Language acquisition in *Second Life*: Improving self-efficacy beliefs

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This study found that collaborative language activities in an immersive virtual world improved students' self-efficacy beliefs about their capacity to use Chinese language in a variety of real-life contexts. However, the complex relationship of in-world and real-life interactions, instructional design, construct validity and other critical issues clearly argue for continuing research in this area. This paper describes a quantitative study of 100 university students enrolled in Chinese language and culture studies at Monash University, Australia. This study focuses on one of the lessons conducted in Second Life which engaged students in a collaborative activity to identify and order food in Mandarin in a Chinese restaurant setting. The results indicated significant improvements between students' pre and post self-efficacy ratings. In addition, it is proposed that the change in self-efficacy ratings can be explained by the degree of relevance of enactive mastery experiences. This in turn has implications for instructional design.

Keywords: virtual worlds, Second Life, self-efficacy, beliefs, second language acquisition, Chinese language

Introduction

Universities and other educational institutions continue to invest heavily in virtual worlds. For instance, Monash University has invested in over 300,000 square metres of virtual land for the purposes of facilitating student learning in a variety of disciplines including Chinese language and culture. Despite this global interest there is a need for continuing empirical research exploring the implications for student learning. Consequently, this research project aimed to investigate if a language lesson in Second Life could sustain or improve students' self-efficacy beliefs through learning activities favouring selective language performance (enactive mastery experiences). The subsequent study included 100 university students engaged in a collaborative activity in a Chinese restaurant in Second Life to identify and order food in Mandarin. The results indicated significant improvements between students' pre and post survey self-efficacy ratings. However, the relationship between virtual worlds and self-efficacy needs to be further clarified.

Virtual worlds

A virtual world is a computer-based environment in which users inhabit and interact via avatars (digital representations of the user). The Association of VirtualWorlds (2008) has listed over 250 virtual worlds including Second Life, Croquet, Quest Atlantis, Exit Reality and World of War Craft. Often virtual worlds, or subsets thereof, are referred to by a variety of other terms including multi-user virtual environments (MUVEs), massively multiplayer online role playing games (MMORPGs) and the Metaverse. Defining virtual worlds in any detail becomes problematic due to the great diversity in media, interface, goals, systems, technological agency, user autonomy and social environment to name only some of the variables (see Schroeder, 2008 for a discussion of the complexity of defining Virtual Worlds). Consequently, it is more productive to describe the particular virtual world (Second Life) in

which this study is set and by which subsequent researchers can gauge the relevance of this study's findings to their own context.

This study reports on one of a series of lessons conducted in a face to face tutorial and in which students simultaneously engaged with each other and then lecturer in Second Life (SL). SL is an internet based three-dimensional virtual world with its own free client browser software. Technical specifications and software functionality can be found at the website: http://secondlife.com/. Of particular relevance to this paper is that users, through their graphical animated avatars can interact through motion (avatar animation), text, voice (VOIP), and the sharing of digital artefacts (eg. notecards, clothing, etc.). Users can customise their avatar, including having several "skins" or bodies with their own look, animations, and voice. The avatars can amass objects (possessions) given to them by, or bought from, other residents of the virtual world. Through these processes as well as the opportunity to create your own clothing and other objects the avatars can become highly personalised and arguably identities in themselves.

The primary focus of interaction in SL is synchronous (text chat and voice), however there is a capacity to interact asynchronously through persistent digital objects such as whiteboards, bulletin boards, slideshows, and notecards which the avatars can interact with even though the 'owner' is absent or offline. In educational contexts this means that students can interact synchronously with each other in a learning exercise but can also return at a later date to interact with the objects and with others. Another valuable characteristic of SL is that users can create three dimensional objects (eg. a classroom under water or a three dimensional concept map) which other users can use, as well as program those objects to do almost anything (eg. a door which asks the avatars to answer a question before it opens). This is significant because it particularly empowers the teacher to be able to shape the environment, objects and tools with which they want to teach and their students engage. Another significant characteristic of SL is that there are no set objectives, goals or game-like rules or rewards. While some authors (for instance Mayrath, Traphagan, Heikes, & Trivedi, 2009) argue that "SL is simply... a platform for users or avatars to create and/or explore places and spaces" (p.2), we suggest that the agency afforded to users in this environment engenders user created diverse, changeable, and rich social environments which are far from simple.

