Multi-User Virtual Environments for the Classroom:

Practical Approaches to Teaching in Virtual Worlds

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Chapter 13
Immersive Education Spaces Using Open Wonderland:
From Pedagogy through to Practice

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ABSTRACT

This chapter presents a case study of the use of virtual world environment in UK Higher Education. It reports on the activities carried out as part of the SIMiLLE (System for an Immersive and Mixed reality Language Learning) project to create a culturally sensitive virtual world to support language learning (funded by the UK government JISC program). The SIMiLLE project built on an earlier project called MiRTLE, which created a mixed-reality space for teaching and learning. The aim of the SIMiLLE project was to investigate the technical feasibility and pedagogical value of using virtual environments to provide a realistic socio-cultural setting for language learning interaction. The chapter begins by providing some background information on the Wonderland platform and the MiRTLE project, and then outlines the requirements for SIMiLLE, and how these requirements were supported through the use of a virtual world based on the Open Wonderland virtual world platform. The chapter then presents the framework

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used for the evaluation of the system, with a particular focus on the importance of incorporating pedagogy into the design of these systems, and how to support good practice with the ever-growing use of 3D virtual environments in formalized education. Finally, the results from the formative and summative evaluations are summarized, and the lessons learnt are presented, which can help inform future uses of immersive education spaces within Higher Education.

INTRODUCTION

Judging by the growing interest in virtual world environments as reflected in computer-assisted language learning international conferences such as WorldCALL and EuroCALL, these applications are part of a group of emerging technologies that have great potential for foreign/second language learning. The shift in the use of the web from static to more interactive uses (the so-called Web 2.0) is reshaping the way we learn (Alexander, 2006). However, there is virtually no research to date to provide evidence of the specific traits and characteristics of technological applications such as virtual world environments that might contribute to the learning of second and foreign languages (L2).

In this chapter we present the findings from the SIMiLLE project. The problem we aimed to address in this project relates to the need to enrich foreign language learning experiences for overseas students who wish to study in a UK Higher Education Institution (HEI). By studying in the UK the students have the advantage of being immersed in the culture, but traditional classroom methods rarely take advantage of the cultural context to control the learning content (classroom learning by definition removes students from the 'real' world). Whereas outside of the classroom, students often cluster together forming linguistic or cultural islands, which are often isolated from their immediate cultural surroundings.

This chapter provides some background information on the technology platform used (Wonderland) and our previous project MiRTLE (Gardner, Scott, & Horan, 2008; Callaghan, Shen, Gardner, Shen, & Wang, 2010). We then describe the SIMiLLE project in more detail including the requirements for the project and how we intended to support best practice in L2 teaching and learning. This is followed by an overview of the design of the SIMiLLE systems and the evaluation frameworks used. We then provide a summary of the key findings from the different evaluation phases employed by the project. The ultimate objectives of this work were to improve the design of immersive education spaces, to assess and validate the effectiveness of different pedagogical approaches, and inform best practice in this emerging field. We hope to demonstrate that the lessons learned from the SIMiLLE trials go towards achieving these objectives.

BACKGROUND

The Use of Virtual Worlds in Education

In 2005, the international student population worldwide was 115 million, growing at a rate of approximately 15% per annum (Perkinson, 2006). Education is increasingly important in modern knowledge-based economies (Clarke & Callaghan, 2007) where learning is rapidly becoming a lifelong process. China is a good example of this rise in demand: it now has the largest higher education system in the world, awarding more university degrees than the US and India combined (Baker, 2007); university admissions in China have risen from under 10% of young people in 1998 to 21% in 2005 (Wang,

2007). This increase is equivalent to a growth rate of 30% per year since 1999 (Li, Whalley, Zhang, & Zhao, 2008).

The worldwide rise in demand for education, coupled with the rapid evolution of information technology, has led to new ways of learning and providing education. ELearning has been promoted by most education institutions and numerous corporations to facilitate better learning and teaching. Learning management platforms, such as Moodle[1] and Blackboard[2], have been in use for several years. Many on-line higher education institutions, such as the UK Open University[3] and the Hong Kong Open University[4], have developed and deployed their own eLearning platforms and infrastructure to provide adaptive and efficient eLearning services. ELearning has become learner-centered, emphasizing pervasive and personalized learning technologies (Thomas, 2008). As both traditional classroom learning and Web-based learning offer strengths and suffer from limitations, there is now a trend for eLearning systems to combine the strengths of the two into blended learning[5] (Kim, 2007). "Computer support for multifaceted communication can improve student learning when students use 3D chat rooms, blogs, and such interactive environments such as virtual worlds" (Dickey, 2005).

