An Immersive Learning Simulation Environment for Chinese Culture

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ABSTRACT

Overseas operations for U.S. government personnel have steadily increased in frequency, spawning a growing emphasis on cultural awareness. Although appropriate behavior in a foreign context is often understated, skillful cross-cultural interactions have significant potential in diffusing, solving, and avoiding problems, as well as promoting healthy and co-operative relationships with local populations. Prior in-country immersion is rarely feasible, and therefore adequate alternatives are needed. A model immersive cultural learning environment integrates Second Life and traditional web content, optimizing the affordances of presence and web content for a robust cultural learning experience. Utilizing principals of situated cognition, authentic learning, and contextualized learning, the immersive cultural learning environment shows promise in meeting the need for cultural awareness training in an authentic, learner-centered environment.

ABOUT THE AUTHORS

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INTRODUCTION

Overseas operations (i.e., Operation Enduring Freedom - Afghanistan, tsunami relief effort) require U.S. government personnel to interact with the local population in different cultural environments on a daily basis, making cultural awareness and competence a necessity. By nature, cultures are highly complex and ill-structured entities and almost any cultural case-event is connected to multiple and often unpredictable knowledge-domains. If one teaches foreign culture to a small and well-defined group of learners, the task of teaching for cultural understanding is less difficult. However, U.S. government personnel are a diverse group with diverse backgrounds, and the situations they encounter in a foreign country are equally diverse.

Teaching cultural competence and awareness to such a group is not an easy task. The best analysis of teaching complex and ill-structured topics, such as culture, has been provided by Cognitive Flexibility Theory. It recommends computer-based, non-linear forms of presentation in which the same knowledge domain is codified and represented in different forms and case-events so that the learner learns to transfer the knowledge across new and varied domains and situations (Spiro, et al., 1988). We propose that optimum characteristics for creating an immersive cultural learning environment may be paralleled with the nine characteristics that define authentic or situated learning environments (Herrington & Oliver, 2000). These principles stress the need for authenticity in context and activity, access to expert performances and modeling, multiple roles and perspectives, collaborative construction of knowledge, reflection, articulation, coaching and scaffolding, and authentic assessment.

We apply these theories in the development of our immersive learning environment to support cultural awareness. While we do not capture all aspects of the target culture in the different learning scenarios, we provide a complex immersive learning environment in which we convey key knowledge domains and foster skill development. We focus on preparing the learner to behave with a level of sophistication that communicates *respect and understanding* of the target culture. Historically, cultural awareness (and cultural competence for some individuals) has been achieved through a combination of linear information and, typically, onsite experience of a given culture. However, the relatively recent technical capabilities of three-dimensional (3D) multi-user virtual immersive environments such as Second Life, and the ubiquity of high-speed internet access and computers open the door for the creation of situated learning (or authentic learning environments) within the context of a target culture. These environments cannot replace real-life experience; however, Resnick (1987, cited in Herrington & Kervin, 2007) describes a "bridging apprenticeship" that connects theoretical classroom instruction and the real life context. The intrinsic value of these bridges lies in the ability to connect one context to another, to take theoretical knowledge and place it in the application domain. We have created an immersive learning environment that has the potential to bridge the gap between theoretical cultural knowledge (provided in the classroom or by the 2D web) and the real life context of the target culture. This environment is hypothesized to improve the level of preparation for U.S. government personnel prior to immersion in the real life foreign context. Improved preparation will result in increased effectiveness in dealing with sensitive and critical cultural issues.

BACKGROUND

Travelers arriving in a foreign culture must have prior knowledge and experience of the culture in order to determine culturally appropriate actions, understand actions of the target population, and synthesize experiences and encounters into a developing cultural framework. In the past, the doors to experiencing foreign cultures were open to either the privileged few whose socioeconomic status allowed such luxuries or to those who where

transferred overseas by the government, military, or private corporations. In many cases, no real consideration for cross-cultural training exists—apart from recommendations to obtain training, to contact embassies, and to read guide books in order to become aware of the climate, history, and general culture of the geographic region.

We have computing technologies with the ability to more easily and cost effectively engage learners and immerse them in a given environment (i.e., culture) to become more familiar and comfortable (i.e., culturally aware) within that context. 3D virtual worlds and metaverses significantly reduce the cost and logistical difficulties that real-life cultural immersion requires and can provide the scaffolding that supports learners in a cross-cultural experience. 3D immersive worlds have the potential to shepherd the learner through the phases of bias and rejection, to expanded knowledge about a foreign culture, to intellectual acceptance, and finally to true cultural awareness.

