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Comparing Role-playing Activities in Second Life and Face-to-Face Environments

Fei Gao

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Abstract: This study compared student performances in role-playing activities in both a face-to-face (FTF) environment and a virtual 3D environment, Second Life (SL). We found that students produced a similar amount of communication in the two environments, but the communication styles were different. In SL role-playing activities, students took more conversational turns, but have shorter exchanges compared to the FTF environment. Students generated an equal amount of topic-related concepts in the two environments. They also reported role-playing activities in SL as more interesting and less formal. The educational implications for this study are discussed.

Introduction

In education, role-playing is a learning activity in which students assume certain roles, improvising behaviors or considering a problem in a particular, pre-defined situation (Ladousse, 1987; Ments, 1989). Students are usually asked in role-playing activities to make a decision, resolve a conflict, or act out a conclusion to an unfinished story. For example, Alden (1999) used role-playing activities to help students learn environmental economic concepts. In the activities, students assumed the roles of representatives from the Government, Mining Industry Confederation, Manufacturing Industry Confederation, and National Conservation Foundation, and came up with solutions to a local pollution issue by using the economic concepts they had learned. The purpose of the role-playing activities was to provoke students to reflect effectively on their learning and to use concepts learned to address new problems. In this paper, we built on previous research on face-to-face and online text-based role-playing activities, and explored the potential of having role-playing in a 3D online environment, Second Life.

Research on Face-to-Face and Online Text-Based Role-Playing Activities

Role-playing is a recognized teaching practice that stimulates reality in the classroom and encourages active experiential learning (Ladousse, 1987; Ments, 1989). The effects of role-playing activities for facilitating learning and collaboration have been well documented in a number of studies.

For example, in Alden's (1999) role-playing activities, students actively reacted to a real situation and acted out their roles. They participated enthusiastically, reflected effectively on their learning, and used appropriate concepts previously learned in the class. Tyce (2002) argued that role-playing activities are crucial in learning because they promote students' learning and creativity by providing real or imaginary experiences. A study (Moses, 1995) focusing on how

student teachers related interpersonally to other staff in school or parents found that role-playing activities helped the student teachers build good relationships, interact closely with each other, and cooperate with the supervisor or other school teachers.

With the development of online education, online role-playing activities are becoming increasingly popular. Research suggests that text-based role-playing activities in online learning environments offer learners valuable, authentic and collaborative learning experiences (Ingram, Hathorn & Evans, 2000).

Lebaron and Miller (2005) studied the role-playing activities in an online course and found that cooperative learning was promoted through online role-playing activities as the participants were able to interact more personally with their peers in the activities. They also concluded that the online role-playing activities provided students an opportunity to apply theories to realistic situations. Wishart, Oades, and Morris (2007) reported the effects of an online role-playing activity, where students were asked to play the role of “net-detectives” and help solve various real life scenarios on internet safety. In addition to facilitating student learning on internet safety procedures, the role-playing activity was also designed to enable students “to empathize with others, to understand their motivation, and to practice behaviors being taught” (p.462). The results showed the activity allowed students to learn about internet safety procedures in a motivating and challenging environment. Arvaja, Rasku-Puttonen, Hakkinen, and Etelapelto (2003) also used role-playing activities to encourage online learners to make contact and collaborate with other participants, which helped create a sense of community in Web-based environments. These studies suggest that role-playing activities, either face-to-face or online, have beneficial effects on student learning when used properly.

Role-playing Activities in 3-D Online Environments

Online role-playing in a 3-D virtual environment is an activity beyond text-based communication. To date, limited research has addressed role-playing activities in 3-D online environments. Dickey (2003, 2005) explored the role-playing activities in one such online environment called Active Worlds, finding that the activities offered opportunities for experiential learning and situated learning within a collaborative learning environment.

Perhaps the 3-D environment with the most potential to explore role-playing activities is Second Life (SL). Second Life (at www.secondlife.com) is a popular online virtual world where players represent themselves as avatars, and interact with each other through text-based conversations, gestures, and so on. Advanced players can construct objects or create various virtual sites for entertainment, business, or education purposes. Second Life has been considered by educators and researchers as offering new possibilities for learning. Oishi (2007) described Second Life as adding “a rich visual aspect to Internet activities such as socializing” (p.54). She argued that SL could be more engaging for students than a classroom because it helps students build their own knowledge through interacting with the world and connect knowledge with personal and social aspects of the world. Czarnecki and Gullett (2007) commented on the importance of social appeal of Second Life, especially for teens who seek out the company of their peers.

