Creating Machinima Empowers Live Online Language Teaching and Learning

1.2 Language Learning Framework for the Use of 3D Virtual Environments and Machinima

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Description: The document will provide a framework for foreign language instruction, foreign language learning, and participant interaction in 3D virtual learning environments. It will clarify and frame the linguistic contexts which could be used in filming the *machinima* for classroom application.

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List of Abbreviations

3D VW	Three-Dimensional Virtual World
CALL	Computer-Assisted Language Learning
CMC	Computer-Mediated Communication
ILS	Immersive Learning Simulations
IVW	Immersive Virtual Worlds
MUVE	Multi-User Virtual Environment
SL	Second Life®
SLTs	Simple Learning Technologies
VE	Virtual Environment
VIRDA-MS	Virtual Reality Dyslexia Assessment-Memory Screening
VLE	Virtual Learning Environments
VW	Virtual World

1. Introduction

3D virtual learning environments (VLE) could be classified as an application of computer-assisted language learning (CALL). According to Kluge and Riley (2008, p. 128), VLEs are regarded as “multi-user virtual environments (MUVE)”. Warburton (2009) considers Second Life® (SL) as the most popular 3D environment used in education compared with other virtual learning environments. Since Linden Lab started Second Life® in 2003, more than 36 million accounts have been created to date (Linden Lab, 2014). This document provides a framework for foreign language instruction, foreign language learning, and participant interaction in 3D virtual learning environments. It aims to clarify and frame the linguistic contexts which could be used in filming the machinima for classroom applications. It includes sections on the history of machinima, the evaluation of machinima in learning environments, the potential of task-based language learning approaches and machinima, and content and language integrated learning (CLIL).

1.1 3D Virtual learning environments

It is argued that virtual environments and virtual reality technologies should be defined as “a computer-generated display that allows or compels the user (or users) to have a sense of being present in an environment other than the one they are actually in, and to interact with that environment” (Schroeder, 1996, p. 25 in Warburton, 2009, p. 415). Edirisingha, Nie, Pluciennik and Young (2009, p. 459) indicate that “a 3D MUVE, such as SL, has the potential to generate a sense of presence among peer learners via their avatars in a 3D environment through real-time interactions that may facilitate relationship-building, learners’ engagement and motivation”. Learners could be present in the environment by creating a new identity in the form of an avatar (Ushioda, 2011). Falconer (2012, para 1) takes this even further by demonstrating that learners can be present in two places at once in such environments. She argues that the “advent of virtual worlds has provided another interface we can now inhabit; that between the virtual and the real. And, particularly, that the notion of in-betweenness becomes significant when virtual worlds are used for education through simulations of real life experiences and activities.”

The first step to access a virtual world is to choose and create your avatar. Although appearances can always be changed later, users generally put a great effort into their first choice of avatar. Savin-Baden (2010) states that the majority of users chooses a beautiful, young avatar. In order to give her students the feeling of difference she challenged them to change gender, use wheelchairs or become an older person and to explore reactions and

acceptance in VWs. As a consequence this process produced a memorable and powerful learning experience for her students.

Sant (2009) distinguishes between two basic performance types we present ourselves in VWs: “role-play” and “real-play”. The choice of appearance, how we wish to be perceived by others and how we perceive ourselves, already reveals something about ourselves. Some people like to choose an unusual, maybe even eccentric avatar or different gender from their real-life (RL) appearance, whereas others choose avatars that represent how they wish to look like in real-life which both reflect the “role-play” performance type suggested by Sant (2009). A number of users choose their avatar according to the resemblance to their looks in real-life representing the “real-play” performance type (Sant, 2009).

Because of the anonymity of their avatars language learners feel less inhibited or stressed and may engage more in a virtual learning environment than in the physical classroom (Chang, 2005; Ushioda 2011). Consequently, learners tend to take more risks and get more actively involved in their tasks and thus support their language learning progress (Peterson, 2010, p. 274).

