

# Computer Game Studies: Research and Educational Designs

Tiago de Souza Lima Gomes  
Universidade Federal de Minas Gerais, Brasil

Marcelo Mendonça Teixeira  
Universidade do Minho, Portugal

## Índice

Introdução . . . . .	3
<i>Massively Multiplayer Online Games</i> . . . . .	4
<i>The Educational Potential of Games</i> . . . . .	5
<i>Analysis of Massively Multiplayer Online Games</i> . . . . .	7
<i>The Analyses Guide Was Divided in Four Sections</i> . . . . .	9
<i>1st Section – Identification</i> . . . . .	9
<i>2nd Section – Objectives</i> . . . . .	9
<i>3rd Section –Tasks</i> . . . . .	9
<i>4th Section – Communication and Interaction</i> . . . . .	10
<i>Problems and Goals</i> . . . . .	12
a) The End of the Game . . . . .	13
b) Subdivision of Main Goals . . . . .	13
c) Degree of Difficulty Among Levels . . . . .	14
<i>Tasks</i> . . . . .	14
a) Order of Tasks . . . . .	14
b) The Link Between Tasks . . . . .	15
c) Extra Task . . . . .	17
<i>Communication and Interaction</i> . . . . .	17
<i>MMOG Players Survey</i> . . . . .	21

<i>Describing the Survey</i> . . . . .	22
<i>Problem Solving Within Games</i> . . . . .	24
<i>Motivation for Task Performance Motivation</i> . . . . .	28
<i>Online Interaction and Communication During Games</i> . . . . .	29
<i>Player Motivation</i> . . . . .	31
<i>Are Online Games Beneficial in Academic or Professional Environments?</i> . . . . .	33
<i>Future Research Directions</i> . . . . .	36
<i>Conclusions</i> . . . . .	37
<i>References</i> . . . . .	38

### Abstract

The online educational paradigm demands a new way of thinking about the pedagogic models and new strategies to intervene in society; strategies that could respond to education contemporary processes. This demand is valid because both the technological development and the social and economic changes, as producers of new cultural patterns, have caused the school to realign itself regarding what is demanded from it: Intentional actions that prepare people to insert themselves with a critical posture towards society. In this sense, the increasing complexity experienced by electronic games began to demand a greater cognitive effort of their players. This has fostered some capacities in its players that could be used within the relations of teaching and learning. This paper describes an exploratory study with two phases: The first one analyses four MMOG (Ikariam, OGame, Gladius and Metin2) and its pedagogical potential related to the development of problem solving skills, communication and interaction skills, and motivation to perform tasks. The second phase is a survey conducted to the players of these games about their motivation to play and their perceptions about its pedagogical potential. The electronic games work not only as didactic interface or objects of analysis, but mainly as a way to produce alternatives educational practices.

**Keywords:** Electronic Games, Cyberspace, Online Education, Interactivity.

## **Introdução**

**I**N the 21st century, people require a new range of capacities constituted by critical thinking, team work, problem solving, collaboration, the ease in use of technology, and the capacity to work with and manipulate information, argue Galarneau & Zibit (2007). Many people are learning these capabilities outside of formal educational institutions and these are now being acquired by leisure when it includes activities that demand any sort of cognitive function. These activities are of personal choice and increasingly include videogames (Johnson, 2006). One can specifically analyze the case of the rising popularity of “Massively Multiplayer Online Games,” (MMOGs) a recent phenomenon made possible by the popularization of broadband connections in addition to the new generation of computers and consoles that permit access to complex virtual worlds with millions of people playing in real-time (Steinkuehler, 2004).

According to Beedle and Wright (2007), the artificial intelligence systems that constitute electronic games function as an organizational mechanism based on rules which maintain the game challenge for players. This continuous cognitive challenge along with activities that demand player cooperation creates a rich environment for incidental learning which is fundamental for the development of useful learning. However, it was the ability to connect these technologies together, giving rise to such networks, which expanded and integrated the use of individual and group in wider setting new standards of globalization. As regards education, it is considered that this new configuration allows communication to expand the territory of the local school for deterritorialized areas of knowledge, enabling viewing school as a true learning community (Silva, 2002).

That is the case of electronic games, representing a valuable interactive space for the education, and that can be accessed at anytime and anywhere in the world.

### *Massively Multiplayer Online Games*

In an effort to establish categories for electronic games that take into account the world of online games, Natkin (2006) creates a classification system that considers the knowledge players possess in terms of game rules proposing four game types: Puzzles; Strategic Games; Action Games; and Adventure Games. This classification also takes into account individual and collective games that can be played both online and offline. Meanwhile, as indicated by the author himself, the combination of these basic game structures leads to other game types. Furthermore, these same items can be expanded into multiplayer games. These will be differentiated according to the type of community: closed (a small group of acquainted players share a game session) and open (players who may or may not know each other meet spontaneously online).

This way, Natkin (2006) describes “Massively Multiplayer Online Role Playing Games” (MMORPG) as being a junction of Action Games and Adventure Games created to be played in multiplayer mode in an open community.

Historically, MMORPGs appear as a form of transferring the universe previously created for “Multi-user Dungeon” (MUD) to the electronic world. Generally, the player must travel the globe performing specific tasks. In this same scope “Massively Multiplayer Online First Person Shooters” (MMOFPS) appeared for war simulations, just as “Massively Multiplayer Online Social Game” (MMOSG) which appeared for environments where socialization is one of the main functionalities (Christofoli, 2006).

It is possible to affirm that these games vary only in terms of the theme chosen therefore they can be designated as “Massively Multiplayer Online Games” (MMOG). This terminology includes electronic games created with the purpose of being played online in multiplayer mode in an open community where the interaction between players is fundamental for success (Galarneau, 2005; Jakobsson & Taylor, 2003).

### ***The Educational Potential of Games***

The new technological brought facility of access to communication by the increase of storage capacity of news and by the processing speed of information in real time, promoting their educational applications inside and outside classrooms (Teixeira, 2009). In this sense, there are various studies that come to positive results after analyzing the application of specific games in a classroom context. This is especially factual when it comes to the improvement of concentration, the stimulation of task performance, the improvement of visual intelligence, and hand-eye coordination (Beedle & Wright, 2007; Ferdig, 2007; Graells, 2001; Van Eck, 2006).

Lévy (2010) adds to that, asserting that the Collective Intelligence is a determining factor in competitiveness, creativity and human development in a knowledge based economy, or in an information economy on the network society.

Electronic games are bringing forward a greater complexity of objectives as well as a challenging environment for the player. Competitors must be capable of learning to define a hierarchy among a wide range of tasks. In this instance, the player must choose the ideal course to follow and define the main goal because the game itself does not always do so. Furthermore, one must be able to use the interactive and communicative tools supplied for the exchange of experiences that permit the establishment of links with other players who can help in obtaining success, argues Johnson (2006).

The environment that places players in control of their own journey meets the desires of a new generation of students. Students born after the popularization of technology and electronic games are known as “screenagers”, children of simulation culture, children of chaos, game generation, digital natives or “Generation Net” (Akilli, 2007; Alves, 2005; Prensky, 2003).

