The Function of Intrinsic and Extrinsic Motivation in Educational Virtual Games and Simulations.

George D. Konetes
Indiana University of Pennsylvania/Department of Communications Media, Indiana, Pennsylvania
Email: g.d.konetes@iup.edu

***Abstract*— Motivational forces play a significant role in the success of using virtual games and simulations for educational purposes. Intrinsic motivation is more difficult to foster in educational applications of games and simulations than those developed purely for leisure purposes. However the education sector is still dependant on this elusive variable in order to obtain desired results and student outcomes. Certain uses of educational simulations lend themselves more to fostering internal motivation, mainly optional and tangential applications, while many forms of direct content delivery for courses or units rely on extrinsic factors for completion and success. Another significant factor in the development of intrinsic motivation is whether or not the game or simulation is mandatory or optional, as required use seems to diminish internal desire to participate. Tangential uses of preexisting non-educational virtual worlds for instructive purposes increases the learners internal motivation, however concerns are raised concerning whether or not this method produces measurable learning outcomes.**

***Index Terms*—Virtual simulations, educational games, distance education, motivation, online learning, virtual environment.**

I. INTRODUCTION

Motivation is a driving agent behind participation, progression and retention in gaming environments. Subsequently, the understanding of how motivational forces operate within multi-user virtual environments is a key to the success of educational games and simulations. A multi-user virtual environment (MUVE) in this context is a three-dimensional immersive learning atmosphere where the visual representation of a user interacts with the representations of other users as well as objects and the world itself in real time [1]. These environments are becoming more common in the entertainment sector due to social popularity and game appeal; however issues surrounding intrinsic and extrinsic motivation have hindered success in educational contexts such as distance education. In this particular study, the term distance education represents formal education taking place with the student physically or geographically removed from the instructor using some form of technology to facilitate learning and contact [7].

Compared with previous generations, many new students at the university level are arriving with advanced digital literacy and enhanced capabilities to assimilate concepts needed to operate within virtual worlds and online games. They are also arriving with minds that have been shaped by quick-paced, highly visual, interactive virtual media, making them more readily adaptable to learning through virtual simulations [1]. In one national survey approximately 60% of faculty members report having some degree of experience in using virtual world simulations and 11% report using them frequently for instructional and research purposes [9]. Educational virtual games and simulations (EVGS) are also noted as agents that may enhance user motivation and satisfaction and subsequently engage learners in innovative and timely ways. However research analyzing both college students' capacity for using and faculty's success at employing virtual simulations for learning is still in its infancy [13]. Primary academic uses of these technologies are to aid in-classroom instruction, facilitate distance education and assist various models of distance and classroom learning hybrids [1]. The purpose of this paper is to analyze the applications of learning simulations and games through the lens of the intrinsic and extrinsic motivational factors associated with different academic EVGS use. Learning to better control and apply these motivational concepts could enhance the value of educational simulations and magnify their impact and effectiveness.

II. REVIEW OF THE LITERATURE

Motivational Forces: Motivation characterizes the learner's intrinsic and extrinsic reasons for participating in and becoming engaged with the content of an educational simulation or game. Higher levels of success in EVGS' are measured by the intrinsic motivational factors created by the activity. This

doi:10.4304/jetwi.2.1.23-36

develops an internal desire to participate, which is enjoyable and self-satisfying. These types of games and simulations draw the learner inherently, and in the best case scenario learning and fun happen simultaneously. Extrinsic motivational factors differ in terms of draw and appeal as the learner becomes motivated by their desire to obtain a reward for their participation or to avoid a consequence for non-participation. Maintaining these factors may require additional efforts on behalf of those managing the simulation, and are most successful when coupled with intrinsic factors.

