

Antecedents of Collaborative Learning

Insights from Massively Multiplayer Online Games

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Abstract—This study focuses on the investigation of features of Massively Multiplayer Online Games (MMOGs) relevant to the support of collaborative learning processes. Through qualitative research (interviews with players, participant observation in MMOGs, research in websites and fora) we identify and describe motivational, cognitive and social features of the tasks and the player interactions emerging within such environments.

Online games; collaborative learning; MMOGs; interactions; virtual teams

I. INTRODUCTION

Except of a growing and profitable industry, Massively Multiplayer Online Games (MMOGs) constitute a new research field in the area of social sciences, economy [1], psychology, and education. Complex sets of social and communicative interactions emerge from the tens of thousands of concurrent users, and the millions of active subscribers [2]. Within the environment of the game, the players talk with each other, they form groups, they cooperate for accomplishing tasks, they fight, they argue, they give and ask for advice, they flirt, they cheat, they set their own rules.

MMOGs have been mainly investigated from the perspective of the social interactions emerging [3, 4, 5], their possible impact on aggressive behaviour [6, 7], possible addictive effects [8, 9, 10], and their motivational aspect [11, 12]. Even though their potential to constitute environments for collaborative learning has been recognised [13, 14, 15, 16, 17, 18] research and relevant empirical data are still limited. The complexity of these environments and the interconnection of different factors require novel research frameworks and tools [18]. Our study is situated within this context, aiming at identifying trends and issues relevant to the emergence of collaborative learning processes within MMOGs.

Our main research questions are:

- What are the conditions that promote collaborative learning interactions in MMOGs?
- What is the impact of the design of the environment and of the community of the players on these conditions?

In this study, we followed an exploratory and qualitative approach. We conducted semi-structured, in-depth interviews, virtual participant observation in two MMOGs, and research in related websites, blogs, and fora. In this article we describe features of the tasks and the interactions of the players, as emerging from the design of the environment and the social environment – the community of the players. Empirical data from MMOGs relevant to the factors involved in collaborative learning, such as the interactions of players and the features of the collaborative tasks, may provide valuable insights for the development of innovative, motivating, engaging and effective collaborative learning tools, environments, and virtual learning communities.

II. THEORETICAL BACKGROUND

A. Learning in MMOGs

Expertise in MMOGs has been linked not only to the achievement (i.e. the level of the player), and the performance (i.e. how efficient the player is) [19, 20], but also to the social and interpersonal skills of the player. The expert player has not only acquired game-specific knowledge, but s/he has also been accepted by the player community, exhibits social, communication and interpersonal skills, has acquired a social capital, knows how to be part of a team [21, 22, 23]. The knowledge and skills emerging within the environment of an MMOG seem, therefore, to be distinguished into: a) knowledge of the content, the game mechanics, and the affordances of the environment, and b) skills related to the interaction with other players such as communication, interpersonal and social skills, group organisation and management, cooperation, argumentation, and conflict resolution.

Investigation of the learning opportunities and the skills practiced or acquired within the environment of an MMOG has to consider, therefore, not only the design of the environment, but also the features and processes of the community of the players.

B. Collaboration in MMOGs

MMOGs constitute “complex and nuanced set[s] of multi-modal social and communicative practices” [15].

Collaboration and interaction with other players is not only an option, but it is rather essential for the exploration of the content, the progress, and even the “survival” of the virtual character in the game.

The quality of the communicative and collaborative processes within a group is definitive for the effectiveness of the team and the learning outcomes [24, 25, 26]. Research recognising the significance of these collaborative and social processes in MMOGs has focused on the features of effective teams. These key features refer to the balanced representation of different classes (types of virtual characters), and of different virtual character levels, the group size, sufficient number of active members, effective organisational processes, interdependence of group members, group cohesion and trust, effective leadership, participation in collaborative tasks, strong social bonds among members, and effective communication and coordination [27, 28, 29, 30, 31, 32].

