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Multi-player Online Role-play Simulation Games for Learning in Higher Education:

Student Motivation and Engagement

by

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ABSTRACT

This thesis examines the motivation and engagement of students using multi-player online role play simulation games (MORPSGs) to learn in higher education. Our research questions are: 1. To what extent do the design properties of a multiplayer online role-playing simulation game (MORPSG) explain the perceived motivation of higher education students to learn using MORPGS? and 2. To what extent do the design properties of a MORPSG explain the perceived engagement of higher education student in learning using MORPSG?

The research literature on role-play simulations, mostly relying on constructivist theory, generally reports that role-plays motivate and engage students (Linser, 2011a). However, this body of literature is marred by (a) lack of clarity of terms; (b) absence of definitions; (c) multiplicity of structural designs and media; and consequently (d) at best, resulted in anecdotal evidence and hence remains empirically problematic. (Shaw, 2010; Baranowski & Weir, 2015)

The current work attempts to remedy this situation. We clearly define role-plays relative to games and simulations as a dynamic artificial environment representing a simplification of a real or fictional social system in which participants interact with one another as roles with given characteristics, objectives and relations (social rules) to one another and within a specified scenario (set of conditions/state of affairs.

From this definition we deduced a model to conceptualize role-plays as necessarily composed of five structural components: Players, Roles, Interaction, Scenario and Environment. Using this structure, we show how each of these structural components can have a wide variety of design properties.

Given the scope of this study we have chosen to focus on only the first three components – Players, Roles and Interaction and chose 20 design properties: 7 that relate to the Player component – whether players preferred to play anonymously, perceived role's relevance to the player, perceived player's identification with the role, the player's preference to play on their own or in teams, whether players actually played anonymously, whether they were able to choose roles and whether they actually played one of their chosen roles; 6 properties relating to the Role component - the perceived centrality of the role played to the scenario, the perceived

objective of the role played, the perceived expected strategy of the role, the number of roles in the MORPSG, the number of players per role, and the type of role played; and finally, 7 Interaction properties – the number of days played, the total time spent playing, time spent on only reading, time spent on only interacting, time spent before and after playing, the number of messages sent, and the number of words used in playing.

The present study thus evaluates the relation between these various design properties of MORPSGs, and the students' perceived motivation and engagement for learning in higher education.

To do so, we gathered data from two MORPSGs that used the same software (Fablusi) to design and deploy the MORPSGs, had both different and similar design properties, and run twice in two different courses located in two different higher education institutions (n=84). We used a mixed quantitative method for collecting the data, that brought together 1. student responses to a questionnaire that gathered (a) student background data, (b) their perceptions and evaluations of the properties of their MORPSGs; and (c) their perceived motivation and engagement; and 2. data analytics collected from the software (Fablusi). From a population of 155 students, 84 answered our questionnaire.

We then examined the extent to which each of the 20 selected design properties correlated with the perceived motivation and engagement of students. We found that 9 of these properties, significantly correlated with both motivation and engagement, 3 properties were significantly correlated to student motivation but not to engagement, and 3 other properties were significantly correlated to engagement but not to motivation. In sum, 12 properties significantly correlated with motivation and thus can to some extent explain the students' perceived motivation levels. Similarly, 12 properties significantly correlated with engagement and thus can to some extent explain the student's perceived engagement levels.

Notwithstanding the above findings, our research has some methodological issues that limit our ability to generalize regarding student motivation and engagement in using MORPSGs in higher education. Firstly, our number of respondents is relatively small (n=84) though it is clearly representative of the research population (N=155) it is not representative of higher education

students generally. Secondly, examining only 2 MORPSGs run twice clearly cannot adequately represent MORPSGs generally. Thirdly, we have collected the data from two completely different courses, each running a different MORPSGs, and we have collected the data in each of these at two different points in time (a year apart) in order to increase the number of respondents. Thus, we could not have guaranteed the similarity in characteristics of the separate groups. Fourthly, we did a bivariate analysis that examined correlational value of variable pairs but did not carry out multivariate analysis to find the extent to which various variables correlate in explaining motivation and engagement. Finally, we have used the same environment, the Fablusi software, for both MORPSGs. The lack of comparison with other platforms excludes data that may have repercussions on student levels of motivation and engagement.

While none of the above issues can be ignored, we nevertheless demonstrated an innovative methodology of data collection using student perceptions of the MORPSGs in conjunction with using data analytics of these MORPSGs as well as finding patterns that may provide some interesting perspectives that future research can address in more detail.

In conclusion, we can provisionally assert that the design properties of MORPSGs can to some extent explain the motivation and engagement of higher education students using MORPSGs. Furthermore, this study points to a potentially powerful way to examine role-plays empirically from the point of view of their design properties. It outlines the beginning of a theoretical model of role-plays that enables an empirical comparison of different role-plays, as well as distinguishing them from games and simulations. Thus, this study helps to remedy some shortcomings of past research. From a practical point of view, it enables teachers, academics and designers, to develop research-based designed role-plays. By selecting design properties for the different structural components appropriate to their particular students yet comparable to other and different role-plays for research purposes, such role-plays are likely to contribute to higher student levels of motivation and engagements and thus to deep learning as the constructivist theory suggests.

1. Introduction to Role-play in Education

Role-playing as a technique for learning, whether for the acquisition of knowledge, skills or understanding, has played both a formal and informal part in the experience of learners throughout human history (Akilli, 2007).

The revolution in Information and Communication Technology (ICT) that transformed modernity has also reshaped education generally and with it created new modalities for role-playing (Linser et al., 2004a; Linser et al., 2008). As a technique for learning in higher education role-plays that previously necessitated presence in time and space sometime with the aid of asynchronous media such as paper slips with written messages, have since the 1980s been transformed into a plethora of multi-media web technologies used for learning in higher education (Vincent & Shepard, 1998), These advanced technologies have enabled the creation of new virtual spaces for interaction that allow both mixed synchronous and asynchronous, public and private, communication in which players can remain anonymous. As opposed to teacher-centered classroom instruction, and even student-centered learning, as in classroom role-plays where anonymity is impossible, in online environments the roles assume center stage allowing the students to remain anonymous and to reflect on their creation as if the roles were objects outside themselves.

Given the increasing use of games and simulations for educational purposes generally (Gibson et al., 2014; Mayer et al., 2013; Ireland et al., 2006), and more particularly role-play simulation games (Linser, 2011a), it would be useful to re-evaluate their online use to better understand their potential and implications in motivating and engaging students. In the current competitive environment of higher education, the level of motivation and student engagement in the learning process are prominent issues (Bonk & Zhang, 2006; Rao & Stupans, 2012; Abdul Jabbar & Felicia, 2015; Stevens, 2015). Moreover, because role-plays enable students to experience their subject matter as a community of practice it prepares them for the roles they may assume in their working lives (Jarvinen, 2007).

The present study aims to investigate some of the implications of such multiplayer online role-play simulations games (MORPSGs) for learning in higher education.

2. Theory and Research Rational

Role-plays, simulations and games are often grouped together and recommended as a constructivist educational technique because, they can provide a social context in which authentic problems are encountered, they are experiential, collaborative and can achieve the objectives of deep learning, higher order thinking and understanding complex phenomenon (Eshet & Hammer, 2006 (Hebrew); Isomäki & Marttunen, 2001; Jasmine, 2010; Bonk & Dennen, 1999; Shapiro & Leopold, 2012; Dingli et al., 2013; Babacan, 2011).

However, from the point of view of the learner, there are at least two variables that enhance or hamper the effectiveness of this learning technique to fulfill its promise: motivation and engagement (Greenblat, 1981; Lantis, 1998; Bonk & Zhang 2006; Edwards et al., 2008). If a game or role-play is not motivating to students the chances of fulfilling the promise of deep learning, higher order thinking, etc. is not likely to be fulfilled. And even if students are motivated but, for whatever reason are not engaged in the activity - though one would expect that motivation would lead to engagement - again, the chances of this constructivist technique leading to successful learning decreases significantly.

The aim of this research is therefore to investigate the degree to which the new multiplayer online role-play simulation games (MORPSGs) are perceived by students in higher education as enhancing or decreasing their motivation and engagement in using this technique for learning.

2.1 Role-play Simulation Games – Definitions

Curiously, despite the reported increase in the use of online role-play simulations in higher education in the past 20 years (Linser, 2011a), there are very few studies of role-play that define the term. Most studies of role-play simply assume that the concept of role-play either needs no definition because it is clearly understood or that it is simply too difficult to define (Shapiro & Leopold, 2012). Moreover, terms like role-play, role-play simulation, role-playing game, role-play simulation games, role-based learning, scenario based learning and other similar terms, are used interchangeably in different studies and even within the same study (Tompkins, 1998). Finally, there seems to be no distinction between role-play that occurs in face-to-face contexts and role-playing that occurs in various online media.

Where a definition is provided, it often lacks the rigor needed to clearly distinguish role-plays as a category that differs from games, simulations and other related phenomenon like what actors do on a stage in a theatre or a movie or having a role in a social context like mother in a family or chairman of the board in a company (see Reigeluth, 1996, below).

In contrast to the poverty of definitions of role-play, there is a plethora of definitions and analysis of games and simulations which are distinguished from role-plays but with which role-plays are often associated (Salen & Zimmerman, 2003; Sauvé et al., 2007).

Salen and Zimmerman (2003) for example, in a meta-analysis of some of the more prominent definitions of games, provide the following definition "A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome." (Salen & Zimmerman, 2003, p. 80). Role-playing games they argue are a limiting case to their definition because they do not necessarily have quantifiable outcomes. They do nonetheless acknowledge that whether a role-play game qualifies to be called a game depends on the framework from which it is viewed, as some role-play games do indeed have such outcomes.

Like for games, there are various definitions of simulation. Some insist that simulations are closed dynamic artificial systems designed to act ″like″, or ″similar″ to, a ′real′ system, as Sauvé and colleagues suggest (2007). They define simulation as "a simplified, dynamic and accurate model of reality that is a system used in a learning context" (Sauvé et al. 2007, p. 4150). While others suggest that simulations can also be representations of imaginary environments. Thus, Akilli defines simulation as "an interactive abstraction or simplification of some real life… or any attempt to imitate a real or imaginary environment or system." (Akilli, 2007, p. 4).

Though there are no clear definitions of role-plays, there are various descriptions of what constitutes a role-play (Feinstein et al., 2002; Loui, 2009; Sancho et al., 2009; Druckman & Robinson, 1998). One study on instructional design, for example, describes role-play as ″a dramatized case study; a spontaneous portrayal (acting out) of a situation, condition, or circumstance by elected members of a learning group.″ (Reigeluth, 1996, p. 22). However, this seems to apply to classroom face-to-face role-plays and is situated within a framework that subsumes it under case studies with theatrical connotations rather than games and simulations.

Generally, as noted above few define role-play, nor clearly distinguish it generally from games and simulations. The problem with lack of definition is that it makes comparative results of studies on the role-play difficult if not impossible to evaluate (as Sauvé and his colleagues argue in relation to simulations - see 2.3 below). For the current purposes, based on the definitions of games and simulations provided by Salen and Zimmerman (2003) and Sauvé and his colleagues (2007) respectively, we propose to define a 'role-play simulation game' as *a dynamic artificial environment representing a simplification of a real or fictional social system in which participants interact with one another as roles with given characteristics, objectives and relations (social rules) to one another and within a specified scenario (set of conditions/state of affairs).* (Linser, 2011a).

Thus, a role-play is a simulation to the extent that it represents a simplified dynamic model of a real or fictional system. Yet, it is distinguished as a specific type of simulation in which participants interact within this system. Like simulations but unlike games, the system may or may not have quantifiable outcomes. A role-play with the objective of understanding or knowledge of some process is thus a role-play simulation, while a role-play that includes some type of scoring for activities, or which ends up with winners and losers is a role-playing game. But unlike games in which the rules are arbitrary, and closer to simulations (which take the relations in the real world as given values), the necessary rules for playing are social rules which can be negotiated and redefined as part of the interaction between players. In Piaget's terms, they are rules of 'self-restraint' and 'self-determination' (Vygotsky, 1933: pp. 5-6) bounded by the social context of which they constitute and simultaneously, within which they are embedded.

Table 1: Simulations, Games and Role-plays: A comparison

	Simulations	**Games**	**Role-play**
Model	Real system	Fictional system	Real or Fictional system
Rules	System rules	Arbitrary rules	Social system rules
Interaction	With the system	With or within the system	Within the system
Interaction type	Neutral	Conflict	Conflict &/or consensus
Input by	System/learner	Player	Player-role
Outcome	Quantifiable	Quantifiable	Quantifiable and/or non-Quantifiable

2.2 Role-plays, Games and Simulations in Constructivist Learning Theory

While the early theoreticians of constructivism like Dewey, Vygotsky and Piaget, have considered the impact of play in children's early cognitive, emotional and social development they did not always distinguish between games, play and role-plays. Nor did they really consider these activities as learning techniques beyond adolescence. It seems that for them the critical issue was the very fact of playing and its effects on the cognitive and emotional development of children (Dewey, 1916; Vygotsky, 1933; Piaget, 1926).

Vygotsky, for example, who mentions the contribution of Piaget in this regard, considered all playing as having rules, though not formalized rules in advance, thus (as will be discussed below) making an implicit distinction between playing games and role-playing. As he points out, "…there is no such thing as play without rules and the child's particular attitude toward them… The child imagines herself to be the mother and the doll a child, so she must obey the rules of maternal behavior" (Vygotsky, 1933: pp. 5-6). The difference between rules of play to rules of games is that "In the first place, they are made by the child himself; they are his own rules, as Piaget says, rules of self-restraint and self-determination." (ibid. 8). Thus, in Vygotsky's formulation the distinction between play and game made by Salen and Zimmerman collapses. But the distinction between formal rules found in games and ad hoc informal rules used in play, including role-play, in Vygotsky's example, remains.

While games and simulations for learning have received considerable theoretical attention (Salen & Zimmerman, 2003), role-plays have generally received little or no theoretical consideration from constructivist theory, either excluding them because they fall outside the definition of games and simulations (Salen & Zimmerman 2003; Sauvé et al., 2007) or grouping them together as a technique, but without explicitly considering how they are related (Feinstein et al., 2002).

2.3 Role-plays, Games and Simulations in the Research Literature

Though there are many studies of role-plays in higher education, the research evidence on the use of role-play simulations, in both face-to-face and online environments, is mostly anecdotal (Shaw, 2010; Raymond, 2010; Schnurr et al., 2014). Nevertheless, it still seems to suggest that

role-plays motivate and engage students (Vincent & Shepherd, 1998; Shaw, 2004; Raymond, 2010; Schnurr et al., 2014).

The anecdotal evidence in past and current research on role-play simulation games is closely tied to the fact that, there is no agreed terminology in the literature (Shaw, 2010). As Sauvé and his colleagues have argued, research finding on the effectiveness of games and simulations for educational purposes show mixed results because there is no agreement on terms (Sauvé et al., 2007). In the research literature on role-plays terms like role-play, simulation, game, role-play simulation, role-playing game, role-play scenario, scenario-based learning, role-based learning and others, are used interchangeably not only across different studies, but even within studies themselves (Shaw, 2010; Linser, 2011a). Thus, as Sauvé and his colleagues argued in relation to games and simulations, this terminological chaos makes comparing results of studies on role-play simulation games in higher education also problematic (Sauvé et al., 2007).

2.4 Structural components and design properties of MORPSGs for education

One of the consequences of the lack of definition of role-play in the literature is the lack of discussion on what exactly constitutes role-play. That is, there seems to be no discussion on the essential structural components for role-plays in contradistinction to games where the definition leads to a well-developed description of the essential constituents of a game (Salem & Zimmerman, 2007) or the essential components of simulations (Sauvé et al., 2007).

Given our definition above, theoretically it follows that every role-play simulation game must have at least five basic structural components: an environment for social interaction that represents a simplified model of some world (or part of it); players who play the roles; roles with definable characteristics, objectives and relations to one another (social rules), interactive communication between roles, and a scenario (specifiable set of conditions or state of affairs within that world). Each of these structural components may be designed differently to achieve the learning objectives of the role-play and the differential design may have different effects on the student levels of engagement and motivation to participate. In what follows, these structural components are elucidated and some of their design properties explicated. Given the limitations of this study, the focus here is only on 3 structural components (Player, Role, Interaction) and

some of their design properties, with only a cursory view of the last 2 components (Environment and Scenario).

2.4.1 Players – the student as player.

The players, in our case students, play the roles, or rather bring life to the roles. It is the student-player's empathetic understanding and interpretation of the role, its characteristics, objectives, capacities and social relations to other roles which forms the basis for the actions of the role and interaction between roles (Shaw, 2010). Unlike games and simulations, the student-player's knowledge and understanding of the world being modeled and the social roles within it, determines the rules of play – the social rules of interaction – in contrast to the arbitrary rules of games or the given built-in rules of simulations (Linser, 2011b). It is the student that must research the role to be played and as player transform the knowledge gained into action in the role-play. In other words, the player must keep in mind the details of the world being represented and it is their imaginative capacity to use these details and their perceived potential impacts whilst playing. Unlike games and simulations where the rules are explicitly pre-defined, in role-plays it is the player that brings his/her explicit and implicit understanding and knowledge of the world into the role-play.

2.4.2 Roles – the interactive agents.

At the most basic level, and what distinguishes role-play generally from games and simulations is the fusion of the player and role within the system - the role, is the central pillar of any role-play (Druckman & Ebner, 2013). Roles are the interactive agents in the system. They define the specific social relations being represented in terms of their scope for potential activity and behaviors to be expected. As indicated above, roles draw their life – their actions and interaction within the system - from the player's interpretation and/or understanding of the expected characteristics, objectives and relations in the world being represented in this environment (Shaw, 2010).

It is important to underscore that motivation of the role is not the same as the student-player's motivation to play or to learn. Rather, as an interpretation of the player's understanding, the role's motivation belongs within the model representing the world in which the subject matter appears,

while the student-player's motivation belongs outside the model and within the real world of the student – the course, the university, teachers, classmates etc. In the language of motivation theory (section 2.8 below), the student's motivation is extrinsic to the role-play (e.g. achieving good marks), the players' motivation is intrinsic (e.g. enjoyment of playing), while the role's motivation is intrinsic to the world of the role-play and defined both by the role's particular and expected characteristics and the scenario being played out.

2.4.3 Interaction – communication between roles.

Interaction refers to the actions and communication between roles during game-play. The social rules of interaction between roles are premised on the same interaction rules in the real world in which such roles exist (Linser, 2011b). While the social rules and norms of interaction are not necessarily formally or explicitly stated, they are usually understood given the relation between roles, (for example, the relations between CEO and other personnel in in the company, or between nurses and their patients or newspaper journalists and interviewees.) Whatever they maybe, these social rules, relations and norms of interaction are continuously negotiated and even transgressed during game-play as they are in the real world. And whatever form they may take they are imbedded in the communicative acts of the roles.

The duration of interaction and how the interaction is implemented, depends on the environment (below 2.4.5), the scenario (below 2.4.4), the role structure (above 2.4.2) and the parameters defined by the course coordinator who implements the role-play in the particular course. Thus, interaction is defined by the means used to communicate (e.g. text, audio etc.); who communicates with whom and why (e.g. President's messages to the Secretary of State on arms negotiations); how many times they must communicate (e.g. minimum 2 messages per day) length of messages required (e.g. 400 words for the role profile); and the duration of the whole role-play (e.g. 5 days, 2 weeks etc.)

2.4.4 Scenario – Sets of conditions/State of Affairs.

Scenario specifies a set or sets of conditions or state of affairs present in the model world that problematizes the issues of the subject matter (Russell & Shepherd, 2010). It may also include the end state of affairs which the roles must strive to achieve by the end of the role-play. The scenario

may be presented as simply a picture, narrative description or a video that outlines the initial conditions or state of affairs – a sort of kick start (Gjedde, 2015). However, while it includes a kick start – a state of affairs to which the roles first need to respond, the scenario may also be conceptualized as a dynamic and evolving sets of conditions and affairs that are continuously probed, modified and negotiated by the interaction between roles - each action taken by a role feeding back into the system. It thus sets new conditions/affairs in the modeled world as a sequence of in-world events – a dynamically evolving scenario (Naidu, Ip and Linser, 2000; Linser, Naidu and Ip, 1999). It may be a fictional textual narrative, a short story or a news item or a case study taken from the real world. It may also be a series of such items that are inserted into the role-play at different points during game-play.

2.4.5 Environment – a model of the world or the world as a model.

The environment is the space in which communicative interaction between roles occurs and simultaneously refers to two different but interrelated aspects: the world which is being modeled and the means used to model that world. For example, let's say that the world being modeled is a children's day care center and the means is a set of online discussion forums where different areas of the day care center, like the playground, the manager's office and even the home of one of the children represent these areas. In a different context it may be a class room or an online discussion forum that represents the real world of nation states (as in UN model simulation) or representing a single office or even a water cooler around which people gossip (Shaw, 2010; Russell & Shepherd, 2010). For educational purposes, the environment embeds the subject matter under study as a simplified representation of the real world in which the subject matter studied appears. Online it may be presented as a background image, or as a 3D world while the details of the world represented remaining in the imagination of the player. In a sense, the world of the subject matter is a constraint for the model of the world for the role-play. But the means of representing that world may vary from face-to-face classroom to various online platforms.

2.5 Design properties and student motivation and engagement

While the basic structural components outlined above, are present in every role-play simulation game, there is a wide variety of ways in which the properties of these structural components are

designed and/or implemented for different educational purposes and objectives. Without first attending to the variable design properties of the basic structural components, the results of studies on the contribution of role-plays to student motivations and engagement are difficult, if not impossible, to coherently organize for the purposes of comparison and evaluation. Moreover, without first considering these variable design properties it is difficult to design effective role-play simulations for particular educational purposes (Stevens, 2015). Given the limitations of this study, in what follows only some design properties of the Player, Role and Interaction components are explicated and exemplified while those of the Scenario and Environment components are only briefly mentioned.

