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Level of abstraction and feelings of presence in virtual space: Business English negotiation in Open Wonderland

Judy F. Chen [a], Clyde A. Warden [b,*], David Wen-Shung Tai [c], Farn-Shing Chen [d], Chich-Yang Chao [d]

[a] Business Administration Department, Overseas Chinese University, Taichung, Taiwan
[b] Marketing Department, National Chung Hsing University, Taichung, Taiwan
[c] Computer Science and Information Management Department, Hungkuang University, Taichung, Taiwan
[d] Industrial Education and Technology Department, National Changhua University of Education, Changhua, Taiwan

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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 physical 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 examined the relationship between level of environment abstraction, within a virtual space, and feelings of presence for business negotiation role playing. Negotiation values were also measured, in relation to environment abstraction. Two levels of virtual space abstraction were implemented, through the open source software Open Wonderland, where class lectures and student driven negotiation role playing took place over a semester. Results indicated a high abstract environment reduced feelings of presence compared to a low abstract environment, even when the low abstract level was not realistic but rather employing a metaphor related to instructional goals. The values students used in negotiation across the two abstraction levels exhibited no difference, indicating the fundamental approach to negotiating was not related to the virtual environment design.

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 role playing. Some cultures, such as Asian cultures, may lack a tradition of in class role playing, 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, especially those with simultaneous multi-users, have stood out for their usefulness 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 been employed as a virtual environment for testing the feasibility of moving into immersive virtual spaces across a number of professional fields. This trend combines computers and education as classrooms become digital and students take the form of avatars.

A fundamental question facing the implementation of a virtual space is level of fidelity in reproducing reality. Dillenbourg (2008) argued 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 examined how that level of environment abstraction impacts students' reported feelings of presence and skill sets used within the class.

* Corresponding author.
E-mail addresses: jfc@ocu.edu.tw (J.F. Chen), cwarden@cwarden.org (C.A. Warden), david60123@gmail.com (D. Wen-Shung Tai), iefchen@cc.ncue.edu.tw (F.-S. Chen), cychao@cc.ncue.edu.tw (C.-Y. Chao).

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Specifically, we investigated an international business negotiation class that implemented a virtual environment at different levels of environment abstraction.

This class is typical of business classes in Greater China that attempt to combine business knowledge and English as a foreign language. We thus built on the well-established research thread of language and computers in the classroom with business subject matter. One of the biggest challenges facing students and teachers in the modern English for Specific Purpose (ESP) classroom is how to make curriculum relevant and immediate while also including realistic practice opportunities. Language skill related to current and future employment opportunities tends to be context-specific and, in ESP settings, the goal of applied use may never be far off (Warden & Chen, 2009). Negotiations held between international businesspeople are not only about the use of English but also about the meeting space, the time limitations, and most importantly, the dynamic relationships during the give and take of a negotiation. Within a standard classroom, these conditions are impossible to simulate. Computers have been used in an attempt to overcome these limitations in the language learning context.

1.1. Computer-supported collaborative learning

Computer Assisted Language Learning (CALL) has moved through the stages of behaviorist, communicative, and integrative (Warschauer & Healey, 1998). The latest approach, integrative, emphasizes using language in a natural context and bringing together students in authentic use. Many of the approaches reported on in extant research use asynchronous interactive tools that leverage the Internet, such as email and electronic bulletin boards (Goodyear, 2005). Asynchronous bulletin board systems have exhibited wide participation, with variable levels of contributions and influences on conceptual change, level of inquiry, and meta-cognition (Lipponen, Rahikainen, Lallimo, & Hakkarainen, 2003). Computer-Supported Collaborative Learning (CSCL) was first noted as different from CALL and computer assisted instruction due to its emphasis on group contribution (Lipponen, 2002). Growth in adoption of local networks, and then the wider Internet, has led to numerous studies showing positive results of broadening the reach of the classroom and overcoming its boundaries (Warschauer & Kern, 2000).

In higher education, students have been found to value highly integrated computer-mediated conferencing (CMC) (Goodyear, Jones, Asensio, Hodgson, & Steeples, 2005). Numerous studies have examined the effectiveness of synchronous text-based chatting, which plays into students' familiarity with online chat through BBS, IRC, MSN Chat, and Yahoo Chat, among others. Although generally not found to contribute to better quality discourse (Abrams, 2003), some researchers have found chat encourages repair of errors, increases accuracy, and lowers errors over time (Yuan, 2003). Improvements in communicative capability have also been observed (Kung, 2004; Tudini, 2003), as well as increased intercultural interaction (Tudini, 2007). Most importantly, integration of student directed online computer use relieves issues of class size and limited ability to practice key behaviors in the traditional classroom (Warden, 2000).