These students have a few things in common. Firstly, they are information producers. Secondly, they prefer learning using the trial-error method performing several tasks simultaneously in a non-linear approach. Furthermore, they maintain a positive perspective on technology and use it as a way of improving socialization through instant

messaging programs as well as the interaction possibilities brought forward by online games, forums and social networks such as “Facebook” (Alves, 2005; Beedle & Wright, 2007; Prensky, 2005; Van Eck, 2006).

Electronic games can be designated as knowledge building environments as well as a place for entertainment (Williamson, 2009). Players become active knowledge builders by actually playing as opposed to being mere observers. They can only be successful in the game after they manage to uncover a series of regulations, actions, and routines (Klopfer, 2008).

This way, players create process of interpretation of the gameplay causing them to develop analogies between symbolic representations encrusted within the competition and their real lives by actively decoding “tips” provided by the game itself. Players then learn the properties of the virtual world by interacting with its symbology thus establishing a relationship between these symbols and by acting accordingly by the rules that govern the game system (Squire, 2002).

Games can be viewed as being authentic learning environments because players are positioned in contact with practical situations, which are closer to real life situations than those experienced in a school environment (Galarneau, 2005; Steinkuehler, 2004; Williamson, 2009).

Even though some authors state that games can increase problem resolution capacities and critical thinking (Steinkuehler, 2004; Williamson, 2009), Squire (2002) believes that there is not sufficient evidence to suggest that students are able to transfer abilities learned in the gaming environment to solve real life problems. This is due to the fact that the problems presented in games are placed in an entirely different context in comparison to those experienced in real life.

The game environment becomes exceedingly motivating as described by Goldstein (2005). Players normally begin playing as a result of a personal choice thus; they do not need any type of exterior power that would entice them to initiate this activity.

According to Squire (2002), the immersive and motivating environments portrayed in games and simulations promote productive gaming. This way, learning occurs through the construction of micro universes, the manipulation of simulations as well as the physical act of playing. Persuasive environments are produced. These are capable of transmitting ideas, manners of acting, and generating a sequence of collateral

learning among players (Pivec, 2009; Williamson, 2009). In addition to this, Pivec (2009) affirms that games such as RPGs or real-time simulations are highly motivational and promote an ideal scenario for cognitive development because they possess immediate feedback with regards to players' actions.

The majority of video games can be played in multiplayer mode. This way, players can use the game's settings as well as other communication tools such as forums and instant messaging programs to discuss strategies and organize groups. Most of the enterprises responsible for these games develop these forms of interaction (Galarneau, 2005).

In conclusion, a game can encourage communication and the construction of social bonds between players not only by supplying communication and interaction tools but also by making this interaction crucial for the accomplishment of tasks and goals. Furthermore, some games are able to create complex, dynamic social systems that are present within the real social links between players through versatile, flexible forms of interaction focusing on the content (Manninen, 2003). In turn, the games have been used how a proposal of rupturing from the traditional educational model based on a linear transmission of knowledge.

### ***Analysis of Massively Multiplayer Online Games***

Four MMOGs will be analyzed with the aid of the "MMOG Analysis Guide" specially designed for this purpose. The aim of this material was see how the selected games increase the problem solving, the motivation to perform tasks and the interactions and communications between players. These three aspects are important because they allow identifying the cognitive challenges that the players are subjected, as well as the need for skills to solve them (Johnson, 2006).

After some research using the Internet search engines (Google and Yahoo), trying to get the main MMOG which were available in portuguese, were free and had at least one official forum. We found hundreds of results, most of them was partly free, where the players can play freely, but it is possible to get some advantages by using real money. Besides that, lots of the games wasn't in portuguese. For that

reason, it was necessary to talk with the players and other forum members and mail lists, trying to found games with a good acceptance and a great number of players.

Some players suggested the game OGame, and a research under the germany company Gameforge, responsible for the game. One can see that, besides being a company dedicated exclusively to this type of game, most of them is also available in Portugal, all have constant updates and an active community through a forum provided by the company.

After that, was chosen the games with the most active forum and a great number of members. Between the selected games, the Metin2 is the only one which can't be played using the web browser. That game was selected as it have a highly immersive environment, attracting the attention of a great number of players. The selected games, as well as the number of daily messages in each game, could be seen at Table 1.

**Table 1.**  
**Selected Games - Number of Players - Forum - Number of Daily Messages**

<b>Game</b>	<b>Number of Players</b>	<b>Forum</b>	<b>Daily messages</b>
<i>OGame</i>	33,799	<a href="http://board.ogame.com.pt/">http://board.ogame.com.pt/</a>	2286
<i>Ikariam</i>	31,099	<a href="http://board.ikariam.com.pt/">http://board.ikariam.com.pt/</a>	745
<i>Metin2</i>	27,095	<a href="http://board.metin2.com.pt/">http://board.metin2.com.pt/</a>	1924
<i>Gladius</i>	13,633	<a href="http://board.gladius.com.pt">http://board.gladius.com.pt</a>	196

## ***The Analyses Guide Was Divided in Four Sections***

### ***1st Section – Identification***

The purpose of this section is to identify the general features of the game. We considered the items name, URL of the Game, Company, System Requirements, Language(s) that is available and Type of Community as general characteristics. And Environment and History of the game as responsible for attract players.

### ***2nd Section – Objectives***

This part will describe the way the main goals of the game are organized and the degree of freedom the player has to accomplish these objectives through the items **Final** (pre-defined final, pre-defined final with multiple paths or final not set), **Subdivision of the main objectives** (Single Task, indicated division or not indicated division) and **Degree of difficulty between steps** (Same level of difficulty, random variation or increase gradually).

### ***3rd Section –Tasks***

As in the objectives, this section analyses the items Task order (sequential tasks or non sequential tasks), Connection between tasks (unrelated or intercorrelated) and Existence of extra tasks (Nonexistent, Not attached to the difficulty level or in consonance with the difficulty level) trying to verify the way as the players organize the tasks they have to perform to complete the main objective.

#### ***4th Section – Communication and Interaction***

This section tends to determine the need of interaction between players to perform tasks and objectives proposed by the game, as well as to identify which official communication and interaction tools are provided by the company who create the games.

**Ikariam**<sup>1</sup> - This game imitates classics such as “Civilization”. Players begin in Greek civilization and acquire knowledge that permits the growth and expansion of the society controlled by the player (Figure 1):

**Figure 1.** Ikariam Homepage



**OGame**<sup>2</sup> - This game simulates a future where one is able to take interplanetary voyages as well as declare war on planets from other solar systems. The player begins with an empty planet and must evolve technologically in order to build up resources and necessary arms to continue the war (Figure 2):

<sup>1</sup> <http://www.ikariam.com>

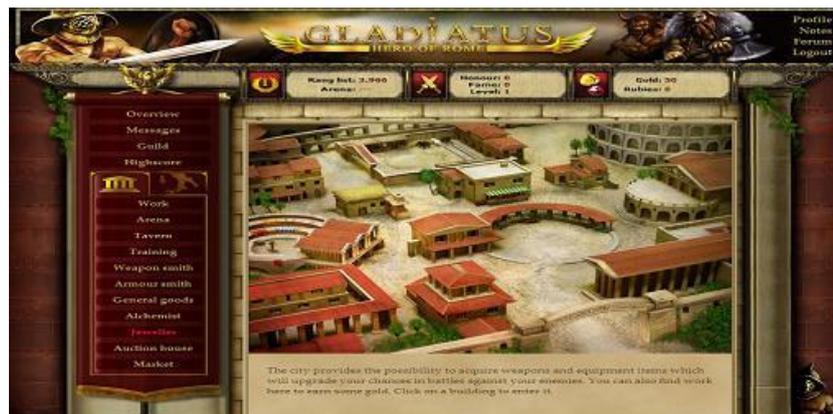
<sup>2</sup> <http://www.ogame.org>

Figure 2. General Status Page of the Planet



**Gladius**<sup>3</sup> - This game simulates the life of a gladiator from the Roman Empire. First we encounter an inexperienced gladiator equipped with only the basics. This character evolves with hard work and strife until he becomes a warrior worthy of great fame and honor.