Successful academic games and simulations should create an intrinsic desire within the learner to participate in and accomplish the tasks given in order to fully engage the student and maximize the educational potential of the exercise. Intrinsic motivation in a simplified form engenders a desire to freely act and to pursue a thing, activity, event or action, based primarily on an unquantifiable internal compulsory desire for pursuit [13]. Many MUVE's become successful and popular based on their ability to foster high degrees of intrinsic desire to play the game for no other reason than pleasure and enjoyment, something which is difficult to obtain in many education-based games [4]. However, virtual world simulations are still seen as the most highly active, interactive and motivation generating educational components of distance education courses [5]. These learning environments are seen as engaging because they advance from the traditional unidirectional lecture format of learning to an interactive multidirectional model [10], which better translates to the skills and expectations of many modern learners [1]. The value of virtual learning endeavors may be measured by the simulation's ability to foster intrinsic motivation in the students; else successful completion of the content and objectives must come as a result of extrinsic motivational factors which may require greater efforts and time commitments by the instructor [13].

External or extrinsic motivating factors provide a penalty-and-reward aspect of inspiration for learners to participate in virtual simulations apart from their own internal desires in order to further the goals of the course, activity or workplace. Extrinsic motivation is in essence a prompt to act or pursue a thing, activity, or event based on an external force such as a rule, punishment, reward, or threat. This form of motivation is often imposed by the instructor, supervisor or authority figure, and is separate from or may even be in opposition to an individual's own desire to act or not to act [13]. These types of motivating factors are often seen in the business and medical sector where employees and trainees are required to participate in an academically based virtual simulation for skills advancement and training. The motivational aspects in this type of case are to refrain from the penalties associated with disobeying company supervision and essentially to maintain or advance ones employment [6]. Extrinsic factors also appear in various academic settings where learners may be required to use a virtual simulation in order to obtain the content of the course or presentation, through which the extrinsic motivation is to succeed in the course [6]. Other less severe and more widely seen examples include courses which incorporate simulations that act as additional resources for students to do supplementary, review or remedial work through [2]. Academic virtual games and simulations however do benefit from incorporating intrinsic and extrinsic motivational factors in order to maximize learner involvement and satisfaction [13].

Academic Applications: Virtual simulations and games are being used to deliver direct primary content, supplement course content, prepare learners for rare or dangerous situations, and tangentially via use of non-educational worlds that are already developed to garner some educational value and experiences. Direct instruction or content delivery is a major role that MUVE's facilitate, using both tradition and evolutionary techniques. However hybrid models mixing elements of classroom learning with virtual world learning are able to use the technology in more purposeful and specialized ways to fulfill specific needs. Additionally, by making use of time and money already spent, the application of non-educational games and simulations in order to further educational goals is the most controversial but also the most financially efficient.

Virtual simulations and games are being used as direct content delivery channels via traditional instruction presentation in real life, but also through learner interaction directly within the virtual environment itself. Various examples exist of courses being taught and primary information being delivered via educational virtual games and simulations [6]. However, these instances of content delivery via simulation are only the beginning of realizing the potential of these academic tools. According to Sims [11] the environment of the EVGS itself may become the instructor of an educational situation, and user interactions within that environment produce learning. One example is a medical science simulation which involves learners exploring and interacting within the simulation itself in order to piece together the clues needed to determine how an outbreak happened and how to contain it. In this EVGS there is no formal instructor, rather the simulation world instructs the learner [2]. Reinhart [10] also describes a scenario where the learner is actually integrated into an immersive world and plays one of many roles alongside of classmates and through these interactions and contributions becomes deeply familiarized with the content as well as underlying themes.