There is an increasing body of research literature in the field of educational uses, including pedagogical advantages, of SL (for instance, Australian Flexible Learning Framework, 2006; Bradshaw, 2006; Campbell, 2009; Mayrath, et al., 2009; Roussou, Oliver, & Slater, 2006; Slator, et al., 2005; The Schome Community, 2007). At a tertiary level it has been reported that in 2008 over 300 universities had a SL presence in which they taught or conducted research (Michels, 2008). For instance, in 2009 at Monash University over 300,000 square metres of virtual land across six SL islands were used to support immersive learning environments for students studying Chinese language and culture, pharmacy, nursing, psychology, education, law and information technology.

Virtual worlds and language acquisition
Virtual worlds such as Second Life are particularly well suited for teaching and learning second languages. Students can immerse themselves in linguistically appropriate environments (eg. Chinese restaurant with Mandarin signs, menus, etc.), adopt roles and even identities which can provide a rich affective and cognitive model for language performance, as well as interact and collaborate with others to achieve complex goals through pedagogically appropriate media such as text, voice, and video. SL can support competency based training such as skill, vocabulary, and grammar like other computer assisted language learning tools but it can also support synchronous interaction with teachers, students and others, including native speakers in rich creative ways.

Schwienhorst (2002) pointed out that the affordance of learner autonomy and creativity in synchronous virtual worlds are particularly valuable in supporting experimental, learner centred environments which can not only raise language and linguistic awareness and performability but also support complex thinking and critical reflection.(Schwienhorst (2002) used the term Virtual Reality (VR), however, his definition is closely aligned with that of the term Virtual Worlds which began to become popular after 2002. Schweinhorst's description of the functionality and affordances of VR are consistent with that of Second Life.) Other potential affordances of virtual worlds for language learning are presented in Table 1.

Virtual worlds in second language acquisition and intercultural awareness require further research. Despite the growing use of these worlds there is a surprising limited field of empirical research literature. Our understanding of the role of virtual worlds in language acquisition is primarily based on text based environments such as MOOs and MUDs. However, virtual worlds add much more than visual and

auditory media, they provide instructors and students greater choices for collaboration, learner autonomy, creativity, and experimentation, including identify formation.