C. Conceptual Framework

Attempting to address the complex issue of collaborative learning in MMOGs, we have proposed, in our previous work, a framework for the investigation of collaborative interactions for learning in MMOG groups [33]. Our framework was based on McGrath’s model for the investigation of group interactions [38] and adapted to the requirements of our research. In this framework we identified the features of the tasks, the members, the interactions, and the structure of the group, as well as the features of the designed and the social environment, as the main factors involved (Fig. 1).

In this paper we mainly focus on the investigation of the features of the tasks and the interactions observed within a group, and on the impact of the designed and the social environment. Features of the tasks (e.g. the quests and missions of the game) such as their format, the rules, the possible solution strategies, the rewards and the penalties, as well as features of the group interactions, the communicative practices, the cohesion and trust or lack of, the competition or collaboration among group members, seem to be relevant to the emergence of collaborative interactions among players. The tasks and the interactions within an MMOG can be products of the game design, the designed environment, as well as products of the interactions with the community of the players - the social environment of the game. In this paper we review the interconnection and relation among these constructs: the tasks, the group interactions, the social environment and the designed environment.

III. METHODOLOGY

Our study was divided in three phases:

Phase 1 Virtual ethnography: we collected data (videos, screenshots, notes) through participant observation in two MMOGs of different format. More specifically, we developed virtual characters in the MMORPG (Massively Multiplayer Online Role-Playing Game) Lineage II, and an account in the real time strategy game Tribal Wars (Greek server), and were involved in the game for 18 and 7 months respectively.

Phase 2 Interviews and Focus Groups: we conducted interviews and focus groups. The interviews examined in this study were conducted from December 2008 until December

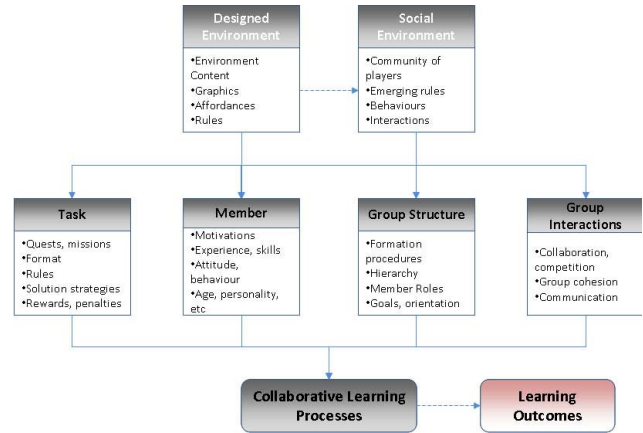


Figure 1. Conceptual framework for the investigation of collaborative learning in MMOGs

2009.

Phase 3: This step took place in parallel to the previous phases. It involved research in external sources (websites, blogs, fora, etc) for collecting information on the design and the player community of the games the participant observation took place, and on the games our respondents played, in order to broaden our understanding of these games, and cross-reference information gathered through the interviews.

A. Interviews Design, Protocol, and Participants

Following a literature research in the area of MMOGs, collaborative learning, and collaborative problem solving, we conceptualised the main themes around which our interviews and observation were constructed. These themes were the gaming habits, the perceptions and attitudes on the available tasks and activities, the communication and collaboration processes, perceptions on the group processes, learning the game, acquisition of knowledge, problem-solving, personal preferences, motivations, demographic details, and general information on the game the respondent plays. Based on these themes, we constructed the main questions of our interviews. The interviews were semi-structured, and the duration of each interview was approximately 1-2 hours.

The research call was publicised through announcements at the University of Patras, Department of Educational Sciences and Early Childhood Education, emails, a webpage (<http://www.ecedu.upatras.gr/voulgari/>), and a Facebook Group, specifically created for the study (<http://www.facebook.com/#!/group.php?gid=57544084646>)

All the participants were initially informed of the purpose of the interview, the confidentiality and their anonymity, and consent was given for the use of the recorded data for research purposes.

We conducted 18 interviews and 2 focus groups. Respondents in our interviews included 15 male and 3 female players, mainly from urban areas. Their average age was 30 years (from 17 to 50). They were from different education and professional backgrounds, most of them unmarried, one of them married and one of them married with children. Most of them were average or expert players and 1 of them was a novice player. The average and expert players had spent from 9 to 30 months on the game. The games they reported playing were: Lineage II (L2), Diablo 2 (D2), Tribal Wars (TW), World of Warcraft (WoW), Age of Conan (AoC), EVE Online (EVE), Rapelz, The West, DoTa, Ikariam.

