Multiplayer online games as educational tools: Facing new challenges in learning

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ABSTRACT

This paper outlines a proposal for the development of educational multiplayer online games based on the activity theory, as an alternative to the current trend in multiplayer gaming and a means of promoting collaboration among students. In order to examine whether online games are engaging for learners, we consider multiple factors regarding game play – such as frequency of game use, gender differences, identification with the characters, and game preferences – as well as some psychosocial factors that may influence learning – such as academic performance, self-esteem, and computer self-efficacy. This paper suggests that online multiplayer educational games should be approached as a complex learning system, based on the principles of activity theory, where the Subjects would interact with other Subjects, Objects and Tools of the game, under specified Rules and create Communities through division of labor, leading to the expected learning outcome. Thus, we suggest taking into account some important issues concerning the Subjects that the activity theory refers to, such as gender differences in playing games, academic performance, self-esteem and computer self-efficacy.

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1. Introduction

Lately, serious attention has been directed to the potential of using online games for learning and various terms have been coined to describe this new educational tool, such as "edutainment" and "educational games". The main characteristic that differentiates edutainment and educational games is interactivity, because, the former being grounded on didactical and linear progressions, no place is left to wandering and alternatives (Denis & Jouvelot, 2005). Educational games require strategizing, hypothesis testing, or problem-solving, usually with higher order thinking rather than rote memorization or simple comprehension (Dondlinger, 2007). The key characteristics of games are: rules, goals and objectives, outcomes and feedback, conflict (and/or competition, challenge, opposition), interaction, and representation of story (Prensky, 2001).

Over the years games became more complex, often social environments, sometimes involving large distributed communities. In many ways, games have become complex learning systems (Prensky, 2006). Additionally, with the appearance of multiplayer games, these environments have been expanded and the numerous interactions among the players have increased the complexity of these social systems.

Commercial massive multiplayer online games (MMOGs) – online computer games that draw together players from all over the world – have come to dominate the digital entertainment industry and have increasingly become the dominant form of entertainment, particularly for children and adolescents (Magnussen & Misfeldt, 2004). These games are an evolution of the formerly known as Multi-User Dungeon or Domain or Dimension (MUDs) and are referred to as "virtual worlds" as they are not simply games in the traditional rules-based sense, but rather "persistent social and material worlds, loosely structured by open-ended (fantasy) narratives, where players are largely free to do as they please" (Steinkuehler, 2004).

It seems that multiplayer games have obvious learning potential, and studies have focused on which types of learning these games support (Herz, 2001; Steinkuehler, 2004). A central element in multiplayer games is that the interaction enables players to communicate and collaborate in the game sessions (Manninen, 2003).

This study is an attempt to highlight multiple aspects of educational games in order to approach online games as a complex learning environment, according to the principles of the activity theory. Therefore, first we will consider the educational value of games as it is described in the literature. Secondly, we will examine the games' potential for player engagement, by presenting research reports on factors such as game use (frequency of game use, gender differences, identification with the characters, game preferences), and some psychosocial factors that may influence learning (academic performance, self-esteem, computer self-efficacy).

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The main attribute of this study is that we propose the development of multiplayer educational games, based on an activity theory basis, constructed as complex social environments, where students collaborate and learn through numerous interactions among other Subjects, Objects and Tools of the game, under specified Rules and create Communities through division of labor. We argue that multiplayer educational games can be a promising educational tool, a viable alternative to the current trend in multiplayer gaming, which will promote collaboration among students.

2. A literature review on games

There is a significant body of research supporting the potential of using games as an educational tool. This research investigates games in relation to the cognitive approach to learning and also examines factors such as player engagement and the psychosocial aspects that have a bearing on learning.