There is a great deal of interest in applying immersive virtual worlds to teaching and learning. Much of this interest has been caused by the success of commercial platforms such as the World of Warcraft (WoW)[6] for on-line gaming, and Second Life[7] for on-line social networking and e-commerce. These environments have a high level of realism and associated levels of engagement, as well as supporting and encouraging social interaction. The most commonly used virtual world used by educators seems to be Second Life, though several others are aimed at this sector, including Open Wonderland[8], Metaplace[9], Whyville[10] and Activeworlds[11]. Other virtual worlds, such as gaming worlds like WoW, have also been used for education. Examples of the use of virtual worlds in education include: Harvard Law School, running simulated law court rooms[12]; Hong Kong Polytechnic University School of Hotel & Tourism Management[13]; Edinburgh Masters course on eLearning[14]; Imperial College London Polyclinic[15]. To date, more than 100 HEIs are registered on Second Life.

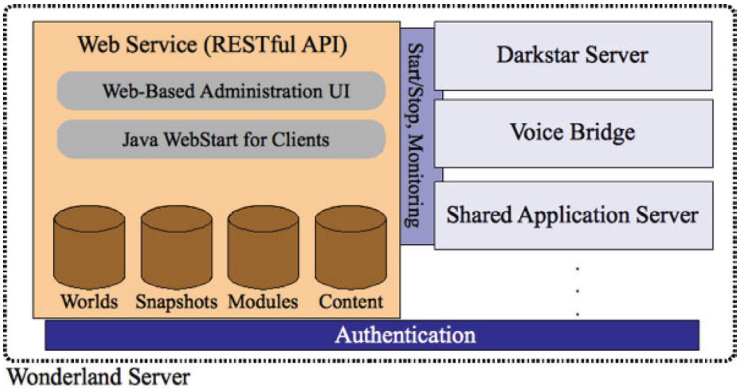
Open Wonderland

Open Wonderland is a cross-platform, open-source toolkit that provides a client-server architecture and set of technologies for building virtual- and mixed-reality environments. The toolkit is built on several technologies, including the Project Darkstar game server[16], jVoiceBridge[17] for adding spatially realistic immersive audio, and jMonkeyEngine[18] (JME) to generate a scene. There is an existing and growing tool chain around JME, including a Collada[19] loader—this is a benefit to Wonderland content developers, as it allows users to easily import 3D objects such as can be found on Google Warehouse[20]. Additional objects and components in the Open Wonderland toolkit (such as a camera device to record audio and video seen from a client) make use of other technologies, such as the Java Media Framework[21].

Open Wonderland provides a rich set of objects for creating environments, and supports shared software applications, such as word processors, web browsers, and document-presentation tools. For example, one or several users can draw on a virtual whiteboard and view PDF documents and presentations. A user, represented by an avatar, can communicate through the avatar to others in the world by means of a headset or microphone and speaker or by the use of a dedicated chat window for text messages. The scene generated by an Open Wonderland client can be viewed from a first-person or several third-person perspectives.

Figure 1 shows the Wonderland Server Architecture. It conforms to the Representational State Transfer (REST) style of architecture. A Wonderland client is run on a user's local PC.

Figure 1. Wonderland Server Architecture



This is achieved using Java WebStart[22], which (so long as the user has Java already installed) allows a user to access a web page to initiate the download and execution of the Wonderland client. The server may also be administered via the same web page. This enables the initial world to be selected, snapshots of the current world state to be taken and modules to be added and removed. Modules may be code that extends the core system's functionality such as an SVG Whiteboard, or artwork such as being developed for the worlds used by the SIMiLLE project. The administrative facilities also allow the Darkstar Server, Voice Bridge and Shared Application Server to be stopped and started together with their properties being set. The Darkstar server is an online games engine and the Voice Bridge provides the audio capabilities in world via Voice over IP with a selectable range of audio qualities. The Shared Application Server allows the in-world sharing of X11 applications such as Firefox and OpenOffice.

The development of the original Wonderland platform by Sun Microsystems was originally conceived as a tool to support collaborative working by Sun employees (Yankelovich et al., 2004). As such it had several clear design goals appropriate for our project:

- Focus on social interaction, formal and informal
- Strong sense of social presence, allowing for discussion of sensitive topics
- Spontaneous, unplanned interactions, particularly socializing before and after planned events to build trust
- Enhance communication during formal interactions
- Design for collaboration
- Seamless document sharing with no need to switch contexts
- Extreme extensibility
- Allow developers to add any sort of new behavior

As such the key strengths of the Open Wonderland toolkit can be characterized as:

- Live application sharing
- Integration with business data
- Internal or external deployment
- Darkstar scalability: from very large to very small implementations
- Open and extensible: 100% Java
- Cross platform: Windows, Mac OS X, Linux and Solaris
- Open source, open art path
- Audio (spatial) as a core feature with extensive telephony integration