Figure 3. Gladius Homepage



<sup>3</sup> <http://www.gladius.com/game>

**Metin2**<sup>4</sup> - This game incorporates battles between tribes from a world dominated by medieval oriental culture as well as magical elements. Here, the player begins with an inexperienced character that has limited abilities and will only evolve after numerous battles defending territory from other tribes. All this occurs with the impending malignant influence of dark magic represented by “Metin stones” (Figure 4).

**Figure 4.** Battle scene from Metin2



### ***Problems and Goals***

The main similarity amongst the four games mentioned above is that the main goal consists in accumulating points or experience. For this reason, the objectives presented by these MMOGs are usually vague:

*Can you turn it into a flourishing town and capital of a mighty island empire? (Ikariam – Game Tour<sup>5</sup>)*

---

<sup>4</sup><http://www.metin-2.com>

<sup>5</sup> [http://www.ikariam.com/tour\\_step1.php](http://www.ikariam.com/tour_step1.php)

### a) The End of the Game

Of the four games analyzed, only Metin2 defines its final stage, being it level 99 of experience. It is important to note that this is the limit placed on the Portuguese version. The Korean version has established its maximum at level 120. The other games can be played using an Internet browser. These games incorporate an equation system that guarantees infinite player evolution. Regardless of this, the need for new resources can be established as a non official barrier for these games.

This limitation is recognized by players who create official forum topics so that they can exhibit their evolution records.

### b) Subdivision of Main Goals

None of the games demonstrate a subdivision of the main goals. This favors the development of different strategies and evolution paths. These techniques can be generalized in three ways: (1) *Offense or attack*: players concentrate on attacking other players; (2) *Defense*: players concentrate on personal defense as well as of their fellow companions in addition to the accumulation of resources; (3) *Commercial*: players aim to gather riches using the exchange of goods.

Each of these strategies includes advantageous and disadvantageous aspects which are studied and commented on by players. These techniques permitted the elaboration of several player classification systems:

**Metin2** – possesses a classification system indicated by the player's current level which is directly linked to the game status;

**OGame** – this particular classification system is divided into three distinct items: Points; Fleet and Research;

**Ikariam** – Players can be classified according to 9 distinct items: Total score; Masonry Masters; Construction levels, Scientists, Research levels, Generals, Gold, Offense Points, Defense Points and Commercial Score;

**Gladius** – this game contemplates six items: Level; Honor; Fame; Victories; Feats and Gold.

### **c) Degree of Difficulty Among Levels**

Ikariam and OGame both focus on resource management therefore; the player must be able to establish a relationship between possible investigations as well as military units and buildings that can be constructed during one's evolution strategy. As the player evolves within the game, the links established by the tech tree increase game complexity thus demanding a greater effort.

The main scope of games such as Gladius and Metin2 are battles. A victory can be ensured by using items that strengthen their avatar creating a non-linear elevation of the difficulty level. These wars can be performed between all players regardless of their level. Furthermore, upon reaching the twelfth level of Gladius, the dungeons are opened. Here, one will encounter adversaries of advanced levels. This may cause the player to forget the new challenge until more points and abilities have been acquired, part start using not allowed strategies, or quit the game.

While playing Metin2, players may find opponents that are much stronger at any given moment. This may cause the player to waste time and resources unsuccessfully thus causing a motivational decrease. On the other hand, facing weaker enemies does not favor the player in any manner because experience can only be gained by facing players of the same or higher level. Players of the four games mentioned employ the official forums in order to share tips on successful strategies.

## ***Tasks***

### **a) Order of Tasks**

None of the games analyzed present tasks in a sequential format. This means that each player can evolve within the game autonomously. This autonomy sparks a greater cognitive effort leading the player to organize existing tasks in order to easily achieve objectives according to the adopted strategy (Johnson, 2006). The maturity of OGame is responsible for the birth of nomenclatures that define one of the possible tactics

adopted by players. These paths are numbered in manuals such as the “OGame Manual”.

### b) The Link Between Tasks

Three of the four games discussed possess a link between the proposed tasks. Gladius is the exception. Players must use what they have learned previously to solve the problems at hand. In Metin2 the player must be able to contemplate the variables such as who is the “preferential enemy,” the ideal character, and how to choose a weapon being as they each possess advantages and disadvantages as can be seen in Figure 5.

**Figure 5.** Maximum Values of Metin2 (Adapted From the Portuguese FAQs)<sup>6</sup>

Weapons		
Strong Against...	Defenses	Other special effects
<ul style="list-style-type: none"> <li>• Esoteric [20%]</li> <li>• Semi-Human [10%]</li> <li>• Orcs [20%]</li> <li>• Demons [20%]</li> <li>• Animals [20%]</li> <li>• Undead [20%]</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• Piercing jabs [10%]</li> <li>• Critical jabs [10%]</li> <li>• Poisoning [8%]</li> <li>• Haze and confusion [8%]</li> <li>• Deceleration [8%]</li> <li>• Quick charm [20%]</li> <li>• Intelligence [12]</li> <li>• Strength [12]</li> <li>• Skill [12]</li> <li>• Life [12]</li> </ul>

In other instances, the employment of techniques learned previously is reflected in the moment of combat. In these games, players tend to use multiple hit sequences which have proven to be efficient in the past. These techniques are also topic of discussion in the forum.

In OGame and Ikariam this relationship appears to be stronger when the players are more knowledgeable concerning the game’s tech tree.