Focus Group A consisted of 6 participants: 3 male and 3 female, aged 16, high school students. The focus group was organised with the cooperation of one of their teachers. The teacher was present during the session.

Focus Group B consisted of 3 participants: 2 male and 1 female, members of the same group in the game D2, aged 20-30.

Most of the interviews and the two focus groups took place face-to-face, and were recorded with a voice recorder, 1 interview took place over a VoIP software (Skype) with the use of a camera (also recorded with voice recording software), 1 interview conducted via an instant messaging software (MSN), and 2 interviews were completed remotely and returned by email.

B. Coding Methodology

For the analysis of our data the software QSR NVivo 8 was used.

The 1st level of coding involved the main concepts as described in section A (i.e. gaming habits, tasks, interactions, group processes and features, learning, motivations, demographics, game-specific information).

For the 2nd level of coding, we defined the sub-themes relevant to the previous level of coding.

At the 3rd level, we identified patterns emerging from the responses of the respondents.

At the 4th level of coding, we organised responses into clusters and units of analysis. An example is presented in Table 1.

IV. RESULTS AND ANALYSIS

A. Tasks and Activities

1) Difficulty Level

Although there are single-player tasks, a large number of quests and missions available can only be accomplished by a group. The difficulty of the tasks, in combination with the high penalties for failing, discourages players from undertaking these tasks alone.

“[...] but you don’t have either the skills, or the experience, or the ship, to cope. [...] So you gather 3-4 more [people] and you all go in together, so as to be able to cope” [M 37 EVE]

In the initial stages of the game, collaboration with other players is not always essential, allowing the player to familiarise with the environment and practice skills and tactics. For attaining higher levels, though, grouping with others is essential; tasks, activities and quests in higher levels are mainly multi-player, collaborative or competitive. In addition, multi-player tasks also provide higher rewards to the players, such as valuable items or experience points. Even specific areas in the environment are difficult to access without a group.

“Up to a point, you can do it by yourself. But the further you go, [the more] you need a team. At the end of the game, nobody can do anything alone” [M 37 WoW]

Participation in collaborative or competitive tasks constitutes a favourable factor for the emergence of interactions among players: friendships, relationships, and alliances may be formed through joint participation in a task.

“You usually make your best friends or your worst enemies during PvP” [M 32 L2]

2) Multiple Strategies

Tasks with predefined solution tactics do not promote discussion, negotiation, and argumentation among players. The repetitive killing of computer generated monsters provides little opportunities for planning and the search of the most appropriate approach. Such tasks only require that the players have the appropriate gear and equipment and know how to manipulate their virtual characters.

Tasks involving the collaboration or competition among players seem to be, though, more dynamic; large numbers of players have to coordinate, groups of players have to be managed, pacts among groups have to be negotiated, terms of war or peace have to be discussed, the enemy’s next move has to be anticipated. Such tasks require not only extensive knowledge of the game and the environment affordances, but also communication and interpersonal skills, and the emergence of processes such as persuasion, diplomacy, negotiation, argumentation, conflict resolution, and decision-making.

“I consider the players that are good in PvP as smart players, because [in PvP] you don’t have to cope with a static thing which you can practice on. [...] In PvP you need many tricks in order to win - even use unorthodox and imaginative methods” [M 29 WoW].

“In Tribal Wars there are many different strategies you can use; make alliances with other players, with other tribes, different tactics for warfare [...]. There is not a predefined path you can follow” [M 26 TW].

3) Reward Distribution

The rewards a task provides upon completion are a definitive selection criterion. Most of the players admitted that they would only take up a task if the rewards are worth the time invested.

