

A Window to Digital Games Interactions in Informal Settings

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Digital games environments have become the main building blocks of today's children's world. However, the impact of the widespread use of digital games on kids and how they learn is not fully understood. The DiGames Research Project main goal is to systematically study kids' interactions and learning while they play digital games in informal home settings. Preliminary results suggest that: (1) Individual acquisition of game skills occurs via repeated transitions between active and passive observations in different difficulty levels. (2) Small group game play interactions is a dynamic blend of collaboration, competition, negotiation and mentoring states, accompanied by ad-hoc conflicts. (3) In MMOG such as RunEscapeTM Players spontaneously take different roles as leaders, warriors, bankers, and reporters, to name a few. (4) In god-like games, such as ZooTycoonTM, players developed high level of conceptual understanding of the games' spaces. Future theoretical and pedagogical research trends are presented.

Keywords digital games; learning sciences, interactions; informal learning environments

1. Theoretical background

There are many indications that digital learning environments such as simulations, digital games and virtual reality environments may provide the cognitive bridge between concrete experiences and scientific abstractions [1, 2]. Such a bridge is crucial for enabling students to cope with complex problem solving and other high order thinking skills that are at the core of scientific and technological issues [3]. Like any popular media, digital games have become the building blocks of children's worlds [4, 5]. Ellis (1983) argues that children usually play in groups, and when they do not, they share their experiences socially. Hence, playing digital games is situated in social and cultural spheres that are perhaps more important than the game itself [6]. Gee (2003) argues that through informal game playing, children learn to participate in what he calls 'semiotic domains', which are shaped by children's interaction with virtual agents and with each other [7]. Likewise, Nijholt (2001) claim that the developments in computer science (artificial intelligence, computer graphics) have paved the way for the assimilation of smart agents within learning environments, as learners becoming more accustomed to them based on their prior videogame experience [8]. However, the study of human-human, human-computer interactions within digital games environments and virtual environments is in its early stages [9, 10].

Although most of playing digital games takes place in informal and home settings, only few case studies focused on the interactions and learning within these settings [11, 12, 13]. In addition, there is not one accepted theoretical model which describes the multimodal interactions and learning in real-time digital games play [14, 15]. Thus, Innovative methodologies are needed for bridging between micro and macro levels of interactions (individual and collaborative) which occur in different space and time scales of digital games play [16].

2. The research goals and questions

The main goal of the DiGames Research Project is to describe and analyze the interactions and learning of kids (age 8-12 years old) while they play different digital games in informal home settings, their natural everyday living space.

The main research questions are:

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(1) What are the characteristics of the kids' real-time interactions while they play digital games in informal home settings?

(2) What are the characteristics of the kids' learning interactions while they play digital games in informal home settings, and how their individual and shared conceptual understanding of the complexity of the digital game spaces evolve over time?

Gaining a better understanding of kids' digital games interactions and learning processes in informal home might contribute to the design of effective pedagogical scaffolding and build-in interfaces. In addition, the study could contribute to the development of a coherent theoretical model of learning interactions in digital environments.

3. Methodology

3.1 The methodological approach

The DiGames Research Project is an exploratory case study. Case study methodology affords a systematic examination of the qualitative and quantitative changes of the interaction, goals and choices made by the learners. These real-time changes could reveal the patterns of the learning processes. Fischer's (1980) skill theory focuses on the ways people develop their skills and the ways they learn in various domains [17]. Analysis of these ways the basis of an approach for studying learning called "microdevelopment", which is defined as a process of change in abilities, knowledge, and understanding occurring in short time spans [18]. The main idea behind the microdevelopment approach is to give scientists a better picture of how learning occurs in real time, rather than relying on snapshots of what children learn at particular points. The microdevelopment approach involves videotaping children actions as they deal with a specific task, coding the responses or words and gestures as they work, and then systematically analyzing all of the information. Active theory is another powerful theory, which can be used for examining the relations of participant and object as mediated by the primary components (tools, community, rules, and division of labor) which constitute an activity system [19, 20]. The analytical framework can be used to describe activity and provides a set of perspectives on practice that interlink individual and social levels. A combination of a microdevelopment approach and an active theory methodology was selected to examine (a) learners' real-time interactions, (b) the overall home micro-culture (emergent norms), (c) small group dynamics, and (d) rules (informal, formal). Commercial off-the-shelf (COTS) computer games, such as NBA2004TM, ZooTycoonTM, Sims2TM, TrackManiaTM, and MMOGs (Massive Multiplayer Online Games) such as RuneScapeTM were used in the study.