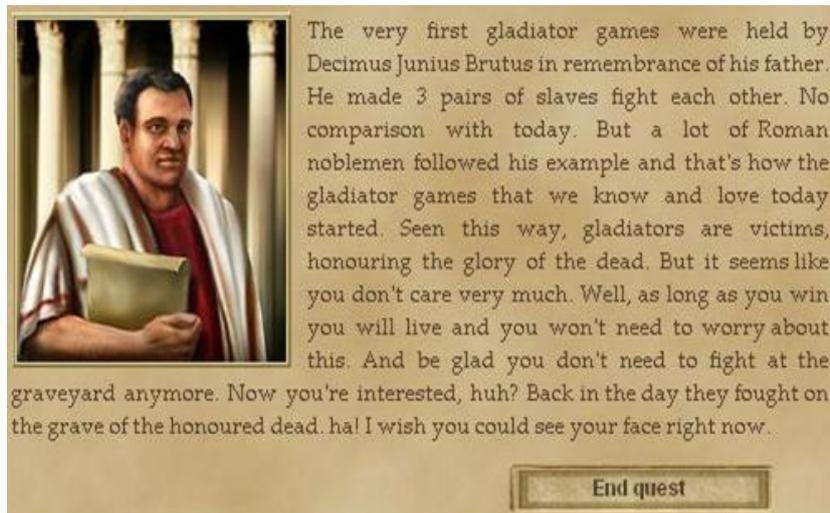
<sup>6</sup> The Portuguese FAQs - Especiais e Valores Máximos - <http://board.metin2.com.pt/index.php?page=Thread&postID=397726>

This understanding should reach far beyond simply knowing. The player must recognize the need for investigating a specific piece of technology as well as evaluating the necessities according to the game strategy. As stated by the player “Djin” under the topic “Research”<sup>7</sup> in OGame:

The way I see it, one cannot establish in a linear way a classification for the importance of research because the importance of each investigation varies depending on the phase of the game we are in. It is important that we define this significance according to our game strategy as well as our needs at that moment.

The tasks in Gladius are presented as disconnected missions. This way, the player does not need to use what was learned in one mission in order to complete the next. For example, the text missions (Figure 6) consist in displaying generic information which is not charged to the player.

**Figure 6.** Example of a Text Mission from Gladius



<sup>7</sup> <http://board.ogame.com.pt/index.php?page=Thread&postID=221810>

**c) Extra Task**

Of all tasks a player can accomplish in each of the four games, the only one that does not award points or experience is the commerce among players or between players and NPCs (Non Player Character). Being as the main goal of the four games is to enhance avatar in terms of points and experience, this was the only activity thought to be supplementary to the main goal. It was also considered that the activity is not related to the difficulty of the level. This simply demands the possession of resources in order to buy the desired merchandise.

***Communication and Interaction***

A “MMOG” is different from other online games because the players have to form groups with the intent of being successful in the game, argues Galarneau (2005). Therefore, the companies that create these games supply a wide range of interactive and communicative tools that can be used by players to organize their groups. Table 2 summarizes the tools found in the four games.

**Table 2.**  
**Interaction and Communication Tools Featured in Ikariam, OGame, Gladius and Metin2**

	Forum	Chat	Inbox	Clan Support	Others
<i>Ikariam</i>	X	-	X	X	<i>Assignment of positions and tasks Control and management of troops and resources</i>
<i>OGame</i>	X	-	X	X	<i>Assignment of positions and tasks</i>
<i>Gladius</i>	X	-	X	X	<i>Assignment of positions and tasks Territory for construction and edification</i>
<i>Metin2</i>	X	X	X	X	<i>Assignment of positions and tasks Territory for construction and edification</i>

All of the games possess an external forum, an inbox for message exchange and support for the creation of new guilds. Only Metin2 incorporates a chat tool into the game environment. This application is crucial because this game is executed within an external program that complicates the usage of instant messaging programs.

In the option “others” one can come across advantages offered to the guilds of each game. These advantages are used in Ikariam and OGame in order to control specific guild duties. In Gladius and Metin2, they allow the player to settle in by creating a specific location for the guild where members can meet and build edifices useful to them (Figure 7). This space can be developed with the use of resources donated by group members.

**Figure 7.** Comparison Between the Luso-Brasil Guild (left) and The Sith Guild (right)



Even though these advantages are made available, Gladius players do not need groups in order to carry out any action within the game. The guild is essentially used as an informal player protection force that can be advantageous to players in some ways.

**A Group of Players Can Support Specific Activities in the Other Games Such as:**

**Facilitate the communication between players** – Using the communicative tools made available by the game, one can contact all guild members in an attempt to exchange informal messages, requests for help, or resources that players may need.

**Momentary Cooperation** – one can cooperate by requesting the aid of a guild member. Usually the request involves attacking a stronger adversary or soliciting defense:

*Guys, I need you!!!!*

*Send me troops so that I can  
defend myself in the City of War I*

*because I was attacked and  
they took everything I had!!!*

*Help me and I'll help you if you  
are ever in the same situation. . .*

*(felipe\_mtx<sup>8</sup>)*

**Permanent Cooperation** – Ikariam is the only game that allows the signing of treaties between players. These can be of a cultural, commercial or military nature.

**Wars between Groups** – This is a possibility featured in Ikariam and Metin2. Guild leaders or another person designated by the leader can declare war on clans. In this case, all members ought to prepare for attacks and imminent defense mechanisms. In Metin2 these wars are declared publically within the game environment (Figure 8).

**Figure 8.** The guild “The Forza” declares war on the clan “VENOM7”



**Product Exchange** – Players announce they are in need of a specific product in the hopes that someone will offer it. Hence, the advantages of a guild are recognized by all players regardless of the adopted game strategy.

<sup>8</sup> Translated from the message sent to the alliance NWA using the guild's forum service on 10/6/2009. There is no fixed address.

### ***MMOG Players Survey***

A questionnaire was developed in order to estimate whether or not players understood the cognitive changes provoked by games and if they recognized whether or not this caused a useful reflex in their professional or academic lives. The data collection instrument has three dimensions: problem solving within games, motivation towards tasks and communication and online interaction during games. A Likert scale with five points was used where 1 indicated “I totally disagree” and 5 indicated “I totally agree”.

This instrument took the investigation of Beedle & Wright (2007) into consideration maintaining the same goal. The population of this study is every player of the four analyzed games. In order to spread the survey in one open topic of the official forums, contact was established with the moderators of the forums.

For the games *Ikariam* and *Gladius*, the respective moderators, *Anfira* and *Devil\_Woman\_20* directed to contact the portuguese Community Manager (CoMa), which is directly linked to the company responsible for the game. The contact was made, and for some months the CoMa shows some interest on the subject, but after sending the final version of the survey the contact was ceased.

For the *OGame*, the moderator *Nudge* authorized the realization of this study since it was conducted using only the private message system (MP), and not in an open topic as it was the initial plan. And in *Metin2*, none of the forum moderators answer the contacts.

As in every one of those analyzed game forums have a section for topics unrelated with the game (off-topic messages), we chose to use that space as an initial form of propagation of the survey. And in *OGame* it was also used the MP system. The forums were chosen in an attempt to reach a larger number of players, because even if the participation of players in this environment is not mandatory, the MMOG is a type of game that requires or at least brings benefits to those using the interaction between its players (Beedle & Wright, 2007; Galarneau & Melaine, 2006; Johnson, 2006). In this case it was assumed then, that all active players have some form of participation in the forums.

The survey concerning the four games studied was conducted on-

line. A total of 321 responses were obtained being 107 for Ikariam, 55 for OGame, 56 for Gladius, and finally, 103 for Metin2. All games possess a public that is mainly composed of males (89%). Furthermore, 66% of this total is below the age of 19 and 72% is below a grade twelve education level. The majority of those surveyed use the internet frequently spending over 20 hours online weekly (42%). It is also important to note that these are players have an intermediate experience level in online gaming being as 56% have played from 1 to 4 years.