2.5.1 Design properties of the "Player" component.

There are diverse designs by which the properties of the "Player" structural component can be implemented. Some role-plays are designed so that the student-players remain anonymous (Cornelius et al., 2011; Linser et al., 2004), others allow the players to know who is playing each role (Shaw and Mendeloff, 2007; Coll-Garcia & Linser, 2006.)

The argument for the first case is that student-player anonymity provides the advantage of safety and freedom to freely express ideas by lessening the pressure of performing in front of one's peers (Lybeck et al., 2010; Wills et al., 2009; Linser et al., 1999), or that ideas can be more fully developed and traditional biases and prejudices (relating to cultural expectation or gender issues) minimized (Babst et. al., 2012; Kaufman, 1998). Similar advantages of anonymity to encourage participation are reported in the wider literature on online teaching using discussion boards MOO and SL environments (Mckenzie et al., 2003; Shortridge et. al., 2007; Freeman & Capper, 1999; Li, 2006; Barrett, 2008) or for peer-assessment (Ward et. al., 2004; Zins, 2000).

On the other hand, arguments for allowing students to know who is playing other roles (lack of anonymity) remind us of the disadvantages of anonymity, such as insensitivity to others, aggressiveness, and predatory behavior because anonymity lowers inhibition and thus provides opportunity for inappropriate behavior, bullying, and the use of offensive remarks and actions to harm or denigrate another student's opinion (Seo & Tindall, 2010, Freeman & Bramford, 2004). Given the anecdotal evidence of much of the literature, the issue whether anonymity contributes

to student motivation and engagement as argued by the proponents of anonymity or whether, as argued by detractors, it opens the possibility for inappropriate behavior that may detract from student motivation and engagement, remains an open question.

Though whether or not a role has personal relevance to a particular student-player or the student-player identifies with the role they are playing may not seem to be properties of design they are nevertheless properties that need to be considered in relation to the motivation and engagement of students. Thus, some MORPSGs are designed so that the roles would have personal relevance to the player-student and/or designed so that players are likely to identify with the role they are playing. A MORPSG designed for a professional development nursing course on the topic of managing difficult behaviors of patients, set up nursing and client roles with which the student nurses are familiar (Nelson & Blenkin, 2008.) Similarly, a MORPGS set up for Norwegian emergency service personnel to develop their intercultural skills, created roles of Norwegian emergency service personnel deployed in a foreign context like Sudan and required them to communicate in English rather than Norwegian (Linser et al., 2008). The assumption in both cases is that students would be more motivated and engaged if they find the roles to have relevance to themselves or if they can identify with the role's expected motivations and interests.

Giving students a choice to select which role they want to play is another "Player" design property that aims to motivate and engage students (Cornelius et al., 2011). Similarly, for Mandernach (2015) engagement rests on the choices made by students as well as on the opportunities available through the institution. For some MORPSGs the opportunity to allow students to choose a role to play from a list of possible roles is provided, while in other MORPSGs roles are simply allocated to the students.

What is clear in the literature is that in the majority of role-play simulations reported, students are given the opportunity to choose roles (Lantis, 1998; Ip & Linser, 2001; Nelson & Blenkin 2008; Ching, 2014; Rector-Aranda et al., 2015), while some simply assign roles to the students (Newberry & Collins, 2012). Perhaps this is not surprising given that Constructivist theory seems to generally promote giving choice to students (Bandura, 1999; Sharan & Sharan 1992) as it is closely associated with a learner-centered perspective (Bonk & Dennen, 1999), autonomy (Hew,

2014), ownership (MCgrail, 2007; Kearney & Schuck, 2005), self-regulation (Brown, 2007), empowers students to take control (Chou, 2001) and leads to experimentation and self-efficacy (Gibson et al., 2014). Moreover, providing students with choices, it is argued, leads to both motivation (Deci & Ryan, 1985; Pintrich, 2004; Lafrenière et al., 2012) and engagement (Skinner et. al., 2008; Berson et al., 2008).

But even when such a choice is provided, it may happen that not all players actually play the role that they chose. It maybe that not all students get to play their chosen role, or only get to play their 2nd or 3rd preference or even don't get to play any of their preferred roles but are allocated a role by the lecturer. Whether or not, students play their preferred role may thus influence the player's level of engagement and motivation.

2.5.2 Design properties of the "Role" component.

Roles vary considerably in the way they are designed for different educational purposes. Depending on the area of study and the specific scenario that represents it, as well as the objective of the role-play, role-plays may be designed with few central roles and many peripheral ones or with all roles having equal weight, or perhaps with few peripheral ones whilst most roles are central and critical to the scenario (Coll and Ip, 2008). Though there seems to be no consideration of students' perception of the role's centrality in the literature, constructivism's insistence on placing the student at the center of the learning process (Cornelius et. al., 2011; Semple, 2000; Chou, 2001) suggests that students who perceive their role to be peripheral to the scenario would be less motivated than students who perceive their roles to be more central.

Regardless of the variations on the centrality of a role in relation to the scenario, the type of objective roles must achieve (individual objectives vs. common objectives) in relation to the scenario, as well as the strategy expected to be used to achieve these objectives (cooperative strategy vs. competitive strategy) are properties that, like in adventure and strategy games, is related to the motivation and engagement of the student (Amory et al., 1999). In an analytical comparison between seven role-plays, Linser, and his colleagues, (2008) argued that individualized type of objectives rather than a common objective for all roles, as well as competitive strategy (conflict vs cooperation), are more motivating and engaging for students.

Their evidence however is mostly anecdotal and thus the question whether these properties of roles make a difference to student motivation and engagement remains an issue to be investigated.

Some MORPSGs are structured so that roles are played in teams – that two or more players play the same role as a team rather than each player playing a role by themselves. Whether roles are played collaboratively as a team or as individuals depends on whether collaborative action forms part of the objective of the role-play and/or whether collaboration is a feature for course assessment by the role-play coordinator (Nelson, 2008). Furthermore, where roles are played by a number of players as a team, the intra-dynamics within the role adds another level of collaborative interaction between players. Given that constructivist theory recommends collaborative learning (Ertmer & Newby, 1993), playing roles collaboratively may also help motivate and engage students using MORPSG for learning. Yet, though constructivist literature on collaborative learning suggests that collaborative work is motivating and engaging (Anderson & Armbruster, 1990; Moore, 1995; Ellis & Newton, 2004; Bonk, 1999; Rice, Wilson & Bagely 2001; Donnelly & McSweeney, 2009) there seems to be very little work on whether collaborating in playing a role is also more motivating and engaging (Kaufman 1998; Chou & Hart, 2009) or whether in role-plays, playing a role on their own, as in 1st person shooter games, students are more motivated and engaged. However, regardless of how a MORPSG is structured, players may prefer to play on their own, or they may prefer to play their role in teams. The former perhaps gives players a sense of total control over the role's action, the latter enables them to discuss what actions the role should take.

MORPSGs may have many roles or a small number of roles. The total number of roles is a design property of role-plays that the literature ignores. But a large number of roles may enable players greater variety and choice in the interactions they can enter into. A larger number of roles may give players a better sense of the world being modeled, while smaller number of roles may focus attention of players on specific features of that world (Nelson & Blenkin, 2008).

Finally, some roles may be designed on the bases of either real world personas or just their function – particular vs. generic (e.g. President Clinton vs. The President) that exist in the world

being modeled (Matz & Ebner, 2011). The latter type is a focus on the social function, the former type, apart from the social function, also includes personal characteristics and known inclinations of a particular real-world person occupying such a social function. Linser, and his colleagues, (2008) observed that the greater the link of roles to real world personalities, rather than functional or fictional ones, the more motivated and/or engaged players will be because it refers the player to the real world in a reflexive process of role identity and real player identity. If centrality of a role can refer to the constructivist recommendation of placing the learner at the center of the learning process, the use of real-world personas means placing the player in authentic contexts. Perhaps because the more obvious the relations to reality, the more students feel they are engaged in a productive enterprise of learning.

2.5.3 Design properties of the "Interaction" component.

There are diverse designs by which the properties of the "Interaction" structural component can be implemented. As previously noted, (2.4.3 above), the contexts in which interaction occurs could be face-to-face interaction, visual and spoken, or written communication. The interaction maybe designed to occur within a group discussion or designed to be limited to one-on-one. It may be synchronous, asynchronous interaction or both simultaneously. Each of these are design properties creating different impacts and effects that may be related to the players engagement in the interaction, and motivation to interact.

Students' time-on-task with educational activities, is a key component of current definitions of engagement (Mandernach, 2015; Kuh, 2003, Salmon, 2003). Thus, the frequency of interaction, the number of days played, the total number of hours invested in playing, the number of hours invested in interaction vs. the hours spent on reading, the hours invested before and after playing, the number of messages and length of their messages, are all indicative of the level of engagement of the students, and perhaps also the extent to which they are motivated (Huizenga et al., 2009). While students may be given the freedom to decide how much they interact, it may also involve specific instructions as to the minimum and/or maximum number of messages they must submit per day or week etc., or the number of hours they must complete (Linser & Coll, 2006). At any rate, the total number of hours a MORPSG may take, the duration, is a design

property that is quantifiable. It may be for a few hours, a few days, a few weeks or even a semester long role-play (Linser & Rashid, 2011). How much of the student's time it takes is likely to influence the student engagement and motivation to participate in the role-play (Amory et al., 1999).

2.5.4 Design properties of the "Scenario" component.

The "Scenario" component is obviously designed to meet the learning objective of each MORPSG and there is a variety of ways by which this can be accomplished. The scenario may be designed as a single textual document or video, which all roles can view, or it may be a number of different texts or videos specific to either groups of roles or specific to each single role. It may be a single text or video that appears only once at the beginning of play, or a number of different texts videos that appear in a certain order and at different junctures over the course of the MORPSG.

The aim of the scenario may be designed so that either all, or some of the roles need to accomplish a common task in cooperation, or it may be that it sets up conflicts between some or all roles.

2.5.5 Design properties of the "Environment" component.

There are a multitude of platforms that can be used for representing the model of the world to which the role-play refers: text based role-plays using discussion forums either with or without using emails (Vincent & Shepard, 1998) on WebCT or Blackboard learning management systems (Russel & Shepherd, 2010); mobile phone based role-plays using both voice and text (Sancho et al., 2009); customizable 3D virtual worlds like Second Life (SL) or Active Worlds using Avatars (Mayer et al., 2013); the text and multi-media environments like the Fablusi Role-play Simulation Generator (Shaw & Mendeloff, 2007); or multiplayer online role-playing games like World of Warcraft (Dickey, 2007); or offline computer role-playing games like PeaceMaker (Kampf & Cuhadar, 2012) and many others. All these have different structural constraints and properties that may impact differently in their contribution to student motivations and engagement.

Regardless of the means used, which particular dimensions of the world being represented depends on the level of detail needed to create an adequate representation of the subject and the degree of relevance to course material. The relevance to course material and the adequacy of representation together with the particular means used are "Environment" design properties that may contribute to either enhance or decrease student motivation to learn using a MORPSG and the level of engagement with it.

2.6 MORPSG design properties, motivation and engagement

From its inception constructivist learning theory placed emphasis on the motivation of the learner (Dewey, 1938; Brunner, 1997). The placing of the learner at the center of the learning process, confronting real or authentic problems and interacting in a social environment were all meant to make learning an experience cognitively relevant to the learner (Semple, 2000; Chou, 2001). Apart from the cognitive effects that this strategy targeted, it was also meant to increase the motivation to engage with the material to be learned (Dewey, 1938; The Cognition and Technology Group at Vanderbilt, 1990; Maher & Mayer, 1997).

Many educational games and simulations attempt to do precisely that by placing learners at the center of the learning process, having them confront authentic problems in an interactive social environment (Eshet and Hammer, (Hebrew) 2006; Foster, 2008). By the same token so do role-play simulation games (Cornelius et al., 2011). However, as one researcher studying a 30-minute face-to-face role-play, noted "not all role-plays are created equal. Teachers must consider how the format of the role-play and the types of preparatory materials used will impact learning outcomes and student motivation." (Stevens, 2015, p. 490). It can thus be reasonably assumed that how online role-play simulation games are designed similarly impacts student motivation and engagement.

Some researchers have used Keller's ARCS model (Attention, Relevance, Confidence and Satisfaction) that was developed for the design of instructional material to evaluate the extent to which the design of role-plays motivates students (Thistleton-Martin & Lewis, 2009; Rao & Stupans, 2012).

Others investigated some of the above design properties of online role-play. Cornelius and her colleagues (2011) suggested that anonymity of students in online role-plays as opposed to face-to-face role-plays, is one such variable that enhances engagement, while lack of engagement by other players reduces it. They also note that students choosing their own roles rather than being allocated a role may enhance motivation, though this requires further study (Cornelius et al., 2011).

These, and more, are all design properties of the basic structure that underlies all multiplayer online role-play simulation games. The extent to which such variable design properties relate to the motivation and engagement of students is the subject of this research.

2.7 Student-Player and Role: identity and motivation

Constructivist learning theory is based on a view of the acting learner who constructs knowledge based on interaction and experience with their social and physical environments (Piaget, 1972; Vygotsky, 2003 (Hebrew); Dewey, 1916; Dewey, 1938; Bruner, 1997; Bandura, 1999; Kolb, 1984; Lave & Wenger 1991). However, a learning theory that materializes as a role-play simulation game, where the active learner is in a sense someone else (Linser, 2004), with characteristics, intentions and motivations different from their own, must confront the question of who is the acting agent – the student-player or the role?

Obviously playing dissimilar roles leads to different actions and motivations for these actions as defined by the characteristics of the role. Thus, one may conclude that it is the role that is the acting subject. However, it is the student-player who interprets these motivations and characteristics, though it is the role that acts, based on these interpreted motivations during game-play.

Several authors have argued that the suspension of disbelief entailed in playing a role in virtual worlds or scenario-based learning, enhances motivation and engagement (Herrington et al., 2003; Argles et al., 2007; Godat et al., 2007.) Linser (2004) argued that the suspension of disbelief requires the student-player to examine their own motivations and evaluate the differences and similarities between his/her motivations and those of the role. This requirement is necessary to be able to act as the role rather than as a student. In role-play the identity and motivations of the

role temporarily replace, or are added to, the identity of the student-player. Students are in a certain sense someone else in the game (Linser, 2004). Thus theoretically, knowledge in the case of role-play is constructed by the student-player based on the communicative actions they take in constructing the identity of the role in its interaction with other roles.

In playing a role, the role and the player seem to merge. As one Australian student who played Hannan Ashrawi in a political science simulation on the Middle East, once put it "it becomes personal". With the suspension of disbelief, motivations of the role (as perceived by the student-player) become enmeshed with the motivations of the student-player.

2.8 Dimensions of Motivation

There are numerous approaches and types of motivation in the educational research literature. More specifically for our purposes, are the various dimensions of motivation that relate to online learning and those that relate to design of instructional material which often overlap those that relate to the design of games. Regardless of the approach, most agree that motivation plays a significant role in learning, and especially when applied to computer-based education generally (Reeves, 1994; Malone, 1984), to the use of games (Dondlinger, 2007) and online instruction (Salmon, 2003).

However, it can't be simply assumed that instructional games, or role-play simulation games, will automatically motivate students just because they are games. Rather, as Reeves (1994) points out in relation to multimedia environments for learning, motivating aspects must be rigorously designed into games just as they are for other pedagogical dimensions.

One common distinction between types of motivation in the literature is the one between intrinsic and extrinsic motivation (Haupt & Cronje, 2003; Hainey et al., 2011). In the context of education, intrinsic motivation is associated with the enjoyment of the learning process which is of critical importance in the design of games generally and more particularly instructional games (Alessi & Trollip, 2001; Dondlinger, 2007). Dickey (2007), like Malone (1981), argues that intrinsic motivation to play games is derived from their narrative contexts that promotes challenge, fantasy and curiosity as well as feedback for players. Extrinsic motivation on the other hand refers to rewards that can be gained from outside the activity, like marks, prizes or higher social

status rather than from the intrinsic enjoyment of playing a game (Haupt & Cronje 2003; Hainey et al., 2011).

Salmon (2003) raises another less common but important distinction between motivation to take part and the motivation to continue. Students might be highly motivated and excited to play a certain game but once they start, they may not find it as challenging or enjoyable as they first assumed and their motivation to continue to engage drops off. The opposite may also be true. Students may not be motivated to play, but once started, their motivation to continue increases as the game progresses.

Amory and his colleagues (1999) investigated game elements that students found appealing including whether the game was easy to play, addictive, too long, challenging, confusing, too difficult, illogical, difficult to play or maneuver and if their performance increased with continuous play. Their findings, among others, suggest that players were motivated by games with objectives requiring high order thinking (Amory et al., 1999).

Some approaches associate motivation with goal-seeking and achievement. Clark and his colleagues (2010) argue that motivation is a result of values held, confidence in succeeding at specific tasks and our mood or emotional state in a two-stage process of goal commitment and effort (Clark et al., 2010). Others see it as a function of the individual's desire for success, expectancy of success and the incentives provided (Cronje & Haupt, 2003). Keller's ARCS model which was developed for instructional design encompasses four components or strategies: Attention, Relevance, Confidence, and Satisfaction. (Cronje & Haupt, 2003; Thistleton-Martin & Lewis, 2009; Rao & Stupans, 2012).

Bandura places emphasis on self-efficacy in motivation through outcome expectations. In other words, motivation is an outcome of the expectation that a course of action will produce outcomes and the value placed on these outcomes (Bandura, 1999). In this context, Schunk (2000) points out that in this view of observational learning, motivation operates through mechanisms of goal setting, self-efficacy and outcome expectations.

Researching games from the perspective of self-determination theory, Lafrenière and his colleagues (2012) developed the Game Motivation Scale that distinguished between intrinsic

motivation, integrated, identified, introjected, external regulation as well as amotivation (Lafrenière, Verner-Filion, and Vallerand, 2012).

Some research into Massively Multiplayer Online Role-Playing Games (MMORPG) to enhance learning and teaching suggests that motivation is built into such games. The factors that promote this intrinsic motivation are challenge, curiosity, control and fantasy and include the three elements of 'interpersonal motivation' - competition, cooperation and recognition (Lee et al., 2005; Huizenga et al. 2009; Hainey et al., 2011). Other models of gameplay motivations propose a four-quadrant model that includes cooperation, competition, immersion and achievement (Rao & Stupans, 2012).

While the above provides various dimensions of motivation in the literature on learning, learning design and games of various kinds, it is imperative to remember that different people are motivated to learn in diverse ways and for various reasons (Hotho & Reimann, 1998; Olka, 2005). For our purposes, this means that we need to also examine the preferred online interaction modalities of students in order to evaluate the online design elements that motivate them.

2.9 Dimensions of Engagement

According to Van Dijk (2013) student engagement is determined by two principles. The first principle is the time and energy spent by the student on educational purposeful activities. The second determined by the institutional efforts to create effective educational practices that will induce student success (Van Dijk, 2013).

Though engagement in games may be self-evident (Connolly et al., 2012), the dimensions that constitute engagement are not. Engagement is an interactive and dynamic construct (Stevens, 2015) that encompasses behavioral, affective and cognitive dimensions (Handelsman et al., 2005; Chapman, 2003; Hew, 2014; Mandernach, 2015). The criteria for measuring these however varies in different studies.

Chapman (2003) presents the cognitive criteria as indexing the extent to which students are attending to and expending mental effort in the learning tasks encountered; the behavioral as indexing the extent to which students are making active responses to the learning tasks

presented; and the affective as the level of students' investment in, and their emotional reactions to, the learning tasks (Chapman, 2003).

Handelsman and his colleagues (2005) devised a measure of student course engagement (Student Course Engagement Questionnaire - SCEQ) that divides course engagement into four distinct dimensions: 1) skills engagement; 2) emotional engagement; 3) participation/interaction engagement; and 4) performance engagement.

Kuh (2003) highlights the practices that promote engagement as 1) collaborating with peers; 2) interacting with faculty; 3) participating in learning communities; and 4) devoting significant time to academic tasks. Similarly, but with different emphasis, the Student Engagement Index (SEI) as devised by Langley (2006) argues that engagement is a function of 1) the level of academic challenge; 2) the quality of student interactions with faculty; 3) active and collaborative learning environments; and 4) enriching educational experiences and supportive campus environment.

The student Engagement Survey (SE) on the other hand examines student engagement as a function of: 1) collaborative learning; 2) cognitive development; and 3) personal skills development (Mandernach, 2015).

While these measures are applied to measure institutional and class levels of student engagement, there are others who attend to more specific variables relating to games, simulations and role-plays like the level of participation and exuberance in participations (Dingli et al., 2013). Others cast a wide net over various design elements like selection of virtual characters, environments, narratives, and multimedia elements as well as on attributes of players such as attention, concentration and self-esteem, the learning objectives, the playability experience, control, and attraction to the game as well as support and rewards (Abdul Jabbar & Felicia, 2015).

Still others focus on variables that impact student engagement such as the choice of real-life stakeholders, immersion, anonymity of players and interaction (Schnurr et al., 2014), familiarity with the role being played (Ching, 2014; Cornelius et al., 2011), with the number of tasks involved

(Huizenga et al., 2009), exchanges with others and group size (Stevens, 2015) and identification with the role (Repenning et al., 2010).

