



Access to Virtual and Action

Learning Live Online

Project Number: 143643-LLP-1-2008-UK

Grant Agreement: 2008 – 4833 / 001-001

Sub-programme or KA: KA3-KA3MP

The AVALON Project and Second Life – The analysis and selection of a virtual world for language learning and teaching

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Education and Culture DG

Lifelong Learning Programme

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1. Introduction

The evolution of technology and its impact on educational pedagogy has given rise to the possible wide-spread use of 3D virtual worlds (VWs) for serious learning. The aim of this report is to explain the rationale behind why Second Life (SL) was selected as the environment for the delivery of materials and training in the AVALON project.

This report describes the AVALON project and its goals and why virtual worlds are a viable tool for education, specifically focusing on language learning. It goes on to describe a taxonomy of virtual worlds and key virtual worlds for each type relevant to the AVALON project are briefly reviewed. The main criteria for choosing a virtual world for the project are then outlined and the virtual worlds meeting these requirements are compared and the final selection made.

2. The AVALON project

The AVALON project (Access to Virtual and Action Learning live ONline) is a two-year project funded by the European Commission as a part of the Education and Culture DG Lifelong Learning Programme. This project aims to:

- create and test out exemplar tasks and activities designed to promote communication amongst the learning community. These materials will be based on work being carried out currently and these tasks and activities will be located in linked 2 & 3D environments and will be made available for future users. These will be accompanied by best practice guidelines for the users.
- create and pilot a training course for teachers who would like to extend their e-learning skills to include virtual teaching worlds. This course will run for the first time during the project and will be offered after the project has finished as an extension of the LANCELOT School as a separate validated and internationally recognized qualification. The materials for running the course will also be available for any other enterprise wishing to run the qualification. 2 & 3D materials will be stored for future users.

Creating the materials and training course will involve a broad sample of the target language learning and teaching communities. This will lead to a further promotion of the benefits of the use of 3D worlds in the development of real world language skills. It will also feed back its results and findings into the wider 3D educational community.

More information about the AVALON project can be found at <http://www.avalonlearning.eu> and <http://avalon-project.ning.com>.

3. Virtual Worlds in Education

Virtual worlds, also known as multi-user virtual environments (MUVES) and massively multi-player online role-playing games (MMORPGs), are three-dimensional digital environments which can be described as "networked desktop virtual realities in which users move and interact in simulated 3D spaces" and where "users are represented as individual avatars which both represent users in the 3D environment, and allow them to interact with other avatars and the environment" (Dickey, 2005:439). Book (2004:2) adds that they are characterised by a shared social space, a graphical user interface, real-time interaction, user-generated content, persistence, and active support for in-world social groups. The "massively multiplayer" designation is related to the characteristic of "scalability" - the capability for thousands of geographically dispersed users to be online at any one time, thus allowing for unprecedented possibilities for social interaction. VWs are defined as being persistent as the world continues to exist even without the presence of users and objects and constructs remain where they are left.

In education, an increasing amount of research is being done on the uses of VWs (Ingram, Hathorn & Evans, 2000; Steinkuelher, 2004; Childress & Braswell, 2006; Hayes, 2006; Delwiche, 2006; Whitton & Hollins, 2008; Livingstone, Kemp & Edgar, 2008). According to this research, there are many reasons to adopt virtual worlds as a learning environment. One of