### *Describing the Survey*

The objective of the survey is to verify if the players, in special the MMOG players, understood the cognitive changes provoked by the games and if they recognized whether or not this caused a useful reflex in their professional or academic lives. In particular, the survey focuses in:

- a) Communication and Interaction skills
- b) Problem solving skills
- c) Motivation to perform tasks

The questionnaire is a simple, fast and easy filing instrument, so that respondents did not lose concentration and interest in completing the task. From this way, we try to guarantee the reliability of the answers, as well as a larger number of completed questionnaires.

#### **The Instrument is Divided in Four Sections**

**Section I – Characterization of the player** - The objective of this section is to determine who the player is. So questions were available to determine age, sex and scholar level of the player.

**Section II – Internet Access and Game's Habits** – It is intend to determine the familiarity of the player with the online and the game environment. For that reason, it was chosen questions about the frequency of internet access and of the game access, for how long did the player plays online and what did the player do online.

**Section III – Learning Perception** – For that third section, a Likert scale with five points was used where 1 indicated “I totally disagree”, 2 indicates “I partially disagree”, 3 was used for “I don’t agree or disagree”, 4 represents “I partially agree” and 5 indicated “I totally agree”. The statements intend to characterize the way as the players realize the effects of the electronic games over the communications and interaction skills (Rosas et al., 2003; Turvey, 2006), the problem solving (Johnson, 2006; Beedle & Wright, 2007) and the motivation to perform some activities (Galarneau & Melaine, 2006; Turvey, 2006).

Besides that, the informations about the communication and interaction skills and the problem solving skills promoted by the games, was conceptualized under two dimensions:

1. The player recognizes that the online game in study, favors certain characteristic;
2. The player is able to use that learned skills under the game environment in the scholar or professional life.

Thus, the statements that characterize the communication and interaction skills fostered by the games are intended to identify: (1) if the game requires collaboration among players; (2) promotes teamwork skills; (3) improves the communication skills of the player; and (4) if players can transfer the communication and interaction skills developed in the game for his life and that if they can use this interaction to solve problems at school or work.

The statements that characterize the ability of problem solving fostered by the games are intended to identify: (1) if the players realize the different ways to achieve a goal; (2) understand the influence of the rules of the game environment; (3) reorder the acquired knowledge when faced with a new situation; (4) if the players can transfer the problem-solving skills developed in the game to his life and if they can use it in their school or professional life.

In turn, for the statements about the motivation to perform certain tasks, they wanted to see if the players feel motivated to (1) assimilate the rules of the game; (2) to search for additional material then the provided by the game; (3) for the achievement of objectives; and (4) to interact with other players

**Section IV – Player’s Opinion** – For this section have been made two free response questions which sought to identify what motivates the player to continue playing as well as for his opinion on whether the online games help on their scholar or professional lives, they were asked to justify the given answer.

### ***Problem Solving Within Games***

The study intended to determine whether or not players understood: the need for dividing a goal into various tasks, if they were able to comprehend the different methods of achieving a goal, if they understood the influence of implicit rules regarding the game environment, if the game situation helped them rethink their knowledge so that they could find ways to achieve goals, if multiplayer games allowed them to ponder the consequences their actions may bring when favoring one option over others, and whether or not they were able to apply capacities developed within the game to their lives academically or professionally speaking.

The means as well as the standard deviation for each of these questions can be found in Table 3.

**Table 3.**  
**Mean and Standard Deviation Calculated for the Survey**  
**Concerning Problem Resolution**

N°	Item	Mean (n=321)	Standard Deviation
13	<i>One must divide a goal into various tasks in order to achieve it.</i>	3,9	1,1
15	<i>The game promotes different problem solving strategies to attain a goal.</i>	3,9	1
10	<i>Achieving a goal is easier when there is a direct link between game rules and goals.</i>	3,9	1,1
03	<i>Game situations help players rethink their knowledge in order to find ways of achieving a goal.</i>	3,9	1,1
07	<i>Multiplayer games allow players to evaluate the consequences of their actions when selecting one option among many.</i>	3,7	1,2
11	<i>Solving problems in this game context has enabled me to do just this in an academic or professional setting.</i>	2,7	1,3

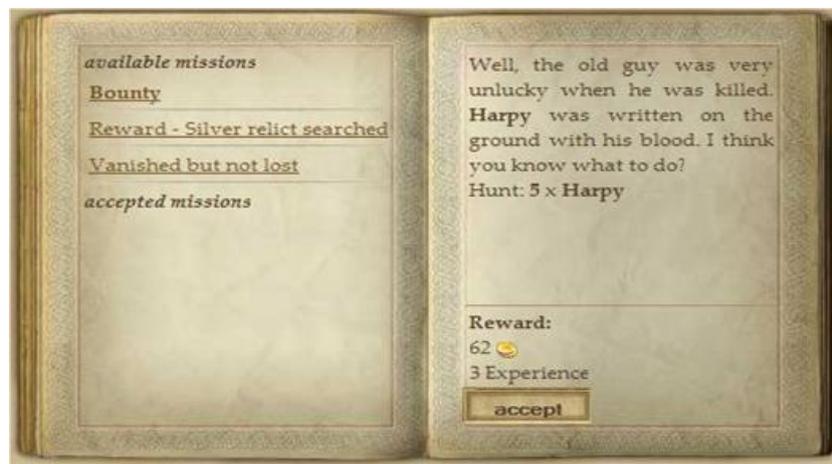
Even though all the results were higher than the estimated mean for the items (2.5), we cannot conclude that players feel that solving game problems aids them in an academic or professional atmosphere. This item displayed a mean of 2.7 with a standard deviation of 1.3. This was the lowest mean. But, the item 13 intended to verify whether or not players understood the need to divide goals into smaller tasks. The answers obtained were positive being as the majority of players (69%-77%) partially or totally agreed with the statement. No more than 49% of Ikariam players totally agreed with the affirmation. This difference can possibly be explained by the fact that for Ikariam, goals are defined in minor detail compared to other games.

The majority of players partially or totally agree with item 15 which inquired about their thoughts on whether or not games demonstrated different ways of achieving a goal. One can contest that even though games do not possess a pre-defined goal, players are aware that what-

ever attitude they adopt within the game results in a point increase regardless of the item that is being measured.

Gladius and Metin2 contain a mission system composed by items quest (Figure 9) that must be performed by the player. These missions possess one single path. Perhaps, it is for this reason that players divided themselves amongst “I neither agree nor disagree” and “I totally agree” on this item.

**Figure 9.** Gladius mission book



The bulk of players partially or totally agrees with the fact that it is easier to perform a task when one is able define the limitations posed by game rules (item 10).

Players also agree, partially or totally, that the game situation allows them to rethink their knowledge when faced with a new situation (item 3). However, in Gladius and Metin2, a large portion of players partially agrees with this affirmation. This may be due to a lower level of game complexity when compared to Ikariam and OGame.

The majority of players are in partial or total agreement when it comes to item 7 which inquired about whether or not they believed games helped them identify the different courses possible when it comes to achieving a goal. The results vary: OGame 56%, Metin2 57%, Gladius 61% and Ikariam 67%.