Engagement in a learning activity is very closely related to the level of motivation, whether intrinsic or extrinsic, engagement "is the visible outcome of motivation" (Gibson et al., 2014, p.10). For Salmon motivation and engagement are connected as a balance between opportunities to contribute to discussion and capacities to respond to others (Salmon, 2003). Salmon explicitly links this to what in the context of games has been termed 'flow' by Csikzentmihalyi (1990) which is a state of complete absorption in a task or a game (Huizenga et al., 2009). Flow can thus be construed as optimal engagement (Salmon, 2003).

2.10 Summary: MORPSG, motivation and engagement in the Research Literature

As a technique for learning role-play has been historically used in face-to-face environments posing certain structural constraints in terms of co-presence in time and space. However, since the 1980's, the revolution in communication and information technology (ICT) and the advent of the internet has enabled new structural possibilities for the design and implementation of role-plays for learning purposes in higher education.

While theoretically the constructivist agenda seems to recommend this technique, along with games and simulations, empirical research on the effectiveness of MORPSGs for learning, has been difficult to compare and evaluate, at least in part, due to (a) lack of clarity of terms, (b) absence of definitions, (c) multiplicity of structural designs and media used, and consequently, (d) resulted in anecdotal evidence and hence empirically problematic. One recent study that compared the research on the level of engagement and effectiveness of political science simulations notes that even though these studies are empirically problematic, it is 'safe to conclude' that they are engaging for students (Baranowski & Weir, 2015). But what makes these simulations engaging for students remains unclear.

3. Aim of the Study and Research Questions

Given the importance of motivation and engagement in the learning process, the present study evaluates the relation between students' perceived evaluation and preferences for various design

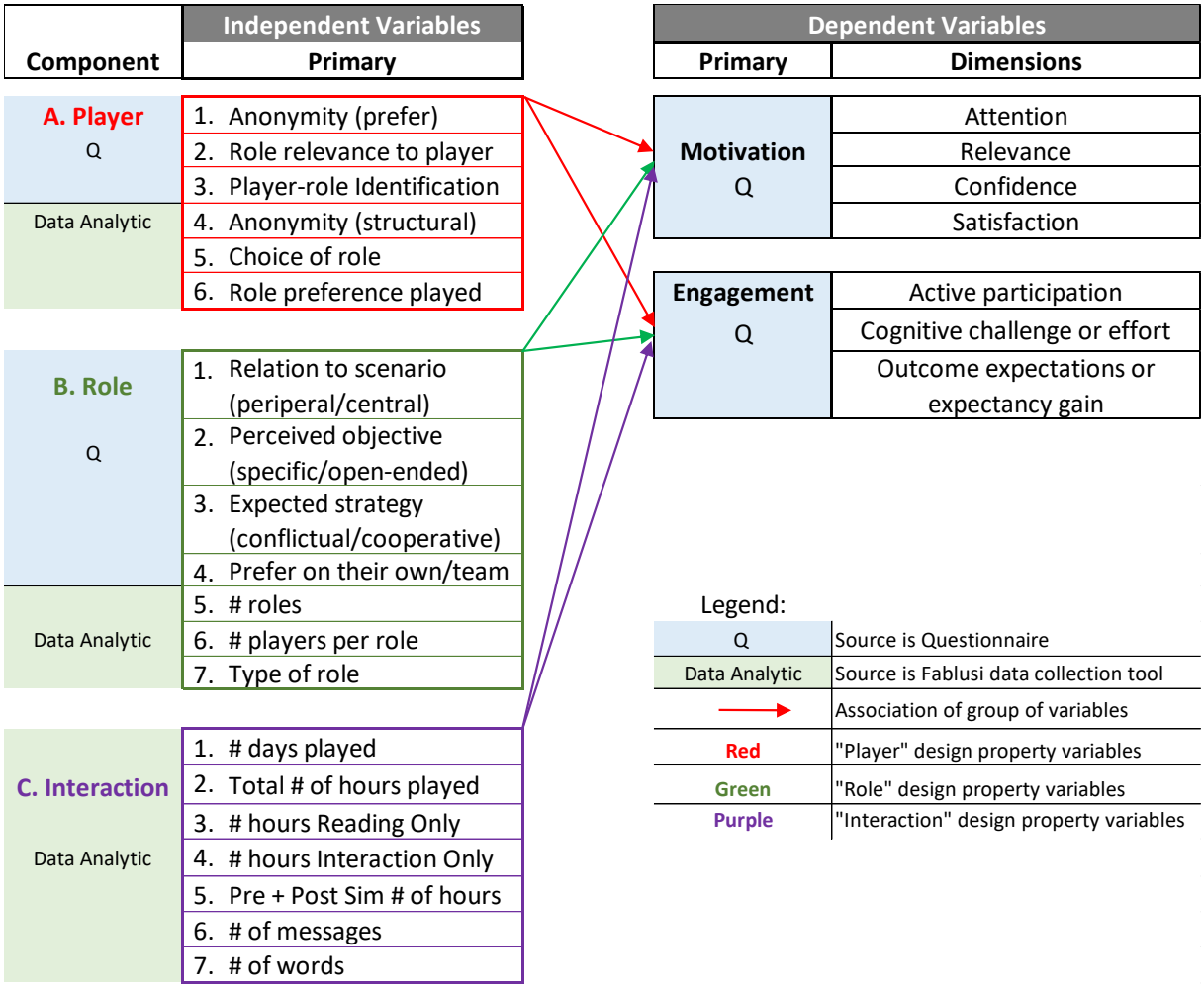
properties of MORPSGs, as well as data analytics of MORPSG, and the students' perceived motivation and engagement for learning in higher education.

As noted, and exemplified above, there are numerous ways in which properties of the basic structure are designed for different educational purposes. Given the scope of the present study and the problematic issues in the literature (section 2.3 above) this study is an exploratory work that aims to find a way to remedy these problems and thus focuses on design properties of just three structural components (Player, Role and Interaction) out of the five components discussed above that characterize every role-play simulation. Moreover, the study focuses only on a limited number of design properties for each of these three structural components.

3.1 Research questions

1. To what extent do the design properties of a multiplayer online role-playing simulation game (MORPSG) explain the perceived motivation of higher education students to learn using MORPGS?
2. To what extent do the design properties of a MORPSG explain the perceived engagement of higher education student in learning using MORPSG?

Diagram 1 – Structural Components and Variables



3.2 Operative Research questions

Given the above research questions, the following are the operative questions for each of the dependent variables. Each question seeks to cast light on a specific property from the three structural components – Player, Role and Interaction - of the MORPSGs examined in this research (see Diagram 1 above) in order to evaluate the degree to which it may explain our dependent variables:

3.2.1 Motivation and properties of the Player component.

1. To what extent does students' preference to play anonymously explain the students' level of motivation for learning using MORPSG in higher education?

Given the literature on anonymity above (see section 2.5.1), we expect that students who prefer playing anonymously are more likely to have higher levels of motivation using MORPSG to learn in higher education.

2. To what extent does the students' perception of the role being of personal relevance to themselves explain the students' level of motivation for learning using MORPSG in higher education?

Given the relation between the student and the player (see section 2.5.1) above) we expect that students playing roles that are relevant to themselves are more likely to have higher motivation.

3. To what extent does the student's identification with role they play explain the students' level of motivation for learning using MORPSG in higher education?

Given the relation between the student and the player (see section 2.5.1 above) we expect that students playing roles with which they personally identify are more likely to display higher motivation levels.

4. To what extent does student anonymity (structural) explain students' level of motivation for learning using MORPSG in higher education?

Given the literature on anonymity (section 2.5.1), we expect that MORPSGs which are structured for anonymity will display higher levels of student motivation.

5. To what extent does having choice which roles to play explain the students' motivation for learning using MORPSG in higher education?

Given the literature on giving students a choice in constructivist theory (section 2.5.1), we expect that MORPSGs that provide students with the provision to choose a role, would have higher student motivation levels.

6. To what extent does playing the student's preferred role explain the students' level motivation for learning using MORPSG in higher education?

Given the literature on choice (section 2.5.1), we expect that playing at least one of their chosen preferences for a role would show higher student motivation levels.

3.2.2 Motivation and properties of the Role component.

1. To what extent does students' perception of the role's centrality in the scenario (central/peripheral) explain the students' level of motivation for learning using MORPSG in higher education?

Given the literature in (section 2.5.2) we expect that students who perceive their role to be more central to the scenario will have higher motivation levels.

2. To what extent does students' perception of the role's objective in the game (specific/open-ended) explain the students' level of motivation for learning using MORPSG in higher education?

Given the literature in (section 2.5.2) we expect that students who perceive the role's objective to be open-ended ones will have higher levels of motivation.

3. To what extent does students' perception of the role's expected strategy (conflictual/cooperative) in the game explain the students' level of motivation for learning using MORPSG in higher education?

Given the literature in (section 2.5.2) we expect that, as in games, students who perceive that their role's strategy to be in conflict with one another will have higher levels of motivation.

4. To what extent does a player's preference to play their role as part of a team rather than on their own explain student motivation to learn using MORPSG?

Given the literature on collaboration as a factor in teamwork (see section 2.5.2), we expect the students who prefer to play their role in teams are going to be more motivated than those who prefer to play on their own.

5. To what extent does the number of roles in a MORPSG explain students' level of motivation for learning using MORPSG in higher education?

Given the literature (section 2.5.2), we expect that MORPSGs that have larger number of roles will have higher student motivation levels than those with smaller number of roles.

6. To what extent does the number of players playing a single role explain students' level of motivation for learning using MORPSG in higher education?

Given that team dynamics adds another level of collaborative interaction between players (section 2.5.2), we expect that where roles are designed to be played in teams rather than as one player per role, students will have higher levels of motivation.

7. To what extent does the type of role (generic/personal) explain students' level of motivation for learning using MORPSG in higher education?

Given the literature (section 2.5.2), we expect that where roles are designed as personal roles, students will have higher motivation levels than where they are designed as generic ones.

3.2.3 Motivation and properties of the Interaction component.

1. To what extent does the total number of days spent on the role-play by players explain student's level of motivation in using MORPSG for learning in higher education?

Given the literature (Section 2.5.3) we expect that the more days played the higher will be the levels of student motivation.

2. To what extent does the student's total number of hours spent playing explain students' level of motivation for learning using MORPSG in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent playing by a student, the higher will be their levels of motivation.

3. To what extent does the student's number of hours spent on only reading information, explain students' level of motivation for learning using MORPSG in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent by a student on only reading, the higher will be their levels of motivation.

4. To what extent does the student's number of hours spent only on interacting explain students' level of motivation for learning using MORPSG in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent by a student in only interacting, the higher will be their levels of motivation.

5. To what extent does the student's total number of hours spent on examining the MORPSG before and after playing, explain the students' motivation level in using MORPSG for learning in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent by a student before and after play, the higher will be their levels of their motivation.

6. To what extent does the total number of messages sent by a player explain the students' level of motivation for learning using MORPSG in higher education?

Given the literature (Section 2.5.3), we expect that the more messages sent by the student-player, the higher will be their level of motivation.

7. To what extent does the number of words generated by a player in a MORPSG explain the students' level of motivation for learning using MORPSG in higher education?

Given the literature (2.5.3), we expect that the higher number of words generated by a student, the higher will be their motivation level.

3.2.4 Engagement and properties of the Player component.

1. To what extent does students' preference to play anonymously explain student engagement in learning using MORPSG in higher education?

Given the literature (Section 2.5.1), we expect that students who prefer playing anonymously will have higher levels of engagement.

2. To what extent does the students' perception that the role they play has personal relevance to themselves explain student engagement in learning using MORPSG in higher education?

Given the literature (see section 2.5.1), we expect that players who perceive their role as relevant to themselves, will have higher levels of engagement.

3. To what extent does the student's identification with the role they play in the simulation explain student engagement in learning using MORPSG in higher education?

Given the literature (see section 2.5.1), we expect that players who identify with the role they are playing, will show higher levels of engagement.

4. To what extent does playing anonymously help explain the students' level of engagement with learning using MORPSG in higher education?

Given the literature (see section 2.5.1), we expect that where players remain totally anonymous, regardless of the students' preferences, students will have higher levels of engagement.

5. To what extent does having a choice in which role to play explain student level of engagement with learning using MORPSG in higher education?

Given the literature (section 2.5.1), we expect that where the provision of choosing a role is provided to students will show higher student engagement levels.

6. To what extent does playing the student preferred role explain the students' level of engagement in using MORPSG for learning in higher education?

Given the literature (section 2.5.1). We expect that playing at least one of the student's chosen preferences for a role will show higher student engagement levels.

3.2.5 Engagement and properties of the Role component.

1. To what extent does students' perception of the role's centrality in the scenario (central/peripheral) explain students' level of engagement with a MORPSG for learning in higher education?

Given the literature (section 2.5.2), we expect that students who perceive their role to be central to the scenario, will have higher levels of engagement.

2. To what extent does students' perception of the role's objective in the game (specific/open-ended) explain the students' level of engagement with a MORPSG for learning in higher education?

Given the literature (2.5.2), we expect that students who perceive that their role's objectives are open-ended ones, will have higher engagement levels.

3. To what extent does students' perception of the role's expected strategy in the game (conflictual/cooperative) explain students' level of engagement with a MORPSG for learning in higher education?

Given the literature (section 2.5.2), we expect that, as in games, students who perceive that their role's strategy to be in conflict with one another will have higher engagement levels.

4. To what extent does a player's preference to play their role as part of a team rather than on their own explain student engagement in learning using MORPSG in higher education?

Given the literature (section 2.5.2), we expect that students who prefer to play their role in teams will have higher engagement levels than those who prefer to play on their own.

5. To what extent does the number of roles explain students' level of engagement with a MORPSG for learning in higher education?

Given the literature (section 2.5.2), we expect that MORPSGs that have larger number of roles will have higher student engagement levels.

6. To what extent does the number of players playing a single role explain students' level of engagement with a MORPSG for learning in higher education?

Given the literature (section 2.5.2), we expect that roles played in teams rather than as one player per role, will have higher student engagement levels.

7. To what extent does the type of role (generic/personal) explain students' level of engagement with a MORPSG for learning in higher education?

Given the literature (section 2.5.2), we expect that students playing real world personal roles, rather than generic ones, will have higher levels of student engagement.

3.2.6 Engagement and properties of the Interaction component.

1. To what extent does the total number of days spent by a student on the role-play explain the student's level of engagement with a MORPSG for learning in higher education?

Given the literature (Section 2.5.3), we expect that the more days played by a student, the higher will be their levels of engagement.

2. To what extent does the student's total number of hours spent playing explain the students' level of engagement with a MORPSG for learning in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent by a student in playing the higher will be their level of engagement.

3. To what extent does the student's number of hours spent on only reading information, explain students' level of engagement with a MORPSG for learning in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent by a student on only reading, the higher will be their levels of engagement.

4. To what extent does the student's number of hours spent only on interacting explain students' level of engagement with a MORPSG for learning in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent by a student in only interacting, the higher will be their levels of engagement.

5. To what extent does the student's total number of hours spent before and after playing a MORPSG, explain the students' level of engagement in using MORPSG for learning in higher education?

Given the literature (Section 2.5.3), we expect that the longer hours spent by students in examining a MORPSG before and after play, the higher will be the student's levels of engagement.

6. To what extent does the number of messages sent by a player explain the students' level of engagement with a MORPSG for learning in higher education?

Given the literature (Section 2.5.3), we expect that the more messages sent by the student-player, the higher will be their engagement level.

7. To what extent does the number of words generated by a player in a MORPSG explain the students' level of engagement in learning using MORPSG in higher education?

Given the literature (2.5.3), we expect that the higher number of words generated by a student, the higher will be their level of engagement.

3.3 Motivation and engagement scales

To measure the level of motivation and engagement, we used a modified form of two scales validated for motivation and engagement respectively: The Reduced Instructional Materials Motivation Survey (RIMMS) (Loorbach et al. 2015) based on Keller's (2010) ARCS model; and the Student Engagement survey (SE), a modified and validated version of the US National Survey of Student Engagement (NSSE) (Ahlfeldt et al., 2005).

The ARCS model is particularly fitting instrument to our purposes because of its background in learning design theory (Keller, 2010). As this study is aimed at evaluating structural design properties in relation to motivation and engagement this is a particularly useful instrument (Thistleton-Martin & Lewis, 2009; Rao & Stupans, 2012). However, given it only relates to motivation rather than engagement, to measure student engagement with a MORPSGs it was necessary to supplement it with an instrument to measure student engagement. The Student Engagement (SE) survey developed from the National Survey of Student Engagement (NSSE) by Ahlfeldt and her colleagues (2005), examines variables that influence engagement levels in the context of college students using Problem Based Learning (PBL) (Ahlfeldt et al., 2005).

While the ARCS model better fits the purpose of evaluating motivation in relation to design, the SE survey fits the purpose of evaluating variables that influence the engagement of students. Because the SE was designed for examining the impact of PBL (Problem Based Learning) on student engagement and since problem-based learning has affinities with games, simulation and role-plays, it makes this instrument useful for the purpose of this study into MORPSGs. In particular, these learning techniques share the basic principle of Constructivist theory that places the student at the center of the learning process confronting authentic problems.

To be useful for evaluating the relationship between design properties of MORPSGs and motivation and engagement both these scales were modified to fit the MORPSGs context. Some words in the survey items of both scales were substituted to adapt and adjust them for measuring motivation and engagement of a MORPSG (questionnaire - Appendix A.) Given the word modification, the Internal consistency of both scales was re-validated in the current study using Cronbach's alpha test (see Appendix B.)

4. Research Methodology

4.1 The research Environment

To create the research environment, this study has used the Fablusi Role-play Simulation Generator (www.fablusi.com) (Fablusi software – for short) that enables the online design, delivery and administration of simulated social systems (Ip et al., 2001). It has been used in various contexts in higher education and enables either large or small number of students, as

either individually or in teams, to play online simulation games designed specifically to meet the objectives of the course in which students are enrolled.

There are three advantages for using this software. The first is that it is a cross platform and browser web delivery system, for computers, mobile phones and tablets. Secondly, this software enables the creation of different MORPSGs across subject domains (e.g. political science, nursing, teacher education, literature, development studies, business management studies) and has been used in various educational institutions. Finally, the whole simulation interaction is saved to a database that can be collected, exported and reviewed, together with basic data analytics (e.g. duration of each players' activity on each of the tasks during game play).

For the purpose of the present research, it makes possible data analytic comparisons of different online role-plays' structural design properties to students' perceived motivation and engagement in these different settings.

4.2 Population

Out of a total of 155 students from 2 different higher education institutions and 2 different courses at Oxford University in the UK and Saskatchewan Polytechnic in Canada, 84 students (54.2%) submitted the questionnaire for this study (see Table 2.) Each course ran a MORPSG specifically designed for their course twice. The first round of MORPSGs was run in May 2017 (Business Strategy and Politics) and March 2017 (Practical Nursing). But in order to increase our research population each MORPSG was run again in June 2018 (Business Strategy and Politics) and April 2018 (Practical Nursing).

Despite the limitations of the sampling procedure, the large sample of our population suggests that our sample is representative of the research population. Moreover, the comparison between two very different MORPSGs from the two institutions enables us to compare both different and similar design properties.

Table 2.

Course Name	level	Institution	Date	Sim ID	# Participants	# Completed Questionnaire	% completed Questionnaire
Business Strategy and Politics	MA	Oxford University	May-June 2017-2018	45yss, 60igp	126	61	48.4%
Practical Nursing	MA	Saskatchewan Polytechnic	March-April 2017-2018	57sjb, 58txl	29	23	79.3%
TOTAL					**155**	**84**	**54.2%**

4.3 Research Instruments

The research design is a mixed quantitative study. The instruments for data collection and analysis include:

1) An online post-simulation self-reporting questionnaire;

2) Data collection tool provided by the Fablusi simulation software; and

3) The SPSS statistical package for the analysis of the data.

4.3.1 Questionnaire.

A post simulation questionnaire composed of 52 items (Appendix A) was administered to collect the following data:

1. Students' background (demographics, and experience with role-playing games in and outside educational environments);

2. Students' self-perception as players in the simulation;

3. Students' perception of the role they played;

4. Students' perception of the scenario; and

5. Student's perception of the simulation environment.

Though we have gathered data on the scenario and environment, we have not used this data in the present study given that it is beyond the limitations of this reseach.

4.3.2 The Fablusi data collection tool.

The data analytic (Appendix C) collection tool internal to the Fablusi software was used to collect data on:

1. The MORPSG's Player structure;
2. The MORPSG's Role structure;
3. The level of role interaction in terms of:

3.1 Time spent on the simulation (including the pre and post simulation activity) and each of the activities within it, including reading versus interactive activities.

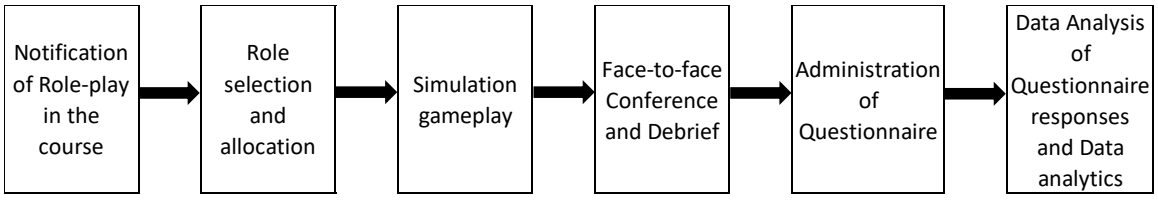
3.2 Number and length of each player's messages in the simulation, task inputs and reading tasks.

4.3.3 SPSS for data analysis.

For analysis of the data we have used the SPSS program to measure the correlations between the 2 dependent variables and the various independent variables (See above Diagram 1.)

4.4 Data Collection Procedure

Diagram 3.