Although the potential of Second Life for supporting student learning has been recognized recently by the researchers (Bell, Peters & Pope, 2007; Czarnecki & Gullett, 2007; Oishi, 2007), educational research on Second Life, in general, is rare. Second Life allows learners to play imagined characters in a virtual world. Combined with the interactivity noted by Oishi (2007) and the social presence argued by Czarnecki and Gullett (2007), the basic building blocks of role-playing activities are present in Second Life. At the time this article is written, we are not aware of any research specifically on the topic of online, educational role-playing activities in Second Life, which is the focus of this study.

Context of the Study

With new forms of learning emerging in contexts like Second Life and other similar 3D immersive environments, this study focuses on understanding the affordances and constraints of this format compared to the previous forms of learning. To date, no studies have been conducted that contrast how, if any, the interaction and learning afforded by role-playing in 3D online environments differ from that in face-to-face (FTF) environments. Understanding the nature of interactions in the two environments would help educators make a well-informed decision on how to design learning activities.



Figure 1. Role-playing in Second Life.

The purpose of this study, therefore, is to examine how students interact differently or similarly in SL and FTF environment. Our research questions are:

- (1) What are the differences and similarities in role-playing in the FTF environment and the SL environment in terms of the nature of interactions?
- (2) What are the students' perceptions of their role-playing experiences in the two environments?

Method

Participants

Thirty-six out of forty-four undergraduate students, who were taking one educational psychology course at a large mid-western university, volunteered to participate in the study. Over 50% of the students had their own laptops or desktops at home, but none of them had any experience with Second Life before this study.

Materials

The role-playing activities took place within a class where the concepts of motivation were introduced. These activities were conducted within the natural curricular scope and sequence of the course. We developed two role-playing activities for this study under the help of the course instructor – one on *Attribution Theory*, the other on *Intrinsic Motivation*. The two activities were designed in a parallel form so that either activity could be carried out face-to-face or in SL.

Each role-playing activity began with a short scenario, where a problem related to motivation was introduced. There were three roles within each scenario: one teacher, one highly-motivated student, and one less-motivated student. Possible dialogues were suggested to the students. The time limit for both forms of role-playing activities was ten minutes. To give readers a better sense of what the role-playing activities are about, here is a brief description of the intrinsic motivation role-playing activity. The basic setting is that the teacher implemented an incentive program to improve student performance on the annual state achievement test. Each time a student completed a required task, the teacher placed a star next to the student's name on a chart. It turned out that student A, who used to perform well, did not do well in the achievement test, but student B's grade improved a lot. After the test, the teacher dropped the incentive program. Student B's performance also dropped. In the role-playing task, therefore, the teacher goes to talk to the two students, trying to know what has happened to the two students and to find out solutions. The two students, in return, need to explain to the teacher how the incentive program has affected their performance and how they think their performance could be improved.

Procedures and Design

A week before the class, we provided a written Second Life tutorial to all students in the class. They were asked to follow the tutorial, apply for a Second Life account, and play around to get familiar with the environment. As a part of class requirements, Students completed several readings on motivation theories before the class started.

During the class, the course instructor started the class with a forty-minute lecture on the big ideas in motivation theories. Then, he asked the students to complete one FTF and one SL role-play activity. All students were randomly assigned to two big groups (Group I or II). Each big group was further divided into mini-groups of three students each. One researcher helped the instructor with grouping to make sure that (a) students who volunteered for the study were evenly distributed into the two big groups; (b) volunteers were grouped together with other volunteers; and (c) the instructor did not know who volunteered to participate and who did not.

Half of the participants were assigned into six mini-groups in Group I, and the other half into six mini-groups in Group II. The mini-groups in Group I did the Attribution Theory Activity in SL first, and the Intrinsic Motivation Activity face-to-face second. The other mini-groups in Group II did the Attribution Theory Activity face-to-face first, and the Intrinsic Motivation

Activity in SL second (see Table 1). The mini-groups remained constant and all students assumed the same roles in both activities.