Players responded differently to item 11 because they adopted a neutral stance with regards to the question at hand. This item tried to verify whether or not players were able to use problem solving skills acquired in the game environment academically or professionally (Table 4). Moreover, 36% of the players disagreed partially or totally with this idea registering 42% for OGame. For this reason, we can say that players have difficulty recognizing that they can transfer problem solving capabilities developed in games to an academic or professional surrounding.

**Table 4**  
**Transference of Problem Solving Capacities Developed in Game Settings to An Academic or Professional Atmosphere**

<i>Solving problems in this game context has enabled me to do just this in an academic or professional setting.</i>	<i>I totally disagree</i>		<i>I partially disagree</i>		<i>I do not agree nor do I disagree</i>		<i>I partially agree</i>		<i>I totally agree</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
<i>Ikariam (n=107)</i>	24	22	19	18	37	35	15	14	12	11
<i>OGame (n=55)</i>	19	35	4	7	17	31	8	15	7	13
<i>Gladius (n=56)</i>	13	23	7	13	24	43	9	16	3	5
<i>Metin2 (n=103)</i>	26	25	13	13	43	42	12	12	9	9

The fact that a big fraction of players does not recognize the possibility of transferring problem solving skills developed in a game setting to their academic lives is in conformity with the fact that teachers and educators are not able to include electronic games in their lessons (Akilli, 2007; Gibson et al., 2007).

### ***Motivation for Task Performance Motivation***

Surveyed players were asked about whether or not the game motivated them towards the performance of certain tasks and/or activities. The common mean of responses on a scale of 1 to 5 is positioned above the average scale numbers with a standard deviation ranging between 0.9 and 1.3 as can exhibited by Table 5.

**Table 5.**  
**Mean and Standard Deviation for the Items Related to Motivation for Task Performance**

<b>Nº</b>	<b>Item</b>	<b>Mean (n=321)</b>	<b>Standard deviation</b>
04	<i>The difficulties I experience while concluding a game level motivate me to discuss game strategies with others.</i>	4,3	0,9
08	<i>My will to play does not diminish even if achieving a goal requires more effort.</i>	3,7	1,2
14	<i>I feel motivated to learn the game rules and commands as soon as I begin playing.</i>	4,1	1,1
16	<i>The challenges put forth by the game motivate me to search for extra material (game forum, specialized sites, etc.) so I can overcome them.</i>	4,0	1,2

These results indicate that players are motivated by the game environment. The socialization power present in games is important. Item 4 questioned players regarding their motivation to interact and communicate with others and this aspect registered the highest mean (4.3) with the lowest standard deviation (0.9) it is apparent that there is a distinction between the need for interaction and the motivational environment put forth by games. It is interesting to note that 50% of Gladius players agreed with this statement when this particular game does not require player interaction.

In item 8, players were asked about motivation when it came to achieving a goal. The majority of Ikariam, OGame and Gladius play-

ers partially or totally agree with this assertion bearing the following results: Gladius 65% and Ikariam 75%. Metin2 registered a significantly lower number of total agreements at 17% and 29% of them neither agree nor disagree. This difference of perceptions can possibly be linked to the mission statements featured in the game which promote the solitary quest for objects. The responses obtained concerning item 14 when asked about the conception of game rules indicate that 45% to 55% of players totally agree.

Item 16 aimed to verify whether or not players felt motivated to search for supplementary material provided by the game itself. The responses obtained specify that more than 70% in all four games, partially agree (25%-30%) and (45%-50%) totally agree with this statement.

### ***Online Interaction and Communication During Games***

The matter placed within this dimension aims to verify whether or not players agree that games promote communication and interaction as well as if they are able to use the newly developed capacities in a gaming environment professionally or academically. The results (Table 6) reveal that players concur that games support these two elements especially when it comes to group work skills. This component obtained the highest mean (4) with the lowest standard deviation (1).

**Table 6.**  
**Mean and Standard Deviation for Items Related to the Promotion of**  
**Communication and Interaction Among Players**

Nº	Item	Mean (n=321)	Standard deviation
05	<i>I find it easier to complete a mission when playing in a group.</i>	3,8	1,2
12	<i>While playing, I find that there are many tasks I cannot perform without the help of others.</i>	3,5	1,3
09	<i>In my experience, playing in multiplayer mode helps me learn how to work in a group.</i>	4	1
01	<i>I can now express myself better thanks to my participation in debates in game forums.</i>	3,4	1,1
02	<i>Interacting with others within the game environment allows me to develop communication skills outside the game.</i>	3,5	1,2
06	<i>Interaction with other players has allowed me to solve academic or professional problems.</i>	2,7	1,2

Meanwhile, the results obtained for item 6 were significantly lower registering 2.7. This question pertained to whether or not players felt they could use communication skills promoted in games to resolve problems in a school or work environment.

Item 5 inquired as to whether or not players felt the game was made easier by collective collaboration. This question obtained favorable results being as 57% of players partially or totally agreed with the statement. Results indicate that Gladius players are uncertain as to the need for player alliance. A little over 1/3 (36%) partially or totally disagree and 43% are in agreement be it partially or totally. This was the only game in which less than 50% of players concurred with the affirmation. The majority of players (at least 64% for OGame) believe that games encourage group work skills. This can be attributed to the fact that MMOG games demand player interaction (Steinkuehler, 2004; Hobbs et al., 2006).

One cannot establish a direct correspondence between the use of the official forum and the improvements in communication reported by players (item 1) because these activities are not linked to game participation. The amount of players in agreement with this idea was restricted in all games, as can be seen in Ikariam where a number below 50% was reported while Gladius registered only 54%.

When questioned about item 2 (whether or not player interaction allowed them to use communication skills in other environments) results indicated that Ikariam players were in agreement with the affirmation registering 66% concordance. The other three games reported numbers above 50%. It is possible to conclude that Ikariam reported a higher amount of agreements because its game structure requires an elevated level of collaboration among players. When speaking of Gladius and Metin2, the number of players that partially or totally agrees is less than the number of those who neither agree nor disagree.

This can be explained by the fact that these games possess a higher amount of tasks that must be performed individually which would limit the instances of communication between players thus making it less viable that they be able to transfer skills acquired during the game to their real lives.

However, in all games analyzed, the amount of players that does not use interaction and communication provoked by game settings to solve problems is superior to those that do (Item 6). Furthermore, the sum of players that neither agrees nor disagrees with this idea is greater in half of the games (OGame 40% and Gladius 41%). The number of Ikariam players that partially or totally disagree with this affirmation is 39% and 43% for Metin2. This outcome shows that even though these games promote player communication, it is informal or merely game related.

### ***Player Motivation***

The study attempted to identify which aspects of each game motivated players to continue playing. In order for this to occur, the questionnaire contained an open question. We obtained 282 responses that permitted

the creation of a classification system (Table 7). The following table displays what players considered as motivational. The social component of games is confirmed by players who reveal that friends encourage them to continue (121 responses). This was the aspect mentioned by most of those surveyed.