Figure 2. MiRTLE. Lecturer's View of Remotely Located Students and Student's View of Lecture

a b

Wonderland is often compared to the Second Life platform. The Wonderland platform is primarily intended to be tailored and integrated by organizations within their own infrastructures, whereas Second Life is a publicly accessible online service with very large numbers of users who can make use of a virtual economy to organize their lives. Second Life has already been used extensively by teaching institutions to carry out online teaching (for example see [Robbins, 2007]). There is no doubt that Second Life has been used very successfully to support online teaching and learning. However, it does have several issues around its use, particularly concerned with the privacy and security for participants taking part in online sessions, and whether there are sufficient controls in place for organizations to use it as part of their formal teaching infrastructure.

MiRTLE

The objective of the MiRTLE project (Mixed Reality Teaching & Learning Environment) was to provide a mixed reality environment for a combination of local and remote students in a traditional instructive higher education setting. Figures 2a and 2b illustrate the virtual classroom from an early version of MiRTLE. The environment augmented existing teaching practice with the ability to foster a sense of community amongst remote students, and between remote and co-located locations. The mixed reality environment linked the physical world of the classroom with a virtual world for remote learners. MiRTLE was deployed across all the major server architectures, including Windows, Mac OS X, Solaris and Linux (Ubuntu). The key achievement was the successful demonstration of the concept of combining physical and virtual worlds into a single practical service. This was validated in several deployment scenarios and the final version of MiRTLE has been adopted by others around the world.

From the initial evaluations of MiRTLE at the University of Essex, a number of valuable issues were highlighted that have implications for future uses of this technology. It particularly highlighted potential social issues, such as the impact on student motivation and perceptions of crowding and jostling for position in the virtual classroom. The trial showed that there was potential for naturalistic and spontaneous social interaction between virtual and physically present students, which may increase a sense of presence for all involved. Teachers also recognized the potential value of this approach, and that, once students are logged on and settled, the MiRTLE environment had a minimal impact on normal learning patterns. A key finding was that spontaneous social interaction between virtual and physically present students was possible. It implies that MiRTLE facilitated a breaking down of the barriers between the virtual and the physical, allowing impromptu and naturalistic exchanges that are likely to increase a sense of presence for all involved.

SIMiLLE

The MiRTLE project was very much about emulating current teaching practice by modeling and augmenting existing teaching or lecture rooms. The SIMiLLE project took a different approach in that it looked to exploit one of the key features of virtual worlds, that of being able to simulate new and existing environments, which can enable effective teaching and learning to take place. One of the aims of the SIMiLLE project was to investigate the technical feasibility and pedagogical value of using virtual environments to provide a realistic socio-cultural setting and content for second/foreign language (L2) learning. It is recognized that optimum language learning occurs when the learner is immersed in the host culture. However, if students are given language-learning tasks to complete in the real (host culture) world, it is difficult for teachers to observe and assess progress. On the other hand, the traditional approach is for students to act out their simulations or role-plays in a classroom setting that is removed from the everyday cultural milieu. The problem for English as a Second Language (ESL) learners based in their home country on distance learning programs is even greater, with no access to the cultural milieu at all. In both sets of circumstances a virtual world that reflects features of the host cultural environment and supports a range of potential everyday language learning interactions could provide a valuable medium for achieving ESL teaching and learning outcomes.

The SIMiLLE project explored the technical viability and pedagogical value of such an approach by building a virtual world for L2 language learning using the Open Wonderland platform.

