Level of Abstraction and Feelings of Presence in Virtual Business English Space

Judy F. Chen[1*], Clyde A. Warden[2]

[1] Dept. of Business Administration, Overseas Chinese University, Taiwan

[2] Dept. of Marketing, National Chung Hsing University, Taiwan

*Email Address of Contact Author: jfc@ocu.edu.tw

Abstract

Virtual spaces allow abstract representations of reality that not only encourage student self-directed learning, but also reinforce core content of the learning objective through visual metaphors not reproducible in the physical world. One of the advantages of such a space is the ability to escape the restrictions of the classroom, yet reproduction of reality may surpass what is needed to encourage feelings of presence. Simultaneously, too high an abstraction level may change participants' attitudes in relation to the core learning goals. This quantitative study examines the relationship between level of environment abstraction, within the virtual space, and feelings of presence for business negotiation role playing. Negotiation values are also measured in relation to environment abstraction. The open source software Open Wonderland is used to implement two levels of abstraction for a virtual space where class lectures and student driven negotiation role playing take place over a semester. Results indicate a high abstract environment reduces feelings of presence compared to a low abstract environment, even when the low abstract level is not realistic but rather employs a metaphor related to instructional goals. The values employed in negotiation role playing across the two abstraction levels exhibit no difference, indicating the fundamental approach to negotiating is not related to the virtual environment design.

Keywords: ESP, MMORPG, Negotiation, Open Wonderland, RPG, Second Life, Virtual

1. Introduction

Role playing is commonly used in both business and foreign language classrooms to practice skills not transferable through traditional lecture approaches. Many educational settings, however, include large class sizes and restrictive classroom designs not conducive to such role playing. Certain cultures, such as across Asia, may also make it difficult for students to overcome social embarrassment encountered when role playing. Online, immersive simulations, present a viable solution to these problems. Over the past decade, numerous academics have reported on the adoption of virtual environments in the educational setting (Mikropoulos & Natsis, 2011). Virtual environments have been specifically pointed out for their capability in encouraging student co-construction of knowledge (De Lucia, Francese, Passero, & Tortora, 2009; Jamaludin, Chee, & Ho, 2009; Jarmon, Traphagan, Mayrath, & Trivedi, 2009), collaboration (Jarmon et al., 2009), and critical thinking (Herold, 2010). In recent years, Second Life has often been employed as a virtual environment for

testing the feasibility of moving into immersive virtual spaces. In numerous ways, this move marks the climax of a trend in combining computers and education, with classrooms becoming digital and students taking the form of avatars. The future of virtual environments in education looks promising, yet little research has examined the parameters of virtual environments mostly focusing on the commercially available Second Life.

At the most fundamental level, the first question facing the implementation of a virtual space is just how much such a space should reproduce reality. Dillenbourg (2008) argues that imitating reality is not the strength of technology, while Kartiko, Kavakli, and Cheng (2010) found levels of avatar virtual reality complexity did not correlate with improved outcomes. All virtual environments are abstractions of the real world, and in many cases, part of the attraction to using a virtual environment is that a design can be created that could not possibly exist in the real world. The current study examines how that level of abstraction impacts students' reported feelings of presence and skill sets used within the class. Specifically, we investigate an international business negotiation class that implements a virtual environment at different levels of abstraction.

Specific salient attributes of a virtual environment for an educational setting are as of yet unknown. The current study investigates the impact of the level of abstractness of a virtual environment on students' feelings of presence. Secondly, we examine if the level of abstraction is related to the skill set used within the virtual environment's role playing simulation. The specific hypotheses tested are:

H1: Increased level of abstract representation of a virtual space will lower reported feelings of presence within a role playing business negotiation simulation.

H2: Negotiation values will increase in a less abstract representation of a virtual space within a role playing business negotiation simulation.

To test these hypotheses, an 18 week university international business negotiation class was designed in Taiwan. Two custom virtual environments were created through the open source software Open Wonderland. Details of the study are covered next.

2. Method

Participants included 48 students enrolled in a university undergraduate business administration degree in Taiwan, ages between 20 and 24 (self-selected convenience sample). The specific class was an elective international business negotiation class, listed as employing distance education tools. A single teacher taught the class, lasting 18 weeks, with a mix of online and classroom sessions.