**Table 7.**  
**Motivational Aspects Mentioned by Players**

<i>Motivation</i>	<i>Total (n=282)</i>		<i>Ikariam (n=97)</i>		<i>OGame (n=46)</i>		<i>Gladius (n=51)</i>		<i>Metin2 (n=88)</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
<i>Friends</i>	121	25	33	19	20	24	22	23	46	37
<i>Personal success within the game</i>	53	11	13	7	10	12	13	14	17	13
<i>Entertainment</i>	40	8	18	10	4	5	9	9	9	7
<i>Challenges</i>	27	6	15	8	4	5	5	5	3	2
<i>Strategies</i>	25	5	15	8	6	7	2	2	2	2
<i>Alliances</i>	19	4	7	4	5	6	5	5	2	2
<i>Game environment</i>	19	4	9	5	4	5	2	2	4	3
<i>Free time</i>	19	4	7	4	2	2	6	6	4	3
<i>Combat</i>	17	4	9	5	4	5	3	3	1	1
<i>Competition</i>	17	4	2	1	4	5	7	7	4	3

This category is proven as factual in responses such as: “*Friends of mine that play convinced me to start. I’ll stop when they do*”.

The difference that exists between player responses can be explained by the Metin2 game atmosphere because this particular game permits real contact between players using avatars and instant messaging systems available within the game.

Metin2 players stated:

*We are able to socialize with people from different worlds in chats (written and voice) and often times these individuals are great company during long playing nights.*

When it comes to personal success within the game, some players (53 responses) stated that the “will to be the strongest” or “try to improve” is the main reason that explains why they continue playing. For these players, evolving in the game is the main motivation. Entertainment, challenges and strategies are the next aspects mentioned.

Alliances, game environment, free time, combat, and competition were also indicated as motivational factors. These elements are expected in MMOGs and recognized by players even though they were indicated by a lower amount of them.

### ***Are Online Games Beneficial in Academic or Professional Environments?***

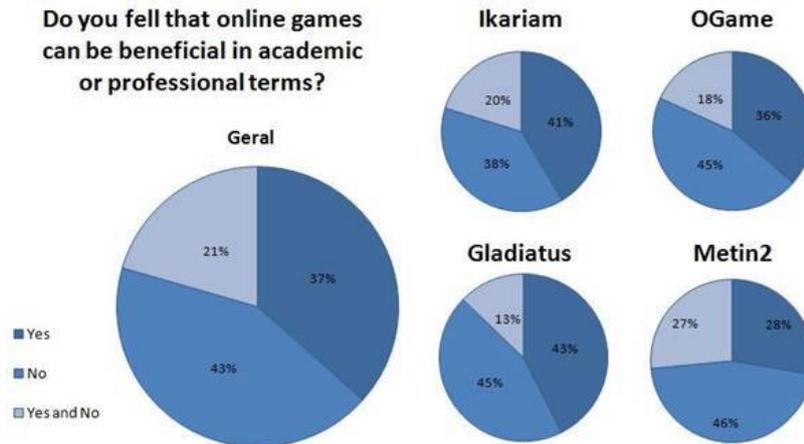
The answers to this question were 268, and 43% of players considered that online games do not benefit life neither academically nor professionally (Graphic 1). This idea is in direct contrast with 37% of players who think they do and 21% who are undecided (agree and disagree).

Metin2 exhibited the greatest difference with regards to responses, 46% of them being negative and 28% being positive (Graphic 1). This difference can be confirmed by the fact that this game places the biggest part of its focus on battles. This way, players can limit themselves to learning a few commands thus making a profound knowledge of the game unnecessary.

The prevalence of negative replies was not registered by Ikariam where 41% of players consider that online games are beneficial on some way.

**Graphic 1.**

Player Opinions Regarding Whether or Not Online Games are Beneficial Academically or Professionally (n=268)



Moreover, as indicated by Table 8, players indicated that the time spent playing games has a negative impact on school or work (n=47). This was reflected in answers such as: “*No, because online games require time. This time would probably be better spent working*”.

This aspect was mentioned by Metin2 players (27% of responses). This can be due to the fact that this game demands special attention during game sessions.

**Table 8.**  
**Negative Categories Between Games and Academic or Professional Life**

Negative categories	Totals (n=268)		Ikariam (n=94)		OGame (n=44)		Gladius (n=47)		Metin2 (n=83)	
	f	%	f	%	f	%	f	%	f	%
Time spent	47	27	12	22	9	33	8	30	18	27
Without motive	40	23	17	31	7	26	7	26	9	14
Merely entertainment	22	13	6	11	2	7	0	0	13	20
Distinction between worlds	18	10	5	9	4	15	4	15	5	8
Addiction	15	9	3	5	3	11	1	4	8	12

Among other negative aspects was the fact that players indicated that games are merely a form of entertainment (n=22) signifying that there is a clear distinction between the real world and the game world (n=18).

Table 8 displays that the majority of players who believed that these four games contribute to their academic or professional lives because they can improve relationships inside and outside of the game (40 players):

*I would say yes. Even though games obviously occupy precious study time, it is obvious that online games stimulate an individual's social component as well as one's perspective regarding problems.*

This result, in combination with others such as the promotion of group work (17 players) and communication (15 subjects) confirm once more the socialization potential contained in these games where player interaction is fundamental. Strategy, stress relief, problem solving, logic thought, and goals were also mentioned (Table 9).

**Table 9.**  
**Positive Categories Between Games and Academic or Professional Life**

<i>Positive Categories</i>	<i>Totals (n=268)</i>		<i>Ikariam (n=94)</i>		<i>OGame (n=44)</i>		<i>Gladius (n=47)</i>		<i>Metin2 (n=83)</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
<i>Interaction</i>	40	16	12	14	9	25	6	16	13	22
<i>Speed of thought</i>										
<i>Without motive</i>	23	9	9	11	3	8	4	11	7	12
<i>Group work</i>	17	7	6	7	3	8	5	14	2	3
<i>Communication</i>	15	6	7	8	2	6	2	5	2	3
<i>Strategy</i>	15	6	4	5	1	3	4	11	2	3
<i>Stress relief</i>	12	5	3	4	1	3	0	0	8	14
<i>Problems solving</i>	12	5	1	1	4	11	4	11	1	2
<i>Logical thought</i>	11	5	6	7	1	3	3	8	1	2
<i>Goals</i>	10	4	3	4	1	3	0	0	4	7

It is important to note that a large number of players, 40 negatively and 23 respectively negatives and positives, did not justify their responses.

### ***Future Research Directions***

The modern technologies of communication and the knowledge society brought an unexpected change, requiring new skills and competences. For over then a decade, the teenagers are increasing their sociocultural literacy by the participation in virtual worlds. Building a new shape of thinking inherent of the social structure and the dynamics of the online learning. Either in a community of practice or by games and simulations, the online environments could be one effective way of promotion

some essential skills for the 21st century like communication, collaboration and independent knowledge search.

The online games present themselves as a supportive environment for the development of competences like the collaboration between teams, the ability of search and work with information and the fast decisions based in preexisting information. Nevertheless, the players are able to distinguish the leisure component of the MMOG from the academic or professional activities. As most of the players don't consider the possibility of transferring the abilities acquired in MMOG to others real life environments.

For that reason it's essential the development of pedagogical and instructional models which incorporate the cognitive benefits bring by the electronic games. Thus should be considered not only in what one could learn with the electronic games, but how is that process working under that leisure environment. One must bear in mind how these online environments can be used as an asset in the process of motivation in the quest for new challenges, persistence in fulfilling the objectives and especially the improvement of interpersonal communication.