Table 1: Virtual world affordances for language learning

Affective filter	It is proposed that virtual presence can result in reduced apprehension and embarrassment that otherwise can impede experimentation such as through role playing. This was noted by Sanchez (Sanchez, 1996) in relation to text based virtual worlds and later supported by Schwienhorst (2002) in relation to graphically rich environments. Morevover, Schwienhorst (2002) pointed out that role play in this context "should not be misunderstood as role playing as in 'at the train station' scenarios in some language classrooms but in the more fundamental sense of using alternative personas to approach potentially construct-altering situations" (p.202).
Persistent environments and persistence records	Virtual worlds are persistent, that is, the environment (eg. Chinese restaurant) and the objects (eg. Chinese menu) do not disappear at the end of the lesson. Users can return to the place of their learning, interact with the objects and, depending on the instructional design, peruse records of the event. In relation to persistent records of the interactions Schwienhorst (2002) argued that they provided learners with "personally meaningful authentic material in the target language" and allowed them to "critically examine their own performance, or rather, the performance of their virtual selves" (p.202).
Physical and linguistic copresence	The immersive social environment of virtual worlds provide a range of discourse elements which are generally not available in less immersive environments. For example, indexical language (*here*, *this*, etc.) is often problematic in teleconferencing or other computer mediated communications (Schwienhorst, 2002). In this regard the value of virtual worlds is that it merges the physical copresence and linguistic copresence of the interlocutors (Schwienhorst, 2002) both of which are important elements in discourse and facilitate learning through the negotiation of mutual knowledge (Clark & Marshall, 1981).
Collaborative group work	Virtual worlds allow students to form groups and collaborate in similar ways to classroom interactions. For instance, by moving their avatars away from the others, a group of students can have a semi-private conversation. Unlike a discussion forum or a text chat, students can dynamically create and reshape groups according to pedagogical imperatives, or interpersonal and social dynamics.
The value of text interactions even in a virtual world experience.	It is proposed that virtual worlds such as Second Life can provide a contextually rich environment (eg. graphic, animation, audio, and text stimulus) which can serve as powerful cognitive aids to text based interactions. Simply because SL can support voice does not mean that it is the most appropriate media for the learning outcomes. Indeed, Schwienhorst (2002) argued that in addition to improving written language skills, writing also facilitates orality as well as linguistic and metalinguistic awareness (see also, Little, 1997; Tannen, 1982; Wells, 1981). Ma's (1996) research in text based virtual worlds also suggested a greater level of self-disclosure, egalitarianism and intercultural awareness than found in face to face exchanges between East Asian and North American college students.
Mediated environment	Virtual worlds have the advantages of other simulations in that information can be included and excluded as needed. The virtual world acts as a mediator of the sometimes overwhelming rich linguistic and cultural information which can be found in real-life experiences. Learner's diverse learning styles (eg. auditory, kinetic, etc) can be supported by providing a rich media environment in which a similitude of real life is offered but which presents processed or synthesised information. In addition, the careful design of the immersive social environment can reduce the need for a layer of abstract thinking which is often required in text-book and other formal learning situations (Carr, 1995).

Self efficacy beliefs

We have argued that virtual worlds are potentially valuable environments for learning a second language and for intercultural awareness. In this study we try to shed light on the impact of a Second Life experience on student self-efficacy beliefs which has been shown to have a significant impact on learning. While we could have tried to measure performative data such as student knowledge of Chinese language in a pre and post test, such information can only tell us what the students have learned. Instead, self-efficacy has been shown to be a strong predictor of future achievement.

Self-efficacy beliefs are defined as ''people's judgment of their capabilities to organise and execute courses of action required to attain designated types of performances'' (Bandura & Schunk, 1981, p. 31). It is a form of self-evaluation that influences decisions individuals make, efforts they exert, and the mastery of behaviour (Eastin & LaRose, 2000). This theory proposes that a student who believes he/she can successfully perform an activity will differ from a student who does not. The former is likely to exert more effort, spend more time, and master the required skills earlier than the latter. In addition, Pajares and Schunk (2001) found that students who had high efficacy beliefs used more cognitive and metacognitive strategies and persisted longer than those who did not.

Bandura's research (1984, 1997, 2006) led him to conclude that students' self-efficacy beliefs are highly predictive of their capability to accomplish academic tasks. This is supported by a number of researchers who have found that self-efficacy has a stronger effect on academic performance, than other motivational beliefs (Lent, Brown, & Larkin, 1987; Pintrich & De Groot, 1990; Pintrich & Schunk, 1996, 2002). However, students' perceptions or experiences of previous performance play the most important role in student judgment of self-efficacy (Pintrich & Schunk, 2002). For instance, students who lack experience in performing related tasks may lead to inaccurate estimations of self-efficacy. Consequently, it is argued that self-efficacy is domain specific and beliefs about efficaciousness in performing one task cannot be assumed to apply to a task in a different domain (Schunk, Pintrich, & Meece, 2007). Similarly, no amount of confidence can produce success when the necessary skills and knowledge are absent (Pajares, 2002). The implication is that while self-efficacy is considered to be predictive of student achievement, that the experiential basis for students' perceptions needs to be considered carefully (Wang & Wu, 2008).