Requirements

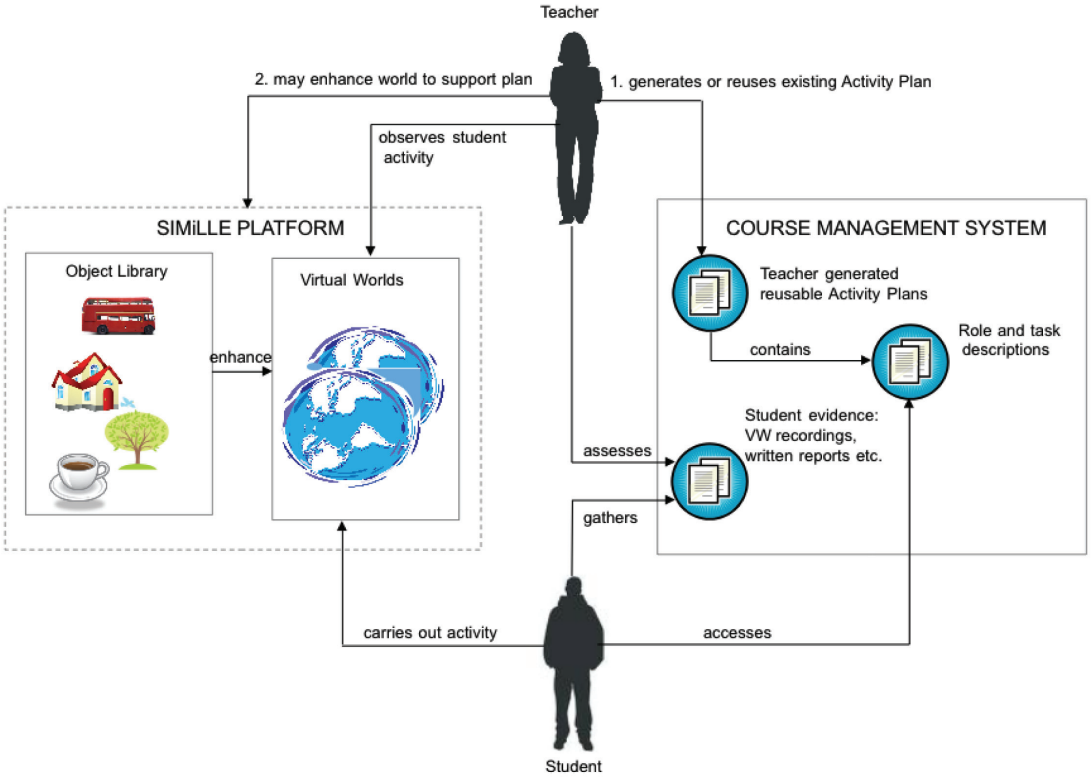
User needs for SIMiLLE were gathered through several workshops and discussions with key stakeholders. As one aim of the project was to evaluate the pedagogical value of virtual worlds for language learning, it was important that the system and processes envisioned in the scenarios were based on specified teaching and learning outcomes drawn from the Common European Framework of Reference for Languages: Learning, Teaching, and Assessment[23] (CEFR). It was also important that the system supported real-world classroom practice. This implied the need to elicit both the dynamics of classroom practice; for example, how simulation and role play activities are embedded in the class format, how many students are in a typical class, how many students each activity involves, how long the activity lasts for, the teachers role in the activity etc.; and, the pedagogical perspective: the types of teaching and learning objectives the activity is designed to achieve, how the activities are developed, documented and assessed, what standards it is based upon, what type of virtual world activities are useful and help to develop the desired language competence.

The resulting SIMiLLE scenarios reflect three different user perspectives. Scenario 1: the teacher perspective, considers the practicalities of creating and managing virtual world activities that meet specified teaching and learning objectives. It includes proposals for documents and processes, such as the Activity Plan and the Role Outline, that support in-world simulation activities for a class of around 16 students. Scenario 2: the classroom learner perspective, considers the experience of the student taking part in the in-world activities designed by the teacher. This includes being briefed about the roles s/he will play within the activity. Finally, scenario 3: the distance learner perspective, considered the experience of learners enrolled on on-line courses from remote locations.

Supporting Practice

To support the use of SIMiLLE in everyday classroom practice, it was necessary to provide a framework to help teachers define the learning outcomes for the Virtual World (VW) activities they design. The framework produced was based

Figure 3. SIMiLLE Concept



on discussions with teaching staff and details drawn from both the CEFR and related local syllabus documents.

At the conceptual level SIMiLLE is envisaged as an open and flexible platform containing multiple resources for teachers to develop and refine their own learning scenarios; enhance virtual worlds with supporting objects; and observe student interactions. It is language independent allowing the creation of multiple worlds to reflect various cultural contexts. Students are able to access the virtual world to carry out tasks, assume roles, make recordings and/or produce written evidence according to teacher instruction. As simulation or role-play activity is embedded within classroom practice, SIMiLLE is seen as working in conjunction with Course Management Systems (CMS) such as Moodle, which support document handling and student-teacher communication. Figure 3 provides an illustration of the overall concept.

The process of developing learning activities within the virtual world starts with the teacher generating an Activity Plan (similar to a lesson plan) based on their desired teaching and learning outcomes. A new learning activity/scenario may imply the need for new objects in a particular virtual world. For example, if the scenario required students to post a letter and no post box object existed in the specified world, the teacher would be able to access the object library and update the world with a suitable virtual artifact. Activity plans are stored on the CMS making them available for reuse or modification.

The Activity Plan contains task and role descriptions for groups of students (possibly for the whole class). As part of the project we produced templates for these documents to enable teachers

to easily plan for new teaching activities using the SIMiLLE platform. When the activity is due to take place, the students access their task and role descriptions on the CMS and then enter the world to carry out the activity. The teacher may be in the virtual world at the same time observing student interactions and making in-world recordings. Similarly the students may be required to record some or all of their activities as evidence or for personal reflection. Alternatively they may be required to produce written reports as evidence. Any such files would be stored on the CMS allowing the teacher to assess progress.