At the beginning of each course that used MORPSGs reported in this study, students were made aware that they will be playing an online role-play simulation game. Each of the MORPSGs varied in the length of time (including optional pre- and post-simulation activity) as determined by the course lecturer as part of the requirement for their course. Each MORPSG also had different number of roles and a different scenario as designed by the course lecturer.

In two (45yss, 60iqp) of the 4 simulations, students were told that they will play the roles in teams of 2, 3 or 4 students (determined by the course lecturer). In the other two simulations (57sjb, 58txl) students were told that each student would play the role on their own. In all simulations in which

students could submit preferences for roles they wished to play, students were also told that roles would be allocated based on first-come-first-serve basis. Thus, the implication was that delaying submitting a role preference means the less likely they are to be allocated the roles they prefer to play.

Before the start of play, each student signed themselves up for the simulation and chose and submitted their role preference online. Only one simulation (56sjb) out of the four did not allow such choice. In two, out of the three remaining simulations (45yss, 60iqp) students were able to choose 5 such preferences while the fourth simulation (58txl) enabled students to choose 3 role preferences.

Roles were then allocated by the lecturers and the students received an email with the URL for the simulation, their login information, the role they were allocated, as well as information regarding their first required task – the role profile; the date the simulation would start and contact email information of the moderators in case they have difficulties. In two simulation (45yss, 60iqp) that played their roles in teams the name and email address of their other team members was also inserted in to that email.

Once they received that email, students could login to become familiar with the software and write their first task - the role profile. Depending on the lecturer's determination of the simulation starting date, they then submitted their role profile and began to play their role, given the kick start scenario and their role profile. At the end of the simulation, two of the simulations (45yss, 60iqp) attended a face-to-face simulated conference as the roles they played and a debrief as students. The two other simulations (57sjb, 58txu) did not have an end of simulation conference but did have an online debrief.

At the end of each simulation, a pop-up window requested students to fill and submit the post-sim questionnaire, emphasizing that it is voluntary and would have no impact on their course assessment (see Appendix D.) Access to the online questionnaire was terminated within two weeks of receiving that notice, the data downloaded, and analysis of questionnaire responses and data analytics began.

5. Data Analysis

Once all simulations ended, the data was downloaded from the Fablusi software and organized into one Excel file, imported into the SPSS package and a two-variate correlational analysis conducted between the independent and dependent variables:

1. For the analysis of the correlation between motivation (dependent variable), with each of the student demographic variables: Age, Gender, Education level, and Language (independent variables) we used one-way Anova tests. While Spearman's correlations were used to test the students' experience with games generally and role-play in education.

2. For the analysis of the correlation between engagement (dependent variable), with each of the student demographic variables: Age, Gender, Education level, and language (independent variables) we used one-way Anova tests.

3. We conducted Spearman's correlations to probe associations between each of the independent variable measures for "Player", "Role" and "Interaction" and Motivation as the dependent variable.

4. We conducted Spearman's correlations to probe associations between each of the independent variable measures for "Player", "Role" and "Interaction" and Engagement as the dependent variable.

5. We conducted One Way Anova tests to probe the associations between each of demographic and some of the data analytic variables of each of the independent variable measures for "Player", "Role" and "Interaction" and Motivation as the dependent variables

6. We conducted One Way Anova tests to probe the associations between each of demographic and some of the data analytic variables of each of the independent variable measures for "Player", "Role" and "Interaction" and Engagement as the dependent variables

6. Findings

6.1 Student Demographics

Student background includes, the demographic data: Age, Gender, Education, Language; and the students' background experience with 1. Online games and 2. Role-play in educational settings.

In the table below presented are the demographic features of the respondents. Of the total 84 respondents, 43% were between the ages of 28-32; 93% had attained an undergraduate, or higher level of education; and 62% reported English as the language they spoke best.

Table 3. Student Demographics

		Count	Column N %
Age	under 18	0	0%
	18-22	2	2%
	23-27	20	24%
	28-32	36	43%
	33-37	23	27%
	38 +	3	4%
Gender	male	34	40%
	female	50	60%
Educational level attained	under-graduate	10	12%
	graduate	38	45%
	post-graduate	30	36%
	other	6	7%
What language do you speak best	English	52	62%
	Not English	32	38%

6.2 Motivation

6.2.1 Age and Motivation.

One-way ANOVA tests were conducted in order to probe associations between age as independent variable and motivation and its factors as dependent variable. (Table 4.)

Table 2. Age and Motivation

Age		Attention	Confidence	Relevance	Satisfaction	Motivation total
18-22	**Mean**	3.17	2.17	3.33	3.17	2.96
	Std	0.24	0.24	0	0.24	0.18
	N	2	2	2	2	2
23-27	**Mean**	2.57	2.32	2.05	2.37	2.33
	Std	1.03	1.08	0.79	1.23	0.85
	N	20	20	20	20	20
28-32	**Mean**	2.9	2.71	2.28	2.44	2.58
	Std	1.28	1.12	1.06	1.18	1.04
	N	36	36	36	36	36
33-37	**Mean**	2.78	2.46	2.5	2.43	2.55
	Std	1.22	1.2	1.22	1.43	1.13
	N	23	23	23	23	23
38 +	**Mean**	3.44	3.67	2.56	4.22	3.47
	Std	0.51	1.15	1.17	0.84	0.89
	N	3	3	3	3	3
Total	**Mean**	2.81	2.57	2.32	2.5	2.55
	Std	1.17	1.14	1.05	1.27	1.01
	N	84	84	84	84	84

No significant differences were found for the total motivation level, or any of the motivation's factors, between the ages.

6.2.2 Gender and Motivation.

One-way ANOVA tests were conducted in order to probe associations between gender as independent variable and motivation and its factors as dependent variable. (Table 5.)

Table 3. Gender and Motivation

Gender		Attention	Confidence	Relevance	Satisfaction	Motivation total
male	**Mean**	2.46	2.29	2.08	2.11	2.24
	Std	0.92	0.95	0.73	1.13	0.79
	N	34	34	34	34	34
female	**Mean**	3.05	2.76	2.48	2.77	2.77
	Std	1.26	1.22	1.2	1.3	1.1
	N	50	50	50	50	50
Total	**Mean**	2.81	2.57	2.32	2.5	2.55
	Std	1.17	1.14	1.05	1.27	1.01
	N	84	84	84	84	84

A significant difference between genders was found for the Attention factor [$F(1,82)=5.473$, $p=.022$]. It seems that females got a higher score in this factor, compare to males, meaning females felt less attentive than males. **(Throughout the questionnaire high scores=disagreement; and low scores=agreement with the statement. See Questionnaire Range in appendix A)** Also, a significant difference between genders was found for the satisfaction factor [$F(1,82)=5.653$, $p=.020$]. It seems that females got a higher score in this factor, compare to males, meaning females were less satisfied than males. Furthermore, a significant difference between genders was found for the total motivation score [$F(1,82)=5.927$, $p=.017$]. Accordingly, females got a higher score, compared to males, meaning females were less motivated. No other significant gender differences were found for the Confidence and Relevance factors.

6.2.3 Education level and Motivation

One-way ANOVA tests were conducted in order to probe associations between educational level as independent variable and motivation and its factors as dependent variable. (Table 6.)

A significant difference between levels of education was found for the satisfaction factor [$F(3,80)=4.734$, $p=.004$]. Tukey Post Hoc test revealed a significant difference between the "other" group of students, who got a higher mean score ($M=4.11$) compare to any other group - under-graduates ($M=2.2.83$), graduate ($M=2.43$) and post-graduates ($M=2.17$), meaning the group

of others has lower satisfaction. No other significant education level differences were found for motivation.

Table 4. Education and Motivation

Educational level		Attention	Confidence	Relevance	Satisfaction	Motivation total
under-graduate	**Mean**	2.57	2.6	2.43	2.83	2.61
	Std	1.21	1.34	1.3	1.51	1.25
	N	10	10	10	10	10
graduate	**Mean**	2.78	2.6	2.34	2.43	2.54
	Std	1.25	0.98	1.07	1.23	0.99
	N	38	38	38	38	38
post-graduate	**Mean**	2.79	2.34	2.14	2.17	2.36
	Std	1.02	1.13	0.82	1.06	0.84
	N	30	30	30	30	30
other	**Mean**	3.56	3.5	2.89	4.11	3.51
	Std	1.26	1.52	1.5	1.03	1.26
	N	6	6	6	6	6
Total	**Mean**	2.81	2.57	2.32	2.5	2.55
	Std	1.17	1.14	1.05	1.27	1.01
	N	84	84	84	84	84

6.2.4 Language proficiency and Motivation.

Pearson's' correlations were conducted to probe associations between language proficiency in English and motivation (Table 7.)

Table 7. Language proficiency and Motivation

Language proficiency	Attention	Confidence	Relevance	Satisfaction	Motivation total
Language you speak best (1=English, 0= Not English)	-.247*	-.216*	-0.209	-.234*	-.260*

* p<.05 **p<.01 ***p<.001

Significant negative correlations were found between the language and the total Motivation score and the factors Attention, Confidence and Satisfaction. Meaning, English speakers present higher motivation on these measures. (Note: higher motivation and not motivation score).

6.2.5 Experience with role-play, online games and Motivation.

Spearman's correlations were conducted to probe associations between experience and motivation. (Table 8.)

No significant correlations were found between the two parameters of experience and the total motivation score and its factors.

Table 8. Experience with role-play and Motivation

Experience with Role-play / online Games	**Attention**	**Confidence**	**Relevance**	**Satisfaction**	**Motivation total**
Experienced in playing online games	0.168	0.139	0.08	0.123	0.172
Experienced with educational role-play (online or face to face)	0.133	0.144	0.035	0.033	0.097

* p<.05 **p<.01 ***p<.001

6.2.6 Player component properties and Motivation.

Spearman's correlations were conducted to probe associations between three properties of the Player component as perceived by the players and Motivation. (Table 9.)

Table 9. Player properties (perceived) and Motivation

Player properties (preferences)	**Attention**	**Confidence**	**Relevance**	**Satisfaction**	**Motivation total**
play my role anonymously	.333**	.338**	.392***	.383***	.424***
personal relevance	.324**	.281**	.322**	.369**	.381***
personally identified	0.17	0.133	0.154	.295**	.223*

* p<.05 **p<.01 ***p<.001

The following are our findings regarding our operative questions on Motivation and properties of the Player component (see section 3.2.1 above, questions 1 through 6).

1. Significant positive medium-low correlations were found between the players' preference to play their role anonymously and total Motivation score (p<.001) and all four of its factors (attention p<.01, confidence p<.01, relevance p<.001, and satisfaction p<.001). (Note: throughout our scales, low scores=high levels and high scores=low levels)

   Meaning, to the extent that players preferred to play anonymously they had significantly higher motivation levels, higher attention, confidence, relevance and satisfaction.

   Thus, our expectation that students who prefer to play anonymously are more likely to display higher levels of motivation was confirmed.

2. Significant positive medium-low correlations were also found between the player's perception that the role they played had personal relevance and the total Motivation score (p<.001) as well as all of its four factors (attention p<.01, confidence p<.01, relevance p<.01, satisfaction p<.01).

   Meaning, to the extent that players felt that the role they played had personal relevance they had significantly higher levels of motivation.

   Thus, our expectation that students who perceived their role as having personal relevance to themselves (the independent variable) would display higher levels of motivation was also confirmed.

3. A significant positive low correlation was also found between players who personally identified with the role they played and the total Motivation score (p<.05) and the satisfaction score (p<.01). No significant correlations were found between Identification with the role and the attention, confidence and relevance factors of motivation.

   Meaning, to the extent that players personally identified with their role they had significantly higher total motivation and satisfaction levels.

   Thus, our expectation that identification with the role would show higher levels of motivation was confirmed.

One-way ANOVA tests were conducted in order to probe associations between the three structural properties of the Player component as independent variables and motivation and its factors as dependent variable. Bonfferoni correction was applied for all ANOVA tests due to multiple comparisons (α=.008). (See means and standard deviations in Table 10).

Table 10. Player properties (structural) and Motivation

Player properties (structural)		Attention			Confidence			Relevance			Satisfaction			Motivation_tot		
		M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N
Anonymity	**Partial**	2.61	1.09	61	2.36	1.03	61	2	0.76	61	2.04	0.93	61	2.25	0.79	61
	yes	3.36	1.23	23	3.14	1.22	23	3.17	1.24	23	3.72	1.27	23	3.35	1.13	23
Choice of role	**No**	2.9	1.39	10	2.67	1.25	10	2.67	1.52	10	3.13	1.52	10	2.84	1.33	10
	yes	2.8	1.15	74	2.56	1.13	74	2.27	0.97	74	2.42	1.22	74	2.51	0.97	74
Choice played	**0**	2.84	1.21	20	2.75	1.2	20	2.64	1.3	20	3.13	1.4	20	2.84	1.17	20
	1	3.05	1.28	40	2.77	1.23	40	2.4	1.03	40	2.57	1.32	40	2.7	1.04	40
	2	2.31	0.82	14	2.02	0.8	14	1.98	0.78	14	1.79	0.78	14	2.03	0.63	14
	3	2.67	1.01	6	2.22	0.83	6	1.94	0.57	6	1.94	0.39	6	2.19	0.58	6
	4	2.56	0.77	3	2.33	0.88	3	1.78	0.77	3	2.44	0.84	3	2.28	0.71	3
	5	1.67		1	1.67		1	1.33		1	1		1	1.42		1

4. No significant differences were found for the two groups of anonymity (yes/partial) and the total motivation score and its four factors.

   Thus, our expectation that the structural property of anonymity would be associated with higher levels of motivation was not confirmed.

5. No significant differences were found for the two groups of choice of role (yes/no) and the total motivation score and its four factors.

   Thus, our expectation that the provision to choose a role would show higher levels of student motivation was not confirmed.

6. No significant differences were found between the five groups of Choice played for the total motivation level and it's four factors.

   Thus, our expectation that students playing one of their chosen roles would display higher motivation levels was also not confirmed.

6.2.7 Role component properties and Motivation.

Spearman's correlations were conducted to probe associations between three Role component properties as perceived by players and Motivation. (Table 11.)

Table 11. Role properties (perceived) and Motivation

Role properties (perception)	**Attention**	**Confidence**	**Relevance**	**Satisfaction**	**Motivation total**
The role I played was peripheral	-0.136	-0.207	-0.177	-0.182	-0.184
The role I played needed to reach very specific objectives rather than open-ended objectives	0.128	0.161	0.164	.250*	0.202
The expected strategy of my role was to cooperate with other roles rather than to compete	-0.209	-0.192	-.226*	-.224*	-.258*
prefer to play on my own rather than in teams	-.236*	-0.183	-0.083	-.222*	-0.213

* P<.05 **P<.01 ***P<.001

The following are our findings regarding our operative questions on Motivation and properties of the Role component (see section 3.2.2 above, questions 1 through 7).

1. No significant differences were found for the players' perception of the centrality of the role and motivation and its four factors.

2. Significant low positive correlation was found between the players perception of the role's objectives as being specific rather than open-ended and the satisfaction score (p<.05). As the respondent scored higher on this question, he/she got a higher score in the satisfaction factor, and vice versa.

   Meaning, to the extent that players perceived the objective of their role to be open-ended they were more satisfied than those who perceived their role to have very specific objectives.

   Though our expectation that students who perceived their role to have open-ended objectives would display higher levels of motivation was not confirmed, students who perceived their role as having open ended objectives had higher satisfaction levels.

3. Significant low negative correlation was found between the player's perception that the expected playing strategy of their role was to cooperate rather than compete with other

roles and the total motivation score (p<.05), the satisfaction (p<.05) and relevance (p<.05) factors.

Meaning, to the extent that respondents perceived that their role's expected strategy was to cooperate rather than compete with other roles (low scores), they got higher motivation scores, as well as higher relevance and satisfaction scores. Which in turns means that to the extent that students perceived that their role's strategy was to compete with other roles rather than to cooperate, the higher was their total motivation, satisfaction and relevance levels.

Thus, our expectation that students who perceived that their role's expected strategy is to compete with other roles rather than cooperate was confirmed.

4. Significant negative low correlations were found between players preference to play their role on their own rather than in teams and the attention (p<.05) and satisfaction (p<.05) factors of the motivation scale. No significant correlations were found between our independent variable and three of the factors constituting the motivation scale - confidence, relevance and the total motivation measures.

   Meaning, to the extent that students preferred to play on their own, the lower was their attention and satisfaction levels. In other words, players who preferred to play their role in teams had significantly higher attention and satisfaction levels.

   Thus, our expectation that players who prefer to play their role in teams rather than on their own was not confirmed. However, two of the measures on the motivation scale, attention and satisfaction, were significantly correlated with the preference to play in teams.

One-way ANOVA tests were conducted in order to probe associations between the three structural properties of the Role component as independent variables and motivation and its factors as dependent variables. Bonfferoni correction was applied for all ANOVA tests due to multiple comparisons (α=.008). (See means and standard deviations in table 12.)

Table 12. Role properties (structural) and Motivation

Role properties (structural)		Attention			Confidence			Relevance			Satisfaction			Motivation Total		
		M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N
# Roles	**> 20**	2.61	1.09	61	2.36	1.03	61	2	0.76	61	2.04	0.93	61	2.25	0.079	61
	< 19	3.36	1.23	23	3.14	1.22	23	3.17	1.24	23	3.72	1.27	23	3.35	1.13	23
#	**1**	3.35	1.2	24	3.15	1.2	24	3.15	1.22	24	3.7	1.24	24	3.34	1.1	24
players	**2**	2.56	1.04	50	2.4	1.06	50	1.92	0.72	50	1.92	0.91	50	2.2	0.78	50
per	**3**	2.67	1.23	6	2	1.1	6	2.28	0.98	6	2.28	0.33	6	2.31	0.81	6
role	**4**	3	1.72	4	2.08	0.63	4	2.42	1	4	2.92	1.34	4	2.61	0.97	4
Type	**g**	3.36	1.23	23	3.14	1.22	23	3.17	1.24	23	3.72	1.27	23	3.35	1.13	23
of role	**p**	2.61	1.09	61	2.36	1.03	61	2	0.76	61	2.04	0.93	61	2.25	0.79	61

5. Significant differences were found between the number of roles for the total motivation score [$F(1,83)=25.528$, $p<.001$], in the Attention factor [$F(1,83)=7.519$, $p<.007$], in the Confidence factor [$F(1,83)=8.802$, $p<.004$], in the Relevance factor [$F(1,83)=27.170$, $p<.001$], and in the Satisfaction factor [$F(1,83)=43.892$, $p<.001$]. For number of roles under 19, the total motivation score and scores for all four factors were higher.

   Meaning, to the extent that the number of roles was 20 or above, the total motivation level was higher, as well as being higher in each of its four factors.

   Thus, our expectation that a larger number of roles in a MORPSG will have higher levels of student motivation, rather than smaller number of roles, was confirmed.

6. Significant differences were found between the number of players per role for the total motivation score [$F(3,80)=9.014$, $p<.001$], in the Relevance factor [$F(3,80)=9.728$, $p<.001$], and in the Satisfaction factor [$F(3,80)=17.111$ $p<.001$]. Tukey Post Hoc revealed significant differences between players who played on their own, who got higher scores in total motivation, relevance and satisfaction (i.e. lower levels of motivation), as compared to those who played as teams of two who got low scores (i.e. higher levels of motivation). Students who played on their own Group 1 also got higher scores compare to group 3 in satisfaction.

This means that those who played their role on their own, were less motivated generally, as well as less satisfied and felt the simulation to be less relevant, than those who played in teams of 2 or more players per role. In other words, where roles were played in teams of 2 or more, motivation was higher as well as feeling more satisfied and that the simulation was more relevant.

Thus, our expectation that playing roles in teams rather than one player per roles would have higher levels of motivation was confirmed.

7. Significant differences were also found for the two groups of type of role (g/p) and the total motivation score [F(1,82)=25.528, p<.001], the attention factor of motivation [F(1,82)=7.519, p=.007], the confidence factor of motivation [F(1,82)=8.802, p=.004], the Relevance factor of motivation [F(1,82)=27.170, p<.001], and the Satisfaction factor of motivation [F(1,82)=43.892, p<.001]. For all measures the students playing generic roles ('g') got a significantly higher scores compared to students who played personal roles ('p').

   Meaning, to the extent that students played personal roles ('p') rather than generic ones ('g'), they had higher motivation levels, were more attentive, confident, satisfied and felt the simulation was more relevant to them.

   Thus, our expectation that playing personal roles will have higher levels of motivation was confirmed.

6.2.8 Interaction component properties and Motivation.

Pearson's correlations were also conducted to probe associations between the amount of time and number of days invested on the Simulation and motivation. (Table 13.)

The following are our findings regarding our operative questions on Motivation and properties of the Interaction component (see section 3.2.3 above, questions 1 through 7).

Table 13. Interaction properties (structural) and Motivation

Interaction properties	**Attention**	**Confidence**	**Relevance**	**Satisfaction**	**Motivation Total**
# of days played	-.288**	-.383**	-.514**	-.570**	-.504**
# of hours played	-0.187	-.332**	-.404***	-.472***	-.402***
# hours Reading Only	-0.067	-0.14	-.237*	-0.208	-0.187
# hours Interacting Only	-0.188	-.331**	-.393**	-.469**	-.398**
Pre+post Sim # of hours	.241*	0.177	.313**	.315**	.300**
Total # of msgs	0.026	-0.019	-0.045	-0.042	-0.025
Total # of words	-0.162	-.232*	-.264*	-.359**	-.294**

* p<.05 **p<.01 ***p<.001

1. Significant negative high to low correlations were found between the number of days played by students and the total motivation score (p<.01), Attention (p<.01), confidence (p<.01), relevance (p<.01) and satisfaction (p<.01) factors. The more days invested on sim, the lower are all these the scores of these factors.