3.2 Data collection

Seven kids (4 boys, 3 girls, age 8-12 years old) participate in the study on voluntary basis. The study, currently in its preliminary stage, is been conducted at the kids' homes. Conducting a case study in informal home settings has many constrains, since informal learning by definition is an unofficial and unscheduled activity [21, 22]. The role of freedom of choice must be kept, hence, playing digital games duration vary between ten minutes and three hours. Sessions also vary in their ad hoc social gathering (individual, dyads, small group), and the different game interfaces and communication tools used (face-to-face, on-line group real time communication using phones, Microsoft's messengerTM, Joysticks and mouse keyboard interfaces, to name a few).

Despite the constrains described above, over 35 hours of digital game play were collected so far, by direct observation, note taking, followed by sporadic semi structured interviews. In one of the kids' living room, low-cost capturing devices (Averkey300TM PC-to-TV convector, VCR) were installs for capturing and recording the digital games play as seen on the screen together with what the kids said.

The recorded video clips were used for instant recall technique. An additional video camera was placed on a table behind the players to capture their body and hand gestures.

3.2 Data analysis

Computerized tools and cutting-edge methodologies, such as sequential analysis and social networks analysis (SNA) are used to examine how kids interact and learn while playing digital games. **Fig 1** shows a preliminary coding scheme that is been used to code how kids construct their individual and shared conceptual understanding of the complex games spaces, and for mapping the individual-group interactions, cognitive-affective and role taking dynamics, and the development of problem solving skills.

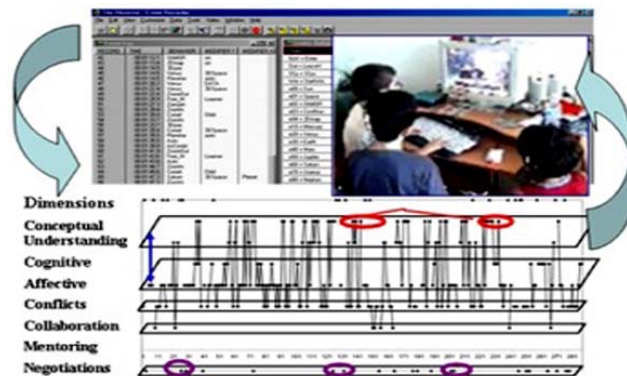


Fig. 1

4. Preliminary Results and future research trends

Since the study is still in its preliminary stages of data collection, preliminary results would be presented from two different perspectives: Individual and small group interactive game play.

4.1 Individual interactive game play - gaming skills acquisition

Analysis of individual interactive game play shows that gaming skills acquisition in racing and sport games (TrackMania™ and EA NBA 2004™, and FIFA World Cup Germany2006™) is composed of repeated transitions between interaction in different difficulty levels.

Fig 2 shows a nine years old kid playing FIFA World Cup Germany2006™ in practice mode level. Playing in low difficulty levels afford a “safe experiment space” for gaining control while experiencing few frustration events. Gaming skills acquisition pattern were found to be a blend of active interactions and passive observations. The passive observations duration was 23% of the total game play sessions mean time. The players used the built-in replay feature frequently during the game sessions. These findings give rise to the following question: What is the dynamics of the active–passive digital game play? One of the trends worth following is: What is the optimal combination of embedding passive observations features in dynamic learning environments. Using computerized tools for time stamping coding of the interactions might result new insights on that theme.