Students formed groups on their own, a total of six groups, remaining in the same group throughout the semester. Online class meetings started three weeks into the semester, alternating between online and classroom meetings during the first six weeks. During this period, class was lecture centric, with the lecturer using the virtual space as an opportunity to assure students overcame any issues and to interact with students through asking questions. The second third of the class introduced students to the pen & paper role playing game (RPG), with each group representing a company, either a buyer or a seller. Within game parameters, each group's specific business situation was randomly determined in order to simulate market conditions. Group business situations and market information changed for each game round. For each

game round, the buyer/seller orientation for each group was also randomly determined, with no guaranty of supply and demand symmetry.

Within each group, two students were chosen to represent their firm in negotiating with other firms. Negotiation strategies and tactics from the lectures were practiced during the RPG. Game rounds moved from the classroom, to the virtual space over a number of rounds. The first RPG round was held in class, the second outside of class with students free to find their own communication methods between groups. By the third game round, all negotiations were held within the virtual space, although students were not limited in time nor restricted from using other communication channels. After each game round, the teacher met with the class to examine results and give input on negotiation skills. Only two group representatives were allowed to directly negotiate within the virtual space, although they were allowed to communicate with their own team members through any medium. This accurately represented a negotiation situation. The twelve representatives completed an online survey form immediately after conclusion each of these simulations.

In order to have complete control over the virtual world, we avoided using Second Life. A number of open source software development projects, at the time, were available. Open Wonderland is a project started at Sun Microsystems, which became independent and fully open source. The software code base is open for anyone to use and contribute to, in much the same way as OpenSimulator. The Open Wonderland program is Java based, meaning users can execute the program without installing a viewer and can login and launch the program from any Web browser. Use of an Open Wonderland's virtual space avoids the risk of students being exposed to offensive issues common in Second Life and/or costs associated with purchase of dedicated space. Open Wonderland offers excellent audio depth perception through a full stereo implantation. Students could use default avatars or create custom avatars. As in Second Life, movement was uninhibited. Participating students quickly grasped how to manipulate their avatars in the virtual space. PowerPoint slides were directly imported along with Web browsers and other tools for lectures within the virtual space. For the current study, Open Wonderland was implemented on a dedicated server based within the host university. Students normally accessed the space from their homes off campus.

In order to encourage a constructivist theme, a metaphor was sought that reinforced many of the teaching points in class, while allowing students to create their own negotiation approaches within the virtual space. Second Life's space has been found useful in communal constructivism, as groups of students can use the space to build their relationships and learning experience (Andreas, Tsiatsos, Terzidou, & Pomportsis, 2010; Girvan & Savage, 2010). Large numbers of students in a virtual space, however, can cause difficulties in interaction—making even identifying who is speaking difficult (Andreas et al., 2010). The six groups of the current study were all to attend lectures and interact within the virtual space simultaneously. A large room, with three walls, was designed to represent a classroom and also act as a central meeting space for negotiations among groups. During negotiation simulations, groups also needed private spaces for meeting and planning as well as establishing bases. Each base allowed group members to visit and initiate negotiations with the groups they choose. Metaphors within a virtual space have been found to help collaboration (Andreas et al., 2010), thus for the low abstract space we employed an island metaphor. Each group owned a small island far enough away from other islands that meetings could be held in private, yet close enough that students could see the

location of other groups (see Figure 1). The classroom/meeting room acted as the central hub, where participants could teleport to and from their group islands by walking through a door on each island or one of the numbered doors in the classroom/meeting room.

Figure 1. The low abstract virtual space, adopted an island metaphor.

The high abstract space removed all environmental cues. The sky was the same as in the low abstract setting, but nothing else was retained. Students' avatars were consistent between the two settings, as were the class slides used during lectures Figure 2.
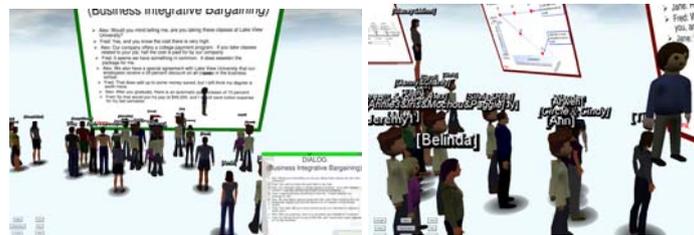

Figure 2. The high abstract virtual space.