Situated cognition (Brown, Collins, & Duguid, 1989), and authentic learning (Herrington & Oliver, 2000) discuss the need for knowledge and skills to be learned in contexts that reflect the way knowledge would be useful in real life (Collins, 1988, cited in Herrington and Oliver, 2000). Indeed, in the quest to teach foreign culture, the contextualization of learning content is particularly significant. Given the constraints of distance, time, and funds, the 3D immersive learning environment provides a context better able to approximate cultural reality than the classroom, or other multimedia materials alone. The integration of Second Life in the development of this immersive learning environment is based on the need for contextualization of information for optimal learner integration. In addition, "just in time" learning is well suited for the 3D immersive learning environment, where pertinent information is delivered at the moment it is demanded by the context or for the situation.

PROJECT DESCRIPTION

The goal of this project is to develop a model cultural immersive learning environment that can be applied to any cultural context. The immersive learning environment consists of two major components that mirror key elements for teaching cultural awareness: information and experience. As a reflection of the *information* element we have developed a 2D traditional web-based component housing text content and links to other multimedia content. The *experience* element is reflected in the 3D immersive space: the *Second China* island in Second Life, a 3D space in which cultural content is experienced virtually by the user.

From a central web-based portal, the user enters the learning environment and chooses between a 2D traditional web-based route and a 3D immersive experiential route (Second Life) according to his or her preference. This dual environment provides a type of augmented reality in which the virtual world is augmented with real-world information to aid in the development and understanding of the core content.

The two components are linked and each component is designed to encourage the user to use and explore the other. The 3D immersive environment constantly provides links to the 2D content for further information about elements encountered and the 2D traditional web-based component includes links to locales and scenarios in *Second China* that reflect, enhance, and reinforce the material covered in the modules.

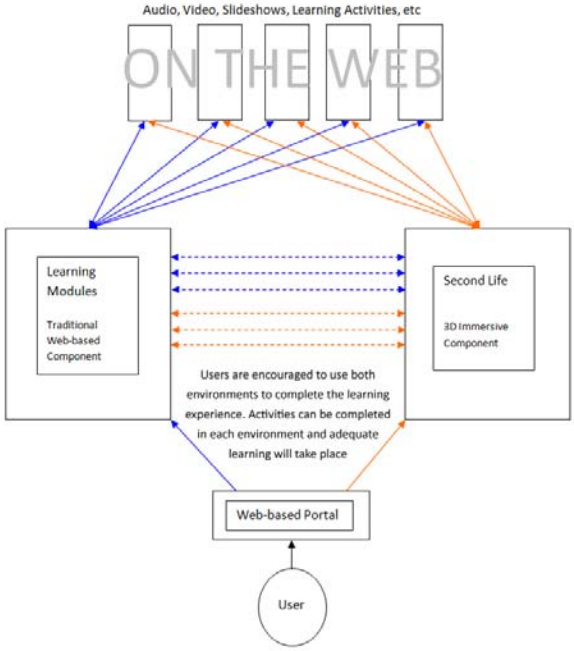

Fig. 1. A graphical representation of the learning environment structure.

The learner who chooses the traditional web-based component first enters an environment that consists of modules, which serve as the core curriculum of the project. Modules consist of text and multimedia content and offer learning activities and quizzes enabling learners to check their understanding of the material covered. By accessing this content first before accessing the 3D content, modules are used to develop prior knowledge about the target culture before achieving presence in the 3D immersive

learning component. It is important to note that while 3D immersive worlds find strong and much deserved grounding in constructivist learning theory, it has been proposed that constructivist learning environments may not be the ideal for the novice learner (Jonassen, Mayes, & McAleese, 1993). According to Jonassen, et al. the development of constructivist learning environments should be tempered with the understanding that constructivist strategies are not the panacea for all kinds of learning, even within the virtual environment. It is for this reason that we include the 2D traditional web-based content, and emphasize the important role that it plays in this immersive learning environment.

Fig. 2. Traditional web-based module content

By choosing to enter the 3D immersive learning component before accessing the 2D content, the user learns by exploration supported by different levels of scaffolding. For freer unguided access to the environment the learner arrives and is met by a greeter (*Jiang)* who is able to detect avatar presence, and offer to guide the avatar to different locations around the island. The learner may accept *Jiang's* offer or may explore the environment independently.