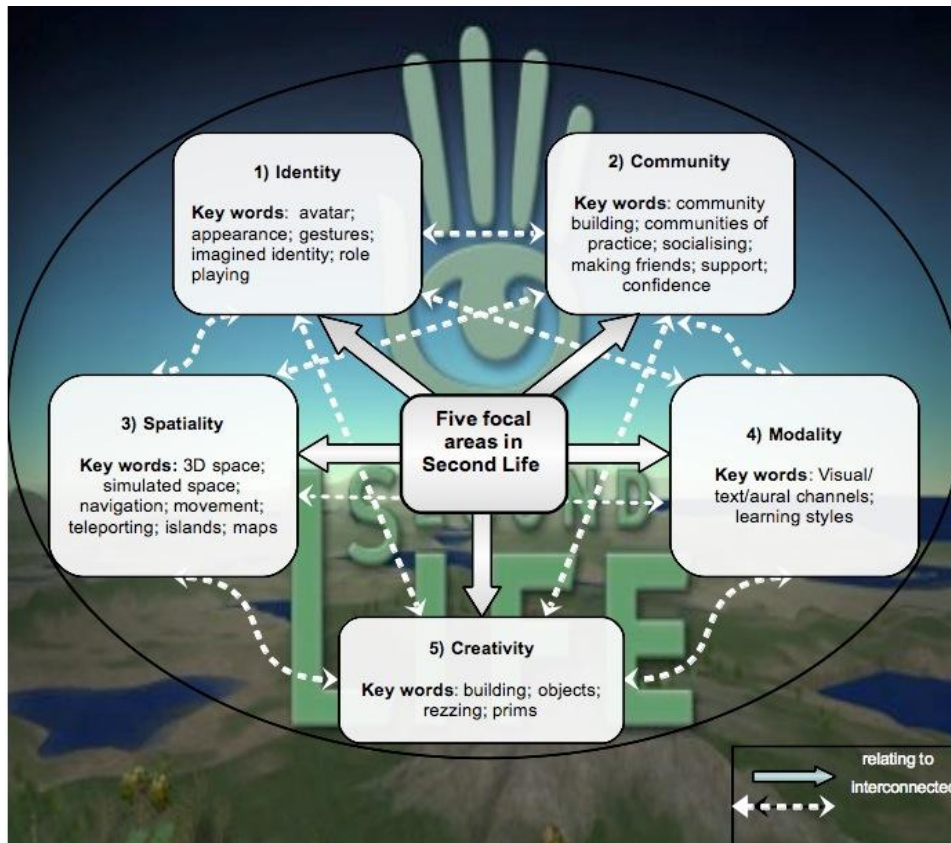
the foremost, is that 3D VWs provide an appropriate space for learning that is in socio-constructivist paradigm. Constructivism is based on the belief that "learners are active constructors of knowledge who bring their own needs, strategies and styles to learning, and that skills and knowledge are best acquired within realistic contexts and authentic settings, where students are engaged in experiential learning tasks" (Felix, 2002:3). Social-constructivism builds on this notion by emphasising that for learning to take place, there must be social interaction between the learner and others, or a "socially and culturally situated context of cognition, in which knowledge is constructed in shared endeavours" (Duffy & Cunningham, 1996 in Felix, 2005:86). VWs are a more sophisticated incarnation of the completely text-based Multiple User Domains Object Oriented (MOOs) and Multiple User Dungeon (MUDs) which are online VWs where gamers role-play in order to solve logical problems. Dickey (2005:440) notes that VWs "afford the communicative and constructivist opportunities of text-based, chat-type applications such as MOOs", but with the added benefit of a 3D interactive environment similar to virtual reality, which according to Winn (1993), "allows first-person experiences by removing the interface that acts as a boundary between the participant and the computer" and "allows us to construct knowledge from direct experience, not from descriptions of experience". Childress & Braswell (2006:189) state that VWs "provide educators with opportunities to develop learning activities which closely replicate real-world learning experiences previously available only through face-to-face interaction". Furthermore, sophisticated simulations can now be done in a safe environment where no one can get hurt and things that would be impossible or impractical to do in real life, such as simulating medical rescue after an earthquake are now possible within a VW due to its ability to be sculpted to take on the characteristics of any environment, limited only by the designer's imagination and building skill. The Horizon Report (2007:25) has suggested that VWs provide a medium for multi-disciplinary learning that stretches across the curriculum and indeed, skills applied in the VW such as leadership, management and learning about foreign cultures or languages can be applied in the real world. De Freitas (2008a:6) adds through VWs:

Structure for learning is no longer posited through knowledge acquisition. Instead, we have the real capability to offer very practical engagement and social interactions with realistic contexts, to offer conceptual experimentation and to create role-plays...and more textured use of information to scaffold learning.

The socio-constructivist learning approach and the creation of social communities, which are integral to VWs and allow for authentic social interaction and knowledge sharing alongside the multitude of possible learning scenarios are strong factors for why they may be used for learning and for language learning in particular, which is discussed in the following section.

The sense of belonging to a virtual community, known as "social presence" (Garrison, Anderson & Archer, 2000:89) is defined as "the ability of participants in a community to project themselves socially and emotionally, as 'real' people, through the medium of communication being used". The use of avatars to represent users in VWs provides a higher level of social presence, or co-presence, than in text-based environments, as an avatar is a visual representation of the user, which according to one study (Bailenson, Yee, Merget & Shroeder, 2006:3), continues to follow real life social norms such as interpersonal distance and eye contact. In VWs, it is this concept of avatars and presence which may lead to more realistic embodied experiences and authentic social interaction.

The potential for using avatars to feel immersed in a virtual world, is closely linked to the concept of 'Identity' – the ability, through avatars, to project one's real life (RL) physical and personality traits into the virtual world, create a completely new persona or have a hybrid avatar, with a mix of the real and the desired. Identity is one of five areas of potential that constitute the AVALON framework (AVALON, 2010) for using virtual worlds in education, the others being 'Community', 'Spatiality', 'Modality' and 'Creativity', as identified in the following figure:



The AVALON framework of 5 potential areas for education in Second Life

4. Virtual Worlds and Language Learning

You cannot have multiple users in an environment and not have some kind of resulting communication between them. The communication may be non-verbal through gestures, appearance, or battle.