Torkzadeh, Chang, and Demirhan (2006) state that self-efficacy is "a dynamic construct that changes as new information and experiences are acquired" (p. 542). However, successes and failures in themselves do not strengthen or weaken self-efficacy beliefs, but rather how the students interpret those experiences (Bandura, 1997). Bandura (1997) proposed that self-efficacy beliefs are influenced in four ways, ranked in order of most to least influential on behaviour: enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective states.

Enactive mastery is considered to be the most influential experience in shaping efficacy beliefs (Pintrich & Schunk, 2002). Past performances serve as an indication of the extent to which one can succeed in doing a task. However, while perceived success can build a strong sense of efficacy beliefs, easy successes are also easily discouraged by failures (Bandura, 1997). According to Bandura (1997) vicarious experience also shapes efficacy beliefs because students often compare their capabilities to those of their friends, classmates, or others who they feel are similar to them in some way. This does not suggest that students equate their efficaciousness to their friends, but rather their perception of their friends' abilities in comparison with their own perceived capabilities provides a means by which they can make judgements about their performance. Verbal persuasion refers to how self-efficacy beliefs can be influenced through the encouragement or other verbal communication of significant others, that is, people who are perceived to have mastery of a given task. However, Bandura (1997, 2004) concluded that self-efficacy beliefs, especially those founded on enactive mastery and vicarious experience are not as easily influenced by verbal persuasion. The fourth influential factor on self-efficacy beliefs is the perception of physiological and affective states in relation to performance of a task. According to Bandura (2004), "people read their tension, anxiety, and depression as signs of personal deficiency" (p. 623). Consequently it is important to consider students' physiological and affective states when designing and implementing learning activities.

There is a growing body of empirical research in the influecne of self-efficacy beliefs on second language aquisition. For instance, Magogwe and Oliver (2007) argue that self-efficacy beliefs relating to language learning "mediate the effect of other influences, such as aptitude or previous achievement, on subsequent performance" (p.341). In the context of a English as a second language course, Ching (2002) found that students with high self-efficacy beliefs were confident about what they could achieve; set themselves challenges and were committed to achieving them; worked harder to avoid failure; were highly resilient and linked failure with insufficient effort or deficient knowledge and skills which they believed they were capable of acquiring. Of particular interest for this research is a study conducted by Lamboy (2003) who found that an online learning environment designed to support different learning styles (eg. visual, kinaesthetic, etc.) of students learning a language can have a positive impact on their self-efficacy beliefs. The implication is that the affordances of the technology such as those described in Table 1, combined with effective instructional design could provide a more effective way to raise the self-efficacy beliefs of students.

This research lies at the nexus of four key issues: virtual worlds (in this case Second Life), instructional design, self-efficacy beliefs, and language learning (Chinese). The literature on virtual worlds indicates that the technology in combination with instructional design can facilitate language learning. Similarly the literature suggests that self-efficacy beliefs, including those related to learning a language can be powerful predictors of student performance and that those beliefs are most influenced by enactive mastery experiences. Consequently, this research intends to explore the proposal that Second Life can sustain or improve students' self-efficacy beliefs through learning activities favouring selective language performance (enactive mastery experiences).

Research design

This paper describes a quantitative study of 100 university students enrolled in Chinese language and culture studies at Monash University, Australia. The subject "Chinese 1" runs in the first semester of each year and is designed for learners who have essentially never formally studied Mandarin Chinese before. In 2009 the subject had 153 students, both undergraduate and postgraduate with 67% having English as a first language. Apart from the use of Second Life in a series of tutorial lessons the subject consisted of the traditional weekly lectures, tutorials, and independent study based on textbooks and other materials. In terms of familiarity with virtual environments, 46% of the learners had never spent time in a 3D virtual world or played a 3D game with an avatar before, 37% a few times, and 17% many times or frequently.