“When [the quest] does not offer any money, I won’t be bothered at all” [M 29 L2]

TABLE I. EXAMPLE OF INTERVIEWS CODING

1 st level: concept	2 nd level: theme	3 rd level: sub-theme	4 th level: patterns	Units of Analysis
Group	Group structure	Leadership	Knowledge	The leader has to be a person of experience and knowledge, so as to be able to help others [F 27 L2] ^a
			Fairness	[The leader] has to respect all the members of the group. [...] S/he has to distribute [rewards] fairly [M 29 L2]
			Patience	It takes enormous patience [to be a leader]. [F 25 D2]
			Wittiness	[...] and s/he has to be very smart, because s/he has to consider many different factors [F 25 D2]
Group	Interactions	Decision-making	Leader	In other teams, the decisions are made by one person. And if someone disagrees, s/he kicks him/her out of the team [M 37 EVE]
			Hierarchy	The 4-5 officers make the decisions [M 33 AoC]
			All members	We all say our opinion on the matter. We discuss the pros and cons. [...] and we decide all together [F 27 L2]

a. Identifier explanation: Female, 27 years old, Lineage 2 player

In the case of collaborative tasks, the distribution of the rewards can become a complex process. The environment may incorporate different reward distribution mechanisms, such as random distribution among group members, collection by the leader, or finder's-keeper's. Although in smaller groups with increased team cohesion, distribution of rewards is usually based on the negotiation and trust among members, and items are granted to the player who needs them more, in larger, more achievement-oriented groups, players often resort to more sophisticated techniques. EverQuest players developed the DKP system, currently employed by WoW players as well, a point system which also considers the participation of the members in group activities [34]. Through this system, players who are more active and committed to the group acquire better rewards.

Participation and completion of a task by a group, also rewards the members of the group with experience points distributed and added to the progress bar of each player, respectively to the level of each player, and to the size of the group: higher level members of the group gain less experience points than lower level group members, and the more the members of the group, the less the experience points gained by each member. This allocation of experience points may discourage higher level players from grouping.

“I don't want to join parties. It's not to my interest. [...] because rewards are distributed to more people, and it also takes more time” [M 29 L2]

4) Motivation

For attracting and sustaining the interest of a wider range of players of different preferences and requirements, a variety of different tasks is integrated. The task preferences as reported by the players in our interviews are: the PvP (player versus player) content, the possibility to select whether to play solo or to collaborate, the rewards, the possibility to plan and employ different strategies, the acquisition of experience points, the repetitive killing of

monsters, the opportunity to explore different areas of the environment, and the variety of activities.

Not knowing exactly what they have to do, having to search for a specific Non Player Character (NPC), and time-consuming procedures were reported by players as the main daunting features of a task.

“When you are at a high level, [quests] are time consuming. [...] because you have to go to unknown areas. And for a beginner... you search for quite some time. Eventually you get tired” [F 20 L2]

“If you are a beginner and you want to level up, the game requires that you complete these quests. And you may have to go to the other side of the [virtual] world, to look for an NPC for 3 hours. Not too friendly...” [F 27 L2]

Progress in the game and through the tasks is incremental. Players have access to quests or tasks which are relevant to their level. Beginner tasks are simple and aim at introducing the environment and the main functionalities. Gradually, after mastering the basic skills, the player gains access to more elaborate missions and activities.

B. Group Interactions

1) Camaraderie and Rivalry

In some cases, the environment divides the players into opposing sides (e.g. the Horde and the Alliance in the WoW, the Elyos and the Asmodians in Aion). This distinction encourages not only rivalry between the opposing sides, but also camaraderie among the members of the same side.

“It has to do mainly with the sense of team. [...] people that don't even know each other, with nothing in common except of the race, consider it their duty to defend the new players” [M 29 WoW]”

The environment provides functionalities for the formation of different types of groups. The main types of groups are the clans, or guilds, or tribes, more persistent and long term groups, and the parties, more ephemeral and task-oriented. Interactions within these types of groups seem to differ: parties are formed by players that may not even know each other, and may never see each other again in the future,

with the main purpose to accomplish a task. As observed during our online participation and from video recordings, discourse in such groups seemed to be more task-oriented and less social. When the members do not know each other they feel less committed to the group and do not always employ their full potential.