The SIMiLLE concept has the potential to address three different contexts of use:

1. As part of a classroom activity involving all class members with a teacher present in both the real and virtual worlds
2. Outside the classroom but with the teacher present in–world
3. As a space for independent activity with no teacher presence

Design

The Virtual World requirements for SIMiLLE were realized using the Open Wonderland toolkit version 0.5. The toolkit provides the capability to build a world that has immersive audio and provides the ability to share desktop applications. It is an extensible system enabling users and developers to create their own worlds and add new features to the worlds in the form of modules. The virtual world supports a range of language learning competences and skills (e.g. listening and spoken interactions) as well as providing a realistic and meaningful representation of British life within the capabilities of the technical platform. Representations of British life are provided by offering a variety of contexts in which interactions can take place. These contexts include a coffee shop, a train station, a travel advice center/travel agents, a bank and a post office. Within each of these contexts a number of objects were required to facilitate the learning activities. Teachers and Students have the ability to adopt a particular persona as required by the learning activity. Example personas identified in the project scenarios included:

- Bank Teller
- Post Office Teller
- Ticket Sales Clerk
- Train Travel Information Advisor
- Travel Agent

In addition, the Moodle Content Management System (CMS) at the University of Essex was used as a repository for all the support resources required for the project trials. These included:

- Activity Plans
- Role outlines
- Teaching support material
- Online help and support materials for the SIMiLLE users (e.g. user guides)

For the trials the use of the Wonderland virtual world was scheduled as part of a planned teaching activity, which was described and supported on a Moodle course page. Hyper-links were used to allow users to seamlessly launch the Wonderland virtual world from a link embedded on an activity description on Moodle, with all staff and students taking part in the SIMiLLE trials being provided with account login information to allow them to access the core Moodle course website.

One of the strengths of the Wonderland platform is the ability to drag content (documents) from the PC desktop into a Wonderland world. These documents are then presented as objects within the 3D world. Any Collada compliant object can be imported and viewed within the world. This feature supported one of the scenarios identified in the requirements, which was the ability for teachers to customise the virtual world with new objects. A useful repository for publicly available Collada content is the Google Sketchup 3D

warehouse[24], which contains thousands of freely available content objects.

The virtual world was constructed using a collection of 3D objects. These were uploaded into the world and positioned where required. Also shared applications were placed in world to support the local context or task requirements (e.g. a web browser was used to access a crossword that was completed collaboratively by the students). The initial models for the world were created using Google SketchUp. These were then exported into either Collada format as.dae files or Google Earth format as.kmz files, which Wonderland can import. The world itself consists of a village and a representation of part of the University campus. The village contains a Railway Station, Post Office and Restaurant. The campus contains a Post Office, Bank, Shop, Travel Agent, Restaurant and Lecture Theatre.

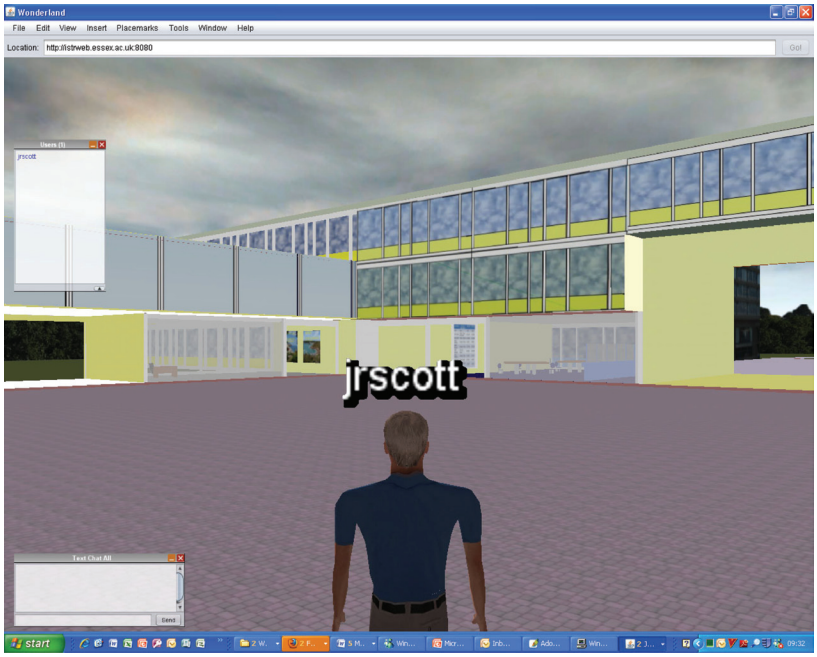
Figures 4 and 5 illustrate screens from SIMiLLE with an avatar firstly standing in the virtual University of Essex campus and then in the Village.