According to the cognitive approach of learning, games could be beneficial for a number of reasons. Firstly, it is claimed that in games knowledge or skills learned and practiced are more likely to transfer than when practiced on a single kind of problem. Once mastered, the knowledge and skills are practiced further to provide overlearning. This leads to the knowledge and skills becoming automatized and consolidated in memory, so that the learner can begin to focus consciously on comprehending or applying new information (Gentile & Gentile, 2005). In addition, games seem to put the learner in the role of decision-maker, pushing players through ever harder challenges, and learning is accomplished through trial and error (Gee, 2003). Games also have a significant advantage in that pupils receive immediate feedback on their actions and decisions, inviting exploration and experimentation (Kirriemuir, 2002). Moreover, games are well-sequenced in levels of increasing difficulty, complexity or pace, with success at subsequent levels contingent upon competencies mastered at previous levels and can be used as an educational tool because they have clear objectives, often set at multiple difficulty levels to adapt to the prior knowledge and skills of each learner (Gentile & Gentile, 2005). Most importantly, the pace of the activities can be adjusted for faster or slower learners, novices or experts, to truly deliver differentiated instruction and this is the embodiment of the spiral curriculum (Bruner, 1960).

Another reason for suggesting games as good educational tools is that they are engaging for players (Prensky, 2001) motivating them via fun, challenge and instant visual feedback within a complete, interactive virtual playing environment, whereby ambience information creates an immersive experience, sustaining interest in the game (Mitchell & Savill-Smith, 2004).

Concerning the psychosocial factors that influence learning, it has been mentioned that games can encourage learners who lack interest or confidence (Klawe, 1994). Moreover, Mitchell and Savill-Smith (2004) state that complex games, in particular, have the potential to support cognitive processing and the development of strategic skills. With regard to academic performance, it is claimed that brain oscillations, associated with navigational and spatial learning, occur more frequently in more complex games, and this increases users' learning and recollection capabilities and encourages greater academic, social and computer literacy skills (Natale, 2002).

The above findings are only some of those that suggest that the prospect of using games in the teaching process is more than promising. It seems that games can teach children in a fun, engaging, motivating, interesting and encouraging way, enabling the teaching of complex new information, otherwise too difficult to be taught in a classroom, since knowledge can be adjusted for different types of learning, and leading to the development of strategic skills through experimentation and trial and error. Thus both academic performance and interpersonal relations can be enhanced according to the principles of the spiral curriculum.

Game researchers often disagree on whether educational games can be engaging for players. To answer this question first, we need to examine multiple factors in game play aspects, such as the frequency of game play by young people and gender differences in their use, identification with the characters of the games and the types of games that young people prefer, in order to gauge the potential of using games as an educational tool. Moreover, since online games are being proposed as an educational tool, we need to examine some psychosocial factors that may influence learning, such as the correlation of game play with academic performance, self-esteem and computer self-efficacy.

2.1. The frequency of game play

The time that young people spend in digital games is an important factor that can determine whether educational games can be interesting for students. American research indicates that digital games keep growing in popularity. Games had a large appeal since the late 90s, when Anderson (US Senate, 2000) claimed that digital games were consuming a larger amount of time every year. The average 7th grader was playing electronic games at least 4 h per week, and about half of those games were violent. Moreover, 77% of children reported sometimes playing games at home, and 24% reported playing every day. Significantly, more than 60% of children reported that they played longer than they intended to play (Cesarone, 1998).

More recent, a recent Greek study discovered a high frequency of digital game use by a representative sample of young participants, since the average daily time that they spend playing digital games was 2.53 h (Mysirlaki & Paraskeva, 2007). Moreover, Massive Multiplayer Online Role-Playing Games (MMORPGs) appeal to a broad age range (Mage = 26.57) and have a greater average usage (22 h of per week) (Yee, 2006).

The latest findings by the Entertainment Software Association (ESA) (2009), which represents US computer and video game publishers, reveal that 68% of American households play computer or video games. Additionally, the number of households playing games increased 3% over 2008, representing the expanding use of entertainment software.

2.2. Identification with the character

Another important factor is whether players identify with the character of the game. Social learning theory suggests that at least some behavior is learned by observing and then imitating a model who displays a certain behavior. In digital games, identification as the perception of a common quality with another, subject or object, occurs with relation to the player and the player's position in the game space as the player incorporates the player-character – an image in that game space – into their own identity so as to become immersed in the game space (Taylor, 2003).