Table 1. *Group/Activity Assignments*

	<i>Attribution Theory Activity</i>	<i>Intrinsic Motivation Activity</i>
Group I	Second Life	Face-to-Face
Group II	Face-to-Face	Second Life

Before the role-playing started, the instructor handed out a sheet of role-playing instruction to each group of students, and told the students to portray the roles as convincing as possible. On the instructional sheet, the settings and the problems were presented to the students. In addition, hints were suggested for each role. For example, here is the hint for student who plays the role of Student A in Intrinsic Motivation role-playing task:

Student A: If you assume this role, your task is to portray an intrinsically motivated student convincingly through your words and actions. Some of the characteristics of a typical intrinsically motivated student are:

- Focusing on the intrinsic value and intrinsic pleasure of learning
- Aiming at developing new skills or achieving a sense of mastery
- Not motivated by external reward

The researchers observed both activities, audio recorded six mini-groups' FTF role-playing activities, and saved their SL chat history. The FTF activities usually lasted 3 to 4 minutes, and the SL activities 8 to 12 minutes. When all students finished both activities, they completed a survey asking about their experiences of participating in the two role-playing activities.

Instruments

The short survey asked students about their role-playing experiences in both the face-to-face and the Second Life environments. The survey was based on a pilot study, and comprised of 22 questions.

The first 18 items of the survey asked students to compare the two environments. More specifically, it contained nine items asking the students to rate and compare (a) the degree of interest, (b) the degree of involvement, (c) the level of control, (d) the easiness of improvisation, (e) the easiness of communication, (f) the amount of communication, (g) the degree of formality, (h) the degree of focus, and (i) the perceived learning in the two environments. These were all five-scale Likert items where -2= strong preference to the SL activity, and 2= strong preference to the FTF activity. After each of the nine Likert items, there was a short answer question asking the students to explain their ratings. The 18 items were followed by another two five-scale Likert items, asking students if they think the SL or FTF role-playing activity a worthwhile one, with 1= Not at all and 5= Extremely worthwhile.

The last two items on the survey were short-answer questions that asked students "What have you learned (not learned) about "motivation" through the Second Life (or face-to-face) role-playing activities?"

Measures and Data Analysis

We used mixed-method approach to analyze the data. For quantitative analysis, we used an experimental design. All students completed the Attribution Theory Activity followed by the Intrinsic Motivation Activity, but were randomly assigned to either do the first activity face-to-face, followed by a Second Life activity, or start with a Second Life activity followed by a face-to-face activity.

Survey responses. Thirty-five of the thirty-six participants completed the survey. While analyzing the 11 Likert items on the survey, we first ranked participants' ratings such that participants' highest rating was recoded as an 11, and their lowest rating was coded as a 1. This was done to help distinguish participants' perception of the two environments, as the students used the scales differently – some used a high degree of variation on the scales, while some used just one or two of the ratings for all 11 questions.

The first nine of the 11-ranked Likert items were analyzed using MANOVA to simultaneously determine if there was some overall preference for one environment or the other (and to control type I error via the use of an omnibus test). Student responses to the nine short answer questions were used qualitatively to support the quantitative analyses. So, for example, when a significant difference was found in favor of one environment over the other, students' responses were used to understand why students preferred that environment.

The next two Likert questions on the survey asked students to evaluate the quality of the Second Life activity and the face-to-face activity, and were analyzed using a matched-pair t-test of the two ratings for each student to see which environment students found more valuable.

Although ultimately measuring the learning from the different formats of role-playing is important, more direct measures of learning in this study were problematic. A pre-post test paradigm was not practical or even desirable in this setting of an existing course, where the goals of the role-playing activities are to quickly and efficiently engage students in the course topics. It would not have fit with the goals of the course, nor would the instructor have agreed to test immediately after the role-playing activities. This was one compromise we made to conduct empirical research in authentic, natural educational contexts rather than laboratory settings (O'Donnell, 2004). Additionally, it is unlikely that small differences in learning would evidence themselves on the final exam several weeks later, or even be attributable to the role-playing activities given other possible explanations and course activities in the intervening time span.