Robbins (2007:27)

Some representative research has been done in the area of communication in VWs in an attempt to analyse the forms of communication in and with virtual environments, including Manninen's (2003) use of Habermas' communicative action theory (Habermas, 1984 in Manninen, 2003) and Squire's (2002) use of Engeström's activity theory (Engeström, 1999 in Squire, 2002). Robbins (2007:27), in her paper on developing a taxonomy of digital spaces, lists the modes of communication between avatars in a virtual world as being:

- Non-verbal : avatar posturing, avatar appearance, movement, non-verbal, sound effects;
- Verbal : text-chat, private instant messages, group instant messages, voice-chat.

In most virtual worlds, avatars are capable of producing non-verbal cues such as gestures, postures and facial features that give insight into their users' state of mind, thereby adding an extra level of realism and approximating the virtual experience to a face-to-face (F2F) experience. The main mode of communication in virtual worlds is via text-chat. Motteram (2001) and Jepson (2005) have argued for the use of chat as an effective social tool and Smith (2003) and Warschauer (1996) add that it resembles F2F interaction in that it may carry the same language development benefits such as negotiation of meaning and repair moves. Boellstorf (2008) also notes that in order to develop linguistic competency in Second Life, it is necessary to gain the skill of following and disentangling multiple streams of chat, as well as

learning how to code-switch between public chat and private instant messaging. Boellstorff (2008:155) comments on the lingua-franca status of English in SL:

Some non-native speakers of English enjoyed its ubiquity because it allowed them to practice English in an environment where grammatical and environmental errors were the norm.

This illustrates how virtual worlds can be used for authentic communication without the self-conscious fear of error, which is found in real life social situations and in the language classroom and works as barrier towards foreign language learning. Vickers (2009) suggests that because a virtual world naturally allows for situated, or "just in time" learning, it allows for "language emergence", where "students create their opportunities for language use and language learning". In his study, Jepson (2005) argues that voice-chat may allow for language production that is more authentic due to the more common use of repair moves. Most 3D virtual worlds have, for some time now, implemented the use of voice-chat, although it is still not used by all avatars, possibly because of the need for extra equipment and set up time in addition to the technical problems it may bring or poor sound quality. Rufer-Bach (2009:122) goes on to explain that there may be more practical reasons for not using voice-chat, such as not wanting local real life (RL) noise to be overheard, wanting to maintain the in-world persona (eg. looking like a man, but being a woman in RL, although the use of voice-morphing in Second Life may change this). Other reasons include that wandering avatars will overhear the audio, which may not appeal to more self-conscious users and the fact that many non-native speakers of a language, may have better writing skills than speaking skills in that language and so will prefer to use text-chat.

For the most part, research on language learning in virtual worlds has focused on the social aspects of virtual worlds, which allow for language acquisition and skills practice through authentic language use (see Vickers, 2007). Research is now being done which specifically looks at teaching and learning languages in VWs through virtual instruction (Salt et al, 2008; Savin-Baden et al, 2009; Kern, 2009; Deutschmann, Panichi & Molka-Danielsen, 2009; Molka-Danielsen & Deutschmann, 2009)

5. A Taxonomy of Virtual Worlds

Virtual Worlds have evolved quite significantly from their initial existence as completely text-based MUDs and later two-dimensional graphic incarnations. The current generation of VWs being used in education are three-dimensional and offer environment and object interaction through the use of 3D avatars. There are currently hundreds of active 3D virtual worlds and many more are continually being launched (and being shut-down as well). However, a large number of these forthcoming and existing VWs are MMORPGs, also known as Game Worlds, which despite being the most popular virtual worlds in terms number of users, they offer more specific and limited learning scenarios compared to those VWs with a more social/communicative focus.

In order to more easily compare the characteristics of 40 virtual worlds, de Freitas (2008a) decided upon 6 different typologies:

- Role-play worlds
- Social worlds
- Working Worlds
- Training Worlds
- Young Worlds
- Mirror Worlds

These are the subcategories of what she calls "Serious Virtual Worlds", which she describes as being "virtual worlds for educational useas opposed to leisure-based" (2008a:4). It is her belief that if VWs are used in education,

learners, through greater empowerment, may play a different and enriched role in the process of forming collaborative learning experiences and engaging in activities which may support their own learning and meta-reflection.

de Freitas (2008a:4)

We will now examine the six typologies and their characteristics:

Role-play worlds, such as World of Warcraft and Entropia Universe, are MMORPGs - game-based VWs, which have a specific reason for existing and a goal, which players are expected to play towards. Furthermore, there are rules and points systems, which are often the main focus of game-play. They are theme-based and cannot be modified to accommodate alternative learning scenarios. However, many of these games have millions of active users and social interaction is a necessary part of the game play. In addition, many of these worlds have their own economies and the buying and selling of items in order to increase one's in-world and real world wealth is a major factor for their popularity. While management, social skills and economics may seem like the primary areas of education which can be focused on in these worlds, there is still a social aspect to the games, which may lead to language learning through social communication.