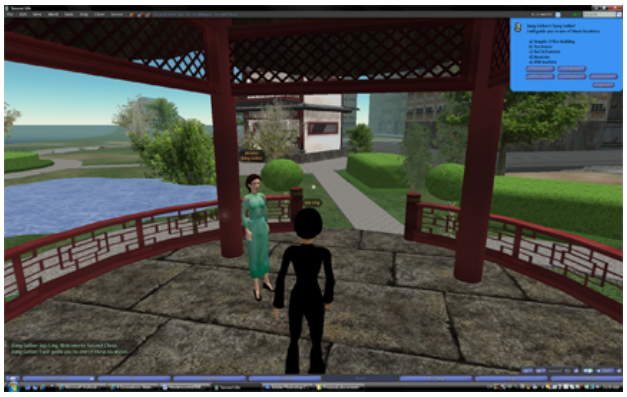

Fig. 3. Guest is met by Jiang, the Second China greeter

Independent exploration of the island may include observing (or, in some cases, performing) activities that are culturally significant (i.e., watching, or doing taichi in the park – Fig.4., or listening to a musician playing the erhu in the teahouse, Fig.5.), or by walking around the environment noting architectural variations, juxtaposition of old vs. new, and other experiential aspects . The learner is free to determine a personally relevant path through the available content and activities.

Fig. 4. Scripted bots performing taichi

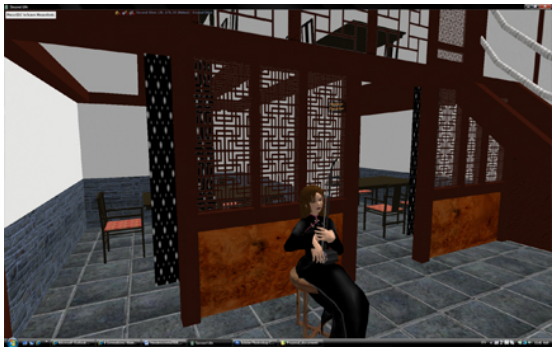

Fig. 5. Musician playing erhu

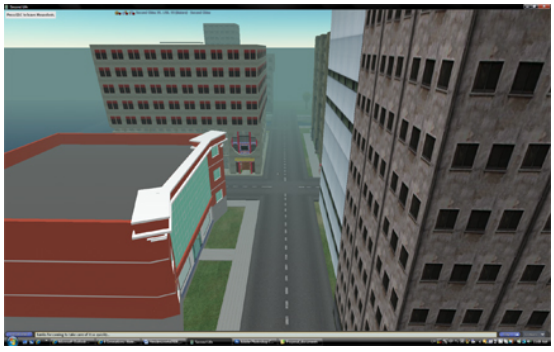

Fig. 6. Juxtaposition of old and new

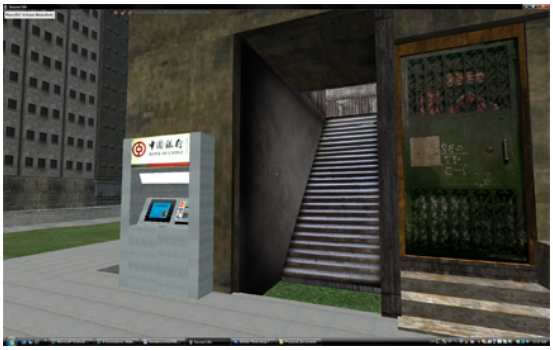

Fig. 7. ATM

While browsing, learners will be able to access videos, or click on items linking to websites or social bookmarking sites that provide a selection of references depending on learner preference. In addition, the learner will find opportunities to engage in cultural activities using scripted animations for avatars or participate in quests for information in the given locale.

If accessed from within the 2D web-based portal, each scenario or locale in the environment is introduced by outlining the target content areas and describing possible learning objectives. At present, this task is performed by a simple popup window, where the introduction popup (see Fig.8) provides the scaffolding which aids the learner in the synthesis of information into a developing cultural framework.

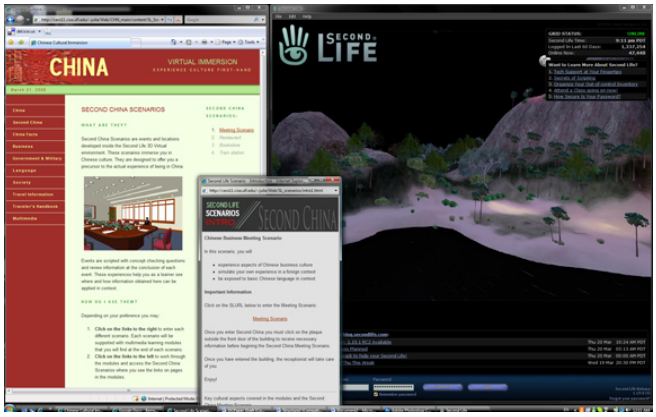

Fig. 8. Intro popup provides rationale for scenario and directions for navigation.