   Meaning the more days played by the student, the higher was their total motivation, the more attentive, confident, satisfied and the greater their feeling of relevance.

   Thus, our expectation that the more days played the higher will be their motivation was confirmed.

2. Significant negative medium-low correlations were also found between the total number of hours played by students and the total motivation score (p<.001), confidence (p<.01), relevance (p<.001) and satisfaction (p<.001) scores. The more time invested in playing, the lower are these four measures.

   Meaning the more hours students spent in playing the higher was their motivation, their attentiveness, confidence, satisfaction and the more relevant it felt for them.

   Thus, our expectation that the longer hours spent playing by a student the higher will be their motivation is confirmed.

3. No significant correlation was found between the number of hours spent on only reading and motivation. However, a significant low negative correlation was found between the

number of hours spent on only reading and the relevant factor (p<.05) on the motivation scale.

Meaning, the number of hours spent on only reading material, such as the scenario and resources (as opposed to interacting), the more the students felt the activity was relevant. However, the number of hours spent on only reading cannot explain students' levels of motivation.

Thus, our expectation that the longer hours spent by a student on only reading, the higher will be their motivation was not confirmed.

4. Significant negative medium correlations were found between the number of hours spent by students on only interacting and the students' total motivation score (p<.01), as well as the confidence (p<.01), relevance (p<.01), and satisfaction (p<.01) factors on the motivation scale. The more hours spent on only interacting, the lower are these three measures.

   Meaning, the more hours students spent in interacting (rather than reading) the higher was their motivation, their confidence, satisfaction and the more relevant it felt for them.

   Thus, our expectation that the longer hours spent interacting by a student the higher will be their motivation is confirmed.

5. Significant positive low correlations were found between the number of hours spent before and after playing (Pre+post Sim # of hours) and the total motivation score (p<.01), Attention (p<.05), relevance (p<.01) and satisfaction (p<.01) factors. The more sim hours spent before and after playing (Pre + post Sim # hours), the higher the scores of these measures.

   Meaning, to the extent that students spent more hours before and after playing the simulation, the lower was their total motivation, attentiveness, relevance and satisfaction levels.

   Our expectation that the longer hours spent before and after play, the higher will be their motivation was not confirmed. Indeed, this finding negates the expectation. It suggests

that the less hours students spent before and after the simulation, the higher will be their motivation level.

6. No significant correlations were found between the total number of messages sent and motivation or any of its four factors.

   Our expectation that the higher number of messages sent by a player the higher will be their motivation was not confirmed.

7. Significant negative low correlations were found between the total number of words and the total motivation score (p<.01), confidence score (p<.05), relevance (p<.05) and satisfaction (p<.01), scores. The higher the word number is, the lower are these four measures.

   Meaning the higher the number of words input by the student the higher is their motivation, confidence and feelings of relevance and satisfaction.

   Thus, or expectation that the higher number of words generated by a player the higher will be their motivation is confirmed.

6.3 Engagement

6.3.1 Age and Engagement.

One-way ANOVA tests were conducted in order to probe associations between age as independent variable and engagement and its factors as dependent variable. (Table 14.)

No significant differences were found for the total engagement level and all 3 of its factors.

Table 14. Age and Engagement

Age		Active participation	Cognitive effort	Development of personal skills	Engagement Total
18-22	**Mean**	2.25	2.4	2.1	2.25
	Std	0.35	0	0.42	0.05
	N	2	2	2	2
23-27	**Mean**	2.4	2.13	2.26	2.25
	Std	0.67	0.6	0.72	0.47
	N	20	20	20	20
28-32	**Mean**	2.21	2.27	2.33	2.27
	Std	0.77	0.59	0.68	0.53
	N	36	36	36	36
33-37	**Mean**	2.27	2.39	2.58	2.42
	Std	0.43	0.75	0.68	0.53
	N	23	23	23	23
38 +	**Mean**	3	2.8	2.33	2.69
	Std	0.66	0.35	0.5	0.25
	N	3	3	3	3
Total	**Mean**	2.3	2.29	2.38	2.32
	Std	0.66	0.63	0.68	0.51
	N	84	84	84	84

6.3.2 Gender and Engagement.

One-way ANOVA tests were conducted in order to probe associations between gender as independent variable and engagement and its factors as dependent variable. (Table 15.)

No significant differences were found for the total engagement level or any of the engagement's factors, between the genders.

Table 15. Gender and Engagement

Gender		Active participation	Cognitive effort	Development of personal skills	Engagement Total
male	**Mean**	2.27	2.18	2.31	2.25
	Std	0.66	0.56	0.54	0.47
	N	34	34	34	34
female	**Mean**	2.32	2.37	2.42	2.37
	Std	0.67	0.67	0.76	0.53
	N	50	50	50	50
Total	**Mean**	2.3	2.29	2.38	2.32
	Std	0.66	0.63	0.68	0.51
	N	84	84	84	84

6.3.3 Educational level and Engagement

One-way ANOVA tests were conducted in order to probe associations between levels of education as an independent variable and engagement and its factors as a dependent variable. (Table 16.)

Table 16. Education and Engagement

Educational level		Active participation	Cognitive effort	Development of personal skills	Engagement Total
under-graduate	**M**	2.58	2.4	2.42	2.46
	Std	0.75	0.81	0.87	0.7
	N	10	10	10	10
graduate	**M**	2.14	2.22	2.37	2.25
	Std	0.61	0.67	0.7	0.49
	N	38	38	38	38
post-graduate	**M**	2.33	2.25	2.27	2.28
	Std	0.69	0.45	0.51	0.42
	N	30	30	30	30
other	**M**	2.67	2.8	2.83	2.77
	Std	0.58	0.74	0.94	0.43
	N	6	6	6	6
Total	**M**	2.3	2.29	2.38	2.32
	Std	0.66	0.63	0.68	0.51
	N	84	84	84	84

No significant differences were found for the total engagement level or any of the engagement's factors, between the levels of education.

6.3.4 Language and Engagement.

Pearson correlations were conducted to probe associations between language as an independent variable and engagement and its factors as a dependent variable. (Table 17.)

Table 17. Language and Engagement

Language proficiency	**Active participation**	**Cognitive effort**	**Development of personal skills**	**Engagement Total**
Language you speak best (1=English, 0= Not English)	-.328**	-0.211	-0.167	-.298**

* p<.05 **p<.01 ***p<.001

Significant negative correlations were found between the language students felt they spoke best and the total engagement score and the factor Active participation. English speakers presented lower engagement scores on these measures. Meaning English speakers had higher engagement levels in the active participation factor and in total engagement.

6.3.5 Experience and Engagement.

Spearman's correlations were conducted to probe associations between experience and engagement. (Table 18.)

Table 18. Experience with online games and educational role-playing and Engagement

Experience with Role-play/online games	**Active participation**	**Cognitive effort**	**Development of personal skills**	**Engagement Total**
Experienced in playing online games	0.041	.239*	0.128	0.173
Experienced with educational role-play (online or face to face)	0.094	.267*	-0.014	0.163

* p<.05 **p<.01 ***p<.001

Significant low, positive correlation was found between the student's reported experience with playing online games and the Cognitive effort factor. As the experience score goes up, this factor

score goes up. Meaning, the less the student has experience with online games the lower is the cognitive effort displayed. Conversely, the more experience with online games the student reports, the higher is their cognitive effort.

Also, significant low, positive correlation was found between the student's experience with educational role-playing and the Cognitive effort factor. As experience score goes up, this factor score goes up. Meaning, the less the student has experience with educational role-playing the lower is the cognitive effort displayed. Conversely, the more experience with educational role-playing the student reports, the higher is their cognitive effort.

6.3.6 Player component properties and Engagement.

Spearman's correlations were conducted to probe associations between the student preferences of the Player components' properties as the independent variable and engagement and its factors as the dependent variable (Table 19).

Table 19. Player component (preferences) and engagement

Player preferences and evaluations	**Active participation**	**Cognitive effort**	**Development of personal skills**	**Engagement Total**
play my role anonymously	0.177	0.185	0.152	.223*
personal relevance	0.132	.233*	0.106	0.174
personally identified	.243*	.234*	0.113	.246*

* p<.05 **p<.01 ***p<.001

The following are our findings regarding our operative questions on Engagement and properties of the Player component (see section 3.2.4 above, question 1 through 6).

1. A significant low positive correlation was found between the scores of players' preference for anonymity and the total engagement score (p<.05). As players scored higher in preferring to play their role anonymously, they got a higher total engagement score, and vice versa.

   Meaning, to the extent that players preferred not to play anonymously, they also felt less engaged, while players who preferred to play anonymously felt more engaged.

Thus, our expectation that students who prefer playing anonymously will have higher levels of engagement is confirmed.

2. Significant low positive and correlation was found between the scores of players who felt that the role they played had personal relevance and the cognitive effort factor ($p<.05$). As the personal relevance score was higher, the cognitive effort score was higher. Meaning, to the extent that players did not feel the role had personal relevance, they felt less cognitive effort, while players who did feel their role had personal relevance felt more cognitive effort.

   Though our expectation that players who perceive their role to have personal relevance to themselves was not confirmed, the finding indicates that players who perceived their role to have personal relevance felt more cognitive effort.

3. Also, significant low positive correlations were found between the scores of players who personally identified with their role and the total engagement score ($p<.05$), the active participation ($p<.05$) and cognitive effort ($p<.05$) scores. As the score for players' identification with the role was higher, the engagement score and the scores these two factors were also higher.

   Meaning, the greater the players identification with their role the higher their total engagement, active participation and cognitive effort. Conversely to the extent that players felt the less identified with their role, the less their total engagement, their active participation and cognitive effort.

   Thus, our expectation that players who identified with their role will have higher levels of engagement is confirmed.

One-way ANOVA tests were conducted in order to probe associations between three of the Role component structural properties as independent variables and engagement and its factors as dependent variable. Bonfferoni correction was applied for all ANOVA test due to multiple comparisons ($\alpha=.01$). (See means and standard deviations in Table 20).

Table 20. Player component (structural) and engagement

Player properties (structural)		Active participation			Cognitive effort			Development of personal skills			Engagement Total		
		M	Std	N	M	Std	N	M	Std	N	M	Std	N
Anonymity	**partial**	2.19	0.66	61	2.15	0.52	61	2.28	0.58	61	2.2	0.44	61
	yes	2.6	0.6	23	2.69	0.74	23	2.62	0.86	23	2.63	0.54	23
Choice of role	**No**	2.85	0.53	10	2.44	0.82	10	2.12	0.95	10	2.44	0.59	10
	yes	2.23	0.65	74	2.27	0.61	74	2.41	0.64	74	2.31	0.5	74
Choice played	**0**	2.53	0.67	20	2.39	0.83	20	2.29	0.79	20	2.39	0.6	20
	1	2.24	0.65	40	2.4	0.57	40	2.55	0.66	40	2.41	0.48	40
	2	2.08	0.56	14	1.97	0.53	14	2.13	0.56	14	2.05	0.42	14
	3	2.08	0.47	6	2.27	0.3	6	2.23	0.5	6	2.19	0.2	6
	4	3	1.15	3	2.13	0.42	3	2.33	0.83	3	2.45	0.76	3
	5	2.5		1	1.2		1	1.6		1	1.71		1

4. Significant differences were found for the two groups of anonymity (yes/partial) and the total engagement score [$F(1,82)=13.881$, $p<.001$], the Active participation factor of engagement [$F(1,82)=6.818$, $p<.01$] and the cognitive effort factor of engagement [$F(1,82)=14.141$, $p<.001$]. Scores are consistently higher for the complete anonymity rather than for the partial anonymity.

   Meaning to the extent that players were only partially anonymous, they reported higher engagement levels, greater active participation and greater cognitive effort.

   Our expectation that where players remain anonymous, regardless of their preferences, students will have higher levels of engagement was not confirmed. Rather, higher levels of engagement levels were reached where partial anonymity was instituted.

5. Significant differences were found for the two groups of choice of role (yes/no) and the Active participation factor of engagement [$F(1,82)=8.479$, $p<.005$]. For this measure the group which had a choice of role got lower scores as compared with the group with did not have a choice of role.

   Meaning to the extent to which choice of role was provided to students, they reported higher active participation levels.

Our expectation that the provision of choice which role to play would show higher engagement levels was not confirmed. However, where the provision for choosing a role was provided, students reported higher active participation levels.

6. No significant differences were found for the five groups of Choice played and the total engagement score and its factors.

6.3.7 Role component Properties and Engagement.

Spearman's correlations were conducted to probe associations between the Role component properties as independent variables and engagement and its factors as the dependent variables. (Table 20.)

Table 20. Role component (preferences) and engagement

Role properties (perception)	**Active participation**	**Cognitive effort**	**Development of personal skills**	**Engagement Total**
The role I played was peripheral	-.261*	-0.153	0.055	-0.117
The role I played needed to reach very specific objectives rather than open-ended objectives	0.167	.354**	0.205	.351**
The expected strategy of my role was to cooperate with other roles rather than to compete	0.115	-0.096	-0.077	-0.05
I prefer to play on my own rather than in teams	-0.114	-.228*	-0.147	-.217*

* p<.05 **p<.01 ***p<.001

The following are our findings regarding our operative questions on Engagement and properties of the Player component (see section 3.2.5 above, questions.1 through 7).

1. Significant low negative correlation was found between students' perception of the centrality of the role to the scenario (peripheral versus central), and the active participation score (p<.05). As respondent scored higher, meaning they perceived their role to be central to the scenario rather than peripheral, they got a lower score in this factor, and vice versa.

Meaning, to the extent that players perceived their role to be central to the scenario, the higher was their active participation levels.

Our expectation that students who perceive their role to be central to the scenario will have higher levels of engagement was not confirmed. However, these students did report higher levels of active participation.

2. Significant low positive correlation was found between the student's perception of the role's objectives in the game (specific objectives versus open-ended objectives) and the total motivation score ($p<.01$), and the cognitive effort factor ($p<.01$). As players perceived their role to have more specific objectives, rather than open-ended ones, they got higher total engagement scores and higher cognitive effort scores.

   Meaning, to the extent that students perceived their role to have specific objectives they also reported lower engagement levels and lower cognitive effort. In contrast, students who perceived their role to have open-ended objectives felt they were more engaged and exerted more cognitive effort.

   Thus, our expectation that students who perceive that their role's objectives are open-ended will have higher engagement levels is confirmed.

3. No significant differences were found between the student's expected strategy of the role (cooperation versus competition) and the total engagement level and its four factors.

4. Significant negative low correlations were found between the students' preference to play on their own rather than in teams and the total engagement score ($p<.05$) and the cognitive effort score ($p<.05$). As participants scored higher in their preference to play on their own, the lower are the scores on these two measures of engagement.

   Meaning, to the extent that students preferred to play in teams rather than on their own, their engagement is higher, and the cognitive factor level is higher.

   Thus, our expectation that students who prefer to play their role in teams will have higher engagement levels is confirmed.

One-way ANOVA tests were conducted in order to probe associations between three of Simulation role structure's measures as independent variables and the engagement and it's factors as dependent variable. Bonfferoni correction was applied for all ANOVA test due to multiple comparisons (α=.01). (See means and standard deviations in Table 21.)

Table 21. Role structure and engagement

Player properties (structural)		Active participation			Cognitive effort			Development of personal skills			Engagement Total		
		M	Std	N	M	Std	N	M	Std	N	M	Std	N
# **Roles**	**> 20**	2.19	0.66	61	2.15	0.52	61	2.28	0.58	61	2.2	0.44	61
	< 19	2.6	0.6	23	2.69	0.74	23	2.62	0.86	23	2.63	0.54	23
# **players per role**	**1**	2.66	0.65	24	2.68	0.72	24	2.64	0.84	24	2.65	0.54	24
	2	2.21	0.61	50	2.11	0.52	50	2.24	0.57	50	2.19	0.43	50
	3	1.83	0.54	6	2.2	0.44	6	2.43	0.6	6	2.18	0.44	6
	4	2	0.87	4	2.36	0.75	4	2.35	0.75	4	2.25	0.52	4
Type of role	**g**	2.6	0.6	23	2.69	0.74	23	2.62	0.86	23	2.63	0.54	23
	p	2.19	0.66	61	2.15	0.52	61	2.28	0.58	61	2.2	0.44	61

5. Significant difference was found for the two groups of number of roles in the total engagement score [F(1,82)=13.881, p<.001], the active participation score [F(3,82)=6.818, p<.01] and the Cognitive effort score [F(1,81)=14.141, p<.001]. For number of roles under 19, scores in these measures of engagement were higher.

   Meaning, to the extent that the number of roles was 19 or under, players reported being less engaged, had lower active participation and had lower cognitive effort. In contrast, where the number of roles was 20 and above students reported higher engagement, greater active participation and more cognitive effort levels.

   Our expectation that MORPSGs that have a larger number of roles will have higher student engagement levels is thus confirmed.

6. Significant difference was found for the four groups of number of players per role and the total engagement score [F(3,80)=5.691, p<.001], the active participation score [F(3,80)=4.336, p<.007], and the cognitive effort score [F(3,80)=5.112, p<.003]. Tukey Post Hoc revealed significant differences between those students who played the roles on

their own (group 1), who got higher scores in the total engagement, active participation and cognitive effort factors, as compared to students who played their role as a team of two players (group 2). Group 1 also got a higher score in the active participation factor, as compare to group 3 (students who played as a team of three) whose score was lower.

Meaning, to the extent that students played on their own, they reported to be less engaged, had lower active participation and exerted less cognitive effort. Conversely, those who played their role in teams of 2 or above, reported they were more engaged, had higher active participation and exerted more cognitive effort.

Thus, our expectation that roles played in teams rather than as single players, will have higher engagement levels is confirmed.

7. Significant differences were found for the two groups of type of role (g/p) and the total engagement [$F(1,82)=13.881$, $p<.001$], the active participation factor [$F(1,82)=6.818$, $p<.01$], and the cognitive effort factor [$F(1,82)=14.141$, $p<.001$]. Scores are consistently higher for students who played generic type roles (group 'g') as compared to personal type roles (group 'p').

   Meaning, to the extent that students played generic roles ('g') they were significantly less engaged, had lower active participation levels and exerted significantly lower cognitive effort. Conversely, students who played personal roles ('p') reported significantly higher engagement, higher active participation and higher cognitive effort levels.

   Thus, our expectation that students playing real world personal roles, rather than generic ones, will have higher levels of engagement is confirmed.

6.3.8 Interaction component properties and Engagement.

Pearson correlations were conducted to probe associations between the time and amount of work invested on the simulation as independent variables and engagement and its factors as dependent variables. (Table 21.)

Table 21. Interaction structure and engagement

Interaction properties	**Active participation**	**Cognitive effort**	**Development of personal skills**	**Engagement Total**
# of days played	-.255*	-.284**	-0.186	-.310**
# of hours played	-.366**	-.360**	-0.143	-.372**
# hours Reading Only	-0.153	-0.149	-0.051	-0.152
# hours Interacting Only	-.365**	-.360**	-0.144	-.371**
Pre+post Sim # of hours	-0.136	-0.122	-0.05	-0.132
Total # of msgs	-.226*	-0.061	0.061	-0.088
Total # of words	-.308**	-.325**	-0.078	-.300**

* p<.05 **p<.01 ***p<.001

The following are our findings regarding our operative questions on Engagement and properties of the Player component (see section 3.2.6 above – questions 1 through 7).

1. Significant negative low correlations were found between the number of days played and the total engagement score (p<.01), active participation (p<.05), and cognitive effort factors (p<.01). The more days invested in playing, the lower are the scores of these three measures.

   Meaning to the extent that the student spent more of days playing, the higher the total level of engagement, the greater the active participation and the greater the cognitive effort.

   Our expectation that the more days played by a student, the higher will be their levels of engagement is confirmed.

2. Significant negative medium-low correlations were found between the number of hours students played and the total engagement score (p<.01), active participation (p<.01), and cognitive effort (p<.01) scores. The more hours students invested in playing, the lower are these three measures.

   Meaning, to the extent that students spent more hours playing, the higher is their total engagement level, the greater the active participation and the greater the cognitive effort reported by students.

Our expectation that the longer hours spent by a student in only interacting, the higher will be their level of engagement is confirmed.

3. No significant correlation was found between the number of hours spent on only reading and engagement nor on any of the factors on the engagement scale.

4. Significant negative medium correlations were found between the number of hours students spent only on interaction (as opposed to only reading) and the total engagement score ($p<.01$), active participation ($p<.01$), and cognitive effort ($p<.01$) scores. The more hours students invested in interacting, the lower are these three measures.

   Meaning, to the extent that students spent more hours playing, the higher is their total engagement level, the greater the active participation and the greater the cognitive effort reported by students.

   Our expectation that the longer hours spent by a student in playing the higher will be their level of engagement is confirmed.

5. No significant correlations were found between the Pre and Post sim number of hours invested and total engagement and its factors.

6. A significant negative low correlation was found between the total number of messages sent by players and the active participation factor ($p<.01$). The higher number of messages input by players, the lower was this measure.

   Meaning to the extent the greater the number of messages sent by players, the greater the active participation level.

   Our expectation that that the more messages sent by a student-player, the higher will be their engagement level was not confirmed. However, the more messages sent by students the higher is their active participation level.

7. Significant negative low correlations were found between the number of words generated by a player and the total engagement score ($p<.01$), active participation ($p<.01$), and cognitive effort ($p<.01$) scores. The greater the number of words input by players, the lower are these three measures.

Meaning, to the extent student-players generate more words, the greater was their total engagement, their active participation and cognitive effort levels.

Thus, our expectation that the higher number of words generated by a student the higher will be their level of engagement is confirmed.

6.4 Summary of Findings

Table 22 below summarizes our findings on the different properties examined, indicating the variables for which significant correlations were found between the independent variable and motivation and its factors as dependent variables, as well as that of the independent variables and engagement and its factors as the dependent variables. It also shows which properties did not significantly correlate with either motivation, engagement or both (the empty cells).