“In a pug [pick up group, random groups], I wouldn’t really care at all [about] how much damage I did, or anything. Things are more irresponsible there. I don’t know you and you don’t know me. We don’t care about anything [in pugs]” [M 29 WoW]

The clans, guilds, or tribes, on the other hand, are distinguished by the commitment of the members, sets of rules, responsibilities and privileges of the group members. Social interactions among members are not uncommon and they seem to increase team cohesion and viability.

Competitive interactions and victory over other players were reported by players in our interviews and were also identified by Bartle [11] as one of the main four motivators for play. Players enjoy the PvP aspect as much as they enjoy the collaborative or solitary PvE (player versus environment) aspect, and games with mass appeal, such as WoW and L2 try to balance between these different aspects so as to attract more players. Some of the most memorable and satisfying experiences in the game reported by our players involve battles between players or among groups of players. They refer to competitive interactions as more challenging, social, dynamic, and unpredictable.

“[...] but whether you’ll win or not, depends on the other player. And this is the part of the game which is amazing” [M 37 EVE]

“It’s different when you have to deal with another human being, in online games. You don’t know how the other person will react” [M 35 L2]

In many MMOGs players may create their own personal networks of players: the friend lists. Using the integrated to the environment functionalities, they send requests for “friendship” to players they enjoy playing or socially interacting with, and receive similar requests. Awareness tools so as to know when your friends are online in the game and interact directly with them through personal messages are usually available. As also reported in our interviews:

“Good cooperation leads to the addition of new people in the friend list. The players know which of their friends are online and talk through the chat channel, so as to cooperate again in the future” [M 37 WoW]

“As soon as I log in [the game] I will first see who is online, so as to chat a bit, before starting to play” [F 25 D2]

In some games, players can only communicate if they have mutually accepted to be added to each other’s friend list, or players of opposing sides cannot communicate at all (e.g. in WoW verbal communication between Horde and Alliance members is not possible), mainly for avoiding arguments and verbal abuse among “enemy” players.

2) *Multiple Interaction Channels*

Players in MMOGs mainly interact non verbally - through actions, and verbally - through discussions [35], via a variety of available channels. Discussions are taking place through text, in synchronous chat or asynchronous fora, or

through voice, while actions involve the animations, movement, and placement of the avatars.

As observed and also reported in our interviews, the most commonly used medium for discourse seems to be the integrated chat functionality. Players chat synchronously through the different available chat channels: channels dedicated to discussions among clan or guild members, among members of a party, among the members of an alliance of groups, channels for trading items, channels for players within proximity. Chat channels are usually the easiest, more direct, and with a faster response rate way of asking a question or making a comment. Typing text, though, can be time-consuming when trying to keep up with the pace of the game and of the other players. Players have developed a jargon for faster text communication; a jargon which might be difficult to follow by an outsider or a new player. Textual discourse in MMOGs and relevant fora and websites is filled with bizarre acronyms and abbreviations for faster communication among players: LFP instead of “Looking for party”, WTB and WTS instead of “Want to buy” and “Want to sell”.

Synchronous chat does not seem to suffice for the cases of elaborate discussions and fast coordination and communication (e.g. during a battle). Our respondents reported that in such cases, they resort to voice communication, through integrated functions of the environment, or, through third party VoIP software, such as Skype, Ventrilo, TeamSpeak, etc., when they do not conflict with the functionalities of the game. In our participant observation our groups also very often resorted to voice communication.

“I prefer to use Ventrilo when possible. Because 9 out of 10 times, when I am in game, I am most probably involved in an activity that prevents me from chatting [typing]. But I also consider Ventrilo a better mode of communication. It’s more direct. You don’t have to type. Very often you can pass a message through the tone of your voice, and it’s definitely a more direct mode of communication” [M 32 L2]

“[In Diablo 2] [Skype] is not very convenient, because you have to be able to hear the drops. Every item dropping has a specific sound. [...] And you have to know, to search fast, and to see what has been dropped. You can’t use Skype at the same time” [F 25 D2]

Fora, on the other hand, although not appropriate for fast communication, seem to support more elaborate discussions. In the real time strategy game Tribal Wars we observed extensive discussions in the dedicated tribe forum, detailed planning of strategies, advice, tips and tricks of the game, exchange of opinions, negotiations, argumentations, introductions of new members, announcements, publication of the tribe rules and even social discussions, threads about music, jokes, films, and general subject discussions.