In addition to the freer, unguided exploration of the environment, scenarios that deliver important cultural experiences have been developed based on the principles of guided-learning. These scenarios are facilitated by a *bot* playing a culturally appropriate role. The *bot* detects the presence of the avatar and guides the avatar through the scenario that mirrors real life. This interactive process exposes the learner to an authentic, though simulated, cultural experience.

Fig. 9. The receptionist* bot *greets visitor

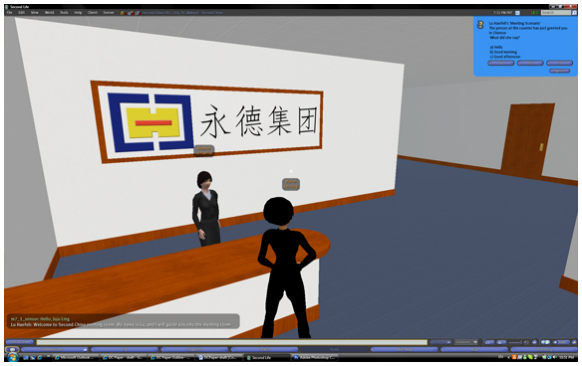

Fig. 10. Questions delivered by popup

Throughout the guided learning experiences, the learner is provided with questions supporting progress through the scenario. Questions are delivered at times in the scenario where the particular concept being checked is necessary for the continuation of the scenario, or where it reinforces prior learning. Depending on which access route the learner takes, these questions play different roles. For the learner who chooses the traditional route, the questions reinforce information already completed in the traditional web-based modules. For the learner who chooses the experiential route, the questions provide a way to highlight information necessary within the given context or at a given moment in the scenario. They provide information at the exact moment that the learner needs it, therefore capitalizing on the learner's readiness to receive and integrate new information about the target content.

When the scenario is complete, the *bot* returns to the starting position. A popup window appears providing links to the web-based content. These links are determined by predetermined learning objectives for the scenario and provide access to more in-depth learning content about the experiential scenario.

Fig. 11. Upon completion of the scenario, Lu bids the learner farewell and returns to her starting position.

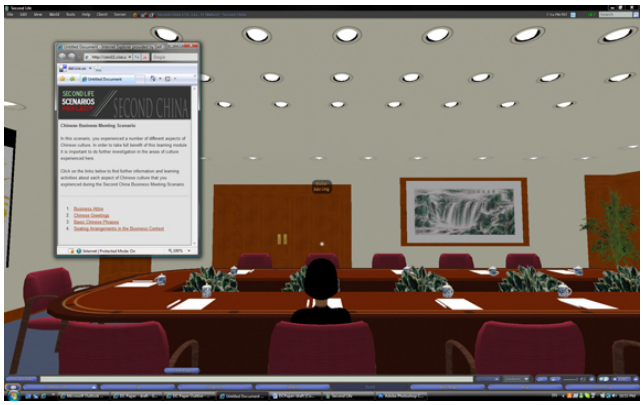

Fig. 12. Final popup window which guides the learner to web-based content for reinforcement of learning during the experimental component.

The *Sky Oracle*

Another feature of the *Second China* environment is the *Sky Oracle*. This is a space where news, public affairs, and issues are covered. The goal of the Sky Oracle is to provide a space for contemporary Chinese issues using a variety of media not traditionally employed for mass communication. This process is defined as follows:

1. A news item is chosen from an outlet, or obtained by interviewing sources who are expert on the item. For example, an item may be the relations of Tibet and mainland China, or how China has changed as a result of hosting the 2008 Olympic Games.
2. The item is coded and represented as a 2D simulation model. For instance, a news item may be encoded using the System Dynamics method, or a control-flow chart.
3. The 2D model is transformed into a 3D architectural space with rooms or segmented areas capturing the semantics in the flowchart nodes.
4. The 2D model is used as a map or heads-up display within the 3D model.

This type of mass media creation is different than the more typical approaches of using story text and video. The extent to which this approach can complement the more traditional media is being studied through experiments. A key question is whether 2D diagrams and charts have any significant effectiveness in 3D, and while this is an ongoing debate across several fronts, the 3D incarnations must take full advantage of presence if they are to be most effective. Research needs to be performed to test for several social science and educational variables such as attitudinal or behavioral change, learning, and memory retention.