Table 22. Overview of Findings

	Motivation					Engagement			
	attention	confidence	relevence	satisfaction	total	Active Participation	Cognitive effort	personal skills	total
Age									
Gender (M/F)	p=.022			p=.020	p=.017				
Education level				p=.004					
Language (English/NonEng.)	-.247*	-.216*		-.234*	-.260*	-.328**			-.298**
Experience with Online Games							.239*		
Experience eductional Role Plays							.267*		
Player									
Anonymity (preference)	.333**	.338**	.392***	.383***	.424***				.223*
Personal relevence of role	.324**	.281**	.322**	.369**	.381***		.233*		
Personally identified with role				.295**	.223*	.243*	.234*		.246*
Anonymity (structural)						p<.01	p<.011		p<.001
Choice of Role						p=.005			
Choice played									
Role									
Peripheral/central to scenario						-.261*			
Objectives specific/open-ended				.250*			.354**		.351**
Strategy cooperate/compete			-.226*	-.224*	-.258*				
Prefer to play on own/team	-.236*			-.222*			-.228*		-.217*
# of Roles	p=.007	p=.004	p<.001	p<.001	p<.001	p=.01	p<.001		p<.001
# of Players per role			p<.001	p<.001	p<.001	p=.007	p=.003		p=.001
type of role g/p	p=.007	p=.004	p<.001	p<.001	p<.001	p=.011	p<.001		p<.001
Interaction									
# of days played	-.288**	-.383**	-.514**	-.570**	-.504**	-.255*	-.284**		-.310**
Total # of hours played		-.332**	-.404***	-.472***	-.402***	-.366**	-.360**		-.372**
# hours Reading Only			-.237*						
# hours Interaction Only		-.331**	-.393**	-.469**	-.398**	-.365**	-.360**		-.371**
Pre+post Sim # of hours	.241*		.313**	.315**	.300**				
Total # of msgs						-.226*			
Total # of words		-.232*	-.264*	-.359**	-.294**	-.308**	-.325**		-.300**

* p<.05 **p<.01 ***p<.001

7. Discussion

Our research questions (section 3.1 above) required us to examine whether the structural design properties of multiplayer online role-playing simulation games may help us explain the perceived motivation to learn and engagement in learning of higher education students using MORPSGs.

In the previous sections, we have has examined 20 such properties, of which 6 were related to the Player component, 7 related to the Role component and 7 related to the Interaction component of MORPSGs. In addition, we have also examined 5 background variables that may also explain the perceived motivation and engagement in learning using MORPSGs.

7.1 Student background, Motivation and Engagement.

Only two student demographic factors, Gender and Language, significantly correlated with motivation, and only Language also significantly correlated with engagement. Males who were 40% of our sample, seem to be more motivated than females (60%), and those who reported English as the language they speak best (62%) were both more motivated and engaged than those who reported other languages that they spoke best (38%). Males also had higher attention and satisfaction levels on the motivation scale, than females, while those who spoke English had higher attention, confidence and satisfaction levels than females. English speakers also had higher active participation levels than females.

Though background experience with online games and experience with educational role-plays did not significantly correlate with either motivation nor engagement, those who reported they had experience with either online games and/or educational role-plays had higher cognitive effort levels on the engagement scale.

The educational level of students also does not seem to have been a significant factor in students' motivation, nor engagement. However, those who reported they achieved one of the higher education levels (under-graduate, graduate or post-graduate) seem to have been more satisfied than students who reported some other educational level. However, the small number of the latter group (7%) suggests that this finding may be inconclusive.

7.2 Player properties, motivation and engagement.

Of the 6 properties we examined that related to the Player component of role-plays, only 3, the players' anonymity preferences, personal relevance of the role to the player, and players' identification with the role, were significantly correlated to motivation. On the other hand, 3 properties, the players' preference for anonymity, players' identification with the role, and structural anonymity, were significantly correlated with engagement.

7.2.1 Anonymity (preferred and structural).

Students who preferred to play their role anonymously displayed higher levels of motivation than students who did not prefer to play anonymously. However, our findings also showed no

significant differences in the level of motivation between student-players who actually played completely anonymous and those who did not. That is, in MORPSGs that were structured so that players would remain fully anonymous, students did not display higher levels of motivation than those who were only partially anonymous. However, this result may be explained by the fact that both MORPSGs that were used for this study, had some level of anonymity, full or partial. Had we examined MORPSGs that were structurally organized to have no anonymity at all, the results may well have been different.

While the literature on online role-plays provides arguments both in favor of playing anonymously (Lybeck et al., 2010; Willis et al. 2009; Linser et al., 1999; Babst et al., 2012; Shortridge et al. 2007) and against playing anonymously (Seo & Tindall, 2010, Freeman & Bramford, 2004), it seems that actually playing MORPSGs structured for full or partial anonymity, does not help explain students' level of motivation. On the other hand, students' preference to play anonymously, regardless of whether they actually played their roles anonymously or partially anonymously, does explain higher level of motivation by these students.

The preference to play anonymously also helps explain student levels of engagement, though there seems to be no significant correlation with any of the factors constituting the engagement scale. On the other hand, unlike our finding in relation to motivation, there is a clear significant correlation between the level of engagement and structural anonymity. That is, students who actually played their role anonymously or partially anonymously, had higher levels of engagement, showed higher levels of participation and higher levels of cognitive effort. Thus, the literature on online teaching, that suggests that anonymity contributes to student participation (Mckenzie et al., 2003; Shortridge et. al., 2007; Freeman & Capper, 1999; Li, 2006; Barrett, 2008) seems to also be applicable to MORPSGs.

We can thus reasonably suggest that while MORPSGs which are structured to be played anonymously may or may not contribute to the levels of motivation of students, it does help explain the higher levels of student engagement as Cornelius and her colleagues suggest (2011). Moreover, students who prefer to play anonymously are likely to demonstrate higher levels of both motivation and engagement.

7.2.2 Personal relevance and identification with the role.

Though the literature on role-plays does not directly address the issue of personal relevance of roles to the students, some role-plays clearly attempt to create roles that have personal relevance to students and/or with which students can identify (Nelson and Blenkin, 2008; Linser et al., 2007). Our findings suggest that students who perceive that the role they play has personal relevance to themselves, clearly have higher levels of motivation, as well as displaying higher levels of attention, confidence, relevance and satisfaction.

On the other hand, there seems to be no significant correlation between the perception that the role is personally relevant to the student and their engagement level, though, these students do seem to have higher levels of cognitive effort on the engagement scale.

Turkle (1994) has argued that role-playing games enable people to work through issues of identity and Linser (2004) has argued, that student identification with the roles they play is indeed what makes role-plays effective due the recursive resonance between the identity of the role and identity of the student created by playing a role. Our findings suggest that identification of the student with the role, can explain higher student motivation levels as well as the higher satisfaction on the motivation scale.

Identification with the role also explains higher levels of student engagement, as well as higher active participation and cognitive efforts on the engagement scale. Though these findings do not demonstrate the veracity of the argument presented by Linser (2004), they do give it some credence, especially if we accept that higher student motivation and engagement support effective role-plays as constructivism seems to suggest (Eshet & Hammer 2006).

Our findings thus lead to us suggest that while the relevance of roles to players can to some extent explain students' higher levels of motivation, they cannot not explain higher engagement levels. On the other hand, student identification with the role they play is likely to lead to both higher levels of motivation and engagement.

7.2.3 Choice of Role and Choice played

Interestingly, and contrary to our expectation, the two structural properties of the Player component, Choice of Role, and Choice played, like structural Anonymity discussed above (8.2.1), had no significant correlations with student motivation nor any of its factors. Furthermore, neither having a choice in which role to play nor playing any of their chosen roles showed significant correlations with student engagement. However, those who did have a choice of role seem to have higher active participation levels on the engagement scale than those who did not have a choice of role.

This finding is interesting because it seems to go against the grain of the literature on constructivism generally (Bandura, 1999; Sharan & Sharan 1992) and on role-play in particular (Cornelius et al., 2011), as well as in the majority of practice of giving students a choice in which roles they would play (Lantis, 1998; Ip & Linser, 2001; Nelson & Blenkin, 2008; Ching, 2014; Rector-Aranda et al., 2017). Giving students a choice, it has been argued, leads both to motivation (Deci & Ryan, 1985; Pintrich, 2004; Lafrenière et al., 2012) and engagement (Skinner et. al., 2008; Berson et al., 2008). Yet this was not confirmed by our findings.

It may be, that for our sample of higher education students, or perhaps for higher education students in general, these properties of the Player component of role-plays, are somehow less important in explaining their motivation and engagement. At any rate, it would be interesting to investigate this further with either a bigger and more representative sample and/or more than the two MORPSGs investigated in this study.

7.3 Role properties, Motivation and Engagement.

Of the 7 properties we examined that related to the Role component of role-plays, 4 properties, the strategy of the role, the number of roles, the number of players per role and type of role, were significantly correlated with motivation. On the other hand, 5 of the properties of the Role component were significantly correlated with engagement.

7.3.1 Centrality, Objectives and Strategy of the Role.

Though there is very little in the literature on roles' relative position to a scenario, every role-play designer must consider which roles are central to the scenario of their roles play and which are more peripheral and perhaps less necessary. The extent to which players perceive the role's position as central or peripheral, can affect their motivation and engagement (Coll-Garcia and Ip, 2008).

Our finding is that players, who perceived their role to be peripheral to the scenario fared no better on the motivation scale than those who felt their role was central to the scenario. However, students who felt their role was central to the scenario had higher active participation levels on the engagement scale, though they were not any more engaged than students who felt their role was peripheral to the scenario.

The type of objectives a role pursues, as well as the strategy to achieve these, are commonly related to the level of motivation and engagement of players in the literature on games (Armory et al., 1990; Blas et al., 2005) as well as in role-plays (Linser et al., 2008). We found that students who perceived their role to have open-ended objectives, were not more motivated than those who perceived their role to have very specific objectives. But they did have higher levels of satisfaction on the motivation scale.

Though they were not more motivated, students who perceived their roles to have open-ended objectives rather than specific one, were more engaged than students who perceived that their role had specific objectives. They also showed higher levels of active participation and cognitive effort.

In contradistinction, students who perceived that the strategy of their role was to compete rather than cooperate, like in games, had higher levels of motivation, felt the role-play was more relevant and had higher satisfaction levels. But they were no different on the engagement scale than students who perceived that their role was to cooperate.

In other words, while students who perceived that their role had open ended objectives had higher engagement levels, they did not have higher motivation levels than those who had specific objectives. However, to the extent that the strategy to reach these objectives was competitive

rather than cooperative, they had higher motivation, yet they were not significantly different in their level of engagement than those who perceived their strategy was to cooperate.

Thus, we can provisionally deduce that the perception of role objectives is related more to levels of engagement while perception of the strategy used is related more to motivation.

7.3.2 Preference to play in teams and the number of players per role.

Collaborative learning is one of the hallmarks of constructivist theory (Ertmer & Newby, 1993), and the literature seems to suggest that collaboration is both motivating and engaging. Our finding is that students who preferred to play their role in teams, were more engaged but do not seem to have been more motivated. However, it seems that they did have higher attention and satisfaction levels on the motivation scale, as well as higher cognitive effort levels on the engagement scale.

Interestingly, despite the fact that those who preferred to play in teams were not any more motivated than those who preferred to play on their own, where students actually played their role in teams of two or more players to a role, they were more motivated and engaged than students who played their role on their own.

7.3.3 Number of roles and type of roles

Both the higher number of roles in a MORPSG and the type role that was personal rather than generic (Matz & Ebner 2011), were found to significantly correlate with both higher levels of motivation and engagement and higher levels on all the factors on the motivation scale and most of the factors on the engagement scale. Students who participated in MORPSGs that had a larger number of roles (20 roles and above) were both more motivated and engaged than students who played in MORPSGs with a smaller number of roles (19 and below). If a greater number of roles means greater variety then this finding is indicative of the importance of variety in MORPSGs to the motivation and engagement of students.

Similarly, those students who played roles modeled on real individuals in the real world (personal) were both more motivated and engaged than students who played generic roles. This finding supports the view that the greater the link of roles to real world personalities the higher

is the levels of student motivation and engagement (Linser et al. 2008). This finding thus supports the constructivist insistence on engaging students in social contexts that exhibit authentic, real world problems (Eshet & Hammer, 2006 (Hebrew)).

7.4 Interaction properties, Motivation and Engagement

Of the 7 properties we examined that related to the Interaction component of role-plays, 5 properties, number of days played, number of hours played, number of hours spent only on interaction, pre and post number of hours, and total number of words, were significantly correlated with motivation. On the other hand, only 4 of the properties of the Interaction component, number of days played, number of hours played by students, number of hours spent only on interaction and the total number of words they wrote were significantly correlated with engagement.

7.4.1 Number of days & hours played, hours spent Reading and hours spent Interacting.

The time students spend on a particular task (in our case MORPSGs) is indicative of both motivation (Mandernach, 2015; Kuh, 2003, Salmon, 2003) and engagement (Huizenga et al., 2009; Amory et al.,1999) as our findings confirm. When we break down the total number of hours students played ($\bar{x}$ = 14:55:48, SD=0.340), into hours spent on only reading (11%, $\bar{x}$ = 1:38:33, SD=0.046) and hours spent on only interacting (88%, $\bar{x}$ = 13:17:15, SD=0.321), it becomes clear that the interactive component of role-plays is indeed the task *par excellence* of MORPSGs. It is also indicative of the importance of active learning rather that only reading material.

Students who in total played more days, more hours and spent more time interacting were both significantly more motivated and engaged than those who in total played fewer number of days and/or hours and spent less time interacting. They also had higher levels on the confidence, relevance and satisfaction factors of the motivation scale as well as higher levels on active participation and cognitive effort factors on the engagement scale. Students who played more days also had higher attention levels on the motivation scale.

7.4.2 Pre and Post play activity

While there is no reference in the literature to the time spent by students on related activity before and after a role-play, unlike the time spent on the playing (above), our findings show that the more hours spent by students before and after play, the lower was their motivation. In other words, the amount of time spent before and after play on MORPSG related activity, can explain lower motivation levels. On the other hand, the number of hours spend before and after play seemed to make no difference, or rather cannot explain neither higher or lower levels of student engagement levels.

7.4.3 Number of messages and words

Similarly, though there is little reference in the literature to the number of messages and words used during a MORPSG, our findings suggest that the total amount of messages sent by players cannot explain the level of students' motivation nor engagement levels. However, students' level of active participation on the engagement scale was higher than those who sent fewer messages.

Yet, students whose total number of words in the MORPSG was higher were both more motivated and engaged than students who whose total input of words was lower. The higher number of words used by a student was also significantly related to higher levels of confidence, relevance and satisfaction on the motivation scale, as well as higher levels of active participation and cognitive effort on the engagement scale.

What this curiously suggests is that even if students sent less messages, to the extent that they use more words in these messages, the likelihood is that their motivation and engagement levels will be higher.

7.5 Summary: Design properties, Motivation and Engagement

Though, generalizations regarding the relationship between MORPSGs' design properties we investigated and the motivation and engagement of higher education students using MORPSGs to learn may be limited, we did find some patterns that are worth noting and investigating further.

7.5.1 Motivation and design properties

Three properties of the Player component that we examined showed that students who: 1. preferred to play anonymously; 2. felt that the role has some relevance to themselves, and; 3. identified with the role they played; were all found to significantly correlate with higher levels of students' motivation in the two higher educational institutions we examined that used MORPSGs.

However, none of the structural properties of the Player component where: 1. students actually played fully anonymous; 2. they had a choice in which role they would play, and; 3. they actually played their chosen role; did not seem to have significant correlations with the students' level of motivation.

In contradistinction, all of the three structural properties of the Role component that we examined, clearly showed that students had higher motivation levels where 1. the number of roles was 20 or above, 2. they played in teams of two players per role or above, and 3. the type of role was personal (i.e. roles that were modeled on real individuals in the real world). On the other hand, the properties preferred by students in the Role's structural component, did not seem to significantly correlate with student's levels of motivation, except for those students who perceived their role to have a competitive strategy rather than a cooperative one.

Finally, with regard to the Interaction component, four of the seven structural properties we examined: 1. where students played more days; 2. where they invested more hours in playing; 3. where they spent more time in interacting rather than reading, and; 4. where students used a greater number of words while playing; students had higher motivation levels. On the other hand, to the extent that students spent more time on MORPSG related activity before and after playing they had lower levels of motivation.

Thus, as can be provisionally deduced from the above, the answer to our first research question, is that the properties of the three structural components we examined can, for the most part, explain students' level of motivation using MORPSGs to learn in higher education.

However, what appears to emerge is that student preferences on the one hand and given structural properties of an MORPSG, on the other, display slightly different patterns in their

relation to motivation. While in the Player component the three student preferred properties we examined seem to explain the students' level of motivation, the three structural properties of this component do not. In the Role component, however this pattern seems to be reversed. In this component it was the structural components that seemed to better explain the level of motivation of the students, whereas student preferred properties of this component, do not explain their level of motivation. However, one of these preferred properties, those who perceived that the strategy of their role was to compete did have higher levels of motivation.

Given that this study did not report on the students' preferences of the Interaction component, but only the structural properties, we cannot at this point note whether a similar pattern in explaining the motivation of students found in the Player and Role components, can also be found in the Interaction component.

7.5.2 Engagement and design properties

Within the Player component, only two design properties preferred by students: 1. where students preferred full anonymity, and; 2. personally identified with the role; displayed higher levels of engagement. However, in contradistinction to our results on motivation, where students actually played fully anonymously, they were also more engaged than students in MORPSGs that were structured for partial anonymity.

Similarly, within the Role component, only two of the preferred properties (out of the 4 examined) reported by students: 1. where students perceived that the objectives of their role were open ended rather than specific, and; 2. where they personally identified with their role; students displayed higher engagement levels. On the other hand, all three structural properties: 1. where the number of roles of the MORPSG was 20 or above; 2. where they played their roles in teams of two or more players per role; and 3. where the type of role was personal (i.e. the role was modeled on a real person in the real world); students displayed significantly higher levels of engagement.

Finally, for the Interaction component, four structural properties (out of the 7 examined) where: 1. the number of days played by students was higher; 2. the number of hours they spent in playing was higher; 3. the number of hours they spent in interacting rather than reading; and 4. the total

number of words they used in their interaction was higher; the higher was the students' level of engagement.

It seems that for the Player component no clear overall pattern emerged from the perception and preferences of students in relation to their engagement levels. On the other hand, for the Role component, as was in relation to motivation, all the structural properties of MORPSGs showed closer association to engagement than the students' preferred properties.

Similarly, again like in relation to motivation, the structural properties of the interaction component were significantly correlated to engagement, but because we only gathered structural data and did not examine student preferences/perceptions with regard to the Interaction component, we cannot determine whether a similar pattern to the one exhibited in relation to motivation, also exists in the Interaction component in relation to engagement.

7.6 Limitations of the methodology.

Before we move on to the conclusions, however, we must first note some of the limitations of the methodology used and therefore the limitations of the study as a whole.

Our methodology suffers a number of limitations that limit the degree to which generalizations can be made. Firstly, our number of respondents is relatively small (n=84) though it is clearly representative of the research population (N=155). Secondly, we have examined only 2 MORPSGs, which we have run twice over the course of 2 years and therefore our sample cannot be said to adequately represent MORPSGs generally nor the populations of higher education students. Consequently, taken together these limitations mean that any patterns we have found have very limited capacity to make broad generalization regarding higher education students' motivation and engagement using MORPSGs.

However, while these two critical limitations cannot be ignored, the innovative methodology of data collection using student perceptions of the MORPSGs discussed in this study, in conjunction with using data analytics of these MORPSGs can provide some interesting perspectives on any patterns we have found.

The third significant limitation of the present work is that we have collected our data from two completely different courses (Business strategy and politics course, and a Practical Nursing course), each running a different MORPSGs, and we have collected the data in each of these at two different points in time (a year apart) in order to increase the number of respondents.

This procedure, which is clearly problematic, as we could not have guaranteed the similarity in characteristics of the separate groups, was taken because this study is at most an exploratory one. We took this path because, as we argued in the introduction to this study, the capacity to compare role-plays has been hampered in the past by a lack in the clarity of terms relating to role-plays, the absence of common definitions, and a multiplicity of MORPSG designs and consequently, at best only anecdotal evidence ensued. Our aim with the current procedure was to explore a way to find general patterns with which future research may be able to overcome the shortcomings of past research on MORPSGs.

The fourth limitation in our methodology is that we did bivariate analysis that examined correlational value of variable pairs. In other words, we only examined how each property of the structural components is correlated to motivation and engagement and each of their dimensions. We did not carry out multivariate analysis to find out the extent to which various variables correlate in explaining motivation and engagement.

While this is clearly an important limitation for generalization from our findings, the analysis we conducted still seems to indicate general patterns that future research can address in more detail.

The fifth limitation is that we have used the same environment, the Fablusi software, for both MORPSGs. The lack of comparison with other platforms may have repercussions on student levels of motivation and engagement. Given the fact that there are many such possible platforms and it is beyond the capacity of this study to do a full analysis, we have not examined the environment properties (the properties of the Fablusi software) in this study.

In sum, these five critical methodological issues considerably limit the capacity of this study to generalize from our findings regarding the motivation and engagement of higher education students using MORPSGs to learn. However, the study does provide a new way of

conceptualizing MORPSGs as well as providing an innovative mixed method of using both questionnaire-based student perceptual data with computer based big data.