Given these limitations, we focused our investigation on student learning by: (a) analyzing students' responses to "what have you learned?" questions, and (b) analyzing their transcripts during the role-playing activities. Analyzing students' perceptions of what they learned presented some challenges as well. Some students misunderstood the two questions as comparing their learning experiences in the two environments (like many of the other questions in the survey), so they responded by commenting on how the differences in the environments affected their role-playing experiences. For example, when asked what was learned in the SL role-playing activity, one student wrote, "I was motivated to speak in the FTF version. However, the pressured scenario made me feel less natural, and so in the SL version I could say what I wanted and it usually made more sense and was not repetitive." Because the students interpreted these questions differently, we restricted our analysis to a descriptive approach, in order to

provide a sense of what was learned by the students in the role-playing activities and the quality of the learning experience.

Role-playing transcripts. The role-playing sessions in both the FTF and the SL environments were transcribed. For quantitative analyses, we calculated a word count to measure how much students contributed to the conversation. We then counted turn-taking in each role-playing activity, that is, the number of times each individual contributed to the conversation. We used ANOVA to test if there were significant differences between the two treatment groups in terms of the total amount of contribution and the frequencies of turn-taking, as well as the potential impacts of other independent variables, which were (a) mini-group, (b) topic, and (c) the role student assumed in the activity.

For qualitative analyses, we used the number of topic-related concepts generated in the role-playing activities as a measure of the quality of the interaction and learning. Measuring learning-related communication in role-playing activities is important because being able to think and talk about the concepts taught is a precursor to learning the concepts, which is also the underlying goal for role-playing activities. The analysis of student talk serves the role of measuring the learning *potential* in this study.

To identify the concepts, we first parsed the transcripts into units of analysis. We decided to use meaning unit as the unit of analysis, with each unit containing only one single idea. In our transcripts, most of the meaning unit contained one sentence, with a few having more than one sentences.

Data analysis was conducted on the consensus coding. Two independent coders read and coded all the meaning units, identifying topic-related concepts. Then, they came together, discussing the concepts they found until they agreed on which concepts should be included. Altogether, they identified 17 concepts under four major themes: Effort Attribution, Ability Attribution, Intrinsic Motivation, and Extrinsic Motivation. For example, the five concepts under the theme of effort-attribution were: (a) willingness to try; (b) importance of effort; (c) persistence; (d) focus and concentration; and (e) commitment and dedication. The two coders then independently coded the data looking for examples of these concepts in the coding scheme. If one unit contained more than one concept, they coded all the concepts it represented. The two coders' level of agreement was 78.8%. They discussed differences in coding until agreement was reached. Examples of each concept in the transcripts are detailed in Appendix 1.

Finally, we counted the total number of concepts generated in the two environments, and used a t-test to examine if the environments made a difference in terms of the number of different types of concepts generated by individual student.

Results

Amount of Communication

Table 2 displays the mean number and standard deviation of words that students contributed to each role-playing activity, as well as the number of turns that students took on average.

Table 2. *Mean (and Standard Deviation) of Total Number of Words and Conversational Turns*

Contributed by Individual Students

<i>Condition</i>	<i>N</i>	<i>Number of Words</i>	<i>Turn-Taking</i>
SL	18	80.22 (45.81)	10.33 (7.84)
F2F	18	76.39 (32.79)	4.56 (2.12)
Total	36	78.31 (39.31)	7.44 (6.37)

On average, students contributed more words in Second Life (mean=80.22) than in the face-to-face environment (mean=76.39). This difference, however, is not statistically significant [$F(1, 26) < 1.00, p > .05, \eta_p^2 = 0.01$] (see Table 3).

Table 3. ANOVA Analysis of Total Number of Words Contributed by Individual Students

<i>Source</i>	<i>df</i>	<i>F</i>	<i>Sig.</i>	η_p^2
Corrected Model	9	4.50	.00***	.61
F2F vs. SL	1	0.16	.69	.01
Mini-group	5	4.07	.01**	.44
Topic	1	0.38	.55	.01
Role	2	9.80	.00***	.43
Intercept	1	271.29	.00	.91
Error	26			
Total	36			

** $p < .01$, *** $p < .005$

There was no effect for the topic, meaning that students contributed equally regardless of the topics. We found, however, that the roles students played in the activity impacted the number of words they contributed [$F(2,26)=9.80, p < .005, \eta_p^2=0.43$], with students taking the teacher role producing significantly greater amounts of words. This was probably because the teacher role typically required participants to assume more responsibilities in initiating and sustaining the conversation than the role of students. Mini-group composition also made a difference [$F(5,26)=4.07, p < .01, \eta_p^2=0.44$], suggesting that some discussion groups outperformed other groups regardless of condition.