Taylor also claims that in games, the player pursues the goals of the player-character and plays from the player-character's vantage point, therefore beginning play based on real or imagined shared traits with the player-character and these shared traits allow for identification. Moreover, it is argued that games encourage identification with characters – from science fiction, or sports, or war stories – but leave little room for enacting the player's own social role (Turkle, 1984).

Mysirlaki and Paraskeva (2007) also found that the time spent playing games and identification with the character correlated positively with $r = .218^*$ suggesting that the more adolescents play games, the more they identify with the character of the game.

2.3. Game preferences

Considering game preferences, an earlier study suggested that the two most preferred game categories, by seventh and eighth grade students, were games that involved fantasy violence, preferred by almost 32% of subjects, and sports games, some of which contained violent subthemes, which were preferred by more than 29%. Moreover, 20% of the students expressed a preference for games with a general entertainment theme, while another 17% favored games that involved human violence (Funk, 1993).

Nevertheless, since the early 90s', the game industry has provided games that offer more than violence. A study that was conducted in 2006, showed a significant positive correlation between the time spent playing games, "action games" and "RPG's (Role-Playing Games)", with $r = .233^{**}$ and $r = .259^{**}$, revealing a strong preference for these games over games that contain violence (Mysirlaki & Paraskeva, 2007). Nowadays, role-playing and strategy games seem to be more popular than first-person shooter games (FPS). The Entertainment Software Association (ESA) (2008) revealed that the best-selling computer games for the year 2007 were strategy (33.9%) and Role-Playing games (18.8%), while shooter games (11.6%) were even less popular than the family games (14.3%).

In addition, the top of the 20 best-selling computer games for 2007 was an online multiplayer game called World of Warcraft (Entertainment Software Association (ESA), 2008). According to a press release by Blizzard Entertainment (2009), World of Warcraft, its award-winning subscription-based massively multiplayer online role-playing game, has expanded its subscriber base to 11.5 million players, up about 15% in 1 year (January 2008), and it continues to grow every day. Overall, Massive Multiplayer Online Role-Playing Games (MMORPGs) seem to have a strong multi-faceted appeal to players, motivating them to make friends and form supportive social networks, or use the environment to become powerful through the achievement of goals (Yee, 2006).

On the other hand, when it comes to developing educational games, we should consider the quite high percentage of the students' preferences for entertainment games, and secondly we should be puzzled by the really low percentage of the students' preferences for educational games, since less than 2% of the adolescents seem to prefer games with educational content (Funk, 1993). Could this low percentage be due to not providing those students with interesting and engaging educational games; and if so, what are we missing?

It is thought that educational software is typically disliked by students 'because the fun factor is missing' (Leddo, 1996). Hence, by taking advantage of students' interest in commercial games, such as MMOGs and MMORPGs, the educational games can use some of their characteristics in order to become more engaging and fun for students. Thus, we should consider which game characteristics, apart from violence, appeal to young people and investigate the potential of exploiting the virtual and competitive element, both prominent features of popular games.

2.4. Gender differences

There seems to be important gender differences in game playing, concerning both the time spent in those games and game preferences. Funk (1993) found out that "approximately 36% of male students played games for 1–2 h per week; 29% played 3–6 h; and only 12% did not play at all. Among female students who played games, approximately 42% played 1–2 h per week and 15% played 3–6 h. Nearly 37% of females did not play any games. Funk & Buchman (1996a) claim that males are found to spend significantly more time playing than females, while Yee (2006) claimed that users under the age of 18 are almost all male (96.8%), who tend to objectify the environment and other users for their own personal gain.

What is more, Facer, Sutherland, Furlong, and Furlong (2003) reported that boys were seen to be significantly more intense games players, with 33% of boys compared with 13% of girls reporting playing games every day and, in detailed observations, boys were seen to 'own' the games technology in the home on a more regular basis. Additionally, Mysirlaki and Paraskeva (2007) reported a significant positive correlation between male participants and the time spent playing games, in a population of Greek players.

Concerning the different reasons why people tend to play these games, Yee (2006) claims that male players are significantly more likely to be driven into MMORPG gaming by achievement and manipulation factors and female players by relationship factors. Female players are more likely to use the MMORPG environment to build supportive social networks, escape from reallife stress and to be immersed in a fantasy world.

