

Handbook of Research on Improving Learning and Motivation through Educational Games: Multidisciplinary Approaches

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Volume I

Information Science
REFERENCE

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Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: <http://www.igi-global.com/reference>

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Library of Congress Cataloging-in-Publication Data

Handbook of Research on Improving Learning and Motivation Through Educational Games : Multidisciplinary Approaches / Patrick Felicia, editor.
p. cm.

Includes bibliographical references and index.

Summary: "This book provides relevant theoretical frameworks and the latest empirical research findings on game-based learning to help readers who want to improve their understanding of the important roles and applications of educational games in terms of teaching strategies, instructional design, educational psychology and game design"--Provided by publisher.

ISBN 978-1-60960-495-0 (hardcover) -- ISBN 978-1-60960-496-7 (ebook) 1. Educational games. 2. Simulation games in education. 3. Cognitive learning. 4. Learning, Psychology of. I. Felicia, Patrick.

LB1029.G3H36 2011

371.337--dc22

2010054437

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this book is new, previously-unpublished material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

Chapter 18

Collaborative Learning in Massively Multiplayer Online Games: A Review of Social, Cognitive and Motivational Perspectives

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ABSTRACT

In this chapter a theoretical framework is proposed for the investigation of Massively Multiplayer Online Games (MMOGs) as environments for the emergence of collaborative learning. Elements and features of MMOGs such as the integrated tasks, the interactions among players, the groups, the members' characteristics, and the environment are examined through the perspective of their motivational, cognitive and social potential, based on literature review, interviews with players and participant observation. It is argued that MMOGs are environments that can integrate a wide range of motivational features, opportunities for social interactions and for the emergence of cognitive processes, into a meaningful context. Implications for the educational practice are also reviewed.

INTRODUCTION

Why should we review Massively Multiplayer Online Games (MMOGs) in a handbook oriented towards educational games, learning and motivation? MMOGs constitute a flourishing industry, attracting and sustaining the interest of millions

of players. Their “massively multiplayer” aspect entails a large number of players logging in the same environment and interacting with each other through their virtual representations, their avatars. Although they are often criticized for aggression, violence, addiction and sensitive to gender and race discrimination issues, with stereotypes describing the typical gamer as socially deviant or

DOI: 10.4018/978-1-60960-495-0.ch018

marginalized, addicted, usually young and male (Soper & Miller, 1983; Fisher, 1994; Anderson, 2004; Wallenius & Punamäki, 2008; Anderson et al., 2010), this debate is still ongoing: the stereotypes have been debunked (Williams et al., 2008) and research on the impact of video games on aggressive behavior and addiction is being challenged, either in relation to the selection of the sample, the statistical methods used, or the interpretation of results (Castronova, 2010). Linking of aggressive behavior with video games does not suggest causality; aggression does not always entail violent behavior; excessive playing does not necessarily qualify as addiction (Griffiths & Davis, 2005; Charlton & Danforth, 2007) or should be attributed exclusively to the medium rather than to individual or social factors. In response to this criticism, and although they are mainly commercial games aiming at the entertainment of the players, far from the formal objectives of the curriculum, a number of studies have discussed their learning potential, focusing on areas such as collaborative problem-solving, the acquisition of expertise, their employment in educational settings, digital media literacy, collaboration skills, informal scientific reasoning, computational literacy, and cultural mechanisms for learning (Griffiths, 2002; Steinkuehler et al., 2007; Schrader & McCreery, 2008).

McGrenere (1996) reviewed multi-player games for education, from the perspective of CSCL and CSCW. Although MMOGs were not directly addressed in this study, since they were at that time at their initial stages, the educational benefits of children's co-operation and social interactions within a gaming environment were recognized. Garris et al. (2002) examined instructional games from the perspective of their motivational features and proposed a model where the instructional content and motivational characteristics of games, such as fantasy, rules, and challenge, trigger the game cycle (user judgments, user behavior, system feedback), and after a debriefing phase (i.e. the instructional support)

may produce learning outcomes. Kiili (2005a) presented a model linking educational theory and flow theory with game design. In this model the challenges based on educational objectives form the heart of the model; design decisions on the gameplay, the storytelling, the game balance, the optimization of cognitive load and appropriate challenges sustain and support motivation, engagement and learning outcomes. de Freitas and Oliver (2006) proposed a framework for the evaluation of games and simulations in relation to curriculum objectives. This framework involved learner or learner group preferences and requirements, the context within which play and learning take place, the representation of the environment, and the relevant learning processes and frameworks. These approaches though did not address the highly social aspect of MMOGs and the role of the spontaneous social interactions of players in motivation and learning. On the other hand, in research on MMOGs involving the social interactions and in-game group dynamics, there is limited review of the learning aspects. The complexity and the dynamics of these environments require novel models and tools for the investigation of the cognitive processes emerging. Our article is situated within this context, attempting to combine aspects of learning, motivation and social interactions into one conceptual framework, and view MMOGs through this interconnection of factors.

Single Player Games, MMOGs and Virtual Worlds

Although MMOGs present many similarities to single-player, stand-alone games and virtual worlds, they also present inherent structural characteristics which may positively impact learning. Virtual Worlds such as "Second Life"©, "There" ©¹, and "Active Worlds" © are being used over the past few years as environments to support learning and training (de Freitas, 2008). Although they present many similarities to MMOGs, such as the 3D space, the graphical representations, the flex-

ibility of user navigation within the environment, the avatars as representations of the players, they also present certain structural differences with MMOGs, such as the different levels of flexibility of the environment, the integrated goal-oriented activities and the predominant role of collaboration and competition, which are considered determinant for the emergence of specific user activities and for learning, as will be discussed in the section on the emergence of opportunities for collaborative learning in MMOGs. In an MMOG the players have to accomplish specific tasks designed in the environment and they have to progress their virtual character. The game rewards them for their efforts. Many of the designed tasks require the formation of groups and the collaboration and coordination with other players.

Interaction -social or task-oriented- among players, is apparently the main difference between MMOGs and single-player games. MMOGs are persistent worlds. Even if the player logs out, there are still other players in the environment, the environment continues to function and in some MMOGs, mainly browser-based, the player may even be attacked by other players. In MMOGs there is not a single goal to be attained or a story to be uncovered, as in single-player games, but rather the player has to accomplish a number of different tasks, situated within a narrative context and a general story background. They don't follow a linear, pre-structured story, or have a single hero, but rather the player is the hero of his or her own story, intersecting with the stories of other players, and selects his or her own tasks and activities.

These features of MMOGs, features such as motivation, collaboration, player-control, interaction with others, goal-oriented tasks, progress in the environment, individualized navigation based on the level of the player and his or her choices, very often come up as features of an effective collaborative learning environment. It seems, therefore, that collaborative learning in MMOGs constitutes an area of research that may provide useful insights for education and for the develop-

ment of effective educational collaborative and networked environments.