Turn-Takings

We examined the nature of turn-taking in both the SL and the FTF role-playing activities by comparing the frequencies of turn-taking in these two conditions. On average, students in the SL

role-playing activities took significantly more turns in the conversation (10.33), than they did during the FTF role-playing exercise (4.56) [$F(1,26)=15.84, p<.001, \eta_p^2=0.38$] (see Table 2 & 4). The frequencies were also affected by types of roles, as the role of teacher usually took more turns [$F(2,26)=7.49, p<.005, \eta_p^2=0.21$], and the mini-group composition [$F(5,26)=3.59, p<.05, \eta_p^2=0.41$].

Table 4. ANOVA Analysis of Number of Turn-takings for Individual Students

Source	df	F	Sig.	η_p^2
Corrected Model	9	5.44	.00	.65
F2F vs. SL	1	15.84	.00***	.38
Mini-group	5	3.59	.01*	.41
Topic	1	0.15	.71	.01
Role	2	7.49	.00***	.37
Intercept	1	105.21	.00	.80
Error	26			
Total	36			

* $p<.05$, *** $p<.005$

Given the differences in the amount of turns, we decided to further look at the number of words per turn. Students in SL produced far fewer numbers of words per turn (mean=7.81) than in the FTF environment (mean=16.77) [$F(1,26)=52.76, p<.001, \eta_p^2=0.17$] regardless of mini-group, topic or role. Students in SL gave shorter responses and the conversation shifted more quickly from one role to the other. To illustrate this, here is an excerpt from mini-group a's conversation in the SL environment about Attribution Theory:

...

Teacher: Students, what's the matter?

Student B: I can't do it.

Teacher: Well, you should really try student b.

Student B: I don't understand the problem.

Teacher: You have to put in some effort to get a result.

Student B: How can I make an effort without knowing what I am expected to do?

Teacher: Don't run away from your problems student b.

Teacher: Let's read the directions, and then you can try to complete the problem once more.

Student B: Ok.

...

In contrast, here is an excerpt of mini-group a's FTF transcript about Intrinsic Motivation:

...

Teacher: So, why did you guys not do very well on the exam today?

Student A: I don't really, you know, care that much about like the incentive program stuff.

I don't really care about the achievement test. I'm more interested in my own learning.

Teacher: In order to move on your progress, you know, you need to do the stuff that is, you know, suggested.

Student A: Okay. Guess you should go talk to Student B about why his grade dropped.

Student B: Umm...My grade dropped because before when you guys have the special chart I felt that it helps me see how well my grade was, and I have confident, you know...Umm...I had a lot of stars...on the chart. My grade will be good but you dropped that, and I didn't have any confidence.

Teacher: The chart should only, you know, always, you know, force you to...

Student A: Ya, I wasn't doing good when there was the chart. So, I think we shouldn't have it.

...

The face-to-face transcript has noticeably longer contributions in each statement than was evidenced by the same participants' role-playing in Second Life.

Content

In this section, we focused on comparing two things in the SL and FTF role-playing activities: (a) the number of concepts generated in each environment; and (b) the length of concept-related units. Students generated 17 concepts in the SL environment and 10 in the FTF environment (See Appendix 1). All but one concept appeared in FTF activities also appeared in the SL ones. An independent t test of number of concepts generated by each student suggested no significant difference in the number of concepts between the two environments [$t(34)=1.23$, $p>.05$, Cohen's $d=0.41$].

Using independent t-test, we found that the average length of concept related units in the FTF environment almost doubled that in the SL environment (9.53 in SL and 18.70 in FTF). The significant difference [$t(34)=-4.23$, $p<.005$, Cohen's $d=-1.03$] suggested the concept-related conversation in the FTF environment was usually longer than that in the SL environment. This is also evident from an analysis of students' role-playing transcripts. For example, in Attribution Theory activity, students in both environments addressed the concept of *importance of focus and concentration*. One of the units identified in the SL was like this "I'll sit down and focus on these problems here", and in the FTF environment, "I don't think I was born with the ability either. But I was working at it, and when I just listened, and focused, I was able to come with the correct answer."(See Appendix 1).