Lesson design

This research is based on only one lesson in a series of on-campus lessons located in a computer laboratory but conducted in Second Life (see Figure 1). The first of these lessons was primarily focused on the learning and practicing of Second Life related skills. The lesson under scrutiny in this study (and the final one for the semester) was specifically focused on language and culture content previously covered in the classroom and in the textbook. In this lesson the students had a number of learning objectives aligned with those of the subject and based on a collaborative learning activity to identify and order appropriate food in Mandarin in a Chinese restaurant setting. For instance, the lesson aimed to strengthen student use of Chinese pinyin Romanisation to input Chinese characters on a computer as well as to be able to read Chinese characters (consequently, this lesson did not allow voice communication). In particular, they were to choose appropriate vocabulary and correct grammatical structures in a dynamic, semi-spontaneous scenario to communicate with fellow learners and the teachers. This communication was centred around, but not limited to, practicing key vocabulary and phrases related to ordering food learned from the textbook and to extend on the textbook through new phrases introduced by the tutor or robots (automated avatars).

Figure 1: Chinese restaurant in Second Life

The activity was made authentic by asking students to work collaboratively to choose the most appropriate dishes for 'people' sitting at their table. They were informed that their table included a Muslim, a vegetarian, a diabetic, someone who did not like spicy food, someone who was allergic to seafood and a friend from Beijing. This required students to be able to understand the menu and the signs and to then make considered decisions between several possible alternatives according to the description of each of the dishes and their negotiated understanding of the context including Chinese culture. In most cases there was no clear answer. In order to complete this task in time, the students were encouraged to form groups, organise themselves and to collaborate through the text chat facility (in Chinese). Students shared their ideas, compared their understanding of the appropriateness of the dishes and eventually ordered the food they chose which was brought to their table by the waiter (an avatar controlled by the tutor). While most of the communication was through the text chat facility in Second Life, students could choose to communicate in the physical classroom to give each other help, especially in terms of using the software and in learning Chinese characters and phrases which they could use in-world. Successful completion of the activity could only be achieved through reading, writing and negotiating choices in Chinese text.

The Chinese restaurant in Second Life was not intended to replicate real life but rather to evoke a sense of immersion in a Chinese setting. The building was in the shape of a traditional Chinese tea house, and Chinese styled furniture and decorations were complemented by Chinese signs and a background recording of people talking in a real life restaurant in China. Upon arrival students were greeted in Chinese by an automated waitress (a robot or 'bot') who also gave them a custom designed Heads Up Display (HUD) which is seen in the top left of Figure 1. This tool, designed specifically for this subject, enabled the avatars to access sound files, pinyin spelling and Chinese character information for each of the dishes. This means that students could click on a dish and both hear the dish name and see its spelling in pinyin and Chinese characters. The students could also ask for more information about each of the dishes which was delivered in the form of a notecard containing the main ingredients and a description of the dish.

Data collection and analysis

The students who chose to participate in this research were asked to complete a short questionnaire at the beginning of the lesson and at the end of the lesson. The questionnaire was short due to time limitations and contained several questions about demographic details and other general information as well as 14 questions asking students to rate their degree of confidence in being able to do various activities such as ordering a meal in Mandarin. Two questions related to using the technology (computers and Second Life), nine questions explored students' beliefs about their ability to use Chinese language in a restaurant setting, and a final three questions asked about their self-efficacy beliefs in language activities generally unrelated to the lesson (eg. the degree to which you feel confident that you can shop in China). These final questions were included because of a desire to explore the potential impact of the lesson on beliefs about highly context specific to more general abilities. Nevertheless, it is recognised that such generalised questions risk losing predictive value (Schunk, et al., 2007; Torkzadeh, et al., 2006).

According to Bandura's (2006) advice the questions were phrased so that the students were "asked to judge their operative capabilities as of now, not their potential capabilities or their expected future capabilities" (p.312). The 14 questions in this study used a 5 point scale of no confidence, little confidence, some confidence, confident, and very confident (an adaptation of the four point scale used by Albion, 2001) although it is recognised that a scale with more steps could have provided greater sensitivity (Bandura, 2006).