In an attempt to explain gender differences in game play, Cassell and Jenkins (1998) claim that the representations of the games (content and nature) are to blame. It is argued that many computer games simply represent a 'male' view of the world, relying heavily on stylised combat or traditional gender roles with female protagonists cast as victims to be rescued (Facer, 2004). It is also thought that games were traditionally designed and marketed almost exclusively for males by males (Griffiths, 1996) and that females enjoy games with characteristics which they consider to be fun, such as games played against the computer, puzzles and quiz games (Griffiths & Hunt, 1995; Mitchell, 2003; Yelland & Lloyd, 2001).

Again, the findings indicate a need to focus on those game features which are universally appealing, or, alternatively, develop multi-faceted games to cater for a wider range of interests.

2.5. Self-esteem

Self-esteem is considered an important psychological factor that affects learning. Funk and Buchman (1996b) found that for girls, more time playing video or computer games is associated with lower Harter scores on six subscales, including self-esteem. However, Fling et al. (1992) report that the amount of game play correlated with aggression and not with self-esteem. Moreover, in a study conduced in a London comprehensive school, computer game play was not linked to self-esteem in girls, but a negative relationship was obtained between

self-esteem and frequency of play in boys, concluding that self-esteem was not associated with total exposure to game play (Colwell & Payne, 2000). Other researchers claim that games are means of encouraging learners who may lack interest or confidence (Klawe, 1994) and of enhancing their self-esteem (Dempsey, Rasmussen, & Lucassen, 1994; Ritchie & Dodge, 1992).

A more recent study (Mysirlaki & Paraskeva, 2007) stated that the time spent playing digital games correlated significantly with one of the factors of a questionnaire based on the Harter scale (Harter, 1985). More specifically, the factor "I am worth as much as other people" correlated significantly with the time spent digital games with $r = -.198^*$, meaning that the more adolescents play games, the more they tend to feel inadequate or inferior. All the other factors correlated negatively but not significantly, suggesting a partial cohesion between high frequency of digital game use and low self-esteem.

We conclude that the relation between self-esteem and frequent game use is still to be clearly defined, nevertheless, given that individuals with low self-esteem usually also demonstrate poor academic performance, we should seriously consider the potential of games to boost learner confidence.

2.6. Computer self-efficacy

Regarding computer self-efficacy, and the extent to which it is affected by frequent use of digital games, it is found that playing recreational computer games may influence children's performance on subsequent computer-based educational tasks (Pillay, 2002).

With regard to that, frequent digital game use is said to be partially correlated with high computer self-efficacy (Mysirlaki & Paraskeva, 2007), as the factors "I feel confident logging onto the Internet", "I feel confident accessing information on the Internet" (internet skills) and "I feel confident describing the function of computer hardware" (advanced skills), were significantly positively correlated with the time spent playing digital games, with $r = .283^{**}$, $r = .229^*$ and $r = .320^{**}$ for each case. All the other factors of the questionnaire, based on the computer self-efficacy form (Murphy, Coover, & Owen, 1989), were positively but not significantly correlated, meaning that the more participants play digital games the more they tend to develop computer self-efficacy. However, since not all the factors were significantly correlated, there seems to be only a partial cohesion between high frequency of digital game use and high computer self-efficacy.

2.7. Academic performance

When it comes to considering the possibility of using games as an educational tool, we need to examine whether the high frequency of game use is affecting students' academic performance. It has been reported that games consume the time adolescents should spend on their homework, which can negatively affect academic performance (Mitchell & Savill-Smith, 2004). Moreover, Hauge and Gentile (2003) report that video game "addiction" is a problem among adolescents, particularly among males, and that addiction is associated with adjustment problems such as poor school performance and aggressive attitudes and behaviors.

However, in a study by Mysirlaki and Paraskeva (2007) the correlation between the factors "Time spent playing digital games" and "academic performance", though negative, was not significant ($r = -.172$), possibly indicating no cohesion between high frequency of digital game use and low academic performance. Furthermore, it has recently been reported that though the amount of time a student spends playing games has a negative correlation with students' scholastic aptitude test (SAT) and grade-point average (GPA) scores, the connection remains difficult because of the complex nature of student life and academic performance, concluding that video game usage may simply be a function of specific personality types and characteristics (Anand, 2007).

