changing the level of difficulty, which should keep an appropriate pace. Besides, 'games should be usable and provide clear goals and appropriate feedback to the players in order to facilitate flow experience' (Kiili, 2005a, p. 19). According to Kiili, inappropriate challenges of the game environment and bad usability of the computer games reduce the possibility of flow experience. Pilke (2004) emphasises the user interface of computer games and states that user interface should not require more cognitive processing in order to facilitate flow experience properly.

Clements (1998) stated that children prefer working with their friends to being alone while they are working on given tasks. Thus, games should provide social interaction for players (Sweetser & Wyeth, 2005). Social interaction among people while playing com-

puter games, in terms of optimal flow experiences, is an important issue. Characteristics of computer games and interaction among students are effective factors on their motivation for game-based learning activities. In order to benefit from the potential of games in classrooms to enhance students' learning capabilities, the motivational aspects of an interactive social game environment should be taken into consideration before the application of game-based learning. Therefore, in this study, children's flow experiences in an interactive social game environment were investigated. During the study, children were allowed to choose and play computer games according to their preferences. Both social interactions among children and influences of computer game genres on their flow experiences were examined by using the following research questions:

1. What are children's interaction patterns in an interactive social game environment?
2. How does the interaction among children influence their flow experiences during gameplay?
3. How do the effects of game genres influence children's flow experiences?
4. What are the effects of other possible factors (eg, gender, game habits, computer skill, etc of children) on their flow experiences?

Method

Participants

Thirty-three elementary school students who are aged from 7 to 9 years-old participated in the study for 6 weeks. They were allowed to play computer games for 1 hour per week during their computer lab sessions. Twelve of the participants were female and 21 were male. Twenty of the participants were first graders, five were second graders and eight were third graders. The majority of the participants ($n = 29$) had personal computers at home. Except for two girls, all of the participants play computer games. While 21 of the participants preferred playing computer games only sometimes, 10 preferred playing computer games almost everyday. The majority of the participants like to play *Super Mario*, *Bumpy's Arcade Fantasy* and *Sonic*. However, gender had an influence on the game preferences of the participants. For instance, while boys preferred playing *Counter-Strike*, *Xman* or *Spiderman*, whereas girls preferred *Barbie*, *Monopoly* or *Sims* (Table 1).

Table 1: Participants' game preferences

Boys	Girls
<i>Super Mario</i>	<i>Super Mario</i>
<i>Bumpy's Arcade Fantasy</i>	<i>Bumpy's Arcade Fantasy</i>
<i>Sonic</i>	<i>Barbie</i>
<i>Counter-Strike</i>	<i>Monopoly</i>
<i>Xman</i>	<i>Sims</i>
<i>Spider-Man</i>	<i>Frizbi Math Adventure</i>
<i>Frizbi Math Adventure</i>	
<i>Rise of Nations</i>	

Some of the participants ($n = 13$) preferred playing computer games alone, but the majority ($n = 18$) preferred playing with their friends. Because majority of the participants had a personal computer at home, for 22 of the participants, the most preferred place for playing computer games was home. In addition, for 14 participants, school was the other important place to play computer games. When participants were asked whether their families would intervene while they were playing computer games, or restrict their gameplay hours, it was found that only five families did not allow their children to play computer games. Four families did not intervene with their children while they were playing, and 22 families intervened by restricting the game genres and playing hours.

Procedure

Data were collected for 6 weeks during the spring semester of 2006. The children had 1 hour free lab activity per week. They played computer games during the lab time. They were distributed to four classes randomly, and each class consisted of children from different ages, gender and grade levels. The numbers of children in the classes were six (three boys, three girls), nine (five boys, four girls), nine (seven boys, two girls) and nine (six boys, three girls), respectively.

Data collection

Data were collected through both qualitative and quantitative methods. Because of the children's ages, more emphasis was placed on the qualitative than the quantitative part by conducting interviews and observations. Children were asked about their gender, age, grade level, computer skills, computer game habits and game preferences. While children were playing computer games, unobtrusive observation was conducted by taking notes regarding their game preferences and interactions among each other. Also, in the interview part, Kiili's (2005b) flow scale was used in a structured face-to-face interview. This instrument aims to measure nine dimensions of flow experience: challenge, goals, feedback, control, playability, frame story, concentration, time distortion and autotelic experience. The original scale consisted of a total of 23 items. The aim of this step was to measure the flow experiences of the players. However, because the participants of this study were 7- to 9-year-old children, three dimensions of the instrument (autotelic experience, time distortion and playability) were removed because children could not understand the related questions of the instrument.