According to Coffman and Klinger (2008, p. 30), a learning platform like Second Life®, for example, serves as a “student-centered virtual learning platform” as it supports individualized learning by giving students the opportunity to choose and develop their learning content.

Even though virtual worlds enable the use of body language for the avatar, such animations often do not look natural. However, in spite of the lack of natural body language and facial expressions in virtual communication, virtual worlds offer unique experiences and opportunities for language learners to practice various skills almost simultaneously as they can read, take notes, share them, have them corrected, speak with others, and listen to others and text chat. All of these activities which would not be possible in a physical learning environment to such an extent (De Jong Derrington, 2013).

Virtual worlds offer learners the opportunity to communicate in real-time, interact, socialize and collaborate (Edirisingha et al., 2009). Furthermore, learners can immerse themselves in the virtual world through role-playing, experiential learning, cooperative learning and game-based learning (Warburton, 2010; Salmon, 2009). Applying a constructivist learner-centred approach (Can, 2009; Kluge & Riley, 2008), allows learners to determine their own learning process and progress. Such a task-based learning approach (Peterson, 2010) provides a great variety of opportunities to learn in authentic, communicative situations, practise reflective thinking and intercultural learning when working in international

groups and not just learn isolated vocabulary, linguistic structures or grammar (Trowbridge, 2013).

3D virtual learning environments are “open access technology platforms where a community of participants create the content of the virtual world” (Molka-Danielsen, 2009, p.). Virtual worlds can be constructed, owned, changed and developed by the “content and objects that are created by the learner” (Keskitalo et al., 2011; Salmon 2009). Learners can design and construct the environment in collaboration with others by determining scenarios, own what they create and construct the knowledge with their own initiative. In this respect, learners may relate better to the content, objects and fellow learners in ways which enable them to be more active and independent in the learning process (Kluge & Riley, 2008). Applying the “learning by doing” approach gives learners the opportunity to create their learning content, design objects collaboratively and foster and engaging learning process.

1.2 Facilitating language learning in virtual worlds

Language learning requires learners to be exposed to rich, comprehensible, varied and compelling linguistic input (Krashen, 2014). Learners need to exploit the foreign language in social, authentic and meaningful contexts in order to individually and autonomously negotiate meaning and produce comprehensible output. Not only grammatical competence but intercultural and pragmatic competences need to be employed in the learning of the target language (Ellis, 2005).

To facilitate the above mode of instruction in foreign language learning virtual worlds could bring new opportunities to the field of foreign language learning. For example, as Warburton, 2009, p. 421) indicates, virtual worlds and Second Life® provide learners with:

1). “Exposure to authentic content and culture”, which could also facilitate exposure to authentic language use;

2). “Visualization, contextualization and simulation: the production and reproduction of inaccessible content” in real life, which could facilitate comprehensible and compelling input;

3). “Extended or rich interactions, identity play and community presence: opportunities for social interaction between individuals and communities, human–object interaction and also intelligent interaction between artefacts”, which could help learners use the language for negotiation of meaning;

4). “Immersion in a 3D environment where the augmented sense of presence, through virtual embodiment in the form of an avatar and extensive modes of communication, can impact on the affective, empathic and motivational aspects of the experience”, thus enabling learners to experience the language in its very authentic and natural environment;

5). “Content production: opportunities for creation and ownership of the learning environment and objects within it that are both individual and owned”; this could help learners with the personalization of communication and to develop autonomy in learning the target language.

1.3 How to deal with challenges that can occur when working in virtual worlds

Kluge and Riley (2008) distinguish between challenges for students and educators. They believe “robust hardware and a broadband Internet connection, liability issues like being subjected to sex, violence, or disruptive players” are the biggest challenges for students who want to participate in virtual classes. Apart from technical issues like bandwidth problems a number of educators might not have the skills to create and design the learning environment. Cost is another challenge facing educators, and many of the features of the Learning Management Systems (LMS), such as reporting the amount of time spent in the virtual world or storing the grades earned and homework to be reviewed later do not exist.