Social worlds, such as Second Life and Active Worlds, are open-ended and exploratory and have as their unofficial 'goal' to essentially allow users to do what they normally do in real life - socialise, build objects and buy and sell goods. However, the world is created by its users, who are given the opportunity to become someone else entirely by changing their name, image, personality and even gender. They are not 'games' as they do have set rules nor a specific goal, and as such, offer a very flexible and community-rich sandbox with which to implement learning tasks. The possibility of interacting with hundreds of people from all over the world, allows for the sharing of culture and authentic communication and language use, making social worlds invaluable environments for language learning.

Working Worlds are corporate virtual meeting places such as Sun Microsystem's Project Wonderland and IBM's Innovate Quick Internal Metaverse Project. Having recognised the affordances VWs offer for communication, collaboration and sharing, these and other large and successful corporations have chosen to develop their own worlds to allow for training, document sharing and staff meetings to be held in a secure environment, inaccessible to the general public and completely tailored to fit their unique business needs. While the level of customisation available to the owner of such a platform is limitless, the costs involved in setting up and maintaining a working world can often only be afforded by companies that are spread around the globe and will recoup their investment by reducing the amount of travel costs of its employees. However, the technology to build these environments are now being made available as open-source software, giving educators with access to the programming skills necessary to use it, the possibility of creating their own worlds for learning and teaching.

Training Worlds, similarly to working worlds, are private and built for the specific purpose of providing a simulated 3D space for training (often with licensed VW building software platforms such as OLIVE). The medical and military fields are making the most use of these training worlds as the simulations that can be created are very realistic and allow for training to be replicated as it would happen in life-threatening and life-saving situations. A successful example of a military training world is America's Army - an extremely realistic military simulation used by the US Army to aid in recruitment. Again, as with working worlds, these training worlds are very costly to develop and maintain, however, the quality of the simulations and the flexibility of customisation is very high. On the other hand, because they are private spaces, the social community is limited to those who specifically use it (as with working worlds) and this limits the quantity and variety of social encounters, lowering the chances for language learning through authentic communication.

Young Worlds, such as Whyville and Habbo, are virtual worlds developed for use by young children and teenagers under the age of 16, with content and security tailored to suit this specific user base. There are 2D, 2.5D and 3D worlds, and most have cartoonish avatars,

contrary to the mostly realistic avatars found in adult-focused VWs. Because of issues related to security, safety and the obvious limitations encountered by having an age restriction, these worlds have not been considered for the AVALON project.

Mirror Worlds, according to de Freitas (2008), are “quite literally worlds or 3D visualisations that mirror the physical world”, which use “geo-spatial databases and mapping services”. The most famous example of this type of world is Google Earth. However, despite being considered a virtual world, they do not fill in the basic requisites of a VW that can be used for language teaching as described in the AVALON project (e.g. 3D environment, use of avatars, communication tools, etc), and so will not be considered. The criteria used to select the most adequate virtual worlds for the AVALON project will be defined in Section 7.

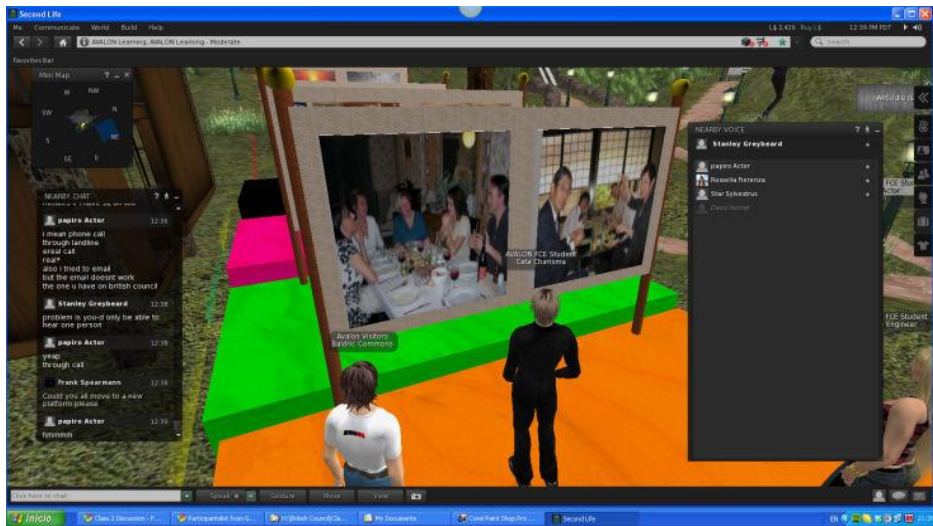
6. Reviews of key virtual worlds

In order to select the most adequate environment for the AVALON project, the following VWs were considered and evaluated, as prime examples of their virtual world type.