We conclude that game use should be controlled, just like any other daily activity, in order not to distract students from their homework. Thus, educational games that would be a supplement to schoolwork should be developed in such a way that it will not be possible to play indefinitely, perhaps by incorporating elements that necessitate a classroom session or recourse to an external source of information before proceeding to the next stage. In this way, it is hoped that the suspense created by the enforced wait would increase motivation and interest in acquiring the knowledge or developing the skills needed to continue playing and focus the player's conscious attention on the new information and its relevance to the system of the game. At this point it should be stressed, however, that there is a risk of players losing interest (particularly individuals less capable of deferring gratification) and, consequently, the games must be sufficiently appealing to ensure that students will not be put off by having to interrupt play to focus on scholastic tasks.

In conclusion, in order to evaluate the possibility of educational games being engaging for students, we needed to consider the possible impact of games on areas such as academic performance, self-esteem and computer self-efficacy, as well as factors indicating the extent of game appeal to young people, such as the time spent playing games, gender differences in game use, game preferences and identification with the presented character.

From all the above, it seems that there is a high frequency of game use by adolescents and that there is cohesion between high frequency of game use and identification with the character of the game. In addition, it seems that males tend to play games more than females though this could be attributed to the nature of the commercial games that does not seem to engage female adolescents. Considering game preferences, it seems that students tend to prefer games that involve action as well as role playing, such as MMOGs and MMORPGs. All these need to be taken into account when developing engaging educational games.

Additionally, educational games that would be a supplement to schoolwork should not pose a threat to academic performance, while the relation between self-esteem and frequent game use is still to be clearly defined. Furthermore, the implied but interesting relationship between computer self-efficacy and frequent game play can be regarded as a positive indication of the potential of using digital games in a computer-based learning environment.

All the above findings strengthen the possibility of games becoming a promising educational tool that will engage students and lead to learning outcomes.

3. Developing educational multiplayer online games on an activity theory basis

The educational value of digital games has been discussed by many learning theories over the years. Firstly, the widespread theoretical framework that tried to explain the relationship between learning and games was Behaviorism with its emphasis on the relevant stimuli

and response. Theorists such as Pavlov, Thorndike, Watson and Skinner laid the foundations of this theory which sees the interaction between the player and the game as a procedure where the player matches question and answer. In this approach, reinforcement comes with the correct match and then learning will occur (Gleitman, 1995; Saettler, 1968). This has led to the criticism of behaviorist edutainment as relying on drill-and-practice and in training rather than understanding (Buckingham & Scanlon, 2002; Facer et al., 2003; Okan, 2003; Prensky, 2001).

Later, cognitivism focused on the individual's construction of representations of the world and therefore, educational games with a cognitive approach (and coding mnemonic and retrieval techniques, etc.) attempted to build intrinsic motivation by integrating learning and game experience (Egenfeldt-Nielsen, 2006). Additionally, socio-cognitive learning theory describes the learning procedure as an imitation of the projected behavior, when that behavior is being reinforced. The imitation is considered as a combination of the factors person, behavior and environment, where the person is controlling its behavior through a self-regulation procedure (Bandura, 1962; Zimmerman, 1989, 1998).

Constructionism followed, focusing on the role of external objects in facilitating the learning process. Papert thought that the active approach to knowledge and the use of external artefacts facilitating the learning experience is essential for constructionism (Papert, 1980, 1998) , and this led to the creation of the microworlds which the learner can engage with and construct different objects and connections that can work as virtual shared artifacts (Papert, 1998).

Though constructionism and cognitivism seem to focus more on the players' role in games, the socio-cultural approach is more global, encompassing player, game, and context (Egenfeldt-Nielsen, 2006).

The socio-cultural approach embodies many theories that focus on mediation for an understanding of the learning process and perceive knowledge as a tool that mediates activity. Theorists like Vygotsky Lave, Wertsch, Wenger and Leontjev see activities as mediated by tools and have formulated theories such as the activity theory, the socio-cultural theory, and situated learning.