Before each interview session, three short descriptions of the flow experiences were explained to the children (Csikszentmihalyi & Csikszentmihalyi, 1998, p. 139), and they were as follows:

1. My mind isn't wandering. I am not thinking of something else. I am totally involved in what I am doing. My body feels good. I don't seem to hear anything. The world seems to be cut off from me. I am less aware of myself and my problems.
2. My concentration is like breathing. I never think of it. I am really quite oblivious to my surroundings after I really get going. I think that a phone could ring, the doorbell could ring, or the house could burn down or something like that. When I start, I really do shut out the whole world. Once I stop, I can let it back in again.

3. I am involved in what I am doing. I don't see myself as separate from what I am doing.

These descriptions were given to help the children conceptualise the flow experience so that they could better explain what they had felt while playing the games.

Results

Influences of social interaction on children's flow experience

The amount of interaction among the children was not high during the initial weeks of the semester because they did not know each other very well. They preferred forming groups with their close friends during these weeks. Afterwards, boys preferred forming boys-only groups several times, and girls preferred forming girls-only groups. During 6 weeks, both girls and boys preferred forming mixed-gender groups only four times. However, girls preferred getting help from boys without forming a group when they could not pass a level or when they needed help with the games. Their game preferences had an important role, because girls preferred playing *Barbie* or *Sims* many times when they were combined in a group.

When the flow experiences of groups were considered, it was observed that flow experiences occurred approximately in each session many times among groups formed by boys. The challenge of the games that they were playing had an important role in terms of their flow experiences. All the group members were involved in the game environment and were really oblivious to their surroundings while they were tackling with game. A boy stated that 'When I am playing *Bumpy's Arcade* game, and while I am bouncing in the game to collect the marks, I am feeling that I am bouncing as if I am in the game environment'. Children in a flow experience were absorbed into the game, they were only thinking of passing to the next level of the game or achieving the given task at these times, and they were less aware of both themselves and their friends. It was observed that during the flow experiences of groups, group members did not help their friends, and that was especially true for girls.

The duration of the flow experiences of children was very limited. Because there were several factors that distracted their attention during gameplay, their flow occurrence was induced, and flow lasted for only 1–2 minutes at most. These events were repeated three to four times for each session, and it can be said that for nearly 140 times, the children, especially the boys, went through flow experiences while they were playing computer games during the study.

On the other hand, flow experiences rarely occurred among groups formed by girls. Because games that they preferred did not include any level or challenge that they would be forced to tackle, so flow experiences did not occur. A girl stated that 'I don't live flow experiences while I am playing *Barbie*, because this game is not difficult and I am just dressing the babies in the game'. In addition, it was very interesting to observe that when girls formed a group, one of them would play the computer game and the others would be watching. Similarly, when they formed a group with boys, generally, all the

boys were playing the computer games by taking turns, but the girls were only watching them.

Girls playing computer games asked for help many times from their counterparts, thus this issue induced both boys' and girls' flow experiences too. However, both girls and boys formed a group together only four times. In these groups, flow experiences occurred among the group members during gameplay. Because of game preferences of some girls (eg, *Barbie*), they preferred playing computer games alone without forming a group. Six boys did not play too much in the classroom, and they preferred helping their friends. In the interview part, they stated that they play computer games too much at home, so they want to help their friends. Because they were experienced gamers, they also played a magnet role in the classroom, and mainly they picked games for their friends. It was also observed that because of their magnet role in the classroom, they led the game preferences of the children, and flow experiences among the groups increased with their help in difficult parts of the game.

Interaction was high among the group members when they found a new game or after they achieved a given task in a game. Flow experiences mostly occurred among group members while they were passing difficult levels of games and after they passed to the next level. A boy stated that 'I am so involved in the game environment while I am playing the most difficult parts or levels of the game because dealing with the difficulties increase my motivation and I have to concentrate on the game to pass to the other level'. Also, during gameplay, groups competed with each other, and this factor also increased the flow experiences of the children. When there is competition, it was observed that flow experiences occurred much more than in other times. Another interesting observation was that flow experience also occurred among children who only observed their friends while they are playing.