To measure negotiation values, we adopted the constructs of self-face and other-face negotiation tactics in Chinese negotiation, as elaborated by (Ting-Toomey & Kurogi, 1998). This scale includes six questions shown to accurately measure values adopted during negotiation among negotiators in Chinese cultural settings (Warden & Chen, 2009). Respondents (all local students raised in a Chinese cultural setting) indicated agreement with statements along a 1 to 7 Likert scale, with 7 = agree very strongly and 1 = disagree very strongly. Negotiation is a social behavior that balances short term and long term goals attempting to obtain maximum benefit while retaining and improving relationships. Balancing self interest with an opponent's needs is universal to negotiation, but in Chinese settings, it is often expressed in terms of face. These values are fluid, depending on the situation. Warden & Chen (2009) found these values to change given the context of the negotiation. In the current study, a high level of abstract virtual space may encourage students to value these negotiation tactics less, as the context appears less real. A less abstract space, in contrast, may encourage a more thoughtful approach to the negotiation, resulting in higher subjective scores on this scale.

For the survey questions concerning the feeling of presence, we employed the 7-item telepresence scale from Klein (2003), commonly used to measure feelings of presence in virtual space settings (Kim & Biocca, 1997; Nelson, Yaros, & Keum, 2006; Persky et al., 2009). Respondents indicated agreement with statements along a 1 to 7 scale, with 7 = agree very strongly and 1 = disagree very strongly. Recently, Second Life has received the bulk of research attention in describing attempts at creating immersive virtual environments (Andreas et al., 2010; Cheong, 2010; Herold, 2010; Jamaludin et al., 2009). Feelings of presence in Second Life are often reported on, but

the opportunity to manipulate the space is somewhat limited as users entering Second Life can move locations within Second Life that are not part of an experiment. The current study implemented an isolated virtual world, not connected to any other parts, allowing complete manipulation of the setting in order to test the impact on subjective feelings of presence. Both levels of abstraction represent non-realistic negotiating settings, with one attempting to match a metaphor with the class topic—the lower abstract setting. The higher abstract setting simply leaves everything up to the participants, with avatars and class slides being the only constant visual between settings.

3. Results

The current study primarily focused on quantifying the impact of a virtual space's level of abstraction on feelings of presence. Data analysis centered on the subjective scores from each group's two representatives who were responsible for executing the negotiation behaviors, representing their group members. Differences in negotiation tactics, resulting from environment abstraction level, were also measured through the survey. The first survey was administered after the negotiation session employing low abstraction and the second survey a week later after the high abstraction session. Both sessions took place sixteen weeks into the course after all students had participated extensively in both high and low abstraction settings, playing the RPG, simulating negotiations. Reliabilities, Cronbach's Alpha, for the first and second simulation survey responses, were .74 and .78, respectively.

A paired two sided t-test was employed to measure any differences between the low and high abstraction levels for each survey question. Results are reported in Table 1. Perceived presence levels within the low abstraction design were higher for all seven questions than for the high abstraction design. Question four was the only question not statistically significantly different ($t = 1.05$, $p = .32$, Cohen's $d = .39$) between the designs (The SIM world seemed to me "somewhere I visited" rather than "something I saw"). Given that both levels of abstraction were quite different from reality, and that the simulation was run through a Web browser, excluding any virtual reality equipment, this issue possibly stands out as students emphasized what they actually saw on the screen.

The largest effect size was exhibited by question five (I felt I was more in the "SIM world" than the "real world" around me when I was going through the negotiation), statistically significantly different between the abstraction levels ($t = 4.75$, $p < 0.01$, Cohen's $d = 1.08$). Questions two (During the negotiation, I forgot that I was in the middle of an experiment; $t = 2.4$, $p < 0.04$, Cohen's $d = 0.89$), six (I forgot about my immediate surroundings when I was navigating through the SIM negotiation; $t = 3.22$, $p < 0.01$, Cohen's $d = 0.92$), and seven (When the negotiation exercise ended, I felt like I came back to the "real world" after a journey; $t = 2.93$, $p < 0.01$, Cohen's $d = 0.98$) also displayed large effect sizes. With six of the seven presence measures exhibiting statistically significant differences and moderate to high effect size, hypothesis 1 (Increased level of abstract representation of a virtual space will lower reported feelings of presence within a role playing business negotiation simulation) is supported.

None of the negotiation question means were statistically significantly different between the two simulations. Question 2 (I am concerned with helping the other person to maintain his/her credibility) had the largest effect size, ($t = -1.33$, $p = 0.21$, Cohen's $d = 0.57$). Small to moderate effect sizes were also observed for questions

three (I am concerned with protecting my self-image; $t = -1.48$, $p = 0.17$, Cohen's $d = 0.43$) and four (I will try to ignore conflict and behave as if nothing has happened; $t = 1.26$, $p = 0.23$, Cohen's $d = 0.47$). Lack of consistency in these results make it appear that differences in negotiation tactics have more to do with the specifics of the negotiation rather than the virtual space design. Considering none of the negotiation self-reported scores exhibited any statistically significant difference, and that effect size was small to moderate, hypothesis 2 (Negotiation values will increase in a less abstract representation of a virtual space within a role playing business negotiation simulation) must be rejected.