RESEARCH FRAMEWORK

Research in the area of learning has emphasized the significance of collaboration and interaction among peers not because of any failure of individual learning but because collaborative learning triggers specific cognitive mechanisms and processes in addition to the individually performed learning cognitive processes. During individual learning activities, cognitive processes such as induction, deduction and compilation emerge. When a group has to collaborate in order to perform an activity, additional activities and cognitive mechanisms are triggered because of this requirement for team working, such as argumentation, disagreement, explanation, adjustment of mental schemata, knowledge elicitation, internalization, reduced cognitive load (Dillenbourg, 1999). Learning theories such as the Situated Learning Theory (Lave & Wenger, 1991) view learning as an activity within the framework of socio-cultural interactions and the engagement in community practices. Collaboration and interaction with others does not necessarily mean, though, that learning will occur. A major concern for collaborative learning research is therefore the investigation of the factors that positively influence the emergence of collaborative learning activities and cognitive mechanisms, in addition to the cognitive mechanisms that emerge through individual learning, and the conditions under which collaborative learning is optimally effective (Slavin, 1996).

Problem-solving is being situated at the core of learning, either through the acquisition of problem-solving skills (Jonassen, 2000) or as a method for attaining specific learning objectives, through constructivist based educational approaches such as problem-based learning and inquiry based learning. Group dynamics and group communication processes are being identified to

be among the most important factors that influence the effectiveness and efficiency of group problem solving (Hirokawa & Pace, 1983; Jonassen & Kwon, 2001). Taking a step back, we may want to ask “What, in turn, are the variables that influence group dynamics?” McGrath (1984, p. 287) proposed a conceptual framework for the study of group interactions: the structure of the group, the environment where the group interactions are taking place, the characteristics of each member, the task or the situation the members are trying to cope with are the factors affecting the group processes. These group processes, in turn, affect the characteristics of the members. Problem-based learning approaches also discuss the impact of the design of the task, the activity or the problem on the internal schemata of the students and the cognitive processes evoked (Jonassen, 2000).

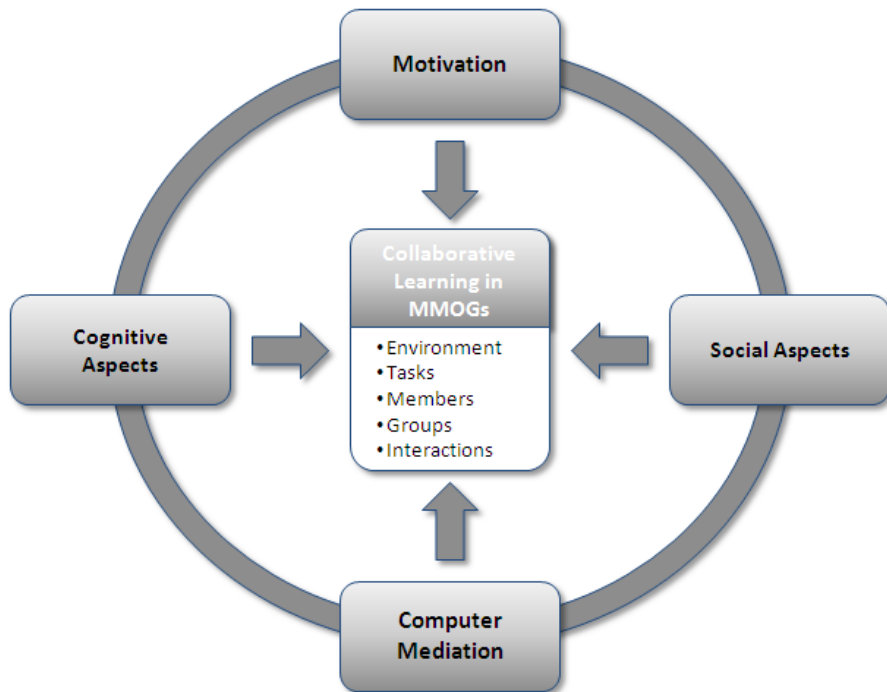
Motivation is another significant factor involved both in individual and in collaborative learning (Dillenbourg et al., 2009). Research in the area of motivation and learning provides empirical evidence that not only the cognitive component but also the motivation component and affective aspects have an impact on learning and the cognitive strategies employed by the students (Boekaerts, 2001; Järvelä and Volet, 2004). Positive emotions such as “happiness, eagerness, fun or excitement” (Volet, 2001) may increase motivation for engagement in a learning environment. Motivation may derive either from the individual interest of the learner or from the situational interest emerging from the environment and the task (Mayer, 1998). Deci and Ryan (1985) defined a number of factors in a learning environment that support intrinsic motivation, the motivation inherent in the activity, while Csikszentmihalyi (1992) also described the common features of flow activities that trigger positive emotions and engagement in the task, such as the built-in goals, the feedback, the rule-bound action system, and the challenges that correspond to the level of the individual’s skills (p. 71). Motivation may also derive from the sense of self-efficacy of a learner, in relation

to the task; the sense of self-control and of having the knowledge and skills required to solve the problem. Self-beliefs of efficacy impact on the engagement and perseverance on a task and the knowledge and skills acquisition. Success or failure in a task is a critical determinant for the development of beliefs of individual capability to succeed in subsequent tasks (Bandura, 1978; 1991). Motivation is also being situated within the environment and the social context and not only investigated at the level of individual cognitive and psychological processes. It does not only constitute a variable that influences learning but it is also influenced by the social and cultural environment (Zimmerman, 1989; Järvelä and Volet, 2004; Dillenbourg et al., 2009).

When collaboration and collaborative learning take place through the mediation of a computer and a specific computer program, additional factors are involved in the activities that promote effective interactions for learning. The setting and affordances of the environment define the types of actions and activities the participants may perform, while computer mediated communication (CMC) presents intrinsic differences from naturally occurring communication among a collaborating group, such as anonymity and absence of nonverbal and real life cues.

Having sketched an outline of the framework for the investigation of collaborative learning in MMOGs (Figure 1), we will describe the opportunities for collaborative learning in existing MMOGs, as emerging from the literature and our own research through virtual ethnography immersion and interviews with players of MMOGs (Voulgari & Komis, 2010)². In the next sections we will review the components involved in collaborative learning and collaborative problem solving in MMOGs, through the perspective of motivation, sociability and cognition. We will not focus specifically on the impact of computer mediation. This aspect will be rather described in relation to the other three constructs.