The research basis for the Sky Oracle is centered on the desire to treat information in a more "product-like" manner, making it possible for flowcharts, for instance, to be represented in 3D, thus combining the structural benefits of a 2D flowchart with the experience of 3D interaction (Fishwick, 2008).

DEVELOPMENT PROCESS

A central core curriculum was defined at the outset and content collection and development is centered around that curriculum. This curriculum was determined by assessing critical aspects of culture for the development of cultural awareness. Content areas are: basic facts (population, demographics, geography, etc.), government and military, business, travel, society, language, and "The Good Foreigner's Handbook" (general guidelines for appropriate behavior in foreign cultures and created for the purposes of this project).

Content collection and new initiatives in the development of the 2D/3D integrated learning environment occur simultaneously. The first scenario to be developed, as previously described, served as the testing ground for the

general concept of the project, team communication and collaboration, and the manifestation of the project concept in practical terms. A scenario was selected based on its suitability for scripting a *bot* in a culturally appropriate guided-learning scenario.

While content development activity takes place, appropriate locales and scenarios are proposed and assessed in terms of alignment to the goals of the project, teaching methodology, and content delivery. Discussions on learner preference, affordances of the technology, appropriate application of said affordances, learning objectives and learner outcomes are a constant.
Through the development of this initial scenario, a number of challenges were encountered in both the technical and non-technical arenas. Documentation of challenges, solutions, and potential solutions follows in the section below.

CHALLENGES -TECHNICAL

The primary technical challenges are focused in two areas: the artistic modeling and design of the Second China environment, and scripting and programming. The modeling of the *Yongde* office building was performed by reviewing reference images for guidance. Some textures for objects within the building were taken from images, and others were created using an image processing program such as Photoshop. It is important to pay attention to detail so that there is somewhat of a "suspension of disbelief" when looking at objects such as conference room chairs, tables, and teacups. If they do not have the appropriate textures, or are untextured, a sense of immersion will be forfeited.

The most complex challenge was the creation of *Lu*, who is a restricted artificial intelligence, acting as a Chinese receptionist at the entrance to *Yongde*. *Lu* is controlled by Linden Lab server code (written in Linden Scripting Language, LSL) as well as local server code written in C# with access to the LibSecondLife (LibSL) library. LibSL is an ongoing reverse engineering project allowing some control over the server from the C# code, instead of from the traditional client visual user interface. Messages must be issued between the two servers to synchronize messages. For example, when a dialog box opens on the Linden Lab server side, the subsequent control must be issued by way of messages to the C# code in order to move the *bot*. The *bot* is resistant to collisions with avatars using an asynchronous timer on the local server side.

Lu operates by an augmented finite state machine (FSM) that dictates her motions between waypoints. At each waypoint, it is possible to invoke specific gestures, quiz questions, and Chinese voice commands. The plan is to formalize the FSM in a form amenable to editing by team members who are not programmers.

CHALLENGES –NON-TECHNICAL

To a certain extent, technological challenges are to be expected in the development of a learning environment such as this. Some challenges on the non-technical front, however, could not have been predicted prior to development of the project.

The Target Learning Community

The first challenge presents itself in the form of a target audience that is, by definition of the contract, diverse. Proposed learner audiences range from military combat personnel to analysts, to linguists. Each one of the target learner groups identified requires a different level of cultural awareness/competence in addition to skills for application under a wide range of circumstances. Each one of these groups (and others yet to be identified) has, if not a "group learner preference," at least a preference for the kind of information necessary to develop the required level of cultural competence. These preferences may be innate, or may be based on level of education, existing cultural awareness, or even time constraints of the target learner community. We must also acknowledge that learner preference is impacted by the generation in which learners were born. We are faced with "new students" (Oblinger, 2003, p. 44) and must design content in a way that addresses contrasting preferences.

While it is impossible to expect that any learner will emerge from any short term learning activity or program as a cultural expert, the project must accommodate for a very broad scope of potential users and be faithful to the mission of developing an immersive cultural learning environment that promotes the development of cultural competence.

To overcome the challenge of meeting the needs of a diverse group of learners, the learning environment will be structured for different levels of learning. To a certain degree, the two components of the learning environment speak to that need as do the guided learning scenarios and the scaffolded browsing activities. McCloskey's report on cross-cultural perspective-taking skills provides brief reviews of perception and training for cultural skills and perspective-taking both within the military and outside. In particular, the inclusion of Peace Corps, USAID and the State Department, and the USMC offer helpful insight and guidelines to be considered during development of a learning environment designed to meet the range of needs of our target learners (McCloskey, 2007).

