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## Virtual Social Presence for Effective Collaborative E-Learning

Katherine G. Franceschi<sup>1,2</sup>, Ronald M. Lee<sup>1</sup>

<sup>1</sup>Florida International University Miami, FL USA

<sup>2</sup>University of Puerto Rico, Río Piedras, PR

{k\_franceschi@yahoo.com, rlee@fiu.edu}

### Abstract

*Collaborative learning is not well supported by current e-learning environments. Effective group collaboration in e-learning efforts is very difficult by the absence of visual identification of the participants and a shared reference space. This paper argues that virtual worlds possess the necessary aspects to foster effective group collaboration in e-learning efforts. The use of virtual representations (avatars) of the participants, the support of various forms of real time communications and the creative capabilities provided in virtual worlds are suggested as the key factors that promote effective group learning.*

### 1. Introduction

Collaboration has been an essential element of educational methodologies for many years. Educators all over the globe from a wide variety of disciplines use group collaboration in their classes. Research has found that group collaboration significantly enhances learning and student engagement [1].

In the context of e-learning, group collaboration is also desirable – however it is more difficult to arrange. Even though e-learning students prefer the use of collaborative learning techniques [2] the available technologies supporting e-learning efforts do not provide the adequate group collaboration tools and as a result the learning outcome is diminished.

The text-based format of current e-learning environments coupled with the lack of face-to-face interactions among the students affect their ability to form distinct social impressions of their classmates. This also affects the trust building process required for effective group collaboration [3]. As a consequence, e-learning participants tend to feel isolated from their classmates. The lack of face-to-face interaction with teachers and peers increases the feeling of isolation and results in poor group collaboration performance.

Technology developments and the proliferation of the Internet have spurred the development of numerous virtual worlds. Virtual worlds have been around for a long time but it wasn't until recently that the potential of Virtual worlds for enhancing e-learning started to attract the educators' attention. This paper attempts to discuss the potential of virtual worlds

for the support of effective collaborative e-learning efforts, through the development of the user's sense of social presence.

### 2. Collaborative learning

Experiential learning is one of the most salient education theories. The principle behind it is that the active immersion of the students in a learning task yields better results than traditional learning methods like reading or lecturing. Proponents also argue that it should be used to promote collaboration tackling that way an additional education objective: cooperative learning.

The effective use of this methodology requires the achievement of student engagement, since the learning process is significantly enhanced if the student is involved or engaged during the learning experience. Over the years, educators have developed and implemented a vast set of education tools, techniques, and methodologies to facilitate engagement in the learning experience. These methods also help develop students' social skills. Thus, experiential learning and cooperative learning have become key tools used by educators to achieve engagement. However, many of these methods rely on face-to-face contact between the participants, which is not easily convertible to e-learning environments.

#### 2.1. E-Learning and collaborative learning

With the proliferation and continuing growth of e-learning the issue of sustaining student engagement is accentuated. E-learners need to be engaged in order to fully benefit from the learning experience. The lack of face-to-face contact hinders the instructor's ability to determine the level of engagement of the student at any particular moment, limiting the instructor's ability to adjust delivery or style as one would in a live classroom. The anonymity associated with e-learning also impedes the appropriate allocation of responsibilities and management of the group task [3]. In order to address these issues it is important to understand the relationship between engagement and presence, and the factors of virtual environments that can affect them.

Engagement is defined as the state in which an individual's attention is completely focused on a particular task [4]. The gaming industry has been one of the most successful in

developing high levels of engagement. They strive for the maximum psychological state of enjoyment and satisfaction a user can experience when his or her attention is entirely focused on the task at hand, known as the state of flow [5]. Presence, on the other hand, refers to the psychological state of being somewhere [6]. The gaming industry enhances the sense of virtual presence by designing life-like 3D computer generated environments and challenging activities.

The concepts of presence and engagement are closely related, but in order to address the issue of poor student engagement in e-learning events it is important to differentiate them. As noted earlier, engagement refers to the user's undivided attention to a particular task, therefore it is sustained that in order to become engaged an individual must first be physically present in the place where the activity will take place. That's where the phrase "day dreaming" gets its meaning; an individual can really be in two places at the same time, when his or her body is where the task is taking place, while their mind is somewhere else. They are present, but not engaged on the task at hand. When working with virtual worlds the relationship is inverted, since the goal here is to achieve presence in the virtual world, which is the user's psychological sense of being in the environment. To achieve a sense of presence in a virtual environment the user must be highly engaged, only then can he or she be psychologically transported to the virtual environment. As a result, in virtual worlds engagement is a precondition of presence [7].

Both, engagement and presence are complex concepts affected by multiple factors. The next section summarizes the factors that affect the emergence of engagement and the sense of presence.