The pre and post questionnaires were matched (unmatched questionnaires were removed) and the data was tested for statistically significant variations using SPSS. A Paired T-test was conducted ($p<0.05$) since the participants were the same across the data collection points. Eta^2 was also calculated to provide an indication of the proportion of the variance explained by the difference of the mean. Additional tests were conducted such as a 2-tailed Pearson Correlation to test the statistical significance of students reported level of immersion and their self-efficacy beliefs ($p<0.05$), however, due to length restrictions these additional findings will be reported in another forum.

Results and discussion

The subject had 153 students enrolled, of which 128 students completed at least one questionnaire. Pre and post questionnaires which could not be paired or those which had missing information were discarded leaving 100 paired questionnaires for analysis. The 100 students in this study consisted of 54 females and

46 males, with 99 aged 25 years or younger. The students spoke 13 languages as a first language, of which English accounted for 59%. All of the students spoke and to a lesser extent had written proficiency in two languages (English and Chinese) however 40% of the students spoke and wrote in 3 or more languages. An ANOVA test was used to explore any correlations between gender, age, and first language with students' self-efficacy beliefs over time, however, no statistically significant ($p<0.05$) correlation was observed.

As mentioned, a Paired T-test was conducted ($p<0.05$) to test if the changes in self-efficacy beliefs between the pre and post questionnaires were statistically significant. Table 2 presents the descriptive and Paired T-test results. The 14 questions are indicated in the first column. The mean is on a scale of 1 (no confidence) to 5 (very confident) and in all but the first item the post-questionnaire indicates an increase in students' confidence. Most of the items indicated a strong statistical significance (p<0.05) in the variation over time with Eta squared showing moderate (>0.06) to large (>0.14) effect sizes (Cohen, 1988) which, when coupled with the increased mean difference, strongly suggests that the lesson positively impacted on student self-efficacy beliefs relating to using the Chinese language in Chinese settings, primarily a restaurant setting.

Table 2: Descriptive statistics and paired t-test of self-efficacy assessment

The degree to which you feel confident to:	Pre Mean	Post Mean	Mean Difference	Std. Deviation	Paired T-test	Sig.	Eta Squared
1. use a computer	4.10	3.95	-0.15	0.75712	-1.981	.050	0.038129
2. use an online virtual world	3.27	3.31	0.04	0.95261	0.420	.675	0.001779
3. read a menu (written in Chinese) in a Chinese restaurant	2.04	2.61	0.57	0.90179	6.321	.000	0.287539
4. order a meal in a Chinese restaurant in Mandarin	1.89	2.59	0.70	0.87039	8.042	.000	0.395138
5. know what to do in a Chinese restaurant	2.52	2.84	0.32	0.90877	3.521	.001	0.11129
6. know a basic range of dishes that can be ordered anywhere in China	2.29	2.86	0.57	0.85582	6.660	.000	0.30941
7. clarify what the main ingredients are in a dish in a Chinese restaurant in Mandarin	1.97	2.62	0.65	0.90314	7.197	.000	0.343487
8. construct Chinese sentences to use in a Chinese restaurant	2.12	2.57	0.45	0.84537	5.323	.000	0.222519
9. initiate a conversation with a Chinese waiter in a Chinese restaurant in Mandarin	2.02	2.61	0.59	0.85393	6.909	.000	0.325311
10. develop a conversation with a Chinese waiter in a Chinese restaurant in Mandarin	1.88	2.38	0.50	0.79772	6.268	.000	0.284102
11. talk about eating in a Chinese restaurant in Mandarin	1.96	2.46	0.50	0.83485	5.989	.000	0.26595
12. travel in China	2.48	2.83	0.35	0.71598	4.888	.000	0.194418
13. shop in China	2.48	2.83	0.35	0.91425	3.828	.000	0.128932
14. see a doctor in China	1.72	1.95	0.23	0.63333	3.632	.000	0.11758

N=100 on all items, Qs 3-14 were all statistically significant (*p*<0.05)

In the pre questionnaire the mean student response indicated that they were confident about their ability to use a computer (Q1) and had some confidence in using an online virtual world (Q2). This could be explained by the fact that the students use computers regularly for their studies but also had already completed at least two previous lessons using an online virtual world. There was no significant variance in their self-efficacy beliefs between the pre and post questionnaire, although there was a small negative shift in their confidence in using a computer which could be explained by a number of students needing to reboot their computer due to a 'freezing' effect in Second Life (presumably a graphics card fault). This is supported by the open ended questions in the post questionnaire, for instance "the limited processing power of these computers limits the immersiveness [sic] and speed of the experience".