Seamless Integration of 2D and 3D

The two components of this learning environment are of equal importance with regard to learning objectives, learner outcomes, learner preference, and the learner experience as a whole. Navigating between the two components of the learning environment is not seamless. In order for an interactive browser window to pop up, a Second Life popup window must be created, directing the student to the appropriate browser window by way of clicking on a scripted button. This extra and superfluous mouse-click has the very real potential to drive a wedge between the two components, thus affecting the ability for them to be seen as connected and part of the same learning environment. Perhaps as a one-time event, the effect of this limitation would be negligible, but as an integral and regular event within the learning environment, the impact of the limitation is quite significant and irritating. Recent changes on the Linden Labs side have made some steps in improving this situation but as yet it is still not ideal.

Affordances

Second Life as a 3D virtual world technology affords us many uses and applications. There is a lot of speculation as to how these technologies will change how we use the web and how we approach online education, among other things. While the reality is that there are many things that we *can* do, the question remains as to whether we *should* do them or not; based on the grounds of learner objectives, learner outcomes, and learner preferences.

Of course, it makes no sense to recreate classroom environments and simply place the real world into Second Life, but in the right context, and based on appropriate objectives, real world simulation can be a powerful teaching/learning tool. As the goals of this project are very closely connected to real world skills, there is argument for remaining "faithful" to reality in the creation of the Second Life experiential component and not deviating by delving into some of the more interesting technological capabilities of Second Life.

However, the fact is that Second Life allows learners to interact with each other and with the environment as an experiential learning resource in many interesting and engaging ways. Limiting the application of the technological capabilities begs the question: "Why use Second Life instead of another more familiar 3D immersive world technology?" If development does not capitalize on the unique strengths of a technology like Second Life, then we are either using the wrong tool, or we need to rethink our objectives and methods, and how we are conceptualizing the role of the technology in the integrated learning environment. While the technology should not drive the learning objectives and must be aligned to curricular goals (Bates & Poole, 2003), the unique technological capabilities of Second Life must not be excluded from discussions about how learning objectives can be achieved.

In addition to learning objectives, outcomes, and preferences, and the alignment of technology to curriculum or activity, cognitive load theory (van Merrienboer & Ayres, 2005) must be addressed. Student descriptions of the learning curve required to use Second Life found in the Proceedings of the Second Life Education Workshop 2006 (Livingstone & Kemp, 2006) provide some evidence underscoring the importance of this issue. We couch this learning curve in terms of cognitive load theory (van Merrienboer & Ayres, 2005). The theory describes the 'load' required to learn a new skill (like using Second Life), but it also points out the importance of student motivation. Students are recorded describing the challenge of using the technology but there is also documentation which claims that student technical ability was as strong an indicator of success as attitude. The manipulation of germane cognitive load in the form of motivation (van Merrienboer & Ayres, 2005) can increase intrinsic cognitive load therefore balancing the learning curve with increased intrinsic cognitive load available for learning and processing information and experiences.

We address the question of "We can do it, but should we?" by research and discussion. The interdisciplinary nature of the team brings with it with varied perspectives and knowledge on the technology and its application in the learning environment. This diversity within the development group is proving to be an invaluable tool in the quest to overcome a challenge such as this. In addition to contributing to the development of a more robust 3D immersive component, these perspectives also encourage the re-assessment of learning objectives, pushing the scope to encompass the simple and concrete and the meta-cognitive. This range also shows promise in developing an environment that promotes learning that is not content-bound, but is transferable not only into a real world Chinese context (in this particular case) but, more importantly, into other cultural contexts.

One feature of Second Life that comes under discussion in the context of our development "Second China" is *streaming media*. Why include a video in Second Life for a learner to watch when it is easier to do so in a web browser? Should the design of the 3D immersive environment be allowed to deviate from reality in order to push out information to learners in the environment? For example, should a large video screen be placed in a Second Life outdoor space in order to show streaming video? As these questions are raised, the team returns to the drawing board, to brainstorm, discuss, research and reflect. Finally, a solution is found which, surprisingly, often leaves all

members of the team satisfied. In this particular example, the video screen can exist and streaming media can be pushed out. What makes it appropriate is the context in which it is found–a karaoke bar, a restaurant, a home. It is of the utmost importance that features of the technology employed make sense within the cultural context and are aligned to support the main goal of the project.