Social Worlds:

- **Second Life**

Second Life, launched by Linden Lab in 2003, is the most popular of the Social Worlds, with the largest active user base and the most active educational community. Open to users over 18 years of age, it features a detailed 3D environment and avatars, voice and standard text communication tools (chat, IM) and it is a social network, with groups and information and object sharing. One of the highlights of SL is the ability to build objects, which are completely owned by their creators. Indeed, most of Second Life itself was created by its users and being a social world, with no stated ‘goal’, this creation of objects and locations is one of its main activities. SL also has a vibrant economy with an enormous market for clothes, accessories, homes and diverse items including educational tools. The environment is completely customisable to fit a land owner’s needs. However, although land may be made private (accessible only to those who belong to a group), visitors may still access the land adjacent to the private parcel, making it an unsuitable environment for the exchanging of sensitive information. There are workarounds, however – such as locating a meeting space hundreds of metres up in the air, where most avatars cannot easily reach. SL is free to use, but users have the option of paying a small monthly fee in exchange for a parcel of land where they can build a home and become a ‘resident’. More serious building projects require the purchasing of an island and the payment of a monthly rental fee, in addition to the initial terra-forming and design and building costs. There are many top universities and educational organisations with a presence in SL, as well as countless classes and training sessions being run daily on a number of different subject areas. Although SL is proprietary software, Linden Lab has released the source code leading to the creation of many open-source tools and viewers by the user community. Of further importance, open-source implementations of SL-viewer compatible worlds now exist in the form of OpenSimulator and its users and the educational community surrounding it are growing quickly. For the moment, however, the still small number of spaces and the vastly inferior size of the user community of these open-source implementations make Second Life a better choice for projects dependent on large scale social interaction and support from the already established educational community.



Second Life

- **Active Worlds**

Active Worlds was launched in 1997 and works much in the same way as Second Life. Although it is free to use with the limited 'tourist' account, paying the a small monthly fee allows one to become a 'citizen', entitling them to features such as having a unique name, unrestricted access to any part of any world, the ability to customise their avatar and to build and own constructs, and access to social networking features such as voice chat, IM and file sharing (tools which are usually offered for free by default in most other social worlds). For users needing more control over their environment and more privacy, personal firewall-protected Universes are available for enterprises and educational projects. These are separate worlds from the main universe and are priced starting at \$2400. A separate set of worlds and a community for educational projects is also available named Active Worlds Educational Universe and boasts over 80 participating organisation. Despite this, Active Worlds is often disregarded in favour of Second Life, especially with regards to educational projects.



Active Worlds

Role-Play Worlds:

- **World of Warcraft**

World of Warcraft (WoW), launched in 2004, is by far, the most popular MMORPG in the history of gaming. With over 12 million registered users and new game expansions released on a regular basis. It is a quintessential MMORPG in that there is an established theme – in this

case, fantasy and the players create characters with a race, class and stats to represent their fighting abilities. In addition to the aim of going on quests and defeating adversaries in order to level up in experience, leading to better weapon and spells, there is an overarching narrative, which allows players to feel they are part a grand plot. WoW also has its own economy, and the buying and selling of items found in the world is a major part of the gameplay. Being a game-based world, it is not possible to customise the environment or build simple objects. While seemingly having limited educational potential, a large body of research has focused on WoW and other MMORPGs, specifically looking at how they can be used to offer insight into social skills and social learning, management skills, economics and language learning (Kadokia, 2005; de Freitas, 2006a; 2006b; 2008b; Warmelink, 2007; Facer et al, 2007; Wagner, 2008) . To play WoW, the user needs firstly, to purchase the software package on DVD and then pay a monthly fee for access to the game servers.



World of Warcraft

- **Entropia Universe**

Entropia Universe, launched in 2003, is science-fiction themed MMORPG where the main focus of the game is to make money – which can be exchanged for real-world currency, being the first VW to implement game world/real world financial transactions. Indeed, its website states:

Entropia Universe is a unique blend of online-based entertainment, e-commerce and social interaction where participants from all over the world can meet and participate in a variety of activities that provide them with the potential for earning money while they play.

To play the game and make money, 'colonists', as players are called, start off with virtually only the clothes on their backs and must do quests or take on jobs in order to build their wealth. Choosing a profession will then lead to skills upgrades and more money to be spent on equipment and items, which can then be traded and sold. However, to really progress in the game, real world money needs to be invested early on to purchase better equipment. Entropia Universe is known for its stunning graphics and lag-less environment. Communication in the game is done through text-chat and only recently through voice-chat, however using this costs a small in-game currency fee. Like other MMORPGs, there is the potential for language learning through simply communicating with other players and reading informational texts throughout the game.