Influences of computer games on children's flow experience

Gender differences played an important role in children's game preferences. While boys preferred fighting or war games, girls preferred *Barbie*-like games. However, both girls and boys played some of the games, such as *Bumpy's Arcade Fantasy*, *Super Mario* or *Frizbi Math Adventure*. It was observed that girls had more tendency than boys towards playing educational games. Some of the girls preferred playing mind games while none of the boys preferred them. Most of the games were in English, but it was observed that language deficiency did not create much trouble for their play. The children learned how to play them by trial and error or by getting help from their friends. Then, they played games without reading the instructions. Nearly half of them ($n = 16$) preferred games including Turkish explanations and instructions.

Children preferred playing more than one game in each session. Girls switched among games more frequently than boys. This had an impact on their flow experiences during game hours. Challenge played an important role in this issue. When the children's computer skills or abilities in a game are lower than the challenge of the game, they became bored or frustrated and tried to change the game. Afterwards, they preferred

picking a game requiring less challenge. It was observed that the boredom level of the girls was lower than of the boys, and girls had more tendency to switch among games than boys. It was observed that some of the girls played games by sharing keys of the keyboard to control the game. Also, magnet players who are experts on the games had an important role in terms of switching among games in the classroom. When one group had switched to a different game, this change was diffused to nearly all other groups, and in the classroom, majority of the children preferred playing the same game.

Game characteristics, game genres and levels of games influenced the flow experiences of the children. According to the results, majority of the children ($n = 24$) emphasised challenge as the most important element. Also, complexity ($n = 18$) and feedback ($n = 9$) were other important elements that children stated. For instance, because of the challenge levels and immediate and clear feedback characteristics, while playing *Bumpy's Arcade Fantasy* game, flow experiences occurred several times among group members. While playing difficult levels of the *Super Mario* game, similar results were found. During the easy levels of that game, flow experiences did not occur among the children. Because of the clear and immediate feedback of the *Monopoly* game, both boys and girls lived flow experiences while playing.

Besides, there were some differences between girls and boys in terms of game characteristics. In other words, characteristics of the games (eg, ludology and narratology) played an important role in children's flow experiences, depending on the player's gender. Boys did not care about narratology, consisting of story themes of the games, too much. Almost all of the girls mentioned the story and aim of the games in terms of narratology in the interview. However, majority of the boys emphasised the rules and gameplay characteristics of games rather than the story, and they stated that because of the rules in a game, they preferred playing it more and more. For instance, while playing *Super Mario*, flow experiences occurred more among girls than boys because girls gave importance to reaching the end of the game to rescue Mario's wife, which was the story of the game. However, boys gave importance to the challenge and complexities of the game more than they did to its story.

Children's flow experience while playing Bumpy's Arcade Fantasy

The flow experience of the children was examined in the fifth week of the study while they were playing a particular game, *Bumpy's Arcade Fantasy*, because almost all of the children preferred playing it. It is a simple puzzle game. In the game, players have to control a ball that is jumping during gameplay through levels. Players have to collect items in the game. If players collect all of the items, they can pass to the following levels. The game also requires high keyboard control, because players have to use the keyboard effectively in order to collect the items so that they can keep playing. In the interviews, children were asked questions about the game to measure their flow experience. As stated in the Method section, we used Kiili's (2005b) flow scale for this purpose. However, because the participants of this study were 7- to 9-year-old children, three dimensions of the instrument (autotelic experience, time distortion and playability) were removed because children could not understand the related questions of the instrument.

Table 2: Mean scores of the flow experience dimensions

Dimension	Boys		Girls	
	Mean	SD	Mean	SD
Challenge	2.905	0.700	2.667	0.735
Goals	2.095	0.944	2.583	0.793
Feedback	1.667	0.913	1.917	0.996
Story	1.381	0.670	2.333	0.985
Concentration	2.476	0.750	2.250	0.965
Control	2.619	0.805	2.583	0.793

The majority of the children stated that the game was not too difficult ($n = 21$). Only five (four boys and one girl) stated the game was very easy. As seen from Table 2, boys emphasised challenge ($M = 2.905$, $SD = 0.700$) more than the girls ($M = 2.667$, $SD = 0.735$). Both boys and girls did not give more importance to feedback ($M = 1.667$, $SD = 0.913$, $M = 1.917$, $SD = 0.996$, respectively) than other elements as well. However, when elements related to narratology were considered, they were found to receive more emphasis from girls than from boys. The mean score of the flow experiences in terms of goals among girls was 2.583 ($SD = 0.793$), whereas it was 2.095 ($SD = 0.944$) among the boys. Also, the mean score of story for girls was 2.333 ($SD = 0.985$), and it was 1.381 for boys ($SD = 0.670$). Results of the flow scale revealed that boys ($M = 2.476$, $SD = 0.750$) concentrated more on playing compared with girls ($M = 2.250$, $SD = 0.965$).