8. Conclusions

The revolution in Information and Communication Technology (ICT) that has been transforming educational technology has over the past few decades enabled new structural possibilities in the design and implementations of games, simulations and role-plays in education. This study has argued that while games and simulations have received much attention both theoretically and empirically, role-plays seemed to receive much less attention theoretically and consequently empirical research into role-plays has lacked the rigor necessary for comparative analysis, and for our purposes, on the level to which they motivate and engage students to learn in higher education. More specifically, the lack of definitions, and confounding terms has resulted, at best, in anecdotal evidence, though these suggest that role-plays do motivate and engage students.

As an attempt to remedy this state of affairs, this study has provided a rigorous definition of role-play that enabled a more detailed view of the structure of role-plays and an analysis of the relation between the properties of these structural components and the motivation and engagement levels of students in higher education. Though this study suffers some methodological shortcomings, as an exploratory study, it never the less has enabled us to answer, even if only provisionally, our two research questions and discern some patterns in the way the different properties of these structural components of multiplayer online role-play simulation games can explain levels of student motivation and engagement.

Our first research question has asked whether the design properties of the structural components of role-plays can explain the motivation of higher education students using MORPSGs to learn. Having examined 20 such design properties of three structural components of role-plays (Player, Role, Interaction) out of the five component we listed (see Section 2), the findings provisionally show that 12 such design properties can clearly explain student motivation levels. The pattern that emerged showed that student motivation and players preferences and perceptions were significantly correlated to a greater extent in the Player component while the structural properties of the MORPSGs and student motivation were significantly correlated to a greater

extent in the Role component. Because we do not have data relating to students' preferences in the Interaction component – data that would have been available had we also examined the Environment component (e.g. whether students preferred using simMail or Chat) – we cannot at this stage comment on the pattern of the Interaction component in relation to motivation.

The second research question of this study asked whether the design properties of the structural components of role-plays can explain the engagement of higher education students in using MORPSGs to learn. Having examined the same 20 design properties of the three structural components of role-plays (Player, Role, Interaction), as we have in relation to motivation, the findings provisionally show that 12 such design properties can clearly explain student engagement levels. Though the pattern of student engagement in relation to student preferences/perception versus structural properties in the Players component is not clear cut, the relation between preference/perception and structural properties in the Role component does indicate, similar to the pattern in relation to motivation, that structural properties seem to show significant correlations to a greater extent than students' preference/perceptions.

Thus, given our findings discussed above, overall, we have found 9 properties of MORPSGs that were both significantly correlated to both motivation and engagement, 3 properties that were significantly correlated to student motivation but not to engagement, and 3 properties that were significantly correlated to engagement but not to motivation (see above Table 22.)

This study has shown that a more rigorous definition of role-play, that leads to a more detailed view of the structural components of MORPSGs, can help organize research that provides insight into the degree to which design properties of structural components are correlated with levels of student motivation and engagement.

What is particularly noteworthy is that in distinguishing between student's perceptions of, and preference for, certain design properties on the one hand, and structural properties of these MORPSGs on the other, is that while questionnaire-based data may indeed show a correlation with motivation and engagement, this cannot tell us whether it is the student's preference that enable higher levels of motivation and engagement, or whether it is the motivation and engagement of students that are *post hoc* responsible for these preferences. In adding analytic

data, on the other hand, it is may be possible to determine with a greater sense of confidence that it is the structural design properties that contribute to student motivation and engagement as they are clearly prior to the level of motivation and engagement of students. Of course, this requires a more detailed analysis than was presented here.

However, given that only two MORPSGs were examined and the relatively small number of our population sample, generalization of our conclusions is very limited. To get a more accurate picture, a larger representative sample is required and a larger number of MORPSGs need to be examined. Moreover, the other components of role-plays, an examination of the scenario properties and the environments used, are also required to get a more complete picture in order to validly generalize our conclusions about the extent to which MORPSGs motivate and engage students in higher education.

A few final comments about what we did not find seems worth making if only because they refer to what is worth investigating further. Firstly, it was surprising to find that none of the properties we examined displayed any significant correlation to the personal skills factor in the engagement scale. Perhaps this is due to the fact that both MORPSGs dealt more with tactical and strategic choices made in relation to the two different scenarios rather than skills particular to the subject domains (nursing strategies in managing difficult behaviors versus international business strategies in securing a contract). Or perhaps this was due to the fact that we chose not to examine the scenario and environment components of MORPSGs where skills might show up as more prominent. Or it could be that our questionnaire did not sufficiently target preferences, perception nor structural properties directly relating student's personal skills. Perhaps a study of the effectiveness of MORPSGs would produce results more appropriate to personal skills. But these would have to wait for a different study.

Secondly, student background also seems to have been less relevant to both motivation and engagement. Age, level of education nor experiences with either online games nor with educational role-play showed significant correlations to either motivation nor engagement. Though some factors on the motivation and engagement scales seemed to significantly correlate with the properties we examined from the student background, the only relevant properties in

the student background, English as the language they spoke best, showed significant correlations to both motivation and engagement, while Males seemed to be more motivated than females.

The limitations of our study generally and the methodology in particular, clearly do not allow us to examine the relative contribution each of these design properties might have to the overall motivation and engagement of students. The study however, does point to a potentially useful way to examine role-play empirically from the point of view of their design properties.

8.1 Contribution of the Research

8.1.1 Theoretical contribution.

This study contributes to our understanding and knowledge of MORPSG for higher education students in three ways. Firstly, it outlines the beginning of a theoretical model of MORPSGs, that can be distinguished from games and simulations yet be comparable for research purposes. By examining the extent to which distinctive design properties of the basic structural components of every role-play is related to student motivation and engagement, it begins to answer the question what it is specifically that makes multiplayer online role-play simulation games motivating and engaging rather than, as is common in the literature at present, generally deferring to the constructivist theoretical agenda that such an educational tool fulfills. Indeed, the uniqueness of examining the distinctive properties of MORPSGs, enables testing the assumptions of constructivism as they relate to the use of MORPSGs for learning in higher education, despite the methodological shortcomings of this study as outlined above (section 8.1).

Secondly, despite its limitations, the contribution of this study lies in its unique mixed methodological framework of combining both students' preferences and perceptions of various role-play properties on the one hand, and objective structural and performance properties derived from analytic data on the other. Thus, to some extent, it enables comparing the degree to which student perceptions and preferences align with given structural and performance analytic data.

Furthermore, by examining two MORPSGs, with different number of roles, scenarios, student cohorts, and environments, the similarities and differences in the design properties of the basic structural components of role-plays become the foci for research rather than comparing

MORPSGs as wholes which makes empirical comparisons more difficult. It enables drawing conclusions, limited as they maybe, about the contributions of particular design properties to student motivation and engagements in higher education rather than providing anecdotal evidence that the experience with this, or that, particular simulation was motivating and engaging to students.

8.1.2 Contribution to practice.

The main practical contribution of this study is in the area of MORPSG design for learning. It enables MORPSG authors to focus on design elements that are more likely to motivate and engage higher education students. Given different student cohort characteristic, educational levels, course objectives and available environments, MORPSG designers, academics and teachers, can begin to develop research-based design of role-plays, that are likely to contribute to higher student levels of motivation and engagements. Consequently, to the extent that motivation and engagement do positively affect learning outcomes, this study can potentially contribute to that effort. But that of course requires a different study, though it may use a similar framework to the one suggested here.

9. Bibliography

Abdul Jabbar, A. I. & Felicia, P. (2015). Gameplay Engagement and Learning in Game-Based Learning: A Systematic Review. *Review of Educational Research*, pp. 1–40.

Ahlfeldt, S., Mehtab, S. & Sellnowb, T. (2005). Measurement and analysis of student engagement in university classes where varying levels of PBL methods of instruction are in use. *Higher Education Research & Development.* Vol. 24, No. 1, pp. 5–20.

Akilli, G. K. (2007). Games and Simulations: A new approach in Education? In D. Gibson, C. Aldrich & M. Prensky, (Eds.), *Games and Simulations in Online Learning: Research and Development Frameworks*. pp. 1-20. Hershey PA: Information Science Publishing.

Alessi, S. M., & Trollip, S. R. (2001). *Multimedia for Learning: Methods and Development* (3rd ed.) Boston, MA: Allyn & Bacon, Inc.

Amory, A., Naicker, K., Vincent, J., & Adams, C. (1999). The use of computer games as an educational tool: Identification of appropriate game types and game elements. *British Journal of Educational Technology*. Vol. 30 No. 4, pp. 311-321.

Ames, C. & Ames, R. (1984). Systems of Student and Teacher Motivation: Toward a Qualitative Definition. *Journal of Educational Psychology*. Vol. 76 No. 4, pp. 635-666.

Anderson, R.C. & Armbruster, B.B. (1990). Some Maxims for Learning and Instruction. *Teachers College Record*, Vol. 91, N0. 3, Spring, pp. 396-408.

Argles, D., Frazer, A., Wills, G. & Wald, M. (2007). Learning Through Rich Environments. In C. Montgomerie & J. Seale (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2007*. pp. 1725-1730. Chesapeake, VA: AACE.

Babacan, A. (2011). Teaching Law Online to Online Law Students at RMIT University. *Turkish Online Journal of Distance Education-TOJDE*. April, Vol. 12 No. 2.

Babst, G., DeGarmo, D., Harth, C., Reinalda, B., & Cabrera, A. (2006). Internationalizing the Curriculum Track Summary: Realizing the Global Imperative in Political Science. *PS: Political Science and Politics*. Vol. 39, No. 3 (July 2006), pp. 533-544.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian Journal of Social Psychology.* No. 2, pp. 21-41.

Baranowski, M.K. & Weir K.A. (2015) Political Simulations: What We Know, What We Think We Know, and What We Still Need to Know. *Journal of Political Science Education*. Vol. 11 No. 4, pp. 391-403.

Barrett, P. (2008). Possibilities and pitfalls of introducing educational innovation: reflection on processes and outcomes in a blended learning design for undergraduate student nurses. In C.

Bonk, M. Lee & T. Reynolds (Eds.), *Proceedings of E-Learn 2008--World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*. pp. 591-601. Las Vegas, Nevada, USA: Association for the Advancement of Computing in Education (AACE).

Berson, I.R., Berson, M.J., Desai, S., Falls, D., & Fenaughty, J. (2008). An analysis of electronic media to prepare children for safe and ethical practices in digital environments. *Contemporary Issues in Technology and Teacher Education*. Vol. 8. No.3, pp. 222-243.

Blank, S. C. (1985) Effectiveness of role-playing, case studies, and simulation games in teaching agricultural economics. *Western Agricultural Economics Association*. No. 10, pp. 55-62.

Bonk, C.J. & Dennen, V. (1999) Learner Issues with WWW-Based Systems. *International Journal of Educational Telecommunications*. Vol. 5 No. 4, pp. 401-417.

Bonk, C., & Zhang, K. (2006). The R2D2 model of online instruction: A mapping out of the components. In *Proceedings of Ed-Media: World Conference on Educational Media and Technology 2006*. pp. 2010-2015. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Brown, C. (2007). Learning Through Multimedia Construction - A Complex Strategy. *Journal of Educational Multimedia and Hypermedia*. Vol. 16 No. 2, pp. 93-124.

Bruner, J. (1997). Celebrating Divergence: Piaget and Vygotsky. *Human Development*. No. 440, pp. 63-73.

Chapman, E. (2003). Alternative approaches to assessing student engagement rates. *Practical Assessment, Research & Evaluation*. Vol. 8 No. 13.

Ching, Yu-Hui (2014). Exploring the Impact of Role-Playing on Peer Feedback in an Online Case-Based Learning Activity. *International Review of Research in Open and Distance Learning*. Vol. 15 No. 3, pp. 292-311.

Chou, C. C. (2001). Formative Evaluation of Synchronous CMC Systems for a Learner-Centered Online Course. *Journal of Interactive Learning Research*. Vol. 12 No. 2/3, pp. 173–192.

Clark, R. E., Yates, K., Early, S., Moulton, K., Silber, K. H. & Foshay, R. (2010) An analysis of the failure of electronic media and discovery-based learning: Evidence for the performance benefits of guided training methods. *Handbook of training and improving workplace performance*. No. 1 pp. 263-287.

Coll-Garcia, J. & Ip, A. (2008). A Trip to Australia: Objectives, Design and Students' Perceptions of a Role-Play Simulation in an English as a Foreign Language Learning Setting. In C. Bonk, M. Lee & T. Reynolds (Eds.), *Proceedings of E-Learn 2008--World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*. pp. 678-683. Las Vegas, Nevada, USA: Association for the Advancement of Computing in Education (AACE).

Coll-Garcia, J.F. & Linser, R. (2006). Web-Based Role-Play Simulations and Foreign Language Learning: An Attitudinal Survey. *EUROCALL 2006, Integrating CALL into Study Programmes*. Granda, Spain 4-7 September.

Connolly, T.M., Boyle, E.A., MacArthur, E., Hainey, T. & James M. Boyle, J.A. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*. No. 59 pp. 661-686.

Cornelius, S., Gordon, C. & Harris, M. (2011). Role Engagement and Anonymity in Synchronous Online Role-play. *International Review of Research in Open and Distance Learning*. Vol. 12 No. 5, pp. 57-73.

Csíkszentmihályi M. (1990) *Flow: The Psychology of Optimal Experience*. Harper & Row, NewYork.

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: integration in personality. In R. Dienstbier (Ed.), *Perspectives on motivation*. Nebraska symposium on motivation. Vol. 38, pp. 237–288. Lincoln, NE: University of Nebraska Press

Dewey, J. (1916 2008). *Democracy and Education.* The Project Gutenberg EBook of Democracy and Education, by John Dewey (EBOOK#852).

Dewey, J. (1938). *Experience & Education*. Kappa Delta Pi, Indianapolis, Indiana.

Dickey, M. D. (2007). Game design and learning: A conjectural analysis of how massively multiple online role-playing games (MMORPGs) foster intrinsic motivation. *Educational Technology Research and Development*. Vol. 55 No. 3, pp. 253-273.

Dingli, S., Khalfey, S. & Leston-Bandeira, L. (2013). The Effectiveness of Incentive-driven Role-play. *European political science*. Vol. 12 No. 3, pp. 384-398. Palgrave Macmillan.

Dondlinger, M.J. (2007) Educational Video Game Design: A Review of the Literature. *Journal of Applied Educational Technology*. Vol. 4 No. 1.

Druckman, D., & Ebner, N. (2013). Games, Claims, and New Frames: Rethinking the Use of Simulation in Negotiation Education. *Negotiation Journal*. Vol. 29 No. 1.

Edwards, P., Domínguez, E. & Rico, M. (2008). A Second Look at Second Life: Virtual Role-play as a Motivational Factor in Higher Education. In K. McFerrin et al. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2008*. pp. 2566-2571. Chesapeake, VA: AACE.

Ertmer, A. & Newby, T.J. (1993). Behaviorism, Cognitivism, Constructivism: Comparing Critical Features from an Instructional, Design Perspective. *Performance Improvement Quarterly*. Vol. 6. No. 4, pp. 50 -72.

Feinstein, A.H., Mann, D. & Corsun, D.L. (2002) Charting the experiential territory. *Journal of Management Development*. Vol. 21 No. 10, pp. 732–744.

Foster, A. (2008). Games and Motivation to Learn Science: Personal Identity, Applicability, Relevance and Meaningfulness. *Journal of Interactive Learning Research*. Vol. 19 No. 4, pp. 597-614. Chesapeake, VA: AACE.

Freeman, M. & Bamford A. (2004). Student Choice of Anonymity for Learner Identity in Online Learning Discussion Forums. *International Journal on E-Learning*. July September, pp.45-63.

Freeman, M.A. & Capper, J.M. (1999). Exploiting the web for education: An anonymous asynchronous role simulation. *Australian Journal of Educational Technology*. Vol.15, No.1, pp. 95-116.

Gibson, D.C., Knezek, G., Redmond, P. & Bradley, E. (Eds.) (2014) *Handbook of Games and Simulations in Teacher Education*. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Gilboa, E. (1979). Educating Israeli Officers in the Processes of Peacemaking in the Middle East, *Journal of Peace Research*. Vol. 16 No. 2, pp. 155-162, Sage Publications, Ltd.

Gjedde, L. (2015). Designing for motivational immersive learning through narrative role-play scenarios. In *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2015*. pp. 337-341. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Godat, M., Yahaya, R., Singh, P. & Euler, T. (2007) Virtual Golden Foods Corporation: Generic Skills in a Virtual Crisis Environment (A Pilot Study). *Journal of Educational Multimedia and Hypermedia*. Vol. 16 No. 1.

Greenblat, C. S. (1981) Teaching with simulation games: A review of claims and evidence. In C.S. Greenblat & R.D. Duke (Eds.) *Principles and practices of gaming-simulation*. Beverly Hills, CA: Sage.

Hew, K.F. (2014). Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. *British Journal of Educational Technology*. Vol. 47 No. 2, pp.1-22.

Hainey, T. Connolly, T. Stansfield, M. & Boyle, E. (2011) The differences in motivations of online game players and offline game players: A combined analysis of three studies at higher education level. *Computers & Education*. Vol. 57, pp. 2197 -2211.

Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). A measure of college student course engagement. *The Journal of Educational Research*. Vol. 98 No. 3, pp. 184-192.

Haupt, G. & Cronje, J. (2003). From Theory to Practice: Towards Classifying Motivational Strategies Used by the Instructor of a Game-Based On-line Learning Event for Adults. In D.

Lassner & C. McNaught (Eds.) *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2003*. pp. 1118-1125. Chesapeake, VA: AACE.

Herrington, J., Oliver, R., & Reeves, T.C. (2003) Patterns of engagement in authentic online learning environments. *Australian Journal of Educational Technology*. Vol. 19 No. 1, pp. 59-71.

Hew, K.F. (2014). Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. *British Journal of Educational Technology*. Vol. 47, Issue 2, pp. 1-22.

Hotho, S. & Reimann, N. (1998). Learner motivation: From dilemma to dialogue. *Forum for Modern Language Studies*. Vol. 34 No. 2, pp. 130-143.

Hsieh, T-L. (2014). Motivation matters? The relationship among different types of learning motivation, engagement behaviors and learning outcomes of undergraduate students in Taiwan. *Higher Education*. Vol. 68 No. 3, pp. 417-433.

Huizinga, J. (1949). *Homo Ludens: A study of the play-element in culture*. Routledge & Kegan Paul, London.

Huizenga, J. Admiraal, W. Akkerman S. & Dam G.T (2009) Mobile game-based learning in secondary education: engagement, motivation and learning in a mobile city game. *Journal of Computer Assisted Learning*. No. 25, pp. 332-344.

Ireland, A., Kaufman, D. & Sauvé, L. (2006). Simulation and Advanced Gaming Environments (SAGE). for Learning. In T. Reeves & S. Yamashita (Eds.) *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2006.* pp. 2028-2036. Chesapeake, VA: AACE.

Isomäki, H. & Marttunen, M. (2001). Human-Centred Use and Development of Information Systems. In C. Montgomerie & J. Viteli (Eds.) *Proceedings of EdMedia: World Conference on Educational Media and Technology 2001*. pp. 812-816. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Jarvinen, A. (2007) Games without Frontiers: Theories and Methods for Game studies and Design. *Doctoral dissertation*. University of Tampere, Finland.

Jasmine, S. (2010). Integrating Technology in Second Language Learning-A Constructivist Perspective. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2010*. pp. 1338-1344. Chesapeake, VA: AACE.

Kampf, R., & Cuhadar, E. (2012). A simulation of the Israeli-Palestinian Conflict as a Tool for Knowledge Acquisition and Attitude Change. In Y. Eshet-Alkalai, A. Caspi, S. Eden, N. Geri, & Y. K. Y. Yair (Eds.), *Proceedings of the Chais conference on instructional technologies*

research 2012: Learning in the technological era. pp. 35–40. Raanana: The Open University of Israel.

Kaufman, J. (1998). Using Simulation as a Tool to Teach About International Negotiation. *International Negotiation*. No. 3., pp.59–75. Kluwer Law International, Netherlands.

Kearney, M. & Schuck, S. (2005). Students in the Director's Seat: Teaching and Learning with Student-generated Video. In P. Kommers & G. Richards (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2005.* pp. 2864-2871. Chesapeake, VA: AACE.

Keller, J. M. (2010). *Motivational design for learning and performance: the ARCS model approach*. New York, NY: Springer.

Kolb, D.A. (1984), *Experiential Learning: Experience, the Source of Learning and Development*, Prentice Hall, Englewood Cliffs, NJ.

Kuh, G. D. (2003). What we're learning about student engagement from NSSE: Benchmarks for effective educational practices. *Change: The Magazine of Higher Learning*. Vol. 35 No. 2, pp. 24-32.

Lafrenière, M.A.K., Verner-Filion, J. & Vallerand R.J. (2012). Development and Validation of the Gaming Motivation Scale (GAMS). *Personality and Individual Differences*. No. 3 pp. 827-831. Elsevier Ltd.

Langley, D. (2006). *The student engagement index: A proposed student rating system based on the national benchmarks of effective educational practice*. University of Minnesota: Center for Teaching and Learning Services.

Lantis, J. S. (1998). Simulations and Experiential Learning in the International Relations Classroom. *International Negotiation*. Vol. 3 No. 1, pp. 39–57.

Lave, J. & Wenger, E. (1991). *Situated Learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lee, M.J.W., Eustace, K., Fellows, G., Bytheway, A. & Irving, L. (2005). Using Massively-Multiplayer Online Role-Playing Games to Enhance Collaborative Learning and Teaching in the Australian High School Classroom. In P. Kommers & G. Richards (Eds.) *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2005*. pp. 2039-2046. Chesapeake, VA: AACE.

Li, Q. (2006). Computer-Mediated Communication: A meta-Analysis of Male and Female Attitudes and Behaviors. *International Journal on E-Learning*. Vol.5, No.4, pp.525-570.