Animations of the virtual character and gestures seem to increase players’ motivation and engagement in the game. The graphical representation and the movements of the character were reported by players as one of the motivations for play. Gestures of the virtual character such as bowing, waving, cheering, dancing, laughing, constitute a further means for socially approaching other players and for non

verbally interacting even with strangers. As one of our interviewees also reported:

“In the beginning, he would just dance in front of me, in game. He was doing it just for the fun of it and eventually we became friends” [F 27 L2]

3) *Group Structure*

The structure of the group, the roles, and the hierarchy are defined, up to a point, by the environment. The ephemeral, task oriented groups, the parties, have a limited maximum number of members (e.g. 9 in L2) and the leader is the only distinctive role as defined by the design. Clans and guilds present a more elaborate structure, allowing for even more than 150 members, with a leader and a hierarchy of officers.

Beyond the group structuring tools and functionalities of the environment, the players may define additional roles in their groups, depending on their needs and objectives: an officer for maintaining the group’s website, or for technical support, or for following the prices in the market.

The criteria for the assignment of a role to a group member go beyond the skills and level of the avatar, and even beyond the player’s experience and knowledge of the game; interpersonal characteristics are also considered, such as communication skills, trust, commitment to the group, relations with the group leader.

Leadership was reported in almost all of our interviews as one of the most important factors for the success of a group.

“The most important factor for [the success of] a clan is the leader. Success begins with the leader; how well s/he knows the game, whether s/he has set goals and whether s/he follows them” [M 32 L2]

Most of our players emphasized the responsibility of the leader. The leader of the group usually spends more time in the game than any other member, has an extensive knowledge of the game tactics and the potential of the different available virtual character types, and is responsible for coordinating and managing the group, managing the shared resources, resolving disagreements and conflicts, motivating existing members and recruiting new members, completing quests for the progress and upgrading of the group.

The privileges of the leader are equally high: the leader is usually the founder of the group. S/he sets the rules of the group - mainly in large groups- decides on the orientation and goals, makes the decisions, accepts or dismisses members, assigns new officers, disbands the group. Most of our respondents reported that although the leader has the final word on the decisions, the members and especially the officers, can discuss, agree, disagree, propose alternative solutions and approaches; and of course members can, at any point, leave the group, if they feel they cannot comply with the requirements or the orientation of the group.

4) *Peer-Mentoring*

Peer-mentoring and apprenticeship emerged as a pattern in almost all of our interviews and during our observation and research in external fora. The support, guidance, and advice from more experienced players, is essential for the

novice players. The complexity of the environment leads the new players to often resort to the help of other players.

“There were certain things that I had, initially, misunderstood. Then, I joined a group. The group [helped me], I learned things, I became more expert, I understood things, and I got to the point where I can also help other, novice players, like a chain - you have been trained and you know how to train the new players” [M 37 EVE]

[...] but [the novice player] needs guidance, otherwise s/he will get bored. It’s tiring in the beginning. If you don’t have someone to guide you through your first steps, you will get discouraged by the complexity of the game; you will get stuck” [M 46 WoW]

Help is provided as advice, information, resources such as in-game currency and equipment, participation in difficult tasks, or “power levelling” (adding a novice player to a “party” of one or more higher level players, so that the novice player can benefit from the distribution of experience points among party members). The latter practice is usually discouraged by the game design: players of higher levels gain very few experience points when combating lower level mobs, while there may be a limit to the maximum level difference among players of the same party. In some cases though, the design of the environment promotes this mentor-student relationship: in L2 there are quests that the player can only accomplish under the supervision of a higher level player, and obtain the reward only after the mentor has accepted to pay an amount of in-game currency.

C. *The Impact of the Social Environment*

Beyond the game design, it is also the community of the players that defines aspects of the gaming experience; it can be a motivator for play, it has an effect on the quality of interactions, the behaviours and the attitudes of players, and it often constitutes a factor for leaving the game.