Online chat does not replace oral discourse, yet the addition of live video is problematic. Point-to-point video, that recreates the classroom over a distance, strains learners to interpret meaning because such video is a one-way communication (Kramsch & Andersen, 1999). Video conferencing approaches tend to follow a traditional view of CMC interaction with one-to-one communication, such as video conferencing over Skype, or one-to-many, with a teacher broadcasting video from the classroom over the Internet synchronously or asynchronously with services such as YouTube. Such approaches dominate the current learning environment, but each approach has its own drawbacks. The absence of oral and visual interaction has been cited as a major drawback of CMC (Wang, 2004a). Wang (2004b) pointed out the importance of body language in encouraging students' creation of their own learning environment.

1.2. Telepresence

Asynchronous video does not allow interaction or any change in point-of-view, but virtual immersive programs can offer this (Grodal, 2000, p. 197–212). Increased control features improve levels of immersion, which can lead to higher levels of user involvement. This experience succeeds by evoking a greater psychological sense of presence (Steuer, 1992). Additionally, players face fluid situations and are presented with continuous choices requiring responses and involvement (Nelson, Keum, & Yaros, 2004). The psychological construct of presence has been cited across numerous studies (Mikropoulos & Natsis, 2011) as a key to improving involvement and, by implication, outcomes. Feelings of immersion were found to increase in virtual reality medical simulations along with increased interaction, imagination, and motivation (Huang, Rauch, & Liaw, 2010). Immersion is often increased through technological improvements, such as interface design. Presence is facilitated through vividness and interactivity with other users (see Fig. 1), both of which are emphasized in Massively Multiplayer Online Role Playing Games (MMORPG).

Virtual gaming points to the untapped opportunity to increase learning through higher levels of involvement while allowing students more freedom and self-directed behavior. Anthropological perspectives of how these approaches function have only just begun (Kern, Ware, & Warschauer, 2008, pp. 1374–1385), with a large research gap and an opportunity for implementation in both business and educational settings.

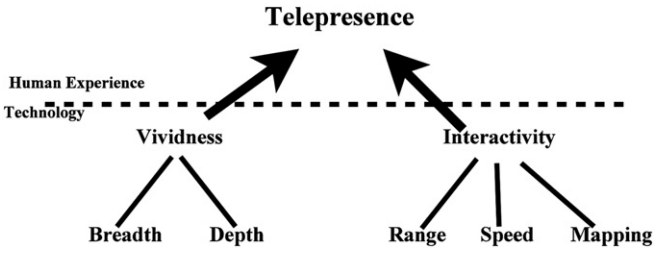

Fig. 1. Technology's characteristics in building telepresence (Steuer, 1992).

1.3. Multi-user virtual environments

A meta-analysis of virtual environments in education (1999–2009) showed the majority of applications involved science topics (Mikropoulos & Natsis, 2011). Additionally, only 12 out of the 53 studies combined visual elements with auditory elements. Undoubtedly, the technology has only recently developed to a level that allows full simultaneous—visual and audio implementation. Nevertheless, these factors are vital to executing a virtual environment that allows complete student-led behaviors and real-time interactions while increasing feelings of presence.

Second Life, a commercial MMORPG, has attracted a number of researchers examining the educational possibilities of a multi-user virtual environment. Second Life allows multiple users to create their own avatars, manipulate environments, and communicate in real-time with other users through live audio, all from their own personal computers connected to the Internet. De Lucia et al. (2009) found the experience of using Second Life for class activity positive and even reported a reduction in distance between teacher and student. Outcomes, however, have shown mixed results. Wrzesien and Raya (2010) found young students did not increase learning effectiveness through the use of a virtual environment, but students reported higher enjoyment and engagement. Cheong (2010) found teacher training in Second Life had mixed outcomes. It appears that skill outcomes may not surpass traditional classroom settings, but the advantage of virtual environments come from the opportunities for CSCL.