Student Perceptions

Student ratings of their experiences in the two environments were ranked for purposes of analysis (see methods section). To further analyze and interpret these rankings, we adjusted the scores such that a rating of 0 indicated no preference for either environment, positive rankings indicated a preference for the face-to-face environment, and a negative rating implied a preference for the Second Life environment (with larger magnitude indicating an increasing preference). MANOVA analysis was used as an omnibus test to determine if the set of student

ratings was different from a mean rating of 0, which suggested no difference between the two environments (see Table 5). We found that overall, there was a significant result [$F(1,34)=2.92$, $p<.05$, $\eta_p^2=0.51$].

Post-hoc analyses were used to examine potential differences on each rating. Students rated two items such that they significantly preferred one environment over the other. First, they rated their degree of interest higher in Second Life [$F(1,34)=6.41$, $p<.05$, $\eta_p^2=0.16$]. Second, they found the face-to-face environment to be more formal than the Second Life environment. [$F(1,34)=6.17$, $p<.05$, $\eta_p^2=0.16$].

Table 5. *Adjusted Student Ratings of the Two Role-Playing Environments (n=35)*

<i>Survey Items</i>	<i>Mean (SD)</i>
Degree of interest	-1.29 (2.98)*
Degree of involvement	.34 (2.91)
Level of control	-.26 (2.74)
Easiness of improvisation	-.03 (3.21)
Easiness of communication	-.25 (3.29)
Amount of communication	.46 (2.98)
Degree of formality	1.31 (3.07)*
Degree of focus	.81 (3.18)
Perceived learning	.57 (2.47)

* $p<.05$, Univariate, 1-sample t-test of mean=0.0

The next two likert questions asked students to rate the value of the SL and the FTF role-playing activities from one to five. The students believed that both activities were moderately worthwhile [SL =4.84(2.25) and FTF=5.52(2.36)]. A matched-paired t-test suggested that there were no statistical difference in students' rating on the value of role-playing activities in the two environments.

Student Learning

From the students' comments to the last two short questions, we were also able to see what they reported having learned through the role-playing activities in the two environments. In Table 6, we presented students comments in seven categories, and the number of students who expressed such thoughts. In general, regardless of role-playing environment, students found that the role-playing activities facilitated their learning of the key motivation concepts. More specifically, they felt that the role-playing activities allowed them to think about how to use different strategies to motivate different people.

Table 6. *Categories of What Students Reported Having Learned through SL/FTF Role-Playing Activities*

<i>Categories</i>	<i>Examples</i>	<i>No. of Students</i>
-------------------	-----------------	------------------------

		SL	FTF
Different ways to motivate different people	“I learned that you need to motivate different people in different ways because they can be motivated by different things.”	7	8
Key concepts of motivation in general	“Key concepts.” “Learned about intrinsic/extrinsic motivation.”	5	5
Challenge of motivating others	“I saw how difficult it can be for the teacher to try and motivate both types of students. I also saw what it was like to be the child and what it might take to motivate them.”	4	3
Importance of intrinsic motivation	“...Intrinsic motivation is important for success. Although the beginning could be extrinsic motivation in doing something, the probabilities of success will increase if learners like the learning process by itself.”	2	3
To motivate others, oneself needs to be motivated first	“You need to be motivated so you can motivate others such as your students or who ever you may work with when you get older.”	1	0
How to motivate people through communication	“You can learn how to communicate better and try and motivate people with your words.”	0	1
Not much learned	“The activity just reinforced what I already knew.” “I didn't really learn anything different from what I had learned from the lecture.”	3	2

Discussion

By comparing the role-playing activities in the SL and FTF environments, the study showed several interesting findings. Students found both activities to be worthwhile. Students, however, did not find them to be educationally equivalent. Compared to the face-to-face approach, students found the Second Life activity to be more interesting and less formal. Two students in particular emphasized that they felt role-playing in SL was more interesting because it was something different and new. As one student wrote, “I was more engaged in the SL role play because I have never done it before and I found it very interesting.” As we described previously, no students had experience with SL before we introduced SL to them. So it is not surprising that they showed great interest in having role-playing activities in SL. We wonder, therefore, when they became more familiar with SL, whether the students would perform differently in SL or evaluate their experiences in SL differently.