Entropia Universe

Virtual World Platforms (used to create Working and Training Worlds)

The following environments are not virtual worlds per se, as they do not start off with inhabitants nor content. Instead, they are platforms used to create private virtual worlds, which can then be filled and populated. The advantage of creating a world with one of these platforms is that the world can be made separate from other environments and if run from behind a corporate firewall or directly from a user's machine, complete privacy and security are assured. The disadvantage in relation to running educational projects is that the learning spaces, objects and tools need to be created from scratch, entailing expenditure of time and money. Furthermore, language learning potential is limited because of the small number of users and in-world content in comparison to full-scale social and game-based worlds. However, building environments for teaching through virtual instruction is one of their strong points – mostly dependent on the skill of the programmers.

- **Open Wonderland**

Formerly known as Project Wonderland, this platform owned by Sun Microsystems was left without funding when Sun was acquired by Oracle. However, the Wonderland user community has continued to support and develop the platform. It is an open-source JAVA platform and based on a modular building process. All content is created outside of the platform with existing graphics and modeling software. The platform offers a complete set of communications tools, including voice-chat in CD-quality stereo sound and even the possibility to voice-chat over a phone line. Worlds built with the platform are private and secure and can be used behind a corporate firewall. Applications and document sharing is also one of its strong points, allowing for the drag-and-drop of a document directly into the environment and subsequent collaborative editing in the virtual world and in the real world simultaneously. Tools and applications can be designed and built to any specification, however advanced knowledge of JAVA is necessary. Because these tools will need to be developed from scratch, this will require some investment of time and resources.



Open Wonderland

- **Croquet Project**

Similar in ideology to Open Wonderland, The Croquet Project, based on the open-source open croquet software development kit (SDK) is now being continued using the also open-source open-cobalt software platform. Like Open Wonderland, open cobalt is free and is platform independent, running the also open-source Squeak programming environment. The platform allows for text and voice chat, video chat and web browsing. Croquet's strong point is its ability to merge virtual worlds with typical video conferencing to create a unique environment. It is also possible to directly drag and drop 3D objects created in external software and other media files into the environment for instant sharing and editing. Croquet also allows programmers to make changes in the environment in real time without needing to reboot the system. As the platform does not run on a single server, but on the users own machine, there are no costs involved in running the software. However, like Open Wonderland, the creation of any object, tool or location requires advanced programming experience – in this instance, of the Squeak language.



Croquet

- **OLIVE**

The OLIVE platform, designed by Forterra Systems and recently purchased by SAIC, has been mainly used by corporations or governmental agencies that want to produce high-quality training simulations. Although the OLIVE environment includes the basic communications tools found in other VWs, the main advantage it brings in comparison to other worlds is the quality of the graphics, mainly with regards to how avatars move and make gestures. Another difference is the look of the world itself, as it eschews the fantasy, futuristic and tropical themes found in the better known social worlds. The worlds created by OLIVE are private and secure, thus ruling out chance encounters with wandering residents, which in conjunction with the previous points, limits its use for language learning through authentic social communication. However, as it is mostly marketed as simulation software, very detailed and realistic role-play scenarios can be designed for language learning, but this will be a very costly endeavour as the platform is not open-source.



OLIVE

7. Criteria for selection for AVALON

The criteria used to select the VW to be used in the AVALON project were based on the following factors, in line with the aims of the project:

General factors

- Age – the AVALON project is targeting language teachers and adult language learners.
- Affordable within AVALON budget and also beyond the funded stage of the project –
- the purchase and monthly rental of land, terra-forming and design and implementation of the AVALON space needed to be within the available budget and needs to be sustainable when the initial funding ceases.
- Connectivity – it was deemed that the majority of the target audience would have access to high-speed Internet connections and relatively recent computers.
- Multi-platform software – considered to be an advantage, allowing for the participation of non-Windows users.
- Software fully functional or in beta, or in danger of being discontinued – beta software or environments known to be closing down in the future would not be worth the investment of time and resources.
- Paid or free to use – if the environment involves the payment of a monthly subscription by its users, this might well put off interested participants and complicate the registration process (as well as adding to the budget). Free to use environments would clearly be preferred.