When it comes to digital games, researchers lately raised the interesting question "how can one theoretical framework account for the moment-to-moment interactions that constitute game play (including the player's goals and intentions) while also accounting for the broader socio-cultural contexts that situate the activity?" (Squire, 2001).

As an answer to this question, activity theory appears to be a theoretical framework for understanding how human activity is mediated by both tools and cultural context (Engeström, 1987, 1993) and can be a strong theoretical basis for understanding the effects of game use on people. Activity theory consists of Subjects – the people or groups, Objects, Tools – which mediate a subject's interactions with an object-, the community of a system, Rules and Division of Labor. In a game, Communities mediate activity through division of labor and shared norms and expectations (Squire, 2001).

Thus, activity theory could be the basis for developing educational games that would aim at creating collaborative learning environments, such as communities of practices, where players would interact with other subjects, objects and tools of the game, under specified rules and create communities through division of labor. In such an educational game, the interaction among the items of the game could result in the expected learning outcome.

The activity system (Fig. 1) is used by the Activity theorists (Engeström, 1987, 1993) to represent the interaction among the factors that impact the activity.

In a game, the activity theory system would represent the interactions among the numerous factors that influence a game activity. Thus, the system of the learning procedure in an educational multiplayer game, based on the activity theory, would summarize the basic interactions among the factors of the Subjects, the Objects, the Tools, the Rules, the Community and the Division of Labor as they appear in a game. Fig. 2 is an attempt to define these factors and their components, in order to map some of the game components with the learning procedure that would take place in an educational multiplayer game.

Furthermore, and since important psychosocial issues were examined in this study, the activity system of a multiplayer educational game is highlighted by some important aspects of the factor "Subject", which we believe should be taken into account when developing an educational game, in Fig. 3.

As presented in Fig. 3, we propose the development of multiplayer educational games, which would be based on an activity theory system and highlighted by some important psychosocial issues. This system is considered as a complex social network, where subjects interact with numerous factors of the games (such as those in Fig. 3) to lead themselves to the learning outcome. These games should be designed
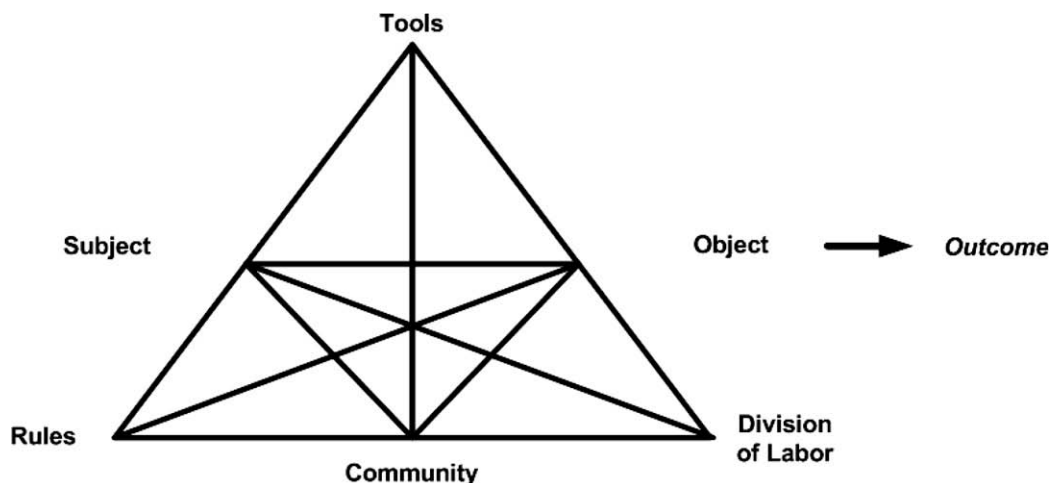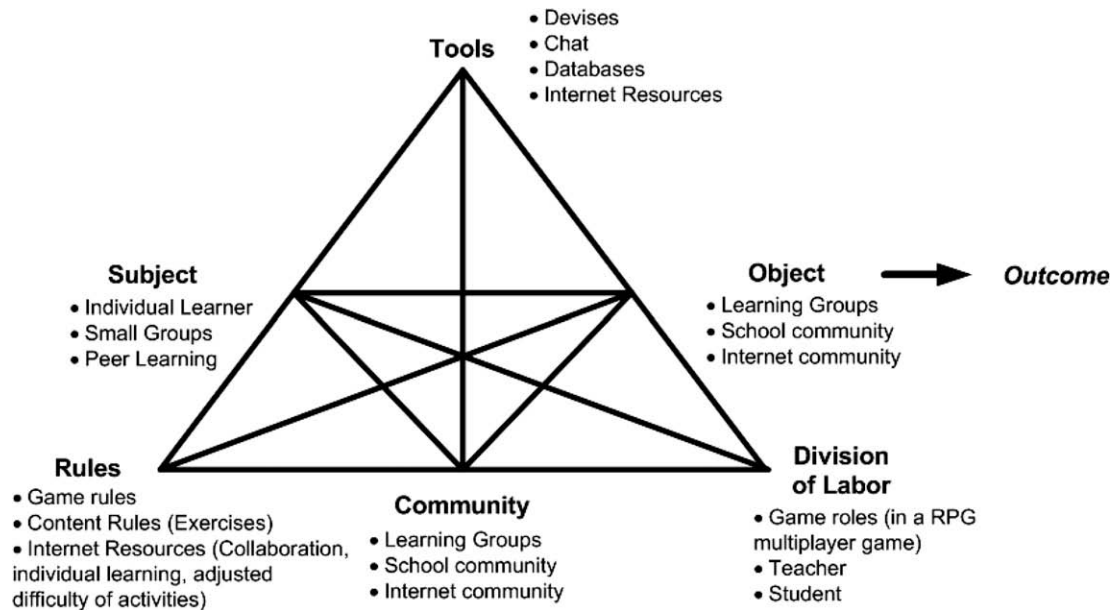