Questions 3 to 11 focussed on students' self-efficacy beliefs in being able to use Mandarin in a specific setting (Chinese restaurant). Questions 12 to 14 asked students about their confidence to do other tasks (travel, shop and see a doctor in China) which would benefit from language proficiency but were not closely related to the lesson context. In all of these questions (Q3-14) Table 2 indicates a statistically

significant difference between the pre and post questionnaire with a positive shift in the mean difference (most with a large effect size, see Eta squared). However, within this positive statistical difference variations can be observed to follow a general pattern: the mean difference (improvement in confidence) and Eta squared (the ratio of responses explained by the improvement in confidence) both increased correspondingly with the contextual relevance of the question to the lesson activity. In other words, students' were more confident about their abilities in contexts closely associated with the lesson activities within the Chinese restaurant setting. This observed pattern reflects the domain specificity principle of self-efficacy, that is, self-efficacy beliefs in one domain are not as applicable in another (Schunk, et al., 2007). The general domain in this study is Chinese language proficiency (which is intimately associated with intercultural awareness), consequently it is not surprising that students who became more confident in being able to perform in a Chinese restaurant setting would also feel more confident, to some degree, in other applications of the Chinese language such as travelling or shopping.

While the domain specificity principle can describe the general trend, we propose that the graduations of change in confidence ratings can be explained by the degree of relevance of enactive mastery experiences. In other words, if a student perceives the experience to be authentic (ie. relevant to real-life tasks) then their enactive mastery will have a greater impact on their self-efficacy beliefs. The significant influence of enactive mastery experiences on self-efficacy beliefs has already been mentioned (see Bandura, 1997; Pintrich & Schunk, 2002) and it is a small logical step to assume that the degree of relevance of the enactive mastery experience would have a similar degree of impact on the students' self-efficacy beliefs.

This pattern is represented in Table 2 where questions 3, 4, 6, 7, and 9 asked students' about their ability to perform language tasks with a high degree of relevance to the learning activity (ie. the learning activity required students to use their Chinese language ability to read a menu, order a meal, know a basic range of dishes, clarify the main ingredients, and initiate a conversation with a waiter). In comparison questions 10 and 11 followed by 8, had a smaller positive mean difference and effect size (Eta squared). These questions asked students to rate their self-efficacy in tasks still related to a Chinese restaurant setting but not as closely related to the learning activity. While students were asked to initiate a conversation with a waiter (Q9) in the learning activity, mainly to order food, they did not have to develop that conversation (Q10) which would require a greater understanding of the language than practiced in the lesson. Similarly question 8 asks students about their ability to construct sentences which was not necessarily required in the activity to successfully achieve most of the tasks. Question 11 asked students about their perceived ability to talk about eating in a Chinese restaurant however, this ability was not enacted in the lesson, and while the students presumably gained greater proficiency in language which could be used in a restaurant setting as well as had a further experience of dining in a virtual Chinese restaurant the enactive mastery experience was not as strongly relevant as other questions (eg. Qs 3, 4, 6, 7, 9). The remaining questions (5, 12, 13, 14) have an even smaller positive mean difference and effect size (Eta squared) which are similarly explained by the degree of relevance to the enactive mastery experience. Questions 12 to 14 are about travelling, shopping and seeing a doctor respectively, and clearly have limited relevance to the learning activity. However, question 5 asks students about their perceived ability to act appropriately (know what to do) in a Chinese restaurant which prima facie appears to be relevant to the learning task. To the contrary, the learning task did not require students to negotiate an understanding of what they would have to do in a real-life Chinese restaurant. The lesson provided clear directions about where the menus where, how they could find out about the dishes, how to order and there was no expectation for students to pay, etc. Consequently it is understandable that students reported similar levels of confidence (pre and post Mean) for being able to travel, shop and dine (know what to do in a Chinese restaurant).