Students' interest in the Second Life activity showed up in the amount of time they were willing to put into it. In both environments, we asked students to complete the role-playing activities in 10 minutes. In the FTF environment, all role-playing activities lasted no longer than four minutes. But in the SL environment, role-playing activities were usually close to or exceeded the time limit. This is understandable since text-based communication was slower than oral communication. What is worth noting, however, is that four students wrote in the survey that they felt the time they had for SL role-playing was too short, and they wished they would have had more time for it. This implied if we had removed the time limit in both environments, some of the SL role-playing activities might have lasted longer.

The conversations that students had during the two forms of activities were also markedly different. Even though there were no overall differences in the total number of words produced in the two types of conversations, there were different patterns of interaction. Students in the Second Life environment took significantly more turns in their conversations, and each turn was shorter in number of words. Based on the survey responses, four students felt they sensed the pressure to respond and talk in the FTF environment. In SL, they could slow down, and think about what they wanted to say while they were typing – “(In the FTF environment,) it's face-to-face, person-to-person, and when something was thrown at you, you had to just come up with something quick, whereas on SL you could take a minute to think about what you wanted to say”. The sense of pressure in the FTF environment might push students to talk longer every time they spoke out. Also, students rated the communication in the FTF environment as more formal, which might also explain their tendencies of talking more in each turn. In the SL environment, in contrast, students sensed the freedom of conversing spontaneously, as one student commented that the role-playing activity in the SL was “more interactive”.

A pre-post test paradigm was not practical or even desirable in this setting of an existing course, where the goals of the role-playing activities are to quickly and efficiently engage students in the course topics. That does not mean, however, that there is no educational value to such activities. Our analyses of *what* students were talking about indicate that in both environments students generated a similar number of on-topic concepts. Students also listed similar themes when asked what they learned from the role-playing activities. This suggests that both environments were equally successful and effective in allowing students to engage in course concepts. This is consistent with student perception on their learning, where they saw no difference in learning in the two environments.

Two pieces of information in the survey raised our interest. First, four students commented that they felt more comfortable in role-playing in the SL environment, because they were introverted people. Here are the comments from two students: “I'm a bit shy, it was easier to role play (in SL)”, and “I'm quite shy so I did have the opportunity to lead people without feeling too forward or aggressive”. Second, some other students wrote that not having to talk to others face-to-face made it easier to open up – “(In SL,) it is a little easier to say some things when you are talking over the internet”, and “(In SL,) I didn't feel embarrassed by what I said because I didn't have to say anything face-to-face. I felt like I could open up more”.

The implications are the following. For students who are introverted, SL could be a more

comfortable environment for role-playing. Furthermore, if the topic for role-playing is highly sensitive or personal, doing role-playing in SL might be a better choice as students would be more likely to open up. These findings are not new. Researchers studying text-based online role-playing and other online interactions already found that online interaction was less restrictive than face-to-face one (Bell, 2001b; Freeman & Barnford, 2004; Freeman & Capper, 1999; Sullivan, 2002). Pilkington and Walker (2003) addressed the advantage of online synchronous communication by saying “students take a greater proportion of the conversation in online than in face-to-face classroom discussion because turn-taking is less restricted, with the possibility of several participants composing responses in parallel” (p.43). Other researchers such as Bullen (1998) discovered that online interaction worked especially well for students who described themselves as shy or introverted. Those students usually found online communication was “liberating” and freed them from competing with more verbally adept students.

Conclusion

As a 3D virtual online environment, the educational potential of SL has barely been tapped. This study is among the first few studies that carefully examine the interactions in SL for educational purposes. In terms of role-playing, both activities contributed to students’ understanding of key concepts of motivation. Second Life seemed equally suited as face-to-face for discussing important course concepts, even if the conversation takes a different form. Students took more conversational turns in the SL role-playing activities, but contributed less on each turn than they did in the face-to-face environment. Students also found the Second Life activity to be more interesting and less formal.