### 3. Engagement

Fostering engagement is no easy task; it requires the understanding of all the formal, social and cultural factors of the experience [5]. Even though engagement is an individual condition and there is no universal formula for it, identifying the main elements that make it possible could be very useful in the design of tasks, tools and environments that attempt or need to foster engagement. Game designers [5] have identified eight such factors: (1) challenge, (2) concentration, (3) clear goals, (4) direct feedback, (5) minimize awareness externalities, (6) sense of control, (7) loss of self-consciousness, and (8) alteration of time perception.

Activities that challenge the user and require them to use a specific skill facilitate the development of engagement. Providing clear goals, direct and immediate feedback to the executed task assists the user's deep focus on the activity at hand. An engaged user gets so absorbed by the activity that it fades his or her awareness of externalities, the user is so deeply involved in the experience that the actions become automatic. An engaging activity should also give the user control over their actions, providing them with a sense of control over the situation. To foster engagement the activity should promote the user's identification with the experience so that he or she

becomes a part of the activity and the concern for the self becomes unimportant. Finally, maximum engagement alters the users' sense of time, stretching or shrinking it according to the activity [5]. Developing engagement does not require the existence of all the factors mentioned above, but in order to foster engagement in a large number of users a balance among these conditions should be incorporated [8].

### 4. Presence

Presence "the state of consciousness, the psychological sense of being in the virtual environment" [6] is a complex concept of multiple aspects. The main aspects are classified as: objective, environmental, and subjective [6]. Objective aspects of presence refer to the automatic responses the user have to the virtual environment. Environmental aspects are related with the user immersion in the virtual environment, through the use of sensory information and stimuli that the virtual reality technology provides. The last aspect of presence, subjective, is concerned with the user's perception of presence in the virtual environment at a particular time. Many argue that in order to measure the success of a virtual environment in developing a strong sense of presence, the focus should be placed in the objective aspects rather than in the subjective ones, since the first are easier to observe as well as more reliable but it's measurement is more complicated [9] and for that reason the vast majority of research on presence uses subjective measures [10]. Successful virtual environments achieve the development of strong levels of presence among their users by carefully combining environmental and social factors and exploiting the available technology to immerse the user's senses in the experience. Various researchers have attempted to identify the main sources of presence [10, 11]. We use Witmer and Singer's [10] categories to present and briefly discuss the sources of presence. The categories are: (1) sensory factors, (2) control factors, (3) distraction factors, and (4) realism factors.

The first group, sensory factors, is very important in the process of developing a sense of presence [5]. These refer to aspects that deal with the development and transmission of sensory in the virtual environment. The goal is to stimulate as many of these sensory dimensions as possible.

The functionalities of the virtual environment and the user's manipulation of it are referred to as the control factors of presence. The degree of presence experienced by the users of a virtual environment is directly affected by their feeling of being in control of the situation. As a result virtual worlds should incorporate a number of features that allow the user to feel in enough control without affecting the development of the sense of presence and/or the goal of the experience. These controls should be consistent with the user's expectations, that is, they should be natural [10].

Distraction factors refer to all elements of the experience and the virtual environment that affect the user's level of attention. The minimization of distractions from the virtual experience can help foster higher levels of presence in the participants. This requires the user to perceive a non-mediated

experience [6, 11]. To increase the sense of presence in the virtual environment, through the minimization of distractions researchers recommend the use of special equipment and devices that feel natural to the user and are non-obtrusive to the experience [10].

Finally, realism factors incorporate all the characteristics of the virtual environment design and the technological medium used to provide the virtual experience and how they facilitate or obstruct the representation of a realistic environment [10, 11]. These factors attempt to develop perceptual realism in the experience. To develop perceptual realism it is necessary that environment representations be realistic and consistent with their real world versions.

The level of presence experienced by the users of a virtual environment is also affected by some of the personal characteristics of the users. Some of these personal characteristics identified in the literature include: the participant's immersive tendencies; prior experience with the virtual environment, and demographics [10].

The previous discussion shows the complexity of the concept of presence and how the level of presence experience by the user of virtual environments can be affected. In summary, the strength of the user's sense of presence will be the result of the interaction of both: the virtual environment's characteristics and the individual's characteristics.

#### 4.1. Social presence

Another set of factors that influence the sense of presence are associated with the social dimensions of virtual environments, called social presence. It refers to the user's perception of the virtual environment as a suitable environment for social networking. The social factors regulate the level of immediacy and intimacy the participant feel towards other avatars, real or agents, in the virtual environment. Social richness in a virtual world increases the strength of presence while interacting with others through a virtual environment by facilitating the user's perception of a welcoming, friendly or personal environment. These factors assist in the transmission of the social, symbolic and non-verbal cues that complement human communications. The incorporation of social factors in virtual worlds empowers the users to control the general level of intimacy of the interactions with others.