Within Second Life, Jamaludin et al. (2009) showed improved epistemic interaction among students through role playing over a number of simulations. Critical thinking and writing skills have also been facilitated through role playing scenarios in Second Life (Jamaludin et al., 2009). Herold (2010) used locations in Second Life to encourage student critical discussion related to portrayal of cultures within Second Life. Rather than reproducing reality, a virtual environment clearly offers opportunities for self-expression on the students' own terms. Augmenting reality is the strength of computer systems, rather than imitating reality (Dillenbourg, 2008). Metaphors within virtual environments add to reality while leveraging a computer system's capabilities. Virtual environments are always, at some level, abstract. At the most basic level, a virtual environment, like Second Life, is a two-dimensional representation. The feeling of presence is created through the illusion of being inside an environment, as long as individuals' actions correspond to responses within the environment (Groenegress, Thomsen, & Slater, 2009). This emphasis on interactivity is the second half of the Steuer (1992) model of presence (see Fig. 1) and clearly where virtual environments excel. Seventh grade math students using a non-immersive virtual reality, where the virtual world was rather simplistic and did not include avatars, improved their skills as a direct result of being able to manipulate objects within the space (Pasqualotti & Dal Sasso Freitas, 2002).

The graphical aspect of a virtual environment is the first half of the Steuer (1992) model, but given that such spaces are abstractions of reality, the current study examines the relationship between presence and virtual environment abstraction. Even low fidelity graphics, such as Wii avatars, can increase user involvement in games when the self-representative avatar represents the user's ideal self, more so than when accurately representing the user (Jin, 2009a; Jin & Park, 2009). Virtual representations of people need not have high fidelity to trigger emotions similar to the presence of real people as shown by experiments with subjects simulating public speaking to virtual space avatars (Slater, Pertaub, Barker, & Clark, 2006). Simple exposure to a relaxing virtual environment, even without interaction, was found to trigger physiological responses, including a reduction in anxiety (Gorini et al., 2009).

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

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

2.1. Negotiation RPG development

Over the previous three years, including students not participating in the current experiment, the teacher of this class developed and tested a pen-and-paper Role Playing Game (RPG) for use within a physical classroom setting. The RPG was developed to simulate buyers and sellers within a market. Each group, representing an individual firm, used a single RPG sheet (downloadable at: http://cwarden.org/negotiation_rpg_sheets.zip), much like a character generation sheet in RPG games. The RPG included a heavy quantitative aspect, suitable for the orientation and background of business administration students in Greater China. Key aspects of the RPG included company finances, quality, delivery, capacity, market goals, resistance levels, and buyer/seller orientation—all central concepts to business negotiation. In the tradition of pen-and-paper RPGs, each group rolled dice to determine its respective firms' negotiation positions and resources for each game round. Previous game testing resulted in a sufficiently random simulation so that each group was exposed to differing levels of opportunities and threats within the simulated market, while avoiding any advantages accruing to a single group. Class-based experiences from the previous years exposed strengths and weaknesses that were salient to the motivations for moving the simulated negotiations into a virtual space.

2.2. Classroom RPG strengths

Student reaction to the pen-and-paper RPG was positive, with class enrollment increasing each of the three years during the simulation's development and testing. Students exhibited high comfort levels with the RPG sheet, quickly generating mathematical formulas for how

Fig. 2. The low abstract virtual space adopted an island metaphor.

different negotiation tactics would generate different levels of sales, expenses, profits, etc. Such analytical planning is a strength of students in Greater China and fits well with textbook lessons on negotiation strategies and tactics. However, actual business negotiation is made much more complex by the unpredictability of other participants in the market. Once negotiation simulations began, the actual complexity was made clear to students and their planning often undermined, forcing students to be more dynamic in making decisions—a key goal for business management training. The result was an exciting learning experience for students, who in class reviews often expressed appreciation for the opportunity to learn by doing.

2.3. Classroom RPG weaknesses

The largest obstacle to the simulation was found to be the classroom itself. A single classroom did not allow groups to hold negotiations in a private manner. Allowing students to move to other locations, throughout the university, made it difficult for each group to locate other groups, as well as drawing the attention of administrators concerned with students disturbing classes in session. Another approach attempted to give students time between classes, a week to two weeks, to meet at their own convenience, in person, Voice Over Internet Protocol (VOIP), cell phone, etc. This approach proved helpful in getting students up to speed in playing the RPG, but was difficult to supervise. With no observation of behaviors, the teacher could not provide personalized feedback, a key aspect of the class. Lastly, the use of English for business could not be monitored when student meetings were diffused. A virtual meeting space presented an opportunity to overcome the class-based weaknesses, while retaining the successful parts of the RPG.