Figure 1. Framework for the investigation of collaborative learning in MMOGs



OPPORTUNITIES FOR COLLABORATIVE LEARNING IN MMOGs

One of the main reasons, for engaging in an MMOG, as opposed to a stand-alone single player game, is the interaction with other people. MMOGs are described as the new “third places”, spaces for socialization and interactions among players (Kolo & Baur, 2004; Steinkuehler, 2005). The social experience of playing has been reported by almost 40% of the players in Seay and co-authors’ study (2004) as the primary reason for playing. Even if the player is engaged in individual activities, other players constitute a context for his or her actions either as a constant “background chatter” in the general communication channels of the game or as an audience for his or her achievements and performances, as a spectacle or a “source of information and chitchat” (Ducheneaut et al., 2006a). Players who select an MMOG seem to rely on this massively multiplayer aspect.

Types of Collaborative Interactions

These social interactions and the social context, though, are not merely a semantic difference to single-player games. Interactions among players in MMOGs are an integral part of the attainment of the goals of the game, the progress of the player, and the general gaming experience. Players are directed by the environment to co-operate and collaborate with others, to interact, to communicate and to form smaller or larger and more structured groups. Players gain more experience points and progress faster when they play as part of a group. Specific content such as areas of the environment or quests and tasks are only accessible to groups of players. Furthermore, the separation of the virtual characters, or avatars (mainly in Massively Multiplayer Online Role-Playing Games) into different races, such as humans, elves, dwarves, orcs, minmatar or callente and different classes such as fighters, priests, mages, knights, mystics, brutors, or even different professions such as

blacksmiths, tailors or miners, depending on the game³, and the character inter-dependency, promote meaningful and task-oriented interactions. The different classes and races complement each other so that fighters, for example, with the skill to cause damage need the company of a mage with the ability to restore lost health points, and a mage needs the interaction with a crafter for the provision of materials and potions.

Interactions in MMOGs are “complex”, “nuanced” and “multi-modal” (Steinkuehler, 2004a). They range from misbehavior of players against other players, such as the repeated killing of a virtual character, to informal and unplanned helpful interactions among passing strangers, and from random acts of fun, such as flirting, dancing, drinking, hugging, smiling, to structured collaborations with friends and the formation of smaller and ephemeral groups, or more structured and long-term such as guilds, and battlegrounds where teams play against other teams (Nardi and Harris, 2006). This variety of interaction types adds to the motivation of the players, the fun and the emergence of rich learning opportunities.

Apprenticeship and peer-mentoring as spontaneous acts of help or as a designed function of the game also constitute a significant part of the gaming experience (Ducheneaut & Moore, 2004a; Steinkuehler, 2006; Schrader & McCreery, 2008). Novice players very often rely on more advanced players for help, in the form of advice, resources, or co-participation in a difficult task (Huang et al., 2009). They ask questions through the chat channels or the fora, they search for information in external websites, and they observe the practices of expert players. Knowledge is distributed and shared among players and is easily accessible. Many of the players we interviewed admitted that they would not have been able to progress in the game as efficiently and effectively, without the support of other players and mainly the support of the group they were members of, while as experts they were willing to provide help to members of their group as well, in return for the

help they once received. Yee (2009) attributed the emergence of acts of help to the design of the environment, to functions such as the severe penalties or the inter-dependence of the characters. In his article on social architectures in MMOGs (2008) he reports “Some players felt that the severe death penalties increased the general willingness of players to help each other, because all players understood the burden of death and, more importantly, all players knew that they too would need help one day”. Players learn and advance in the game through their interactions with other players. Achievement, progress and learning the game seem to be the result of both design decisions of the environment as well as the social practices emerging from the community of players. Learning mechanisms, therefore, cannot be viewed only as a “designed object” but also as a “social practice” (Steinkuehler, 2004a).

The Quests as Designed Tasks for Learning

MMOGs, though, do not only rely on the social practices of players for the emergence of learning mechanisms. The environment provides designed tasks and activities the players may engage in, either individually or collaboratively. These tasks constitute the problems-to-be-solved having the two critical attributes described by Jonnasen (2000): an “unknown entity in some situation” and the social, cultural, or intellectual value to the community the problem is situated in. These tasks help the players learn the game, acquire experience and advance. Although MMOG environments present a variety of goal-oriented tasks and problem opportunities, such as designed tasks, tasks imposed by social pressure, or goals the players set for themselves, the easier discernible and investigated problem unit is the quest. The quests or questing system is one of the main distinctive, embedded functions of MMOGs (Schrader & McCreery, 2008). Through the quests the play-

ers learn the mechanics of the game in an active, participatory mode.

A number of studies have focused on in-game quests, mainly for examining and defining their features and their role in the game context, viewed from the perspective of ludology or the perspective of narratology⁴. Quests are structured and structural components of the game and the game story, guiding and defining the personal growth and the spatial expansion of the player-avatar (Juil, 2002; Jenkins, 2004; Aarseth, 2004; Ashmore & Nitsche, 2007). They fulfill the definition of well-defined and well-structured problems as those “for which there are absolutely correct and knowable solutions” (Kitchener, 1983), with an initial state, a goal, the challenges, the tasks, the rules, and the success or failure conditions.

Although quests are distinguished based on variables such as their linearity, the duration, or whether they are single or multiplayer (Tosca, 2003), or based on what the player is required to do, such as bounty quests, collection quests, escort quests, goodwill quests (Dickey, 2007), they mainly involve the search for an item or an NPC (Non-Player Character), the collection of items, or killing a large number of computer generated monsters, processes which are particularly time-consuming and repetitive and are often criticized by players and referred to as “grinding” (Ducheneaut et al., 2006b; Huffaker et al., 2009). One of our interviewees (male, 26 years old) insightfully suggested that when the tasks require a predefined strategy there is no motivation for the players to discuss, negotiate, plan and make decisions. They just go ahead and do the task.

The Social Environment as a Dynamic Context for Learning

MMOGs, thought, do not lack opportunities for critical thinking, planning of strategies, negotiation and discussion. These opportunities mainly

involve the dynamic content of the environment and the interaction with other people: co-operative, where a consensus and a collective decision has to be made among the members of a group, or competitive where the players have to fight against other players. Although, concerning the Player versus Player (PvP) aspect of the game, the level, the class, the gear and the items of the avatar indicate the odds for winning (Steinkuehler, 2006) there are a number of additional variables defining the final outcome. Some of our interviewees admitted that when they have to duel with another player, the outcome cannot always be guaranteed, since the reaction of the other player or group of players is not always predictable. Different strategies and group dynamics may bring the battle to an unexpected outcome. In the web-based strategy MMOG “Tribal Wars” ©, we had the opportunity to observe players resisting multiple attacks by stronger enemies, due to their skills and experience, the tactics and strategies they employed. The formal group of players, discussed later, very often has to make decisions concerning, for example, a group task, the election of a new leader, acceptance or ban of a member, the negotiation of pact or war terms with other groups of players or the planning of a strategy for a raid or a battle against another group. Such situations present rich opportunities for negotiation, explanation, argumentation, agreement, disagreement, revision of ideas, adaptation, accommodation of different viewpoints, processes which are valuable for the development of collaborative problem solving cognitive skills (Cho & Jonassen, 2002).