The goal of social presence is the portrayal of a virtual environment that supports virtual social encounters, with other users or with agents. To be successful these interactions should incorporate elements that make it similar to a real life social encounter, elements like the head and body movements, verbal and text communications, and simultaneous representation of multiple users or agents. These factors are precisely what could be of great assistance in the development of effective collaborative e-learning endeavors.

## 5. Virtual learning environments

E-learning is possible thanks to the technological advancements and their wide availability. To support e-learning efforts various learning environments have been developed, environments like Blackboard and Moodle. These environments are designed to help the instructor in the administration of the course. The set of functions, tools and navigational aids that are incorporated in these systems are extremely valuable for organizing the educational material and give a clear structure to the e-learning effort.

The technology is used as a proxy for the classroom environment in an e-learning initiative and attempts to facilitate and enhance the learning process and the student's experience. The design of the virtual learning environment also attempts to promote sharing and transfer of ideas, and the rise of social spaces. They strive to achieve this by supporting different types of social interactions through text-based synchronous and asynchronous communication tools, and in some instances with audio, between the participants of the e-learning effort. But besides the availability of various communication tools the text-based interfaces of the majority of these environments and tools do not support properly the appearance of effective learning communities of students. The limitation of current virtual learning environments lies in that the lack of face-to-face contact among the participants hinders their ability to develop and identify a common goal, which is crucial for the sense of belonging to emerge. If a participant does not feel part of a community he or she will be less likely to collaborate successfully and effectively. As a result, the desired level of engagement and the desired outcome of a collaborative e-learning effort are less likely obtained.

## 6. Virtual worlds

Virtual worlds are like video games but online with shared participation with many other players. These were originally termed Massively Multiplayer Online Role Playing Games (MMORPG's). Others virtual worlds are less game-oriented, and serve more as social spaces, where people meet to chat and do things together (go sightseeing, dancing, etc). Virtual worlds support the simultaneous participation of a large number of users, through the use of an avatar, in an activity performed in a persistent 3D-computer generated environment. As suggested, they can be either game oriented or more socially oriented 'open culture' virtual worlds. The game oriented virtual worlds focus on the fulfillment of the game tasks, challenges, and goals posed by the game designer to all the participants. On the other hand, open-culture virtual worlds do not follow a particular theme or have a specific goal for their users. Since these worlds do not limit the users experience most have evolved into some sort of 3D social space, where many aspects of a real societies appear.

The fast growth of these virtual worlds has called the attention of commercial entities, making commercial activity one of the most dominant social aspects found in virtual

worlds. The business interest in virtual worlds is not limited to the virtual world's usage fees. Realizing that every day more and more potential customers are spending increasing amounts of time having virtual world experiences, a large number of companies have developed some type of presence in the virtual world arena. Business activity in virtual worlds can also be appreciated by the large number of in-world businesses developed and managed by the users. Most of these businesses are targeted to the enhancement of the user's virtual experience

### 6.1. Education in virtual worlds

Of special interest to us is the growing interest in using virtual worlds for education. The popularity of virtual worlds has led many educators to seek for virtual world applications that foster engagement and effective group learning. Current educational uses of virtual worlds concentrate on the open culture worlds, since these provide more flexibility than their counterparts. These worlds are being used as an alternative venue to hold lectures and conferences that promote distance collaboration. A number of non-profit organizations, like NOAA and NASA are also making use of the available virtual worlds to get their message across to a larger and more diversified audience.

### 6.2. Engagement and virtual worlds

The use of a 3D environment provides the user with a larger number of visual stimuli, which can assist in the development of user engagement. The use of avatars is the main characteristic of a virtual world that can help achieve higher levels of student engagement. Visual recognition of their peers, even if it is virtual, would help in the trust building process in teams. It can also help the team in their assignment of the team's responsibilities to team members and make them feel more accountable for their actions.

### Conclusions

This paper presents support for two claims. The first claim is that virtual worlds possess the necessary characteristics to foster a stronger sense of social presence than current e-learning environments. The second claim is that a higher sense of presence results in higher levels of student engagement, which in turn enhances performance in collaborative efforts, as well as the student's overall performance. The use of virtual visualizations of the students

and the instructor, real time communications, the use of non-verbal cues and the creative tools provided in virtual worlds are believed to be the factors that can enhance the level of engagement and the degree of effectiveness of the collaborative task. One of the authors (Franceschi) is currently studying the effectiveness of virtual worlds in the sense of presence and social presence during collaborative tasks as well as in the collaborative task's performance versus other learning environments.

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