Linser, R. (2011a). What can we learn from the last 20 years of Role Based E-learning? Analysis and critique, In M. Koehler & P. Mishra (Eds.), *Proceedings of Society for Information*

Technology & Teacher Education International Conference. pp. 2153–2158. Chesapeake, VA: AACE.

Linser, R. (2011b). Reflexivity of Roles and Rules in Role Based E-learning. In C. Ho & M. Lin (Eds.), *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2011*. pp. 2409-2415. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Linser, R. & Rashid, T. (2011). Role-play Simulation as Alternative to Work Experience Placement. In C. Ho & M. Lin (Eds.), *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2011*. pp. 1423-1432. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Linser, R., Lindstad, N.R. & Vold, T. (2008) The Magic Circle – Game Design Principles and Online Role-play Simulations. In Luca, J. & Weippl, E., (eds.) *Proceedings of ED-MEDIA 2008 – World conference on Educational Multimedia, Hypermedia &Telecommunication, Vienna, Austria*. pp.5290-5297. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Linser, R. (2004). Suppose you were someone else: The learning environment of a web-based role-play simulation. In R. Ferdig, C. Crawford, R. Carlsen, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2004*. pp. 2403-2408. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Linser, R., Waniganayake, M. & Wilkes, S. (2004a). Where is the Teacher? E-learning Technology, Authority and Authorship in Teaching and Learning. In Cantoni, L. & MclLoughlin C., *Proceedings of ED-MEDIA 2004 – World Conference on Educational Multimedia, Hypermedia & Telecommunications, Lugano, Switzerland*. pp. 3636-3641. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Linser, R., Waniganayake, M. & Wilkes, S. (2004b). A Different Lunch: role-play simulations in preparing Early Childhood Leaders. In Uskov, V. (Ed.) *Web-based Education – 2004, Innsbruck, Austria*. Feb 16-18. ACTA Press.

Linser, R., Ip, A. & Naidu, S. (2001) Simulated worlds: rapid generation of Web-based role-play. In *Proceedings of AusWeb 01, the 7th Australian Worldwide Conference*. pp. 21-25.

Linser, R., Naidu, S., & Ip, A. (1999). Pedagogical Foundations of Web-Based Simulations in Political Science. In *Proceedings of the Australasian Society for Computers in Learning in Tertiary Education conference*. pp. 1–9, Brisbane, Australia: QUT.

Loorbach N., Peters, O., Karreman J. & Steehouder, M. (2015) Validation of the Instructional Materials Motivation Survey (IMMS) in a self-directed instructional setting aimed at working with technology. *British Journal of Educational Technology.* Vol. 46 No. 1, pp. 204–218.

Loui, M.C. (2009). What Can Students Learn in an Extended Role-Play Simulation on Technology and Society? *Bulletin of Science, Technology & Society*. Vol. 29 No. 1, pp. 37-47. Sage Publications.

Lybeck, K., Bruhn, D. & Feyissa, S. (2010). The reality of virtual reality: Second Life as a tool for online peer-teaching activities. In J. Sanchez & K. Zhang (Eds.) *Proceedings of E-Learn 2010 –World Conference on E-Learning in Corporate, Government, Health Care, and Higher Education*. pp. 1410-1419. Orlando, Florida. Association for the Advancement of Computing in Education (AACE).

McKenzie, B., Mims, N. & Bennett, E. (2003). Successful Online Assessment, Interaction and Evaluation Techniques. In C. Crawford, N. Davis, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2003--Society for Information Technology & Teacher Education International Conference*. pp. 426-431. Albuquerque, New Mexico, USA: Association for the Advancement of Computing in Education (AACE).

Maher, M. L. & Mayer, H. (1997). "Understanding Motivation and Schooling: Where We've Been, Where We Are and Where We Need to Go". *Educational Psychology Review*. Vol. 9 No. 44.

Malone, T.W. (1981). Towards a Theory of Intrinsically Motivation Instruction. *Cognitive Science*. No. 4, pp. 333-369.

Malone, T. W. (1984). Toward a theory of intrinsically motivating instruction. In D. F. Walker & R. D. Hess (Eds.) *Instructional software: Principles and perspectives for design and use*. Belmont, CA: Wadsworth Publishing.

Mandernach, B.J. (2015). Assessment of Student Engagement in Higher Education: A Synthesis of Literature and Assessment Tools. *International Journal of Learning, Teaching and Educational Research*. Vol. 12 No. 2, pp. 1-14.

Matz, D., & Ebner, N. (2011). Using Role-Play in Online Negotiation Teaching. In C. Honeyman, J. Coben, & G. DiPalo (Eds.), *Rethinking Negotiation Teaching Series: Venturing Beyond the Classroom.* No. 2, pp. 293–317. DRI Press.

Mayer, I., Warmelink, H., & Bekebrede, G. (2013). Learning in a game-based virtual environment: a comparative evaluation in higher education. *European Journal of Engineering Education*. Vol. 38 No. 1, pp. 85–106.

McGrail, E. (2007). Laptop Technology and Pedagogy in the English Language Arts Classroom. *Journal of Technology and Teacher Education*. Vol. 15 No. 1, pp. 59-85.

Naidu, S., Ip, A., & Linser, R. (2000). Dynamic Goal-Based Role-Play Simulation on the Web: A Case Study. *Educational Technology & Society*. Vol. 3 No. 3, pp. 190–202.

Nelson, D. & Blenkin C. (2008). Achieving Learning Outcomes Through Online Role-Play Simulation. In C. Bonk, M. Lee & T. Reynolds (Eds.), *Proceedings of E-Learn 2008--World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*. pp. 1131-1142. Las Vegas, Nevada, USA: Association for the Advancement of Computing in Education (AACE)

Olka, K. (2005). Creating E-Learning Based on Adult Learning Theory. In P. Kommers & G. Richards (Eds.) *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2005*. pp. 2924-2931, Chesapeake, VA: AACE.

Piaget, J. (1926). *The Language and Thought of the Child*. New York: Harcourt, Brace.

Piaget, J. (1972). *The Principles of Genetic Epistemology*. Basic Books, New York.

Pintrich, P.R. (2004). A Conceptual Framework for Assessing Motivation and Self-Regulated Learning in College Students. *Educational Psychology Review*. Vol. 16, No. 4, pp.385-407.

Pintrich, P.R., Smith, D.A.F., Garcia T. & McKeachie, W.J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. The Regents of the University of Michigan.

Rao, D. & Stupans I. (2012). Exploring the potential of role-play in higher education: development of a typology and teacher guidelines. *Innovations in Education & Teaching International*. Vol. 49 No. 4, pp. 427-436.

Raymond, C. (2010). Do Role-Playing Simulations Generate Measurable and Meaningful Outcomes? A Simulation's Effect on Exam Scores and Teaching Evaluations. *International Studies Perspectives*. No. 11, pp. 51–60.

Rector-Aranda, A., Raider-Roth, M., Glaser, N., & Behrman, M. (2017). "I had to live, breathe, and write my character": Character Selection and Student Engagement in an Online Role-Play Simulation. *Journal of Jewish Education*. Vol.83 No.4, pp.280-309.

Reeves, T. (1994). Evaluating What Really Matters in Computer- Based Education. *Computer Education: New Perspectives*. pp. 219–246.

Reigeluth, C. M. (1996) What is instructional design theory and how is it changing? In Reigeluth, C.M. (Ed.), *Instructional Design Theories and Models*. London: Lawrence Erlbaum Assoc. Publ., pp. 5-29.

Repenning, A., Ioannidou, A., Luhn, L., Daetwyler, C., Repenning, N. & Keyser, D. (2010) Mr. Vetro: Assessing a Collective Simulation Framework. *Journal of Interactive Learning Research*. Vol. 21 No. 4, pp. 515-537.

Russell, C. & Shepherd, J. (2010). Online Role-Play Environments for Higher Education. *British Journal of Educational Technology*. Vol. 41 No. 6, pp. 992-1002.

Salen, L. & Zimmerman, E. (2003). *Rules of Play, Game Design Fundamentals*, Cambridge and London: The MIT Press.

Salmon, G. (2003) *E-moderating: The Key to Teaching and Learning Online*. Second Edition, Taylor & Francis Books, London.

Sancho, P., Moreno-Ger, P., Fuentes-Fernández, R., & Fernández-Manjón, B. (2009). Adaptive Role-playing Games: An Immersive Approach for Problem Based Learning. *Educational Technology & Society*. Vol. 12 No. 4, pp. 110–124.

Sauvé, L., Kaufman, D. & Renaud, L. (2007). A systematic review of the impact of games and simulations on learning, in C. Montgomerie & J. Seale (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2007*. pp. 4149-4157. Chesapeake, VA: AACE.

Schnurr, M.A., De Santo, E.M. & Green A.D. (2014). What do students learn from a role-play simulation of an international negotiation? *Journal of Geography in Higher Education*. Vol. 38 No. 3, pp. 401-414.

Schunk, D. H. (2000). *Learning theories: an educational perspective* (3rd Ed.) Columbus, Ohio: Merrill. pp. 15-18.

Semple, A. (2000). Learning theories and their influence on the development and use of education, *Australian Science Teachers Journal*. Vol. 46 No. 3, Sep.

Seo, K.K. & Tindall, D. (2010). Promoting Social and Cultural Sensitivity in a 3D Online Social Virtual World. In J. Sanchez & K. Zhang (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2010*. pp. 1201-1205. Chesapeake, VA: AACE.

Shapiro, S. & Leopold, L. (2012). A Critical Role for Role-Playing Pedagogy, *TESL Canada Journal*. Vol. 29 No. 2, Spring, pp. 120-130.

Sharan, Y. & Sharan S. (1992). *Expanding Cooperative Learning through Group Investigation*. Teachers College, Columbia University.

Shaw, C.M. (2004). 'Using role-play scenarios in the IR classroom: An examination of exercises on peacekeeping operations and foreign policy decision making', *International Studies Perspectives*. Vol. 5 No. 1, pp. 1–22.

Shaw, C. & Mendeloff, D.A. (2007). Connecting Students Internationally to explore Post-Conflict Peacebuilding. *Proceedings of the fourth annual APSA Conference on Teaching and Learning in Political Science*. Charlotte, NC: American Political Science Association.

Shaw, C.M. (2010). Designing and Using Simulations and Role-Play Exercise, *The International Studies Encyclopedia*.

Shortridge, A., McPherson, M., Loving, G., & Lee, L. (2010, June). Using Web-based Approaches to Enhance High Fidelity Clinical Skills Education. In *Ed-Media: World Conference on Educational Media and Technology*. pp. 2921-2925. Association for the Advancement of Computing in Education (AACE).

Skinner, R.A. (2008). The Challenges of Transnational Online Learning. *Journal of Asynchronous Learning Networks*. Vol.12 No.2, pp. 83-89.

Skinner, E., Furrer, C., Marchand, G. & Kindermann, T. (2008). Engagement and disaffection in the classroom: part of a larger motivational dynamic? *Journal of Educational Psychology*. vol. 100, pp. 765–781.

Stevens, R. (2015). Role-play and student engagement: reflections from the classroom. *Teaching in Higher Education*. Vol. 20 No. 5, pp. 481–492.

The Cognition and Technology Group at Vanderbilt (1990). Anchored Instruction and Its Relationship to Situated Cognition. *Educational Researcher*. Vol. 19 No. 6, (August-September) pp. 2–10.

Thistleton-Martin, J. & Lewis, K. (2009). On the Ning, Nang, Nong, Where the 'Web' Goes Bong. In G. Siemens & C. Fulford (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2009*. pp. 3821-3831. Chesapeake, VA: AACE.

Tomkins, P.K. (1998). Role playing/simulation. *The Internet TESL Journal*. Vol. IV, No. 8, August.

Van Dijk, H.G. (2013). A theoretical understanding of student engagement in curriculum: review and development. *Administratio Publica*. Vol. 21 No. 1, pp. 84-101.

Vincent, A. & Shepherd, J. (1998). Experiences in teaching Middle East Politics via internet based role-play simulations. *Journal of Interactive Multimedia in Education*. Vol. 98, No. 11.

Ward, A., Sitthiworachart, J., & Joy, M. (2004). Aspects of web-based peer assessment systems for teaching and learning computer programming. In *IASTED International Conference on Web-based Education*. pp. 292-297.

Waniganayake, M. Wilkes, S. & Linser, R. (2007). Creating Thinking Professionals: Teaching and Learning About Professional Practice Using Interactive technology. in T. Townsend & R. Bates (eds.) *Handbook of Teacher Education*. pp.675-690, Springer, Netherlands.

Wills, S., Rosser, E., Devonshire, E. Leight, E., & Russel, C. (2009). *Encouraging role based online learning environments - The BLUE Report*. University of Wollongong, Research Online.

Zins, C. (2000). Success, a Structured Search Strategy Rationale, Principles and Implications. *Journal of the American Society for Information Science*. Vol.51, No.13, pp. 1232-1247.

עשת י. והמר ר. (2006). *עקרונות בעיצוב ובניתוח של סביבות למידה ממוחשבות*, בית ההוצאה לאור של האוניברסיטה הפתוחה, רעננה.

ויגוצקי, ל. (2003). "חינוך והתפתחות שכלית", מתוך: אלכס קוזולין וגבריאלה עילם (עורכים), *מחשבה ותרבות – אסופה*. בהוצאת ברנקו וייס לטיפוח החשיבה, ירושלים.

10. Appendices

10.1 Appendix A: Questionnaire for higher education students' motivation and engagement

Instructions

There are 52 statements in this questionnaire. Please think about each statement in relation to the simulation you have just participated and indicate how true it is. Give the answer that truly applies to you, and not what you would like to be true, or what you think others want to hear.

Select your responses from the dropdown menus and follow any additional instructions that may be provided regarding the dropdown menus that are being used with this survey. Thank you.

#	**Question**	***Range***
1	Age: Select (dropdown)	*Under 18, 18-22, 23-27, 28-32, 33-37, 38 and above*
2	Gender: Select (dropdown)	*male, female*
3	Educational level attained	*undergraduate, graduate, postgraduate, other*
4	Where were you born?	*Western Europe, Eastern Europe, Nth America, Central America, South America, Nth. Africa, Central Africa, Southern Africa Middle East, Asia, Central Asia, South East Asia, Australasia, Other*
5	What language do you speak best?	*Open Ended Answer*
6	I prefer to learn in face-to-face settings rather than in online environments	*True, mostly true, moderately true, slightly true, not true*
7	I learn more by reading and writing than attending class discussions	*True, mostly true, moderately true, slightly true, not true*
8	I prefer playing on my own rather than in teams	*True, mostly true, moderately true, slightly true, not true*
9	I prefer online text communication that enable me time to think about how I articulate my messages and responses rather than online audio and visual means that require immediate responses	*True, mostly true, moderately true, slightly true, not true*

10	I am experienced in playing online games.	*True, mostly true, moderately true, slightly true, not true*
11	I am experienced with educational role-playing simulations (either online or face to face)	*True, mostly true, moderately true, slightly true, not true*
12	I prefer to play my role anonymously rather than others knowing which role I'm playing	*True, mostly true, moderately true, slightly true, not true*
13	The role I played has personal relevance for me	*True, mostly true, moderately true, slightly true, not true*
14	I felt personally identified with the role I played	*True, mostly true, moderately true, slightly true, not true*
15	The role I played was peripheral to the game scenario rather than one of the central roles	*True, mostly true, moderately true, slightly true, not true*
16	The role I played needed to reach very specific objectives rather than open ended objectives	*True, mostly true, moderately true, slightly true, not true*
17	The expected playing strategy of my role was to cooperate with other roles rather than to compete with them	*True, mostly true, moderately true, slightly true, not true*
18	I felt that the moderators were useful in helping with the simulation	*True, mostly true, moderately true, slightly true, not true*
19	The major aim of the scenario we played was to reach a common goal rather than individual objectives	*Agree, somewhat agree, somewhat disagree, disagree*
20	The scenario was relevant to the course material	*Agree, somewhat agree, somewhat disagree, disagree*
21	The scenario was an adequate representation of the subject matter of my course	*Agree, somewhat agree, somewhat disagree, disagree*
22	The interface for the simulation was easy to use	*Agree, somewhat agree, somewhat disagree, disagree*
23	I liked using textual communication that gave me time to think before acting	*Agree, somewhat agree, somewhat disagree, disagree*
24	I preferred using the simMail and/or forums rather than the chat	*Agree, somewhat agree, somewhat disagree, disagree*
25	I preferred using a computer web-browser rather than a mobile phone or tablet app.	*Agree, somewhat agree, somewhat disagree, disagree*
26	I feel the simulation was too short, a longer one would be better	*Agree, somewhat agree, somewhat disagree, disagree*
The following Adapted to fit MORPSGs from: The Reduced Instructional Materials Motivation Survey (RIMMS) (Loorbach et al. 2005)		
27	The quality of the messages helped to hold my attention.	*True, mostly true, moderately true, slightly true, not true*
28	The way the information is arranged on the role profiles helped keep my attention.	*True, mostly true, moderately true, slightly true, not true*

29	The variety of reading profiles, messages, news, etc., helped keep my attention on the simulation.	*True, mostly true, moderately true, slightly true, not true*
30	As I worked with this scenario I was confident that I could learn how to work well with the simulation.	*True, mostly true, moderately true, slightly true, not true*
31	After working with the scenario for a while, I was confident that I would be able to complete the tasks in the simulation.	*True, mostly true, moderately true, slightly true, not true*
32	The good organization of the simulation content helped me be confident that I would learn to work with the simulation.	*True, mostly true, moderately true, slightly true, not true*
33	It is clear to me how the content of this scenario is related to things I already know.	*True, mostly true, moderately true, slightly true, not true*
34	The content and style of the scenario convey the impression that being able to work with the simulation is worth it	*True, mostly true, moderately true, slightly true, not true*
35	The content of this scenario will be useful to me.	*True, mostly true, moderately true, slightly true, not true*
36	I enjoyed working with this scenario so much that I was stimulated to keep on working.	*True, mostly true, moderately true, slightly true, not true*
37	I really enjoyed studying using this simulation	*True, mostly true, moderately true, slightly true, not true*
38	It was a pleasure to work on such a well-designed scenario	*True, mostly true, moderately true, slightly true, not true*
The following is Adapted to fit MORPSGs from Ahlfeldt's Engagement Scale (Ahlfeldt et al. 2005)		
A. During the simulation about how often have you done each of the following?		
39	Asked questions during the simulation or contributed to simulation discussions	*Very Often, Often, Sometime, Never*
40	Worked with other roles on projects during the time of the simulation	*Very Often, Often, Sometime, Never*
41	Worked with classmates outside of the simulation to complete simulation tasks	*Very Often, Often, Sometime, Never*
42	helped or provided simulation information to other roles	*Very Often, Often, Sometime, Never*
B. To what extent has this simulation emphasized the mental activities listed below?		
43	Memorizing facts, ideas or methods from the simulation and readings so you can repeat them in almost the same form	*Very much, Quite a bit, Some, Very little*

44	Analyzing the basic elements of an idea, experience or theory such as examining a specific case or situation in depth and considering its components	*Very much, Quite a bit, Some, Very little*
45	Synthesizing and organizing ideas, information, or experiences into new, more complicated interpretations and relationships	*Very much, Quite a bit, Some, Very little*
46	Evaluating the value of information, arguments, or methods such as examining how others gathered and interpreted data and assessing and accuracy of their conclusions	*Very much, Quite a bit, Some, Very little*
47	Applying theories and/or concepts to practical problems or in new situations	*Very much, Quite a bit, Some, Very little*
C. To what extent has this simulation contributed to your knowledge, skills, and personal development in the following ways?		
48	Acquiring job or career related knowledge and skills	*Very much, Quite a bit, Some, Very little*
49	Writing clearly, accurately, and effectively	*Very much, Quite a bit, Some, Very little*
50	Thinking critically and/or analytically	*Very much, Quite a bit, Some, Very little*
51	Learning effectively on your own, so you can identify, research, and complete a given task	*Very much, Quite a bit, Some, Very little*
52	Working effectively with other individuals	*Very much, Quite a bit, Some, Very little*

10.2 Appendix B: Motivation and Engagement Scales Reliability

Given that some of the wording of the original scales were altered to apply to multiplayer online role-play simulations the internal consistency of the scales were validated in the current study using Cronbach's alpha test:

Motivation reliability

Attention – α=.812

Confidence – α=.755

Relevance – α=.795

Satisfaction – α=.877

Total Motivation reliability - α=.926

Engagement

Active participation - α=.560

Cognitive effort - α=.758

Development of personal skills - α=.800

Total Engagement reliability - α=.812

10.3 Appendix C: Data Analytic Table

	Dimension	**Range**
1	Number of roles	*N*
2	Number of players per role	*1,2,3,4, > 4*
3	Type of role	*generic / personal*
4	Anonymity (structural)	*yes/no*
5	Choice of Role	*yes/no*
6	Role preference played	*1,2,3,4,5, None*
7	Number of days played	*N*
8	Total number of hours played	*Hours*
9	Number of hours only Reading	*Hours*
10	Number of hours only interacting	*Hours*
9	Pre + Post Sim number of hours	*hours*
10	Number of messages per role	*N*
11	Number of words	*N*

10.4 Appendix D: Invitation to fill the post-simulation Questionnaires

Hi all

We are at the end of the simulation, and we would greatly appreciate it if you all, individually (not as your role), fill in the Post-Sim Questionnaire under Tasks in the left menu. It is by no means obligatory to do so, and will not reflect in anyway on your assessment.

The questionnaire is part of a study on the use of online role-plays in higher education. All information collected will remain completely confidential. All data collected will appear in the study in aggregate statistical form only.

If you are interested to see the results of this study, you can email a request to Roni

Thanks

The moderators