Do players actually learn something, though, in an MMOG? If we want to examine MMOGs as learning environments we have to investigate the knowledge and skills that the players exhibit in the game and whether this knowledge may be transferable to other domains. In the next section we will review the types of knowledge and skills emerging.

Cognitive Perspective: The Expert Player

What is the definition of “expertise” in an MMOG? Who is the expert player? Overview of research in the area of problem-solving in games indicates that the key for the acquisition of expert knowledge and the development of high level problem-solving skills is the meaningful encoding of game-related information in memory and the integration of new knowledge into coherent schemata (Frensch and Sternberg, 1991). Chess players could search through internal representations of current and anticipated game situations and be able to select the most appropriate move in the game. The skills, the domain specific knowledge and the metaskills, the knowledge and strategies for the selection, the organization and coordination of the appropriate for each task skills, seem to be the main features of an expert problem solver (Mayer, 1998).

Huffaker and co-authors (2009) identified two dimensions of expertise in MMOGs: achievement and performance, with achievement referring to the level of the player and performance referring to how efficient the player is. Wang and co-authors (2009) also linked expertise to the measurable, through logs and achievement records, performance of the player. Knowledge of the game mechanics and high achievement scores do not seem, though, to address the highly social aspect of MMOGs. Players may only function within the players’ community and they may only reach higher levels with the co-operation of other players. Social skills such as communication and collaboration skills seem, therefore, to be linked to the progress in the game and the acquisition of expertise. Furthermore, achievement may not always be a reliable indicator of player expertise for two main reasons: (a) cheating behaviors often observed in MMOGs. Players may exchange game accounts with friends, they may buy high level characters, or hire companies to level up their characters (Yee, 2006a; Dibbell, 2007) and (b) a player with a very good knowledge of the

game may spent more time on supporting other players or leveling up the group, than in leveling up his or her own character, behavior which was also reported by players we interviewed.

Skills and Knowledge of the Expert MMOG Player

During our interviews a wide range of answers came up in the question “What do you think are the features of a good player?”, answers such as “the one with the most extensive knowledge of the game”, “the one who has explored the content”, “the one who acts efficiently with respect to his or her gear”, “the one with a good real-life personality”, “the one with the best behavior towards other players”, “the one who reaches his or her objective more efficiently”, “the one that plays for the game and not for winning”. It was interesting to observe that age was related to the orientation of these answers. Younger players tended to consider achievement as the predominant feature of a good player, while older players (above 30) highlighted maturity and social skills as more essential. Features of the good player seem to combine knowledge and efficiency in the game mechanics, internalized strategies involved in the game-play, inter-personal skills such as collaboration, leadership, coordination, co-operation, effective communication, competition, persuasion, diplomacy or strategy planning skills, and real-life personality traits. Gee also linked the skills of the virtual character with the skills and knowledge of the real player in an effective unit (Gee, 2007, p. 77).

The trends which emerged in our interviews were also supported by research in the area. A number of studies have examined the strategies of expert players, the skills they exhibit, their motivations and social practices in the game. A good player is not only the player who “mindlessly” gains experience points but also the player who has developed a holistic perception of his or her actions as well as a sense of the actions of others

in the environment (Reeves et al., 2009) and also the player who has acquired a “social capital”, who has communication skills and has been accepted by the community of players (Ducheneaut & Moore, 2004b). There seems to be a positive relation between socialization and expertise, either as a motivation for engagement in the game or through the formation of groups for coping with difficult tasks (Wang et al., 2009). The consideration of both game-related knowledge and achievement as well as social and interpersonal skills in the investigation of expertise in MMOGs would, therefore, provide a more holistic approach of MMOGs as environments for collaborative and not only individual learning.

The Acquisition of Expertise

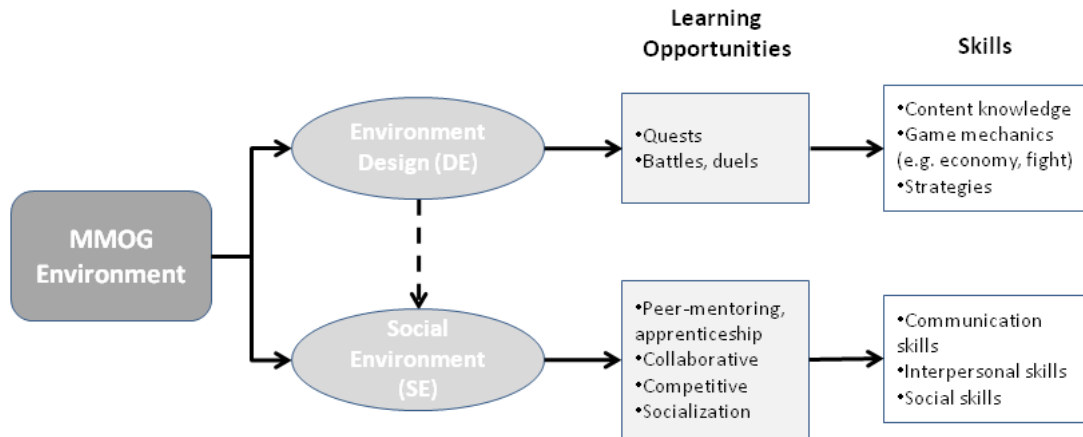
From this perspective, what are the skills emerging from an MMOG and how does a player practice these skills and acquire expertise? The easy and short answer is: by playing, by spending hours in front of the computer screen, which is not far from the truth. Players learn the game by spending time on it, through repeated and effortful practice, by trying out small variations of the “same” response to the enemy, by completing the game tasks, by seeing each game relative to previous games, by approaching other players, talking to them and establishing relations, by selecting the appropriate group or group members, by telling jokes, coordinating combat actions, being sensitive to the needs of other players, distributing loot to team members (Ducheneaut & Moore, 2005; Wang et al., 2009; Reeves et al., 2009). They learn the game by playing, by referring to external resources such as websites, and by conversing with others (Nardi et al., 2007). The player is actively engaged in the exploration of the environment and the construction of knowledge, in accordance to principles of exploratory and constructivist based learning approaches (Ma et al., 2006; Gratch & Kelly, 2009).