Another item on the technological capabilities list is *collaborative learning* and the *social nature of Second Life*. The collaborative social aspect is a major feature of this technology and one about which many Second Life advocates in the education community have great expectations. These collaborative learning spaces have much to offer to the online instruction of languages and communication skills in a number of disciplines. The 3D immersive environment has the capability to provide context and perceptual immersion which only enhances practical aspects necessary for these kinds of disciplines and makes situated learning as close to reality without a real life physical presence. While the technology is wide open for the creation of collaborative learning spaces, the design, management, and tracking of outcomes of the application of these features is a challenge.
Second Life is open to the world and residents come from all over the globe. In our case, we are targeting Chinese culture, and there are residents in Second Life who are Chinese nationals. These residents may be considered as a resource that could easily be tapped by inviting them to our island in order to interact with learners. This sounds ideal and extremely authentic–which it is, provided the integration of Chinese SL residents into the learning environment is carefully designed and structured.

Without careful planning and design, however, there is little chance that this kind of initiative will function at a level that impacts the cultural awareness of the learner. First, not every native of a country is culturally aware enough of his or her own culture to be able to impart anything meaningful to another human of another culture. Second, depending on how "recruitment" or invitations are made, there is no way to know if the resident is actually Chinese. If this is the case, interaction with a Chinese national (or an avatar who claims to be a Chinese national) would have negligible impact on the development of cultural awareness. Instead of using volunteers or "visitors" to the island, one would need to recruit a "culture crew" to staff the island. This crew, ideally comprised of known Chinese nationals, given training and directives, could be tasked with participating in interactions scripted in a way that would have much greater potential in aiding the development of cultural awareness in learners.

Building and moving objects in-world is another unique technological capability of Second Life. Building tools are heralded as user-friendly (when compared with other 3D building software packages) and many novice builders are making good use of them without difficulty. Many developers in the Second Life educators' community build their own objects, and others hire more expert builders in-world relatively inexpensively. While this is important and useful in bringing the use of Second Life into the main stream and creating useful spaces for educational and other purposes, the ease of building and moving objects real-time remains a technological capability which is a challenge to integrate into our learning environment in a meaningful way.

Although building culturally appropriate artifacts may be an excellent way to reinforce learning, the question as to whether this is a good time investment/learning outcome payoff remains to be seen. We have discussed two specific ideas for leveraging Second Life's unique technical capabilities: 1) moving Chinese characters around to create valid words and 2) having a *bot* throw oracle bones to tell the future and provide advice. The first idea utilizes Second Life's dynamic user-driven positioning capability, and the second idea involves dynamic rezzing of prims (i.e., the oracle bones) to provide a more engaging experience for the participant. At this time we are still unsure about the integration of
these events.

CURRENT FINDINGS

What we have found in our deliberations and team discussions is that Second Life content and processes are appropriate based on the *contextual relationship to the learning objectives*. For example, we placed a movie in the business meeting room, and allow visitors to interact with the teacups. We also allow the visitor to find out more about the artwork on the walls of the conference room.

The reasoning here is that 1) the artwork is relevant to the conference room, and would normally appear there, and 2) allowing the visitor to learn more about it provides cultural and contextual relevance even if that learning may not be a direct transfer from an actual conference room. Even though these may not be objects and activities that actually transfer from the real-life scenario, they are contextually relevant to the meeting room activity; the movie introduces the recent growth of the Chinese economy (relevant to business), and serving tea is also relevant at business meetings. Something that might not be as appropriate is placing Chinese traditional music in the space. This is not only because music would not normally be in a business area, but also because this music is not related to the

business scenario in any tangible way; it lacks contextual relevance, unlike the movie that informs about China's potential for business. Therefore, while we began the project with the idea that we would build scenarios based on purely real-world transfer, we found this to be too limiting. Our criteria have evolved to rank *context relevance* higher than *reality transfer*. Given this strategy, we are not limiting Second China to a training environment, but rather allowing it to reflect elements of guided and unguided experience of culture.

In summary, we have found that items that would normally appear in the real-world scenario are natural candidates for inclusion in the virtual equivalent (i.e., a meeting room desk), but that items that are contextually related (i.e., the movie object, or the ability to click on a teacup) may also serve as additional candidates. Items that have neither real-world transference nor contextual relevance are mostly likely to be removed from a scenario.

EVALUATION

A peer review committee comprised of experts in the areas of language and culture instruction, computer assisted language learning, computer and information systems engineering, Chinese language and culture, and digital media, visual rhetoric, and game studies has been established in order to evaluate the effectiveness of the Model Immersive Cultural Learning Environment.

At the time this article was written, the first of a number of planned peer review activities had taken place. Members were guided around the Second China island and participated in one of the planned learning scenarios.