## ***Conclusions***

Two complementary studies were also conducted. The first analyzed Ikariam, OGame, Gladius, and Metin2 promote problem solving skills as well as the achievement of goals because they possess an open narrative structure without any indication of the possible paths a player can take. Furthermore, all games count on a wide variety of tasks that demand an elevated amount of cognitive effort. These games benefit from the collaboration of other players in order to help solve problems or in the creation of war between guilds. This permits the acquisition of group work skills. These same characteristics are understood by players however, the majority of players are not able to transfer capacities developed to their academic or professional lives.

Motivational environments are those where players feel at ease to explore virtual worlds thus constructing and testing their knowledge using feedback supplied by the game environment. This statement is a

reflection of answers provided by players that are motivated to interact with other players in an attempt to achieve goals, the acquisition of specific game rules, and the search for supplementary material supplied by the game itself.

These games permit and demand the exchange of information as well as the construction of collective knowledge. Even though these are recognized by players that mention friends as being the main playing motivation and indicate better relationships as being the main positive aspect of gaming, this is also recognized by analyzing the game mechanism as well as the interaction and communicative tools supplied by the companies responsible for the four games. This demand was less experienced in *Gladius* because the player's personal success isn't linked to the group.

However, this study confirmed that there is a clear distinction between the gaming world and the real world. This can be verified by two main aspects: (1) a large part of players believe that they develop capacities such as how to work in a group and solve problems but they are unable to use these skills in a professional or educational environment (2) a large part of players does not consider that games help academically or professionally. For online education, the electronic games represents an extension of knowledge and an interactive room outside the traditional classrooms, in which the virtual is not opposed to reality, it complements.

## ***References***

- AKILLI, G. K. (2007), Games and simulations: A new approach in education?, in GIBSON, D.; ALDRICH, C. & PRENSKY, M. (eds), *Games and simulations in online learning: Research and development frameworks*, *Information Science Publishing*, pp.1-20.
- ALVES, L. (2005), *Game o ver: Jogos eletrônicos e violência*, São Paulo: Futura.
- BEEDELE, J. B. & WRIGHT, V. H. (2007), Perspectives from multi-

player video gamers, in GIBSON, D.; ALDRICH, C. & PRENSKY, M. (eds), Games and simulations in online learning: Research and development frameworks, *Information Science Publishing*, pp. 150-174.

CHRISTOFOLI, J. F. (2006), *Authority distribution in a proxy-based massively multiplayer game architecture*, Tallahassee: The Florida State University.

FERDIG, R. E. (2007), Preface: Learning and teaching with electronic games, *Journal of Educational Multimedia and Hypermedia*, 16 (3), pp. 217-223.

GALARNEAU, L. & ZIBIT, M. (2007), Online games for 21st century skills, in GIBSON, D.; ALDRICH, C. & PRENSKY, M. (eds.), *Games and simulations in online learning: Research and development frameworks*, *Information Science Publishing*, pp. 59-88.

GALARNEAU, L. (2005), *Spontaneous communities of learning: Learning ecosystems in massively multiplayer online gaming environments*, in Proceedings of DiGRA 2005 Conference: Changing Views – Worlds in Play, pp.1-9.

GIBSON, D.; HALVERSON, W. & Riedel, E. (2007), Gamer teachers, in GIBSON, D.; ALDRICH, C. & PRENSKY, M. (eds.), Games and simulations in online learning: Research and development frameworks, *Information Science Publishing*, pp. 175-188.

GOLDSTEIN, J. (2005), Violent video games, in RAESSENS, J. & GOLDSTEIN, J. (eds), *Handbook of Computer Game Studies*, MIT Press: Cambridge, pp. 341-357.

GRAELLS, P. M. (2001) Los Videojuegos: las claves del éxito, in *Enciclopedia Virtual de Tecnología Educativa*, retrieved October 29, 2008, from: <http://dewey.uab.es/pmarques/videojue.htm>.

HOBBS, M.; BROWN, E. & GORDON, M. (2006), Using a virtual world for transferable skills in gaming education, in *Higher Education Academy Subject Network for Information & Computer Sciences*, 5 (3), s/p.

- JAKOBSSON, M. & Taylor, T. L. (2003), The sopranos meet everquest: Social networking in massively multiplayer online games, in *Proceedings of DAC 2003*, Melbourne, Austrália, pp. 81-90.
- JOHNSON, S. (2006), *Tudo o que é mau faz bem: Como os jogos de vídeo, a TV e a Internet nos estão a tornar mais inteligentes*, Lisboa: Lua de Papel.
- KLOPFER, E (2008), *Augmented learning: Research and design of mobile educational games*, MIT Press: Cambridge.
- LÉVY, P. (2010), From social computing to reflexive collective intelligence: The IEML research program, *Information Sciences*, 180, pp. 71-94.
- MANNINEN, T. (2003), Interaction forms and communicative actions in multiplayer games, in *The international journal of computer game research*, 3 (1). Retrieved October 14, 2009 from: <http://gamestudies.org/0301/manninen/>.
- NATKIN, S. (2006), *Video games & interactive media*, Wellesley: A K Peters.
- PIVEC, P. (2009), *Game-based learning or game-based teaching?* retrieved September 30, 2009 from: <http://emergingtechnologies.becta.org.uk/index.php?section=etr&rid=14692>
- PRENSKY, M. (2003), Digital game-based learning, in *ACM Computers and Entertainment*, 1 (1), Book 2.
- PRENSKY, M. (2005), Computer games and learning: Digital game-based learning, in RAESSENS, J. & GOLDSTEIN, J. (eds), *Handbook of Computer Game Studies*, Mit Press: Cambridge, pp. 97-122.
- SILVA, B. (2002), A Glocalização da Educação: Da escrita às comunidades de aprendizagem, in *O particular e o global no virar do milénio, cruzar saberes em educação*, proceedings of the V Congresso da Sociedade Portuguesa de Ciências da Educação, Porto: Sociedade Portuguesa de Ciências da Educação, pp.779-788.

- SQUIRE, K. (2002), Cultural framing of computer/video games, in *The international journal of computer game research*, 2 (1), retrieved October 14, 2009 from: <http://gamestudies.org/0102/squire/?ref=HadiZayifla.Com>.
- STEINKUEHLER, C. A. (2004), Learning in massively multiplayer online games, in *Proceedings of the 6th international conference on Learning sciences*, Santa Monica, California: International Society of the Learning Sciences, pp. 521-528.
- TEIXEIRA, M. (2009), *Análise da rádio web como uma interface dinamizadora da prática educativa: Estudo de Caso da RUM*, Master Dissertation, Braga: University of Minho, pp. 157.
- VAN ECK, R. V. (2006), Digital game-based learning: It's not just the digital natives who are restless, *EDUCAUSE Review*, 41 (2), pp. 16-30.
- WILLIAMSON, B. (2009), *Computer games, schools, and young people: A report for educators on using games for learning*, retrieved September 30, 2009 from: [http://www.futurelab.org.uk/resources/documents/project\\_reports/becta/Games\\_and\\_Learning\\_educators\\_report.pdf](http://www.futurelab.org.uk/resources/documents/project_reports/becta/Games_and_Learning_educators_report.pdf).