Through these practices players seem to develop both domain-specific knowledge as well as interpersonal and social skills (schematized in Figure 2): how to effectively play their role in the group, how to coordinate a group combat, how to be a good teammate, they practice leadership skills such as reinforcement of good behavior and addressing coordination problems, they learn how to respect and empathize with the needs of other players, they learn that they have to attract the interest of other players, how and when to use humor, how to approach strangers and form relationships, how to ask and answer questions (Ducheneaut & Moore, 2005), they learn the facts, the strategies and the ethos of the game (Nardi et al., 2007). Despite the strong indications, though, empirical evidence relating engagement in the game with the acquisition or not of these skills and their transfer to other contexts and to real life is still limited. Players do develop context specific knowledge, they learn the content of the game and they have to interact successfully with other players, but do they learn these interpersonal skills in the game? And if so, can these be transferred to other domains and to real life? This could probably be an interesting research direction, with valuable implications for the employment of MMOGs in the educational practice.

MOTIVATIONAL AND AFFECTIVE PERSPECTIVE: THE FUN OF THE GAME

The exponential growth of player population, the time the players spend in the game, and the emergence of an online games culture has led a considerable part of research on MMOGs to focus on their motivational elements. The motivation of the players, the “fun” of the game, is one of the strongest aspects of MMOGs. The immersion of the players in the game environment, their passion and enthusiasm identifies with what is described as “flow experience” (Csikszentmihalyi, 1992;

Figure 2. Summary of the opportunities for learning and relevant skills emerging in an MMOG



Stapleton, 2003; Kiili, 2005b) at which state the users concentrate and are deeply involved in the activity. During our interviews, a number of interesting responses came up to questions relevant to the motivations for play. These responses referred mainly to the social aspect of the game, the sense of freedom of choices, mode and pace of playing, the graphic representation of the environment, the game rewards, the personalization of the virtual characters, and the narrative and story background of the game. These responses were consistent with research in the area of motivation in MMOGs.

Bartle (1996) set the foundation for research on player motivation in MMOGs by proposing a typology of players: (a) achievers, players interested mainly in attaining goals and accumulating valuable in-game items, (b) explorers, players interested in exploring and experimenting with the environment, (c) socialisers, players mainly interested in role-playing and communicating with others, and (d) killers, players more inclined in acquiring weapons and cause distress to other players. Later research verified Bartle’s typology or enhanced it; escapism, immersion to the environment, the genre of the game, relationships, manipulation of the game, rewards, choice, control, collaboration, challenge, and interactions with real people, seem to be strong motivators for playing, with achievement and the social aspect

being the most prominent among them (Yee, 2005, 2006b, 2006c; Dickey, 2007; Williams et al., 2009). Different motivators relate to players of different age, gender, usage patterns and in-game behaviors indicating that MMOGs may address a wide spectrum of player types and individual preferences. Further on, we elaborate on these motivational components as a result of environment design elements:

- **Fantasy and Background Story:** Rieber (1996) distinguished fantasy in games into endogenous or exogenous. Endogenous fantasy is inseparably linked to the learning content of the game and not merely the “sugar coating”. The endogenous fantasy and the narrative environment seem to support intrinsic motivation of players (Dickey, 2007). They provide a context for the tasks, the virtual characters, and the representation of the game environment. They also address players’ individual preferences. Interestingly, some of our interviewees related aspects of their real life ideology to specific game and virtual character background story aspects.
- **Graphic Representation:** The representation of the virtual environment, the 3D graphics, the audio, the music and the ani-

mation add to the immersion of the players. The external representation of a problem or a task seems, furthermore, of particular importance for the problem solving procedure. It determines the perceived information and structures and the processes to be activated, and affects the cognitive processes during problem-solving (Jonassen, 2004).

- **Virtual Character Design:** In MMORPGs players may select and customize the appearance and skills of their virtual character; they relate to it, they exhibit it for attracting the admiration of other players and it partially defines their role within a team (real life personality traits and expertise are also considered for the assumption of a role in the team). The representation of an avatar also seems to have an impact on the behavior of the players. Yee and Bailenson (2007) positively linked the attractiveness of an avatar to the intimacy with strangers, and height to the confidence of the player. The design of the virtual character also adds to the intrinsic motivation of the environment.
- **Design of Quests:** Well designed quests as designed tasks and as components of the game narrative, may contribute to the “emotional engagement” of the players as they can be “the *glue* where world, rules and themes come together in a meaningful way” (Tosca, 2003); they provide challenge, context and purpose for the tasks, and reward. The difficulty of the tasks corresponds to the level of the player, adding to the players’ sense of control and manipulation. Quests may be either individual or collaborative. As described earlier, the format of quests seems to be standardized and some of the players we interviewed admitted that they only take up quests if the reward is worth the time spent on them.
- **Rewards:** In-game tasks and actions provide immediate reward to the player: with every computer generated monster killed, with every task completed, the player gains in-game currency, experience and skill points that help him or her progress in the game; the more difficult the quest or the task, the more rare and valuable the items gained. The player is rewarded even after a few minutes of play, even after a few minutes after logging in the game for the first time, and continuous to be rewarded throughout the game. These rewards increase play time, engage the players, and render games into “virtual Skinner boxes drawing the players deep into the game” (Ducheneaut et al., 2006a).
- **Flexibility and Adaptability of the Environment:** Except of the pre-designed tasks and quests of the game, the players may also select their own goals depending on their playing style, their individual preferences and their level (Juul, 2007). They may decide that they want to gain more in-game currency, through trade, or explore the environment, or they may decide which quests to accept and how much time to spend on them. Progress through the tasks and quests of the game is incremental. This flexibility and adaptability provides them with a sense of control and of freedom.
- **Social Relationships:** Design decisions such as the communication channels available and their features, the interdependence of characters and the necessity to group, the dependence on other players, the severe penalties and the crisis scenarios, increase the opportunities for meaningful relationship formation, altruism and trust. Through meaningful interactions with other real people, players derive memorable and salient emotional experiences (Yee, 2006c). These relationships often extend to real life as well. Both in our interviews and

in game-related fora a large number of testimonies of real life relationships, friendships or even marriages originating from the game, were reported.

Although motivation may have a positive impact on learning, the content of knowledge in MMOGs is mainly focused on the acquisition of game-specific information relevant to the goals of the game. Hoffman and Nadelson (2009) suggested that for the transfer of games into a pedagogical context, a direct relationship should be established between the game and the learning context. For the employment of an MMOG in an educational setting, the aforementioned motivating features should be coupled with the appropriate educational and academic content.

SOCIAL PERSPECTIVE: FORMATION AND PROCESSES OF IN-GAME GROUPS

So far, we have reviewed the social aspect of the game as a strong motivator for play and as a context within which social skills can be practiced and collaborative learning may occur. The social aspect of gaming involves two main components: the features and affordances of the environment and the social interactions that emerge in the player community. The design of the environment may support or prevent co-operation and communication among players. Peaceful in-game areas, for example, dedicated to sociability and exchanges among players, may favor playful and casual interactions (Koster, 2009). Furthermore, the rules and social practices of the game are also shaped by the community of the players. Myers describes a case where the rules set by the community of the players, were sometimes considered more important than the objectives of the game, and players deviating from these rules were marginalized and even rejected (Myers, 2008).