2.4. Open wonderland

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 was 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 Open Simulator. 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 simulation. 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.

2.5. Participants & class

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 course 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 participated in all online activity at their own convenience, using their own computers at whatever location they preferred. Students were introduced to the virtual component of the class during the first class meetings, with normal class-based lectures following, including instructions/examples of software use, headset/microphone setup, and troubleshooting. The third class meeting location was changed to the virtual environment, and thereafter alternated between virtual and physical meeting spaces (nine classes in the classroom and seven classes online). By the fourth week, students were exposed to all aspects of the class, thus informing their decisions to remain in the class or drop the class.

2.6. Experimental design and procedures

Students formed groups on their own, a total of six groups, remaining in the same group throughout the semester. The first third of the class sessions focused on foundational concepts of negotiation. The second third of the classes introduced students to the pen & paper RPG, with each group representing a company, either a buyer or a seller. 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 whereas 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. A week after each game round, the teacher met with the class, in the physical classroom, to examine results and give input on negotiation skills.

Approximately half of the class lectures were held in the virtual space, alternating between the low and high abstraction levels. Students retained their avatars across all lectures and simulations. Some objects were consistent between the high and low abstraction environments, such as floating signs with instructions at the location of entry (see Fig. 4). All students thus had an opportunity to experience both settings. The final two RPG rounds were held exclusively within the virtual space, with a 3-h time limit, and no communications between groups allowed outside the virtual space. Only two representatives per group 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 concluding each of these simulations.

2.7. Abstraction construct

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 experiences (Girvan & Savage, 2010; Konstantinidis, Tsiatsos, Terzidou, & Pomportsis, 2010). Large numbers of students in a virtual space, however, can cause difficulties in interaction—making even identifying who is speaking difficult (Konstantinidis et al., 2010). The six groups of the current study all attended 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 (Konstantinidis 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 so that meetings could be held in private, yet close enough that students could see the location of other groups (see Fig. 2). 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.

The high abstract space removed all environmental cues. The sky was the same as in the low abstract setting, but no other visual metaphors were retained from the island/classroom setting. Students' avatars were consistent between the two settings, as were the class slides and instructions used during lectures (see Fig. 3).

2.8. Negotiation construct

To measure negotiation values, we adopted the constructs of self-face and other-face negotiation tactics in Chinese negotiation, as elaborated by Ting-Toomey and 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 1–7 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, negotiation values are often expressed in terms of face. These values are fluid, depending on the situation. Warden & Chen 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.

2.9. Presence construct

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 1–7 scale, with 7 = agree very strongly and 1 = disagree very strongly. Recently, Second Life has received research attention in describing attempts at creating immersive virtual environments (Cheong, 2010; Herold, 2010; Jamaludin et al., 2009; Konstantinidis et al., 2010). Feelings of presence in Second Life are often reported on, but the opportunity to

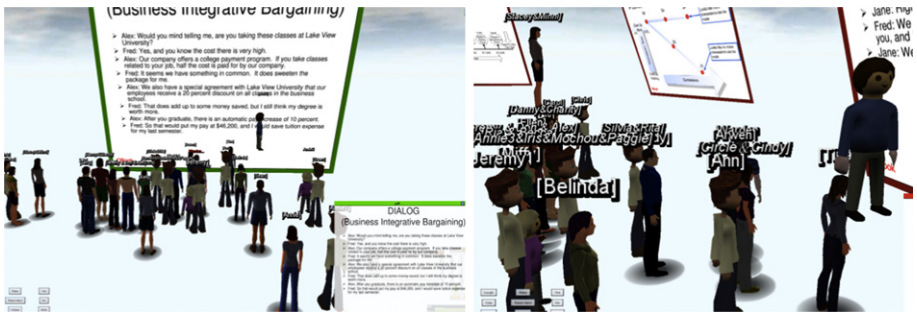

Fig. 3. The high abstract virtual space.