Education readiness

- Existing educational community – this would be advantageous in that the environment would already have been tried and tested for this purpose and the community would have already published research papers and developed pedagogies. Being able to share ideas and materials and work with experienced members of the community would also be a great boon to the project.
- Prior familiarity with environment/contact with educational community – experience of using a particular VW by the AVALON project partners would allow for a more informed choice and contact with members of that educational community would make future support and collaboration possible – a definite advantage to the project.
- Strong and active community of users – an environment with an already established base of active users can be understood as a testament to its usability and lasting appeal. The existence of users also gives a sense of ‘population’ and ‘not being alone’, in this way intensifying the sensation of immersion and sets up an environment where language learning through social interaction may take place.
- Existing user-content – linked to the criteria of an existing educational community/strong community of users; learning tools, objects and locations which have already been created in the environment can be used and re-used and will not need to be re-invented – thus saving time and money, while taking advantage of the imagination and skill of the original builder.
- Existing marketplace for tools/objects – being able to procure and purchase already made educational tools would save the project team time and money in having to design and develop them themselves.
- Communication tools (voice, chat, IM) – these basic communication tools are essential for language learning in an immersive environment.
- Ability to build (user-created content) – being able to build and own the creations allows users to interact directly with the world and change it. Unleashing this creative element can lead to learning opportunities.
- Customisation of avatar – the concept of identity, can lead to a deeper sense of immersion, thus facilitating the learning/teaching process. Furthermore, shy or less communicative learners are given the opportunity to create a new persona and be someone else, in this way, perhaps finding new avenues for communication and learning.
- 3D vs 2D – A strong sense of immersion and social presence would require a 3D environment and 3D avatars that can move within and interact with this environment.
- Proprietary/Customisable environment – given the multitude of possible scenarios needed to facilitate language learning, proprietary environments would naturally limit the possibilities of creating new scenarios and discovering and modifying already existing ones. A customisable environment is essential.
- Able to interface with external apps (internet, etc) – being able to integrate the Internet and already existing documents (text docs, images) with in-world tasks is essential so as to save time and work from re-creating materials, as well as extending the users desktop into the VW and extending the VW into the WWW.
- Game design vs open design – game-based VWs cannot usually be modified, while open VWs can. Additionally, each has different areas for learning that can be exploited. Open design worlds have the particular potential for large scale language learning through social interaction (if there is a large user base).
- Creation of Groups (and other Social Networking features) – from a language learning perspective, being able to join groups can strengthen the sense of belonging to the virtual community and opens up possibilities for communication with other users of shared interest. From a teaching perspective, being able to create groups can significantly facilitate teacher/student communications and allows selective permissions to be given to large numbers of learners at once.
- Economy driven – These VWs might be very good for learning about business and managing resources, but might not be the best for language learning due to the amount of focus on buying/selling and not doing other things.

Note: It was deemed that students participating in the project would be over 18 years of age. As a result, no Young Worlds were considered. It was also assumed that students would have access to high-speed Internet connections and relatively recent computers, able to handle high-quality 3D graphics. Thus, in order to achieve the greatest sense of immersion, only virtual worlds in 3D environments were considered. Therefore, Mirror Worlds and the factors of age, connectivity and 3D were disregarded when making an initial choice amongst the selection of VWs.

8. Comparison of selected virtual worlds

In order to more succinctly compare the affordances of the key virtual worlds reviewed in Section 6, the data has been tabulated into two sections: General Criteria and Education Readiness.

General Criteria

Virtual World	Affordable	Multi-Platform	Free to use	Open/game design	Private/Public	Graphics quality	Economy Driven	Text chat	Voice Chat	3D/2D	Fully Funct
Second Life	yes	yes	yes	open	public	v. good	some	yes	yes	3D	yes
Active Worlds	no	no	limited	open	both	good	no	yes	yes	3D	yes
Open Wonderland	yes	yes	yes	open	both	v. good	no	yes	yes	3D	yes in dev
Croquet	yes	yes	yes	open	both	v. good	no	yes	yes	3D	yes in dev
OLIVE	no	yes	yes	open	private	excellent	no	yes	yes	3D	yes
World of Warcraft	yes	yes	no	game	public	excellent	some	yes	yes	3D	yes
Entropia Universe	no	no	yes	game	public	excellent	yes	yes	paid	3D	yes

Education Readiness

Virtual World	Prior familiarity	Educational community	Active user community	Customisable environment	Can build content	Can add own content	Can script cont	Can use existing content	Market of tools and objects	Can customise Avatar	Web linking	External documents	Group
SL	yes	very strong	very strong	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
AW	some	some	some	paid	paid	paid	yes	yes	no	yes	yes	yes	paid
OW	some	some	no	yes	yes	yes	yes	no	no	no	yes	yes	no
Croq	some	some	no	yes	yes	yes	yes	no	no	no	yes	yes	no
OLIVE	no	no	no	yes	yes	yes	yes	no	no	no	no	yes	no
WoW	no	no	very strong	no	no	no	no	in-game	in-game	limited	no	no	limited
EU	no	no	strong	no	in-game	no	no	in-game	in-game	limited	no	no	limited

The results of the comparison show that:

- Purchasing a private world in Active Worlds, OLIVE and Entropia Universe is beyond what can be afforded in the AVALON budget.
- Open Wonderland and Croquet are the cheapest options as they are open-source. However, costs to code environments, objects and tools might be significant.
- Active Worlds and Entropia Universe are Windows only, thus reducing the potential of the project to reach a wide range of participants.
- Active Worlds and World of Warcraft require monthly fees to use without limitations.
- The non-social worlds - World of Warcraft and Entropia Universe, are proprietary and game-based and thus cannot be modified to suit the tailored needs of a learning environment, but can be used for learning skills inherent to the game world (by playing).
- Of the non-game-based worlds, Second Life has the largest active user community, and the largest educational community.
- Only Second Life and Active Worlds have access to a large number of already built locations, scenarios, objects and tools.
- Only Second Life has a marketplace for objects and tools (with a wide variety of educational tools available).
- Second Life, Active Worlds, Open Wonderland and Croquet allow for web access in-world and the use of external media and documents.
- Only Second Life allows for total customisation of avatars and complete social networking tools with the free user account.

Taking into account the main issues of affordability, existing educational community, large active user base, ability to interface with external media and ability to build and re-use existing content, the following three virtual worlds were shortlisted for use in the AVALON project:

- Second Life
- Open Wonderland
- Croquet

From this, it was clear that only a social virtual world (or platform to build one) would allow the flexibility needed to craft different learning scenarios and learning/teaching tools. Furthermore, and importantly, the fact of there already being communities of educators working in these worlds would allow for future collaborations and knowledge sharing – one of the initial aims of the AVALON project.

9. Virtual World showdown: Second Life, Open Wonderland and Croquet

Deciding between these three environments required considering, amongst other factors, their stability and quality of the platform interfaces, the size of their user communities, the availability of content within them and whether the platform would continue to be supported and used in the medium to long term future. These points are summarised in the following table:

Virtual World	Pros	Cons
Second Life	<p>The community using and supporting SL is enormous and is constantly growing.</p> <p>Interfaces are open and stable, and a lot of open source code is available.</p> <p>A wealth of content is already available saving on development time.</p> <p>It is widely used by educational institutions (including Harvard Law School).</p>	<p>Browser was unstable, but has greatly improved with Viewer 2, which now has the ability to add a web texture to any object.</p> <p>Proprietary voice system (not open source).</p> <p>Interfacing restrictions in protocol, volume, frequency.</p> <p>Small fee required to upload textures and sounds.</p> <p>Poor performance in crowded areas.</p> <p>Simplified graphical model (but recently improved with lip synching).</p>
Open Wonderland	<p>Java based, very stable and scalable.</p> <p>Can run private worlds.</p> <p>Powerful interfaces, easier to integrate than Second Life.</p> <p>Small but vibrant community.</p>	<p>Not much content or support available - thus more expensive to use.</p> <p>Still in development.</p> <p>Requires expensive Java programming to create environments and objects.</p>
Croquet	<p>Smalltalk-based open source - easy to program.</p> <p>Allows for peer-to-peer worlds, which may dynamically grow.</p> <p>Mature and stable technology.</p>	<p>Very small community.</p> <p>Almost no content - thus very expensive to use as learning environment.</p> <p>Still in development.</p> <p>No digital rights management or permission systems.</p>

Second Life, Open wonderland, Croquet: Summary of Pro and Cons

Despite the growing interest in the open-source platforms of Open Wonderland and Croquet, there is no denying the advantages that Second Life brings with regards to established social and educational communities. Not only do we hope to make contact with other educators working in virtual worlds, but it is hoped that students who visit these social spaces will use language for authentic communication with other users. For this to take place, there needs to be a large community of users. Second Life also clearly has more content available for educational purposes. The ability to re-use environments and objects will save a tremendous amount of time and effort. Although Second Life does fall behind the others in terms of stability, it is hoped that this will improve in future updates. Additionally, open-source implementations parallel to official releases of Second Life viewers and tools will guarantee that Second Life will not disappear very soon.

Having analysed all the data collected on these three environments, it was agreed that Second Life was the best option to implement language learning and teaching scenarios in a virtual world as it completely filled all the requirements specified by the AVALON project.

As a result of this final decision, the tools to be used by the AVALON project would therefore be:

- Second Life for a 3D environment
- Moodle for a Learning Management System (LMS)
- Sloodle for 2D / 3D integration

10. Recommendations for future study

The virtual worlds mentioned in this report were analysed from a language learning/teaching perspective. Second Life fits the needs of the AVALON project, however, projects focusing on other areas of education would need a different set of criteria in order to be able to choose the most adequate VW. Game-based worlds, Young Worlds and Mirror Worlds all offer different affordances for different learning scenarios and should not be disregarded at a glance.

The value of using VWs in education is increasingly reaching a larger number of educators and with the wide variety of open-source platforms now available, it is only a matter of time before they become as ubiquitous in learning and teaching online as the web itself.

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