For the investigation of collaborative learning, collaborative problem solving and group dynamics in particular, we need to define a group within which we could be able to study the variables involved, such as the characteristics of the members and the interaction processes described in the theoretical framework. The most prominent group type may have different names in different MMOGs -the guilds in the “World of Warcraft” ©, the clans in “Lineage II” ©, the tribes in “Tribal Wars” ©, the Corporations in “EVE Online” ©- but it presents certain indentifying features, distinguishing it from the casual, goal-oriented groups: it constitutes a structured and formal group, defined by the game mechanics, it is of a more permanent and long term nature and it presents specific rules, formal practices, orientation and hierarchies. Most of our interviewees identified this type of group as the most important. Research on group dynamics in MMOGs has mainly focused on this type of groups, which we will call for purposes of conciseness “formal groups”.

Group Processes and Practices

Most MMOGs provide mechanisms for the formation of either ephemeral, casual groups or for structured, formal groups. Casual groups are task and combat-oriented and they disband after the completion of the task. Although there is usually a limit in the number of players that may join a casual group, it is up to the players to decide on its optimal structure and size, in order to effectively attain their goal. The goal, the orientation and the size of the formal groups also depend on the decisions of participating members. Williams and co-authors (2006) proposed a typology of guilds in the “World of Warcraft”, based on their goals and orientation: (a) social guilds, (b) PVP guilds, (c) raiding guilds, and (d) role-play guilds. They also linked the size of the guilds to their goals: smaller guilds were more social-oriented, while large and huge guilds were mainly goal, achievement and performance-oriented.

Successful and effective formal groups in MMOGs present specific characteristics such as the balanced representation of different classes with different skills, complimenting each other, the number of members, so as for the group to be sufficiently active, a wide character level spread, effective organizational processes, interdependence of members, group cohesion, the sense that the group may help the members achieve their goals, fair distribution of game rewards, matching of self identity and personal objectives with group identity and goals, effective leadership, time spent on collaborative tasks, and strong social relations and bonds among members (Ducheneaut et al., 2007; Pisan, 2007; Malone, 2009; Ho & Huang, 2009). Chen (2008) described the collaborative practices of his guild in the “World of Warcraft” © in relation to task-oriented activities: planning strategies for the task, performing the task together, coordinating, learning through trial-and-error, reflecting on any failures, re-assessing their approach and performance, communicating, and developing trust among group members. When socially constructed goals, such as friendship and having fun, were valued more than game mechanics goals or individual achievement goals, such as completing the task and gaining reward items, then survival of the group after a failure was more probable. Failure to address these characteristics usually entails the withdrawal of members or the failure of the group.

Interactions may be distinguished in (a) actions and (b) discussions or (a) nonverbal and (b) verbal (Manninen, 2001). Players communicate through their gestures, the virtual body language, their actions but also through text-based or audio-based communication via the different communication channels integrated in the environment: chat windows for private messages, messages to a specific group, messages to the general population within a specific area or within the whole game world (e.g. the server), fora integrated or external to the environment or voice communication through tools integrated in the environment or third-party

applications (e.g. Skype©, TeamSpeak©, Ventrilo©). MMOGs provide communication channels exclusively for the members of a group, through voice or text. Rich media for CMC were found to have a strong impact on the affective state, on community and friendships (Rauterberg, 2006; Williams et al., 2007). Communication through voice (VoIP) and text have positive effects on joint task coordination, on problem solving and on dealing collectively with dynamic situations, while the integration of tools to support the complex social and managerial tasks involved in group management are necessary for the development of positive and trusting groups (Steinkuehler, 2004b; Halloran, 2009).

An extended part of the communication among players also takes place beyond the game, through external websites, official or player-developed. Through these sites players post their questions, their answers, their perceptions of the game, tips and advice, their experiences, they argue, they coordinate their actions in the game, they publicize their achievements and they recruit new members. A large part of the game content spills over outside the game environment, it is user-created, and it was considered by players we interviewed as an essential resource for success in the game.

Summarizing this short review of research in the area of MMOGs formal groups, in relation to the scaffolding of collaborative processes and learning, factors such as the communication channels available, the size of the group, the goals of the group, the characteristics of the members, appropriate tasks for each group, the distribution of rewards, and the social goals and bonds among group members positively affect both task-oriented performance and collaborative problem solving, as well as the affective and motivational state of the group members. As argued by most of the researchers examining group dynamics in MMOGs, design decisions have a direct impact on the formation, the survival and the success of in-game groups and consequently the learning occurring within these groups. Furthermore, the flexibility of the

environment gives the opportunity to the groups of players to select their own goals, set their own rules and define their in-group interactions.

In Table 1, we summarize features of the designed (DE) and the social environment (SE) in relation to specific guidelines emerging from research in the area of collaborative learning and collaborative problem solving, relevant to research in group interactions in MMOGs.

MMOGs IN THE EDUCATIONAL PRACTICE

Although single-player games are being used for learning and in school settings, MMOG employment is rather limited, and mainly within the framework of research. Further on we will present some indicative examples of MMOG employment in the educational practice (for more comprehensive reviews of game application in

Table 1. Summary of MMOG features relevant to the support of collaborative learning interactions, as emerging from the Designed (DE) and the Social (SE) environment

	MMOG Environment Features	Requirements for Collaborative Learning
DE	Environment affordances for the formation of different types of groups (casual, formal)	Mechanisms for the formation of the groups according to the given problem, support collaborative problem solving and learning (Hoppe & Ploetzner, 1999).
SE	Players decide on the structure and the synthesis of group	
DE	Environment affordances of different group sizes	The size of the group is relevant to the nature of the task and the background of the members of the group (Dillenbourg, 1999; 2000).
SE	Players decide on the size of their groups	
DE	Skills are distributed among virtual characters For attaining a goal, co-operation of different characters or multiple players is required.	Shared goals and distributed knowledge, which increases interdependence among students, seem to positively influence collaboration (Hoppe & Ploetzner, 1999).
SE	Knowledge and experience is distributed among players Attainment of group goals also helps members progress and acquire rewards	
DE	Different virtual characters and different character levels have access to different in-game areas and resources (equipment, materials, etc)	Heterogeneity of resources available to the students positively affects the quality and quantity of interactions (Fidas, 2005).
SE	Players are of different cultural and cognitive backgrounds, of different age, experiences, skills, and personalities	
DE	A variety of different and complimentary character types, with different skills, abilities, and role in the group Affordances of the environment define hierarchy in groups (e.g. group leader)	Different and complimentary roles assumed by the collaborating parties constitute an important cognitive dimension for the collaborative problem solving activities and for learning (Hoppe & Ploetzner, 1999).
SE	Real life personality and skills of the players are also considered for assignment of a role in group	
DE	MMOGs may support both co-operation and competition for addressing the preferences of different players	Productive interactions and co-operation rather than competition should be promoted (Dillenbourg, 1999).
SE	Players may select a competitive or a collaborative style of playing	
DE	Verbal communication is mainly channeled through text or audio (e.g. chat, forum, VoIP) Nonverbal communication in MMORPGs through avatar animations and actions Mainly support of <i>comcon</i> communication network (all members communicate with all other members), but also possibility for one-to-one communication	Communication structures supporting high level questions and explanations constitute factors with a positive impact on collaborative problem solving and learning (Webb, 1989; Hoppe & Ploetzner 1999).
SE	Players select the communication channels to use They resort to external, third party software for enhancing their communication (e.g. VoIP)	