Table 1. Comparison of abstract levels for presence and negotiation tactics.

Question	Level	Mean	t	p
NQ1 I am willing to sacrifice my self-interest for the benefits of our relationship.	Low	5.42 $(1.08)^{0.27}$	0.9	0.39
	High	5.17 (0.72)		
NQ2 I am concerned with helping the other person to maintain his/her credibility.	Low	4.58 $(1.62)^{0.57}$	-1.33	0.21
	High	5.33 (0.89)		
NQ3 I am concerned with protecting my self-image.	Low	4.67 $(1.15)^{0.43}$	-1.48	0.17
	High	5.17 (1.19)		
NQ4 I will try to ignore conflict and behave as if nothing has happened.	Low	4.92 $(1.56)^{0.47}$	1.26	0.23
	High	4.25 (1.29)		
NQ5 I will dominate the argument until the other person understands my position.	Low	4.00 $(0.95)^{0.25}$	-0.56	0.59
	High	4.25 (1.06)		
NQ6 I will give and take so that a compromise can be made.	Low	5.58 $(0.90)^{0.22}$	0.56	0.59
	High	5.42 (0.51)		
PQ1 During the negotiation, I felt I was in the world the computer created.	Low	5.17 $(1.47)^{0.5}$	2.69	0.02
	High	4.42 (1.51)		
PQ2 During the negotiation. I forgot that I was in the middle of an experiment.	Low	5.00 $(1.60)^{0.89}$	2.4	0.04
	High	3.67 (1.37)		
PQ3 During the negotiation, my body was in the room, but my mind was inside the world created by the computer.	Low	4.83 $(1.47)^{0.45}$	2.02	0.07
	High	4.08 (1.83)		
PQ4 The SIM world seemed to me "somewhere I visited" rather than "something I saw."	Low	4.92 $(1.24)^{0.39}$	1.05	0.32
	High	4.50 (0.90)		
PQ5 I felt I was more in the "SIM world" than the "real world" around me when I was going through the negotiation.	Low	5.33 $(.78)^{1.08}$	4.75	0.01
	High	4.42 (0.90)		
PQ6 I forgot about my immediate surroundings when I was navigating through the SIM negotiation.	Low	5.25 $(0.97)^{0.92}$	3.22	0.01
	High	4.17 (1.34)		
PQ7 When the negotiation exercise ended, I felt like I came back to the "real world" after a journey.	Low	5.50 $(1.45)^{0.98}$	2.93	0.01
	High	4.08 (1.44)		

Note. PQ = presence question. NQ = negotiation question. Parentheses are SD and raised text is Cohen's d effect size. All t-tests are two tailed paired, df = 11.

4. Conclusions

The current study shows that students' reported feelings of presence are higher in a virtual space using a non-realistic visual metaphor than a completely abstract space. Importantly, neither space influenced students strategies used in the negotiation RPG played within the virtual spaces. Findings echo Kartiko et al. (2010), showing no difference in presence or outcomes related to avatar complexity. Kartiko et al. reported even moderate levels of complexity promoted the feeling of presence. This

issue is important as increased complexity in virtual spaces require higher computing power both at the server and the client, as well as increased bandwidth.

Simple graphics in a virtual space may work as well as complex graphic in encouraging the feeling of presence. The question remains as to just how far this can be taken in the context of the overall metaphor employed in a virtual world. If the objective of the virtual space is to train specific skills that require detailed information, conveyed visually, then improvements in skill will be related to the level of detail in the simulation, as in training radiotherapist (Bridge, Appleyard, Ward, Philips, & Beavis, 2007). For other areas of learning, maybe even most, the visual appearance of a virtual space is less about skill obtainment than about employing a metaphor that strongly reinforces the underlying pedagogy of the class. Such visuals can impress upon students meanings that would be lost in a traditional lecture. In the current example, the island and meeting room metaphor was very effective in reinforcing the importance of teamwork in negotiation, the independence and separation of each team, and the need to meet for trading information. In the case of an RPG, students in a physical classroom can understand these points, but acting them out is difficult as their real world relationships with all the students in the class present a barrier.

5. Acknowledgement

6. References

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