A second application of EVGS is as a part of a hybrid brick-and-mortar or distance education course designed to supplement student learning, prepare students for upcoming situations and to act as training for rare events that cannot be replicated using traditional means. Various educational simulations and games are used in situations to provide students with ancillary or peremptory skills and awareness and to stimulate them beyond the means of traditional classroom exercises [12]. For these students, this often exists as a hybrid approach to using EVGS to supplement classroom

learning and interactions, which could not be obtained in the classroom [2]. Disaster preparation is one such example of how a virtual simulation is advantageous and superior to most traditional exercises, which cannot replicate a rare or dangerous event [6]. One simulation was used in a more casual manner and permitted distance education chemistry students to enter a virtual representation of their soon-to-be brick-and-mortar laboratory in order to reduce anxiety of upcoming social interactions and spatial unfamiliarity [3].

Thirdly, an application of virtual spaces is the use of tangential non-education based games and simulations to immerse students in various simulations relevant to course work and to help build various skills which are exemplified in various virtual games. Using existing virtual worlds to apply EVGS learning concepts is a process that is more financially efficient than most other applications [2]. This strategy places learners in a preexisting virtual world, be it educational in nature or not, and has them participate in various activities which further learning objectives of the instructor. This procedure is then followed by debriefing the students in an attempt to facilitate and gauge learning [13]. A sometimes advantageous or disadvantageous variable is interaction with unbeneficial aspects and users of the virtual world, which may either add depth to the project or add distraction [4]. One example mentioned placed a group of students in a non-educational popular video game which was set in a historic context. The students played the game, interacted with the environment and each other, and upon exiting the virtual world became much more interested in the historical content because a new dimension of relevance was gained through the experience. Also a significant amount of historical content was retained by the students despite their limited interaction with the virtual world [13]. Another example describes using a massive multiplayer online role playing game (MMORPG) to teach students strategic teambuilding and interaction skills because the nature of the game was centered on player collaboration to accomplish specific objectives [8].

III. DICUSSION

Analysis of Theory and Applications: The motivational forces at work when educational virtual games and simulations are used for primary content delivery differ based on the purpose and design of the simulation and how well it encourages the learners to buy in to the idea, the world and the exercise. According to Hansen [6] EVGS are being used as primary methods of delivering course content. Each of these methods may differ in terms of the motivational factors which propel the learners through the content and the technology. However the motives of the students become clearer as specific instances are mentioned such as in the outbreak simulation discussed by Bailenson [2]. In this instance the EVGS is used as a means of teaching process, procedure and scientific content, however the motivating factors are split between intrinsic and extrinsic as many of students did find the experience interesting and internally motivating, however all of the learners were required to participate regardless of whether or not interest was developed. Reinhart [10] mentions a slightly different scenario where the primary goal of the virtual simulation was to create such a high level of intrinsic motivation within the learners that they desired not only to navigate the simulation but to participate in it and actually become an integral member helping facilitate the operation of the EVGS. These two examples appear to differ, in that the one mentioned by Bailenson [2] encourages students to become intrinsically motivated by the simulation and the one mentioned by Reinhart [10] requires intrinsic motivation for the exercise to be successful. Based on the motivational concepts mention by Warren [13] the first simulation would appear to be generally more successful with a large audience while the second would be highly successful with a smaller audience.

When the hybrid model of EVGS is used, the resulting motivational forces become more defined and observable depending on the specific application with required simulations centering on extrinsic factors and optional simulations drawing on more intrinsic factors. On one side of the conceptual framework is the business and training use of EVGS mentioned by Hansen [6] where the primary motivational factors are extrinsically imposed by the supervisor, professor or authority figure. However on the opposite side of the conceptual model is the example given by Dalgarno [3] where distance education students were given access to an EVGS in order to help them prepare for future on-location work in order to reduce potential anxieties. In this instance the primary motivation for accessing and participating in the virtual simulation is intrinsic desire to explore, prepare and learn as there were no external rewards or penalties imposed for participation.