The conclusion that role-playing activities work in a Second Life environment may be surprising to some people who are concerned that role-playing may not be as effective without direct face-to-face interactions. Yet our analyses of students’ role-playing conversations indicate they are every bit as rich in conceptual content as their face-to-face counterparts. For online educators who are interested in using role-playing activities, these findings represent good news. Role-playing activities are one additional pedagogical tool available for online courses that may offer a convenient way to engage students in learning course concepts as well as interacting with one another.

An important message to take away from this study is that even though the learning potential may be similar in the two environments, each environment comes with its own affordances and constraints (Koehler & Mishra, 2008; Mishra & Koehler, 2006). In this case, Second Life affords a more informal or conversational style and is constrained in the amount of non-verbal communication it can offer. Face-to-face role-playing activity, however, affords more of a formal learning environment that may allow students to elaborate more but constrains who may or may not feel comfortable contributing, and when they may contribute according to the rules of turn-taking. The challenge to every educator, then, is to maximally leverage these unique affordances in the service of student learning.

Based on the previous discussions, our study also suggested several promising directions for future research. One direction is to examine the performance of students with different personalities in the two environments to see whether introverted students could learn better from

role-playing in SL. Another direction is to have students role-playing on more sensitive topics, and examine whether students would be able to communicate better in SL as compared to in FTF environment. In addition, it is still unknown how role-playing in SL is different from role-playing in other online environments, such as in text-based asynchronous or synchronous online communication. Finding answers to these questions is important to explore these questions so that educators and instructional designers would be able to make better-informed decisions on how to choose from different formats of role-playing activities.

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Appendix

Appendix 1

Examples of the Identified Concepts

<i>Themes</i>	<i>Concepts</i>	<i>Examples</i>
Effort Attribution	Willingness to try	“Alright, i shall try my best.” (SL) “I’ve been trying...I mean... and I believe I can do well, but I just have to keep on trying.” (FTF)
	Importance of effort	“You have to put in some effort to get a result.” (SL) “I think if you work harder, you can get this. It’s really not that bad.” (FTF)
	Persistence	“Ten times. But I guess I still haven't tried hard enough.” (SL)
	Focus and concentration	“I’ll sit down and focus on these problems here.” (SL) “I don’t think I was born with the ability either. But I was working at it, and when I just listened, focused and concentrated, I was able to come with the correct answer.” (FTF)
	Commitment and dedication	“Well it really isn't about being smart or not, it is more about how committed you are to success.” (SL)
Ability Attribution	Low self-efficacy	“I can never do any of these square roots.” (SL) “But I got it wrong and I am just not good at it. I don’t have any ability to do it.” (FTF)
	External attributions to success or failure	“how can i make an effort without knowing what I am expected to do?” (SL) “I guess you are just really smart.” (FTF)
Intrinsic Motivation	Focusing on intrinsic pleasure of learning	“I just like math.” (SL) “I’m more interested in my own learning.” (FTF)
	Aiming at developing	“I like to see myself getting better at solving math

	new skills	problems.” (SL)
	Motivated by personal goals	“If you reach your personal goals you win.” (SL)
	Not motivated by external reward	“I don’t like having it (incentive program) because I am not motivated to work harder.” (SL)
	Decreased motivation on excessive external rewards	“(With the incentive program,) I am not motivated any more.” (SL) “I could not try (with the incentive program) because I didn’t have any motivation.” (FTF)

Extrinsic Motivation	Focusing on normative-based standards	“the grade is the most important thing for me.” (SL)
	Motivated by tangible external reward	“I love the chart, though. The chart was awesome.” (SL) “My grade dropped because before when you guys have the special chart I felt that it helps me see how well my grade was, and I have confident, you know...Umm...I had a lot of stars...on the chart.” (FTF)
	Aiming at surpassing others	“There is no way to show that I’m doing better than everybody else. I’d like to see that I am beating them.” (FTF)
	Motivated by peer admiration	“I’d like to have my friend to say, oh, look at your stars, you are awesome.” (SL)
	Decreased motivation with external reward removed	“I am not motivated any more (after the incentive program).” (SL) “My grade will be good but you dropped that, and I didn’t have any confidence.” (FTF)