education and learning, see also de Freitas, 2009, and Ke, 2009). In the following examples MMOGs designed specifically for education were used, with the exception of one commercial game. “Quest Atlantis” ©, an educational MMOG developed by the Indiana University School of Education, is one of the most commonly used educational MMOGs. It was specifically designed for educational purposes and presents the students with the challenge to save Atlantis from imminent ecological distraction. “River City Project” ©, a Multi-User Virtual Environment, was developed by Harvard University and aims at promoting information and communication, scientific inquiry, thinking, problem-solving, interpersonal and self-directional skills. “eScape” © was developed with the collaboration of the University of Oulu and the University of Jyväskylä. The learning activities applied in the cases summarized below were mainly based on exploratory, inquisitory, and problem-based learning strategies. Students were given a problem and they were required to explore within and beyond the game environment (e.g. in web sites) in order to collect the appropriate data and information, and plan the most appropriate approach for solving the problem, in co-operation with their peers⁵:

Cases of Educational MMOGs Application

- Ketelhut and co-authors (2006) implemented “River City Project” in approximately 2000 middle school students. Their findings indicated that students learned the content, they were highly motivated and engaged, and inquiry learning was facilitated.
- Research on the use of “eScape” on university students showed that the game allowed the students to engage in constructive collaborative activity, and multiplayer games could be used to promote group cohesion and development, when employed

in a pedagogically meaningful manner (Bluemink and Järvelä, 2010).

- Kim et al. (2009) investigated social problem solving in controlled settings using the commercial MMORPG “Gersang” ©. They concluded that meta-cognitive strategies that require interaction with peers, such as “think-aloud” and “modeling” had a stronger positive impact on problem solving ability and learning.
- “Quest Atlantis” was used in a fourth grade gifted class for supporting socio-scientific inquiry in the curriculum (Barab et al., 2007). The study suggested that multi-user virtual worlds can support academic content learning. The role of external resources and teacher facilitation was also highlighted.
- “Quest Atlantis” was also used in after school sessions for 11 months on academically at-risk students. The environment attracted, motivated and engaged students but constant negotiation was required among the student-centered approach, the goals and activities the students selected, the curriculum objectives, and the role of the teacher (Tay & Lim, 2010).

Despite the potential of MMOGs as environments for collaborative learning, their implementation in educational settings still requires extensive design and planning. Commercially available MMOGs lack the educational content appropriate for formal education objectives. Although MMOGs do not seem to be appropriate for the school setting, due to time and curriculum constraints, their design, integrating motivational, cognitive and social features, conveyed through and exploiting the advantages of the computer mediated environment, may provide useful insights for the design of collaborative learning environments, as well as of the practices that promote student engagement in learning activities. Players in MMOGs, supported by the game environment, willingly and spontane-

ously form groups, collaborate, interact and learn the game, in order to achieve both game goals as well as their own objectives. Similar engagement and effective involvement in the activities and content are the ultimate goal of any educational collaborative learning environment.

During our interviews, we conducted a focus group of 6 16-year old students (3 boys and 3 girls) in the presence of their teacher. What started as a 1 hour long focus group ended up a 2.5 hour passionate talk, from the part of the students, on their achievements in the game, their progress, their interactions with other players, and their knowledge of the game content. After the end of the focus group, the teacher confessed that she hadn't imagined that MMOGs would be so much more than mere mindless and superficial interaction with the computer, and she admitted that she felt as if she had found a code of communication with her students. She observed that one of the most talkative and passionate students in the focus group, was actually a student who barely talked and participated in class activities and tasks. It is possible that the sense of freedom and of control on their own pace provide to the students the opportunity to assume responsibility of their own progress, within the context of their own objectives as well as the recognition of the player community. The players balance between their own freedom of choice and the constraints and rules of the social and the designed environment.

Although, so far we have discussed the ways learning theories and learning context could apply to MMOGs, the reverse, the employment of MMOG design features and practices in educational approaches, could possibly produce positive, for the students, effects. For games, learning occurs even beyond the environment, in online or real life communities, where players talk about the game, they share their achievements, and discuss their problems and solutions with peers and experts. Williamson and Facer (2004) examined these practices, and proposed that such a model of learning could inspire educational practices.

Applying the Framework

In Table 2 we summarize the features of MMOG as examined in this chapter, through the perspective of our framework. This schematization though is indicative and could possibly be expanded including more features and elements, as there is a strong interdependence among the constructs of the framework: motivation, cognitive aspects and social aspects interact with each other, while features and elements of the tasks, the members, the group structure and processes seem to overlap; the fantasy background is relevant not only to the environment but also to the tasks and the avatars, and group cohesion is not only motivating for players but also impact team learning behaviors and the construction of shared meaning (Van Den Bossche et al, 2006). Furthermore, factors relevant to the quality of interactions have to also be considered. Collaborative learning depends on the quality and content of communication among players (Barron, 2003). Groups are more effective, and collaborative and individual learning are favored when the members listen to each other and build on each other's suggestions and ideas. The table below though, as applied in the examination of positive features of MMOGs, could be of use to educators for the identification and exploitation of these features and possibly their transfer to other contexts, such as classroom practices or the design of similar networked educational environments.