Initial feedback, while positive, highlights the need for attention in the following areas: continued research (specific user groups, interface design theory, evocative objects, learning curve required by users of the technology, and principles of culture education), instructional design (clearer objectives, orientations for technology and learning, etc), and evaluation metrics and user groups.

The peer review provided the following information:

1. The environment reflects sound principles of video game and interface design theory.

2. The combination of 2D traditional web-based content and a 3D immersive experience is significant.

3. Limitations of the technology (Second Life), limited user experience, and required user learning curve in the 3D environment necessitate the development and implementation of scaffolding to support learning experiences.

4. The virtual world's role in education is still unclear, as is the impact it will have on education. There is some evidence to support the claim that virtual worlds will be significant in how we define education in the future. In this particular context, this issue may be couched in terms of defining cultural education as *"understanding how to participate in a culture"* versus *"learning about a culture"*.

Assumptions and perceptions of adherence to theory can only be evaluated and afforded scientific merit by following adequate evaluation procedures, namely constricting the application domain, identifying learning (and other metrics), and conducting a solid evaluation study.

EXPERIMENT

In addition to ongoing peer review activities, evaluation of the model immersive cultural learning environment will proceed incorporating recommendations from the initial and from subsequent peer review evaluations.

For the first in a series of experiments, the representative user populations will be drawn from two ROTC programs at the University of Florida (Air Force and Army). The control group will use the 2D traditional web-based content coupled with a flash-based version of the business meeting scenario in Second China. The experimental group will have access to 2D web-based content and the 3D interactive business meeting scenario in Second China. Both interfaces will be identical except for the primary user interface: a 2D flash-based scenario, versus a 3D immersive scenario in Second Life.

A series of questions will be asked and will be divided into two categories: 1) questions of a spatiotemporal nature and 2) all other questions. The two hypotheses for this experiment are 1) that students in the experimental group will score significantly higher on the spatiotemporal questions and 2) that students in the experimental group will score significantly higher on non-spatiotemporal questions.

Current expectations are that the first hypothesis will be confirmed. The outcome from the second hypothesis is unknown but there is supposition that knowledge placed in physical context may increase user ability to absorb traditional web content more readily.

CONCLUSION

Literature about Second Life and virtual worlds published by the broader education community (to the extent that it has been researched by the team thus far) has been called "patchy" (Kamel Boulos, Hetherington & Wheeler, 2007) and tends to focus mainly on student motivation, information dissemination/transmission, and creative development (Livingstone & Kemp, 2006). Literature that speaks to learner outcomes, efficacy of Second Life as a learning environment, and other more concrete results is, as yet, hard to find. The limited research translates into the challenge of working in somewhat uncharted territory.

At this point in time, much has been achieved in the development of this project. Core curriculum has been set, providing the foundation for the development of the learning environment. The 2D traditional web-based content designed to prepare users and reinforce learning has been written. In addition to the general infrastructure of roads and walkways and a collection of buildings, the *Second China* island now houses a park, a business, a teahouse, a government administration building, an ATM and a phone booth. The park contains a number of buildings of traditional Chinese architectural design, a *bot* who guides visitors around the island, a group of *bots* performing taichi, and a musician playing the *erhu*. In the business setting, a model guided scenario (described in this paper) has been developed, complete with scaffolding to support the learner through the scenario, and with links to the 2D web-based content. Exploration opportunities have been included in the scenario and in the broader *Second China* context. Additional elements of music and video are present and browsing opportunities and other multimedia elements continue to be integrated as the project progresses. A strong set of principles have been identified (authentic learning), and work is being done to drive development according to these principles. A peer review committee has been established and work has commenced on measurement and evaluation of the efficacy of the learning environment.

The use of 3D immersive environments for cross-cultural education shows much promise. The level of authenticity and interactivity reflected in the design of *Second China* (and other spaces) is unable to be matched in the regular classroom or on the 2D web. Such authenticity of context can only support the performance of authentic activities, therefore providing a powerful bridge between the traditional instruction and the real-life cultural context. We may already be at the point where we accept that the lines between classroom instruction and the virtual environment are blurred by educational applications of technologies like *Second Life* (Childress & Braswell, 2006). Our goal is to blur the lines between a virtual cultural experience and a real-life cultural context.

Continued development of the immersive cultural learning environment faces the challenges of harnessing the technology in a way that directly and indirectly supports educational objectives, of developing experiences in the virtual context that represent authentic experiences in the real life context, of packaging the learning experience in a way that motivates and doesn't overload, of developing meaningful and authentic opportunities for collaboration, reflection, and articulation, and of optimizing the affordances of the technology without losing sight of the central goal: the development of cultural awareness.

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