The authors have proposed that the degree of relevance of enactive mastery experiences has a corresponding positive effect on students' self-efficacy beliefs. It is further proposed that virtual worlds may facilitate perceived relevance and sense of authenticity by providing an immersive experience. A 2 tailed Pearson Correlation test was conducted to test the relationship between students' reported degree of immersion and their degree of self-efficacy beliefs in the post questionnaire. A statistically significant ($p<0.05$) correlation was found for questions 3-6 and 10-11 but surprisingly not for questions 7-9 (all of these questions related to language performance in a Chinese restaurant). The authors have made some attempt to explain this apparent anomaly (which we cannot explore in this limited forum) however we have concluded that a more detailed study needs to be conducted to explore the possible connections between virtual worlds and perceived relevance of enactive mastery experiences.

Conclusion

This research project aimed to explore the proposal that a language lesson in Second Life could sustain or improve students' self-efficacy beliefs through learning activities favouring selective language performance (enactive mastery experiences). In this study 100 university students participated in a lesson conducted in Second Life and which engaged them in a collaborative activity to identify and order food in Mandarin in a Chinese restaurant setting. The lesson was designed to give students authentic opportunities to read and write in Chinese (eg. read a menu, order food) and to participate in a dynamic, semi-spontaneous scenario (collaborating with peers). The quantitative results from the pre and post questionnaires supported the research proposal by indicating a statistically significant increase in student' self-efficacy beliefs in using Mandarin in real-life Chinese settings.

There are, of course, several caveats to this conclusion. For instance, the changes to self-efficacy beliefs were measured over a single lesson. There is no indication of the resilience of these beliefs, that is, the predictive value of these beliefs when students attempt to employ their language skills in a real Chinese restaurant. As Bandura (1997) pointed out, while perceived success can build a strong sense of efficacy beliefs, easy successes are also easily discouraged by failures. Consequently the nature of the mediated environment needs to be considered in terms of its relationship to perceived success in the enactive mastery experience. A further concern is the validity of the data collection instrument which raises student awareness of their efficacy beliefs and may influence the impact of the lesson. A final concern, highlighted by Feldon and Kafai (2008), is that virtual worlds research should consider the implications of simultaneous real-life and in-world interactions of students' in the computer classroom, this is reinforced by Wang and Wu's (2008) observation in online learning that student/peer feedback can significantly influence self-efficacy beliefs.

In this study it was observed that the students were more confident in their self efficacy beliefs (see Table 2, Mean difference) relating to tasks which were similar to those in the lesson activity (eg. ordering food). Nevertheless the increase in confidence was also statistically significant, although noticeably smaller in effect size (see Table 2, Eta squared), in tasks which were considered to be only peripherally related (eg. shopping or seeing a doctor in China). This pattern reflects the domain specificity of self-efficacy beliefs. An implication of this is that while the lesson in Second Life appeared to strengthen students' confidence in specific tasks and to a lesser extent in more general tasks it is necessary to remain wary of this periphery effect since Schunk, et al. (2007) pointed out that these kinds of general questions lose predictive value.

The results in this study have led the authors to propose that the graduations of change in confidence ratings (both Mean difference and effect size, see Table 2) can be explained by the degree of relevance of enactive mastery experiences. In other words, if a student perceives the experience to be authentic (ie. relevant to real-life tasks) then their enactive mastery will have a greater impact on their self-efficacy beliefs. However, the results were unclear whether the immersive three dimensional setting significantly influenced students' perception of that sense of relevance. The implication is that while virtual worlds appear to be able to support students' perception of relevance, and thereby more effective enactive mastery experiences, further research still needs to be conducted to explore the relationship between the affordances of virtual worlds and the instructional design, including the simultaneous real-life and in-world experiences/interactions of students, in the impact on self-efficacy beliefs.

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