EVALUATION

The framework for the evaluation of SIMiLLE was underpinned by theoretical and methodological considerations reported in research on related fields such as general education, e-learning, computer-assisted language learning (CALL), and more specifically, computer-mediated communication (CMC). In this context, a core goal of the SIMiLLE project was to contribute to the body of research aimed at identifying and exploring the specific traits and characteristics of technological applications such as Virtual World environments that might contribute to the learning of second and foreign languages.

The importance of providing instructed L2 learners with opportunities to engage in interaction and activities that can prepare them for 'real-life' communication has long been recognized by language educators. For the last 30 years, computer applications have increasingly permeated and transformed L2 learning and teaching by providing a new dimension and opportunities for students

Figure 4. SIMiLLE Virtual University of Essex Campus



to interact and communicate with other learners and with native speakers. Furthermore, "there is a substantial body of data that indicates that student perceptions of CALL are on the whole positive" (Felix, 2008: 156). However, the nature and complexity of this field can result in a tendency to shape pedagogical practice driven by technology, which might have not been adequately researched. We are therefore, challenged "to integrate technology appropriately into our practice… and this requires reflection, research, and innovation" (Gillespie, 2008: 122).

As outlined in previous sections of this chapter, the problem we aimed to address in this project related to the need to enrich foreign language learning experiences for overseas students who wish to study in a UK HE institution. Second language acquisition (SLA) research indicates that certain conditions need to be met for L2 learning to be successful (Ellis, 1994, 2005), for example:

- Learners need to be exposed to the target language, i.e., comprehensible, rich, and varied input.
- Learners must have opportunities to produce the target language, e.g., comprehensible output.
- Learners need to be able to negotiate meaning and use the target language in a social, authentic context.
- Intercultural and pragmatic aspects have to be addressed in order to help L2 learners become competent L2 users since language is embedded in specific cultural and communication contexts.

A key issue, therefore, for materials designers, foreign/second language tutors, and SLA researchers alike is to establish the extent to which specific CALL applications can support the above conditions. CALL evaluation, however, has historically lacked 'methodological rigor' (Reeder et al., 2004, p. 258), an essential issue we need to address if we want to be able to provide our

Figure 5. SIMiLLE Virtual Village

learners with robust L2 learning materials. To this goal, the SIMiLLE evaluation was informed by data gathered by means of both introspective and empirical techniques. Furthermore, the evaluation cycle of the project included the analysis of processes and outcomes during the formative and summative stages of the virtual environment evaluation, an approach which is not normally adopted in CALL evaluative frameworks despite its importance (Reeder et al. 2004, p. 260).

The two phases – formative and summative cycles – of the SIMiLLE evaluation process addressed two general evaluation criteria:

A. Delivery/interaction issues, i.e. the virtual world environment as such (what participants think about it, their experience, motivation, ease of use, etc.). This type of evaluation primarily used judgmental evaluation methods (e.g. pre and post questionnaires and focus groups).
B. Knowledge gains in terms of content knowledge (e.g. socio-cultural knowledge: life on campus, life in Britain, academic life) and, importantly, in terms of second language learning gains, were assessed by means of micro-genetic analysis of interaction. Data collection methods included observations, in-world recordings, and audio recordings.

More specifically, and taking into account the evaluation criteria highlighted by Chapelle (2001), we aimed to determine the value and potential of SIMiLLE to support L2 learning with respect to: (a) practicality and acceptability issues; in other words, it is necessary to determine the potential of this environment for the implementation of pedagogic tasks designed to enable the type of interaction identified as supportive of second language acquisition; (b) authenticity; this issue involves two fundamental aspects: on the one hand, the interaction between the pedagogic tasks offered by means of the virtual world environment and the type of tasks L2 students need to carry out in non-pedagogical contexts, and on the other hand, the extent to which students are able to see that connection; (c) learner fit; this criterion refers to the appropriateness of the tasks in relation to the students' age, computer experience, needs, and so forth, as well as establishing whether or not the difficulty level of the SIMiLLE tasks is appropriate for the learners to increase their L2 ability; this issue is closely related to (d) L2 learning potential; that is, we need to determine the extent to which SIMiLLE and the pedagogic tasks implemented in this environment provide opportunities for learners to achieve the tasks and L2 learning objectives, e.g. in relation to interaction, collaboration, co-construction of knowledge, focus on form and meaning, etc.; finally, (e) impact, which refers to the overall learning experience undergone by the students and includes the extent to which the environment supports learner autonomy or the ability for students to exercise control over the environment, resources, and language. These five issues were addressed in relation to the virtual world environment, the pedagogic tasks, and the students' performance while carrying out the tasks. The SIMiLLE evaluation cycle comprised of a mixed methods approach to data collection and analysis in order to gather introspective and empirically based information.