When the tangential use of existing MUVE's is applied with an educational purpose in mind there is an increase in intrinsic motivation, however there is only sparse evidence to support that this application of MUVE's and their associated motivational increase has measurable impact on learning. According to Dickey [4], use of existing non-education based virtual worlds such as MMORPG's is supportive of intrinsic motivation factors, as the games themselves only exist due to intrinsic interests. Warren [13] mentions supporting examples of this approach, noting how in one such exercise students were debriefed afterwards to reveal what they had learned and the results were significant. However, there was no way to evaluate what the learners had gained based on specific content objectives, as much of what was gained seemed scattered and haphazard [13]. From a perspective of motivation, these tangential approaches seem to foster greater intrinsic motivation with some learners, however more research is needed to determine the effectiveness of this process and whether or not the increase in motivation towards these non-education MUVE's results in additional learning.

Questions for Further Research: Does gender affect a

learner's intrinsic motivation towards using EVGS as primary, optional and tangential systems for content delivery and elaboration?

Can increasing extrinsic motivational forces reach a level of intensity where a learner's intrinsic motivation is increased or diminished?

ACKNOWLEDGEMENT

Special thanks to Ms. Jennifer Tissue for assistance with proofreading and formatting.

REFERENCES

[1] Annetta, L., Murray, M., Laird, S., Bohr, S., & Park, J. (2008). Investigating student attitudes toward a synchronous, online graduate course in a multi-user virtual learning environment. *Journal of Technology and Teacher Education, 16*(1), 5.

[2] Bailenson, J., Yee, N., Blascovich, J., Beall, A., Lundblad, N., & Jin, M. (2008). The use of immersive virtual reality in the learning sciences: digital transformations of teachers, students, and social context. *Journal of the Learning Sciences, 17*(1), 102-141.

[3] Dalgarno, B., Bishop, A., Adlong, W., & Bedgood, D. (2009). Effectiveness of a virtual laboratory as a preparatory resource for distance education chemistry students. *Computers & Education, 53*(3), 853-865.

[4] Dickey, M. (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, 55*(3), 253-273.

[5] Grunwald, S., Ramasundaram, V., Bruland, G., & Jesseman, D. (2007). Expanding distance education in the spatial sciences through virtual learning entities and a virtual GIS computer laboratory. *International Journal of Distance Education Technologies, 5*(1), 54-69.

[6] Hansen, M. (2008). Versatile, immersive, creative and dynamic virtual 3-D healthcare learning environments: a review of the literature. *Journal of Medical Internet Research, 10*(3).

[7] Konetes, George. (2009). The organizational, governmental and external political forces shaping distance education. *International Journal of Instructional Technology and Distance Learning*, 6(1), 59-65.

[8] Konetes, G., & Wiggins, B.E. (2009). The effectiveness of virtual teams. In Proceedings of the *Laurel Highlands Communications Conference* (pp.11-18). Indiana: Indiana University of Pennsylvania.

[9] McMartin, F., Iverson, E., Wolf, A., Morrill, J., Morgan, G., & Manduca, C. (2008). The use of online digital resources and educational digital libraries in higher education. *International Journal on Digital Libraries, 9*(1), 65-79.

[10] Reinhart, C. (2008). Constructing the cafe university: teaching and learning on the digital frontier. *On the Horizon, 16*(1), 13.

[11] Sims, R. (2008). Rethinking (e) learning: A manifesto for connected generations. *Distance Education, 29*(2), 153-164.

[12] Tao, Y., Cheng, C., & Sun, S. (2009). What influences college students to continue using business simulation games? The Taiwan experience. *Computers & Education, 53*(3), 929-939.

[13] Warren, S., Barab, S., & Dondlinger, M. (2008). A MUVE towards PBL writing: effects of a digital learning environment designed to improve elementary student writing. *Journal of Research on Technology in Education, 41*(1), 113-140.

George D. Konetes is currently a Teaching Associate at the Indiana University of Pennsylvania (IUP) in the department of Communications Media. He is also a Doctoral Candidate in the Ph.D. in Communications Media and Instructional Technology program at IUP. His research interests include distance education, virtual teams, virtual simulations, and social aspects of text messaging.