Fig. 4. Floating instructions in high abstract space and avatars negotiating in low abstract space. Instructions included the teacher's photo (here with the teacher's avatar—teacher's name: Prof. Warden) and were consistent between abstraction levels.

manipulate the space is somewhat limited as users entering Second Life can move to locations within Second Life that are not part of the experiment. The current study implemented an isolated virtual world, built in Open Wonderland, not connected to any other virtual locations or systems, allowing complete design 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 the lower abstraction level attempting to match a metaphor with the class topic. The higher abstract setting simply leaves everything up to the participants, with avatars, instructions, and class slides being the only constant visual cues between settings. The high abstract space lacked any clear ground, allowing avatars to fly up and down, which students often took advantage of in order to gain better views of slides during class lectures.

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 the 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 16 weeks into the course after all students had participated in both high and low abstraction settings, playing the RPG negotiation simulation. Reliabilities, Cronbach's Alpha, for the first and second simulation survey responses, were 0.74 and 0.78, 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 ($t = 1.05$, $p = 0.32$, Cohen's $d = 0.39$) 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 the fifth presence question (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 two (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) is rejected.

3.1. Observed behaviors

Because seven classes were held in the virtual space, before the experiment, students had ample time to learn how to control their avatars, as well as comprehend the two types of virtual space. In the high abstract virtual space, floating signs instructed students toward meeting areas, as there was no clear single meeting location. In both spaces, floating signs supplied instructions to remind students of technical issues, such as microphone setup (see Fig. 4). Given that simply operating an avatar in a virtual space can present challenges to students, especially non-information science majors (Petrakou, 2010), these cues were helpful. Technical issues were solved during the

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 (0.78)$^{1.08}$	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.

first few weeks of class, including breakout sessions, where small groups (normally 15 participants) met in the virtual space with the teacher—making problems more soluble.

The negotiation RPG was first executed in the physical world, with students negotiating in a classroom once and then on their own terms, at any location and time, for the second round RPG. Thus, negotiation strategies and behaviors were not new to the participants when the RPG was moved to the virtual space. Relationships between individual students and groups were transferred to the virtual space with very little change from the physical classroom. Students exhibited a high level of comfort working in both virtual spaces. No explanation for the different settings was given nor was one requested.

4. Discussion

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 it lowers the barriers of entry for educators seeking to leverage virtual spaces for their educational efforts. Hardware expenses are a central concern for educators facing restricted resources. Increased complexity in virtual spaces requires higher computing power both at the server and the client, as well as increased bandwidth, and programming/design efforts. Feelings of presence may be encouraged at much lower cost than is commonly thought.

Simple graphics in a virtual space may work as well as complex graphics 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 radiotherapists (Bridge, Appleyard, Ward, Philips, & Beavis, 2007). For other areas of learning, may be even most, the visual appearance of a virtual space is less about skill obtainment than about employing a metaphor that 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 effective in reinforcing the importance of teamwork in negotiation, the independence and the separation of each team, and the need to meet for exchanging 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 and the physical classroom present barriers.

An increased feeling of presence in the virtual space does not necessarily lead to better or increased learning (Persky et al., 2009), but may lead to more engagement when given problems to solve and participants to collaborate with. In other words, virtual worlds are not naturally better than the physical world at helping students retain knowledge, but when the physical world is a fixed classroom, with large numbers of students and no space for realistic role playing, and/or students are resistant, for personal and/or cultural reasons, then the virtual world can be quite beneficial—even if it is somewhat abstract when compared to reality.

Immersive virtual environments have grown in popularity mostly through commercial online game development. Second Life has been used as a space to measure psychological values and attitudes within a business context (Jin, 2009b). Given that Second Life contains many distractions in its free version and can become expensive if private areas are purchased, including recurring fees, the increasing availability of open source alternatives offers educators more flexibility in building virtual spaces that fit their needs. The current study shows that Open Wonderland is such a viable alternative for educators.

5. Limitations

This study did not examine objective skill outcomes. The negotiation tactics quantified are related to values adopted by negotiators. Consistency across the two simulation levels shows that a high abstract setting does not negatively influence these values and that students treated both negotiations equally serious. Although reported feelings of presence were higher in the low abstract space, the current experiment only employed two spaces. It is unknown if a realistic space, i.e., reproduction of reality, would be related to even higher levels of presence. Future research should examine different environments as well as different metaphors. A metaphor can be helpful in reinforcing teaching goals, but how exactly this mediates or moderates feelings of presence is an important issue that requires further investigation. Lastly, the current study narrowly focused on survey responses previously linked to feelings of presence. How those feelings are interpreted by individuals or what the feelings mean within the context of the class can be investigated in the future through a qualitative research approach.

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