Participants

The participants were student volunteers (N =11) and a language tutor recruited at the University of Essex. Five students participated in the formative phase of the evaluation trial. They were all speakers of English as a foreign language at upper intermediate level. The participants' mother tongue included Arabic, Turkish, and Thai.

For the summative evaluation phase, six students and their class tutor volunteered to participate. The students were enrolled in a general English course at intermediate level (level B1 according to the CEFR). The participants' mother tongues included Arabic and Chinese.

All participants were computer literate, but none of them had any prior experience of using 3D virtual world environments.

Data Gathering Instruments and Procedure

Data was gathered in a sequence of three sessions for the formative evaluation phase and four sessions for the summative evaluation trial (see Table 1 – the figures indicate the allotted time in minutes allocated to each task).

Data Analysis Procedure

Data gathered through the sequence of sessions summarized above provided the raw information for analysis. The information gathered by means of the various questionnaires was collated and analyzed primarily to investigate students' perceptions about the environment and their experience while carrying out the tasks. The questionnaires also provided information about the relationship between the students' background and computer familiarity and their personal evaluation of the activity while interacting on SIMiLLE.

Observations of students' interaction while carrying out the tasks (i.e., screen recordings) and the focus groups audio recordings were analyzed qualitatively.

Main Findings

a. *Practicality and acceptability:* SIMiLLE appears to be a suitable environment for the satisfactory implementation of this type of task and the identified drawbacks did not have a substantial effect on the participants' views about the environment.
b. *Authenticity as perceived by the participants:* Some students described SIMiLLE as a "realistic environment" and some said

Table 1. Summary of data collection procedure and timing for the formative evaluation (FE) and the summative evaluation (SE)

Session A	**Timing**	
	FE	SE
(1) Consent forms	5'	5'
(2) Biodata and computer use/CALL/elearning/VWs experience/history questionnaire	10'	10'
(3) Task (1): SIMiLLE familiarity training provided by (a) written instructions sheet; and (b) training task	90'	40'
(4) Training feedback questionnaire to gather information about 3a and 3b	15'	10'
Session B		
(5) Participants carried out Role-play task – their interactions were recorded using screen capture software.	45'	45'
(6) Post-task questionnaire	12'	10'
Session C		
(7) Participants carried out Treasure Hunt task – their interactions were recorded using screen capture software.	N/A	30'
(8) Post-task questionnaire	N/A	10'
Session D		
(9) Focus group session – audio-recorded	42'	35'

The sessions took place in a computer lab where participants were able to log in to SIMiLLE. The researchers were present during the sessions and technical support was available when needed.

that the tasks carried out in-world could "prepare them for real-life interaction" in similar situations. Nonetheless, a student identified certain disadvantages of interacting in SIMiLLE such as increased difficulty in turn-taking since body language and facial features which normally empower face-to-face interaction are difficult, if not impossible, to simulate.

c. *Learner fit:* Students found both tasks "useful", "good for variety", "useful for practice and vocabulary" and to "increase their confidence in speaking". Nonetheless, pedagogical tasks must be carefully fine-tuned to students' L2 learning needs and linguistic ability in order to provide students with an adequate level of demand and challenge to maximize opportunities for L2 learning. This is particularly important in an environment such as SIMiLLE where learner autonomy is an important factor for students to feel at ease while completing their language tasks.

d. *L2 learning potential:* The tasks provided learners with opportunities to practice listening, speaking, reading and writing in the L2 as well as opportunities to work on vocabulary. Participants also engaged in negotiation of meaning; they had opportunities to pose questions, make requests, ask for information, clarification, and practice functions such as agreeing and disagreeing. Importantly, the participants considered the experience in SIMiLLE highly relevant for their L2 development. Furthermore, the video recordings provide specific examples of language related episodes (Swain & Lapkin, 1995) such as work on vocabulary items, e.g., spelling the word 'dungeon' and collaboration to help a partner get to a place by giving directions in the L2.

e. *Impact:* Participants felt very comfortable interacting and using SIMiLLE and praised their overall experience with the environment. They found their work during the trials very relevant for their L2 learning. On the negative side, the students listed the following as some problematic issues which need to be addressed: prolonged delays, e.g., waiting for avatars to download and/or move; limited number of places to visit in-world; and the visual quality of the world. These limitations were mainly due to the Beta quality of the Wonderland toolset being used and external project constraints.