Fig. 2

Additionally, three kids said that their quick gaming skills progress was a result of peer interactions. For example, one kid playing FIFA2006™ explained his fast progress from novice to professional level by the fact that *“I watched my friend play this level before I played it myself, so it’s easier for me now”*. Another kid playing Tony Hawk Pro Skater2™ said: *“you need to know where the secret playgrounds are hidden to get more points... my big brother’s friend showed me”*. These examples emphasize that digital game play in informal home settings are more than individual interactive play. Therefore, there is a need to gain better understanding of the dynamics of individual – small group interactions, as well as, real-time learning processes during digital games play.

4.2 Small group digital games play - complex interactions

Preliminary results regarding small group digital games interactions suggest that: (1) The digital games play interactions have different stages, spanning from **teaching** (in which the kids’ main aim is a collaborative game play, as are to minimize the knowledge gap between the players) to **cheating** stages (in which the kids’ aim is to win by maximizing the knowledge gap between himself and his counterparts); (2) There are constant changes between four main game play states: Collaboration, Competition, Negotiation and Mentoring. Several game plays were accompanied by ad-hoc conflicts; (3) Players spontaneously take different roles as leaders, managers, bankers, engineers, and warriors, to name a few. For example, while playing TrackMania™, an on-line extreme racing game, two kids (age 10 years old) used the “construct your extreme track”, a built-in game feature, over 32% of the over all session duration which lasted over one hour long. They designed together a racing track, which was named by them as *“the most boring racing track in the world”*. The two kids explained that *“we wanted to build an ever lasting racing track. This one goes for ever. You can’t finish the race, since there is no finish line to be found”*. After testing the track by driving a car along the pathways one of them said *“The track makes you feel like a small ant wandering around”*. Another collaborative interactions occurred in RuneScape™, which is a MMOG quest game. One kid was a mentor, showing a second kid, which was sitting next to him. The second kid took the role of the passive observer. A third kid was playing on-line in his house [different physical location]. He used the “follow me” strategy to follow the mentor. The two kids, interacting on-line, exchange information, used a regular phone line as an additional real-time verbal communication channel. During the fifty minutes session, the two players exchanged goods, made alliances and performed joint attacks on other on-line avatars and other artificial bots. One of the future research trends worth followed is to examine the relations between kids’ on-line MMOG interactions and the emergent of their real world social interactions patterns; (4) In god-like digital games such as ZooTycoon™ and Sims2™, players demonstrate high level of interest and motivation, building a high level of conceptual understanding of the game space complexity. Three kids (age 8-11 years old) developed an interdisciplinary knowledge. For exam-

ple, during FIFA World Cup Germany2006™ play, one kid (age 9 years old) performed a spontaneous geographical inquiry, by using the embedded Glob dynamic map for identifying different national teams geographical location, and using an Atlas to compare the nations' population and size. (5) Frequent episodes of spontaneously breaking the game rules for the creation of a new game with a new time-space framework were observed.



Fig. 3

Fig. 3 shows two girls play a racing game by using a split screen. While playing Wacky races™ in dyad, one kid (age 9 years old) said “*Its more fun to play bump-up cars in the river, so lets go I'll show you the way*”. While the auto bots kept racing on their course, the two kids "virtual cars" left for a joyful new adventure which had no time limit, bumping their cars into each other in the “river”, laughing. Another example, of making a different game play, was the use of the built-in replay and camera motion control as a tool for making the funniest NBA2004 clip, as the kids “switched” the original competitive goals with his holistic goals of making a creative and funny cool clip. (6) In most game plays session, artificial bots behavior perceived by the kids as **stupid** (A.S) was found to be a powerful tool of making the kids laugh. A future research trend, would be to systematically map all the game events which makes kids laugh, and to see how these events are connected to other events, such as learning the game rules, building a conceptual understanding of the game space and the development of professional gaming skills.

4. Further information

For further information on the conceptual framework and computerized tools used in the DiGames Research Project, and for possible future collaboration, Contact Dr, Elhanan Gazit at gazit@hit.ac.il

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