Conclusion

Computer games are one of the most popular and widely used technologies in today's world; thus, game-based applications are getting more roles in educational settings. Social interaction in classroom and motivational aspects are playing important roles in games. Therefore, in this study we aimed to examine children's flow experiences in interactive social game environments to understand the effects of motivation. Similar results were found in previous studies when children's gameplay characteristics were considered. A study conducted by Bakar, Inal and Cagiltay (2006) concluded that boys were more active than girls when playing computer games. In the present study, flow experiences occurred several times among boys, because of the finding that boys preferred playing games more than girls.

Results of the study revealed that children have a tendency to form a group while playing. Boys preferred forming a group more than girls did. When flow experiences are considered, it was observed that flow experiences might occur among children while they were playing games as a group. Just like in the study conducted by Kiili (2005a), in the present study, it was also observed that while people are under the flow experience, they are so involved with dealing with the game environment that during the activity they do not care about the things that happen around.

Computer games have to include some characteristics in order to attract the attention of children and keep their motivation at a high level. Similarly, to facilitate the flow experiences of children, computer games should be designed properly. Sweetser and Wyeth (2005) stated that players should be given appropriate and clear feedback at appropriate times during gameplay. In our study, game genres had a significant role in the children's flow experiences. Games including levels or parts that have different degrees of difficulty, facilitated or increased the flow experience of the children. As Pilke (2004) emphasises, the user interface of computer games, as well as computer games requiring less cognitive process, increases the flow experience of children. Also, different game genres had an effect on the social interaction of children. Kiili (2005a) emphasises the challenge of the games regarding flow experience. Results of our study revealed that, in accordance with Kiili's statements, challenge is very important for children, and it is the most effective factor increasing the flow experience.

Flow experiences occurred among children in a group while they were playing a game as a group. While ludology had more effect than the narratology of computer games on the flow experiences of boys, narratology had more effect among girls. According to Gorriz and Medina (2002), girls prefer playing computer games including stories based on social issues, and they like dealing with computer game environments supported by narratives. Similarly, in our study, girls liked the stories of games and they gave more importance to nonplayable parts of games. Interesting stories motivated them while playing computer games. They also switched games by taking into consideration the stories of games. In previous studies (eg, Denner, Bean & Werner, 2005), it was concluded that computer games appealing to girls should have some characteristics such as minimising competition and complexity. Similarly, in our study, girls did not prefer computer games including competition and complex environments. However, boys concentrated on winning games and dealt with the challenge and complexity of games. Passing to the next level or winning games were their main aims during gameplay. Also, the challenge and complexity elements of games had mainly more effect than clear feedback on the flow experiences of the children. Because of the tendencies of the children for forming a group, and because of the occurrence of flow experiences among all of the children in groups, computer games might be so designed as to be used by a group of the children in game-based learning activities.

Children preferred switching among the games that they played frequently when they played alone, but they did not switch among games as much when they were in a group. Because the children's motivational level was low, computer games in game-based learning applications should be designed by taking into consideration these issues. Girls like stories more than do boys, while boys like the complexity of games and dealing with game environments. It is seen that girls and boys expect different components or characteristics from computer games. There are differences of preference between girls and boys, and for that reason computer games might be designed by considering the expectations of both groups. Furthermore, not only the gameplay preferences of boys and girls are different, but also their game design preferences. Kafai (1998) found significant differences between boys and girls about their game design preferences. She stated that

girls and boys have different perceptions and preferences in terms of designing computer games. It can be concluded that the motivation of the children might be high when they are working in a group or playing a game with a group of children; thus, group-based activities might be more effective than individual-based ones. Last but not least, competition might facilitate or increase the flow experiences of children in game-based learning applications.

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