Fig. 1. Activity system.

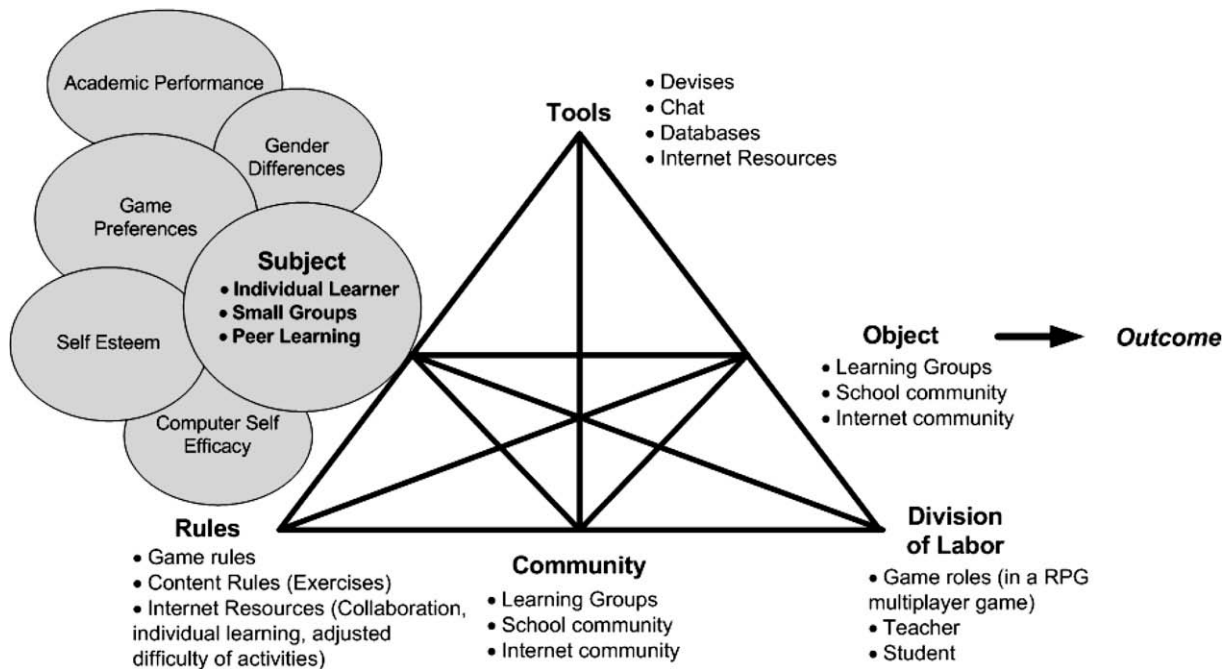**Fig. 2.** Activity system in proposed multiplayer educational games.