Social interactions and the relations with other players were reported even by expert players with high achievement scores, as one of the main motivators for play. Most of our respondents started playing the game with real life friends or relatives, or were motivated by them to join the game.

Social bonds among group members were reported as one of the main factors for group cohesion and effectiveness. Very often players arrange, when possible, real life meetings with their co-players. We also had the opportunity to attend such meetings with our in-game groups.

“When the group has strong links, the members will not start blaming [the leader, for a failure]. [...] That is the difference between a good team and an inexperienced team” [M 37 EVE]

The goal, the orientation, and the quality of communication and collaborative interactions and processes in a group are relevant to the goals, the preferences, the behaviour and attitudes of the members. Behaviour and attitude of a group member was often reported as the cause for the dismissal of the member. When the member does not comply with the rules of the team, or does not communicate well and disrupts communicative processes of the team, it is often marginalized or expelled from the group. Similarly, a member may leave the group if the communicative practices of the group do not agree with the goals and attitude of the member.

"[...] he was extremely rude and offensive. [...] Consequently, the rest of the people considered him as a person they didn't want to be with. So they just dismissed him" [M 29 WoW]

Offensive behaviour from other players, combined with the lack of appropriate penalties from the designed environment and the administrators of the game, can discourage, disappoint, or lead to the rejection of the game by players. Our team in Tribal Wars was disbanded when members of the hierarchy considered the behaviour of an opposing team offensive and violating the ethos of the game. They deleted their accounts and left the game. Players also reported that they stopped the game, when their in-game friends decided to leave the game as well.

"[...] conversations, discussions and actions of other players, in other tribes, have made me feel really stupid for even being in the same game with them. [...] what I am really trying to say is that I intend to hit 'delete' very soon" [Group Leader TW Tribe forum]

"The first thing I avoid is 'flaming' - the use a bad language for offending others. [...] And if I see a game where the administrators don't take care of [such behaviour], I leave it immediately" [M 26 various games]

V. DISCUSSION

Our limited sample and our explorative approach does not allow for extrapolations to the design of all games and the general community of players. Our aim is to rather describe emerging trends for further research. The design of tasks, as well as the interactions among players are complex issues, and the variables involved are not limited to those described in this article. We mainly focused on the issues that emerged from our interviews, participant observation and information from relevant websites and fora.

Our main objectives were to investigate factors and conditions that promote collaborative learning in MMOGs, and the impact of the designed and the social environment. Our focus was on the interconnection of the tasks, the group interactions, the social environment and the designed environment.

The format, the features, the representation of a task or a problem, and the interaction and communicative processes that emerge, constitute critical components for the effectiveness of a collaborative learning environment [37]. The tasks convey the cognitive content and scaffold the interaction of the participant with the environment and with others, while the quality of interactions defines the construction of shared knowledge and attainment of the learning outcomes [25, 26]. We approached our two main axes of focus (tasks and interactions) through the perspective of their motivational, their social, and their cognitive aspects. Tasks can be motivating when they address the interest of a wide range of players, when their level of difficulty corresponds to the level of each player, when they provide appropriate rewards to all members of the group; they are cognitively intriguing when they promote critical thinking, planning, decision making; they are social when they require the joint effort of different players. Learning in MMOGs through collaboration is spontaneous and intuitive. Players learn the game through their interactions with other players,

through support, advice, guidance, peer-mentoring, confrontations. The more the available interaction channels, the richer and more effective the interactions among players are.

Although the design defines most of these aspects of the environment, the social environment emerging plays an equally critical role. The sense of freedom, self control and autonomy, sustains the motivation, engagement, and active participation of the players. The players feel free to make their own rules of conduct, to set their own goals, and select their mode and pace of playing. The virtual character is the medium through which players express their personalities, attitudes, ideas, and behaviour – a combination of the avatar and the real life personality of the player. Players very often made references to real life – in some aspects, the game transcends the limits of the designed environment and seems to spill over to real life; and inversely, real life seems to penetrate the virtual environment. Such features and qualities of MMOGs seem to be relevant to the design of an effective collaborative learning environment that could engage and sustain the active participation of students.

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