In conclusion, the participants identified the following characteristics as contributing to a positive experience:

- The training documents were useful and helpful in enabling independent use of the world.
- SIMiLLE has the potential to help students learn about UK cultural aspects.
- Both tasks were perceived by the participants as activities that can prepare them for their stay in the UK.
- The environment has the potential to simulate real places.
- They found the opportunity to use in-world applications such as sticky notes and the Web browser motivating and potentially useful.
- They also considered the 'sharing' of those applications an asset to promote interaction.
- The use of avatars might help 'shy' students to interact more freely than in a face-to-face situation.
- The use of avatars can help individuals to 'explore different identities'.

Aspects which still need to be improved include:

- Training documents need to be enhanced by increasing the use of visual support, for example by producing videos dem-

onstrating the basics of using SIMiLLE and interacting in this 3D virtual world environment.
- A 'trouble-shooting' sheet could be prepared to support teachers.
- It is essential that teachers are aware of the options available to them to follow and monitor students as effectively as possible since this is of paramount pedagogical importance.
- Visual aspects of the world can be enhanced.
- Work on the delivery of a more stable platform.
- Improve downloading time.

The Teacher's Perspective

With regard to SIMiLLE as a teaching environment, the participating teacher considered it a potentially useful tool to help language tutors increase interest levels and modify the pedagogic approach in the L2 classroom. She also thought that working in this kind of environment might help increase motivation levels which, in turn, can make the target language more memorable for students. Importantly, she felt that the students were freer in their speaking and were able to focus on communication to a greater extent because the use of avatars decreased the potential stress associated with making errors. In other words, anonymity would give students more confidence and be more adventurous while communicating in the L2. She considered the fact that body language and facial expressions are very limited in SIMiLLE might prove to be an asset because students would need to be more accurate with their language – particularly pronunciation – to be understood by their partners.

The only drawback reported by the teacher was the issue of monitoring. She found the world a restrictive environment for this task and reported that finding students was not always easy. Finally, the fact that students can be located in different parts of the 3D world, might hinder the ability to help all students. This can be particularly important with large numbers of students.

CONCLUSION

This chapter has described work on the SIMiLLE project using a virtual reality environment (Open Wonderland) to support teaching and learning for second language learning. This was built on previous work on the MiRTLE project that explored how the same platform could be used to augment existing (generic) teaching practice (i.e. lectures). The approach we took in designing the SIMiLLE immersive education space was rooted in the clear pedagogical needs of teaching second and foreign language learners. The role of the virtual world in this instance is to provide a rich environment for learners to practice their skills in a variety of realistic settings, and allow teachers and learners to configure the environment and to record and playback their experiences for further reflection and review. A key issue we addressed was in supporting the best practice and processes involved in using this new type of environment. As part of this we have developed template activity plans and role outlines which teachers could use to structure their teaching sessions, and we integrated this and the virtual world within the University of Essex course management system (Moodle). We also described a range of formative and summative evaluation activities, which have been used to assess the effectiveness of this approach, and to validate the pedagogical approach being used, and inform best practice in this emerging field. Overall the outcomes from the SIMiLLE trials were very positive. This is particularly encouraging considering the relative immaturity of the virtual world tools being used. With the support of the open source community we hope to see drastic improvements in the reliability, scalability and usability of these systems in the future. What we hope to have demonstrated

by this work is the need for a clear pedagogical framework that informs the usage of these virtual world tools. This needs to include the development of appropriate tools to support the design of effective learning activities (for example, activity plans and role outlines), and be underpinned by effective training and support materials. We believe that this is critical to the successful use of and ultimate widespread adoption of virtual worlds within formalized education in the future.

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ENDNOTES

1 http://moodle.org/
2 http://www.blackboard.com/
3 http://www.open.ac.uk/
4 http://www.ouhk.edu.hk/
5 Blended learning is the process of incorporating many different learning styles that can be accomplished through the use of 'blended' virtual and physical resources.
6 http://www.worldofwarcraft.com/
7 http://www.secondlife.com/
8 http://www.openwonderland.org/
9 http://www.metaplace.com/
10 http://www.whyville.net/
11 http://www.activeworlds.com/
12 http://slurl.com/secondlife/Berkman/69/54/24/
13 http://slurl.com/secondlife/Polyusotel/114/158/26/
14 http://slurl.com/secondlife/Vue/205/53/30
15 http://slurl.com/secondlife/HealthLands/94/109/31/
16 RedDwarf is the official community fork of Project Darkstar: http://www.reddwarfserver.org/
17 http://jvoicebridge.dev.java.net
18 http://www.jmonkeyengine.com/
19 https://collada.org
20 http://sketchup.google.com/3dwarehouse/
21 http://java.sun.com/products/java-media/jmf
22 http://java.sun.com/javase/technologies/desktop/javawebstart/index.jsp
23 http://www.coe.int/t/dg4/linguistic/CADRE_EN.asp
24 http://sketchup.google.com/3dwarehouse