Fig. 3. Activity system in proposed multiplayer educational games highlighted by subject factors.

to be engaging for learners, taking into account factors such as gender differences and preferences, with a view to developing computer self-efficacy and enhancing academic performance and self-esteem.

From such a socio-cultural perspective, the most important point in understanding how games engage players in educational environments may be that good games engage players in multiple ways and the interplay between these different forms creates dynamic learning opportunities (Squire, 2001).

Moreover, it is claimed that the goal should be the exploration of relationships between variables, events, and complex patterns (Egenfeldt-Nielsen, 2006). These factors' interactions in a game is so close to the way children play, that playing an educational game should be considered as a complex learning procedure, similar to the everyday social interactions among children in the playground. Jessen's study (1995, 2001) supports this view as it accounts for the appeal of games to children by pointing to the similarities between children's existing play culture and the video game culture.

Furthermore, with particular regard to the more modern game technologies such as multiplayer gaming, these interactions are becoming more complex, since multiplayer games can be played against real people anywhere in the world or against the computer, which means

that the multiplayer games can be played at any time (Prensky, 2001), anywhere and by anyone, upgrading the complexity of human inter-actions and forming large communities in an expanded and more complex socio-cultural context.

4. Conclusions

The paper tried to examine the potential of online games as educational tools in a game-based collaborative leaning environment on an activity theory basis. Therefore, and because of the important role that Subjects play in the interaction that occurs among the items of the game, we needed to consider game impact on academic performance, self-esteem and computer self-efficacy, as well as important aspects of player engagement with a bearing on the way educational games should be developed.

The findings indicate that adolescents spend a considerable amount of time playing digital games and tend to identify with their char-acters. Educational games could exploit this inclination and the factors which determine player-character identification must be further explored. In addition, it seems that males tend to play games more than females and this difference could be attributed to the nature of commercial games that does not seem to interest female adolescents. Thus, we need to further examine what boys and girls prefer in games in order to develop educational online games incorporating aspects with the potential to engage different personality types and, more importantly, exploit multiple skills and intelligences, in true reflection of real-life collaborative environments. Considering game content, it seems that students tend to prefer action and role-playing games, such as MMOGs or MMORPGs, and this could be taken into account when developing educational games.

Educational games will have to negotiate the intriguing conundrum of being interesting enough to engage students, without being addictive and thus detrimental to academic performance. We have suggested that this could be achieved by integrating elements that limit play sessions and oblige players to actively engage in an external educational task before continuing play, ideally in collaboration with other players. Alternatively, the game itself could function as the basis of an innovative and motivating homework assignment.

The relation between digital game use and self-esteem cannot be clearly defined yet, since research so far has only yielded conflicting or ambiguous results. However, given the crucial role of self-esteem in academic performance and social adjustment, we feel that it is vital to investigate the issue further. Finally, the suggested potential of games with regard to improving computer self-efficacy is an encouraging finding and should be more fully exploited.

In conclusion, we have considered the basic principles of activity theory, which seems to be a solid theoretical ground for an appraisal of educational games, in conjunction with the main trend in multiplayer video gaming (MMOGs and MMORPGs, such as World of Warcraft and Lineage), to propose the development of online multiplayer educational games, which would create communities of learners who would learn through a social experience. This can only be achieved by taking a host of factors into account and drawing upon both the technical expertise and creativity of the computer industry and the insights yielded by education theories and research.

For further studies we stress the need for more systematic research exploring the impact of games on psychosocial issues and the cre-ation of online, multiplayer educational games based on learning and instructional design principles.

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