Summary of Key Points for the Educational Design and Implementation

Summarizing some general directions for the educational design and implementation of multiplayer game environments, as emerging from this chapter, we are highlighting the interconnection of motivational, cognitive and social factors and their functional integration into a meaningful context within and beyond the game environment:

Table 2. Mapping elements and features of MMOGs on framework constructs

	Motivational Aspects	Cognitive Aspects	Social Aspects
Environment	<ul style="list-style-type: none"> • Fantasy, background story • Graphic representation • Freedom of choices and playing style 	<ul style="list-style-type: none"> • Content 	<ul style="list-style-type: none"> • Social architectures for the promotion of interactions among players
Tasks	<ul style="list-style-type: none"> • Goal-oriented • Challenge • Reward, feedback • Purpose • Matching to individual preferences and skills • Sense of control 	<ul style="list-style-type: none"> • Require planning and strategy • Well structured and ill-structured problems 	<ul style="list-style-type: none"> • Require collaboration
Members	<ul style="list-style-type: none"> • Avatar selection and personalization 	<ul style="list-style-type: none"> • Distribution of knowledge 	<ul style="list-style-type: none"> • Interdependence of players
Groups	<ul style="list-style-type: none"> • Group cohesion • Help to members • Group identity matching individual identity • Fair rewards distribution • Wide range of classes and levels of members 	<ul style="list-style-type: none"> • Socially constructed goals • Groups appropriate for tasks (size, structure) 	<ul style="list-style-type: none"> • Rich communication channels • Group management tools • Social bonds among members
Interactions	<ul style="list-style-type: none"> • Sharing of achievements with other players • Support for social interactions • Communities in and beyond the game for support and discussion 	<ul style="list-style-type: none"> • Support of collaborative problem solving practices and discourse 	<ul style="list-style-type: none"> • Multiple channels for verbal and nonverbal communication

- The availability of opportunities for a variety of interaction types, ranging from social interactions to goal-oriented and from co-operative to competitive, provides the players with the possibility to engage in their preferred activities as well as to practice different social skills.
- Multiple communication channels, through voice, audio, text, or gestures, supporting these different types of interactions, facilitate and promote socialization, co-operation, discourse and discussions among players.
- Functions such as the interdependency of the players, the distribution of knowledge and skills within the community, the difficulty of the tasks, and the link of the success of the individual with the success of the team, promote and support group formation and co-operation among the participants. Co-operation emerges as an integral part of the attainment of the objectives.
- The availability of a wide range and variety of tasks and activities provides a motivation for engagement to different player or group types and requirements and players of different cognitive styles.
- Furthermore, for the promotion of discussion, planning, negotiation, argumentation, and decision making in groups, tasks (e.g. quests) should allow for a variety of approaches and strategies. One single dominant effective strategy for the solution of a problem would direct the players to blindly adopt this strategy.
- The design of the environment should provide some degree of control and freedom to the players and to the player community, through features such as the customization of the virtual characters, the emergence of socially constructed goals, the freedom to select or not specific tasks and activities, and the possibility to adopt different

playing (or learning) styles and player behaviors.

- The meaningful integration of the motivational elements of the designed environment, such as the representation of the environment, the audio, the music, the virtual characters, the fantasy background, the rules, the challenges, the goals and the feedback, into the appropriate educational content and context, could facilitate the implementation of MMOGs into formal education. The balance, though, between the curriculum objectives, which have to be attained within a specific time-frame, and the freedom of action of the players-learners has to be carefully considered, even at the level of the design of the environment.
- For an educational MMOG, the role of the educator has to also be considered at the design level, possibly through the development of virtual characters specifically for the teachers, with specific abilities, responsibilities and role within the environment. From within the environment, it could be easier for the teacher to interact with the players-learners, rather than as an outside observer, and provide the appropriate instructional support and assessment of players' actions, knowledge, achievements and behavior.

CONCLUSION AND FURTHER RESEARCH

In this chapter we reviewed factors involved in collaborative learning processes such as the types of interactions, the learning processes and outcomes, the group dynamics, the size and structure of the group, the characteristics of the members, the tasks, the environment, the group communication processes, motivation, and emotion. We presented a framework for the investigation of the learning potential of MMOGs and applied it in the examination of existing MMOGs through literature review

and data collected from interviews and participant observation in different MMOGs.

Research in MMOGs has highlighted the importance of appropriate mechanisms for the support of different forms of interactions and effective communication among players, the significance of co-operation through mechanisms such as the interdependence of players and the shared knowledge, and the impact of motivation, task-oriented activities and social bonds among players. The large disparity of players requires the implementation of a wide range of motivational components, with achievement and socialization being the most prominent. Players of different gender, age and behavior are motivated by different aspects of the environment. In this chapter it is argued that MMOGs are environments that have the potential to meaningfully integrate such a diversity of motivators, as well as opportunities for cognitive and social processes, into a functional context, where learning of the content and practice of social and interpersonal skills are supported.

Even younger children and adolescents become experts in MMOGs, they commit to the game, they learn its mechanisms and processes, and they interact, very often in equal terms, in relation to their knowledge of the game, with adults. Research though and empirical data on the skills acquired and developed through MMOG playing is still limited. Are the social and interpersonal skills practiced in the environment existing characteristics of the player's personality? Can they be developed in the game and transferred to other contexts, and under which conditions? This could be an interesting direction of research with valuable implications for the educational practice.

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KEY TERMS AND DEFINITIONS

Computer Supported Collaborative Learning (CSCL): Scaffolding of collaborative and distance learning through the mediation of a computer system, usually via the internet, through appropriate computer software or e-learning platforms.

Computer Supported Collaborative Work (CSCW): Support of collaborative work via the use of relevant computer systems.

Flow Theory: A theory, in psychology, proposed by Mihály Csikszentmihályi. Flow describes a mental state where the individual is focused, motivated and fully immersed in an activity or a task.

Intrinsic Motivation: Individual motivation that derives from the activity or the task rather than from external rewards.

Massively Multiplayer Online Games (MMOGs): Sometimes referred also as MMOs, they are video games, played over the internet and capable of supporting hundreds of thousands of players simultaneously.

Massively Multiplayer Online Role Playing Games (MMORPG): A genre of Massively Multiplayer Online Games where the players assume

virtual characters (avatars) and interact with other virtual characters, often within a fantasy context.

Persistent Worlds: Virtual worlds, such as MMOGs, which exist and evolve even after the player has logged out.

Virtual Worlds: Computer simulated 3D environments, accessed through the internet, supporting interactions among users, through their virtual characters, as well as between user and environment.

ENDNOTES

¹ “There.com” has closed down since March 2010: <http://www.there.com/info/announcement>

² As part of our research, we conducted 15 semi-structured interviews of MMOGs players and 1 focus group, participated in immersive virtual ethnography in the games “Lineage II” and “Tribal Wars”, and looked into MMOG-related fora and websites. It is not within the scope of the paper to extrapolate findings from this part of our research, due to the size and the selection of our sample. All volunteers to participate were interviewed.

³ These examples are taken from three different games, namely “Lineage II”, “World of Warcraft” and “EVE Online”.

⁴ There is a debate between narratology and ludology in game studies. Narratology views games as novel forms of narrative, while ludology supports that games should be viewed as systems in their own terms.

⁵ For examples of educator resources and learning activities in “Quest Atlantis” and “River City Project” see also <http://atlantis.crlt.indiana.edu/site/view/Educators>, and http://muve.gse.harvard.edu/rivercityproject/curriculum_teachers.htm respectively.