Warburton (2009) reports a survey of newsgroups, blog posts and the extant literature from Warburton and Perez-Garcia (2009) where they discovered eight broad categories impacting on the field:

1). Technical issues are either computer related like bandwidth, hardware and firewalls or server issues like down time and lag, or use-related issues like navigation, creating objects, manipulating one’s avatar.

2) Identity issues like the freedom to play with identity and manage reputation can become an issue of concern, and accountability for actions may become displaced.

3) Culture issues like sets of codes, norms and etiquette for joining communities.

4) Collaboration issues like the need to build trust and authenticity while cooperating. As a result and because of a minimal social network scheme operating within the virtual learning environment, external services such as wikis, blogs or a virtual learning environment (VLE) are often needed to support the interactions between avatars.

5) Time constraints in relation to validating, running and teaching activities. Checking object permissions, intellectual property rights and accessibility also require a lot of instructor time.

6) Economic issues are also important. Even though the basic account access to Second Life® is free, many other functions such as buying land to build, creating teaching spaces or uploading images and textures require extra funds that teachers may not have available to them.

7) Standardisation remains a problematical and challenging area given that there is little interoperability between various virtual platforms.

8) Social discovery issues such as when avatars remain trapped at the center of their own community provide limited mechanisms for the engaging other people, unlike other social networking services such as Facebook.

2. Other virtual worlds

There are a range of other virtual worlds and environments in addition to Second Life® worthy of consideration in the context of language learning environments. The following list describes a number of the most important ones currently being used by educators:
OpenSim (http://www.opensimulator.org) or *OpenSimulator* is an open source multi-platform, multi-user 3D application server. It can be used to create a virtual environment (or world) which can be accessed through a variety of clients, on multiple protocols. It also has an optional facility (the Hypergrid) to allow users to visit other OpenSimulator installations across the web (otherwise known as the Metaverse) from their 'home' OpenSimulator installation.

There (http://www.there.com/) is a social virtual world where people go to spend time with friends, meet new ones, and have fun in a 3D environment. *There* was created to take online communication to a new level, allowing people to incorporate emotion, body language, and even voice into real-time communication with one another as in real life.

Olive (https://www.leidos.com/products/simulation/olive) is a powerful, dynamic software platform that enables customers to deploy their own persistent and secure 3D virtual worlds where users can train, collaborate and rehearse using realistic human avatars in customised terrain over computer networks. *Olive* provides a video game-like 3D user interface with access to a variety of functionality and rich media. *Olive* virtual worlds bring together physical presence, action, voice, data and media in a realistic, context-specific simulated environment.

Twinity (http://www.twinity.com/en) is an online, immersive and connected virtual environment that complements and amplifies the interests of the youth demographic by focusing on music, pop culture, fashion, celebrities, self-expression, communication, community and social networking. *Twinity* makes it possible for media partners and brands to connect with this influential demographic in a compelling and interactive social entertainment world.

Entropia Universe (http://www.entropiauniverse.com/) is an advanced 3D online virtual environment with a developed planetary system and one universal Real Cash Economy system. Each planet offers a wide variety of exciting entertainment. You can travel between the planets through space and socialize with people from all over the world. It does not cost anything to join and there are no subscription fees.

Open Wonderland (http://openwonderland.org/) is a Java open source toolkit for creating collaborative 3D virtual worlds. Within those worlds, users can communicate with high-fidelity, immersive audio, share live desktop applications, and collaborate in an education, business, or government context. *Wonderland* is completely extensible; developers and graphic artists can extend its functionality to create entirely new worlds and add new features to existing worlds.

Active Worlds (http://www.activeworlds.com/) offers a comprehensive platform for efficiently delivering real-time interactive 3D content over the web. Activeworlds' 3D content is dynamic, visually compelling and most importantly provides users with a richer, exciting online experience.

3. Machinima

The word "machinima" is a neologism derived from combining the words "machine" and "cinema". Middleton (2008, p. 216) defines Machinima as "self-contained, highly granular digital videos". Machinima are digital visual narratives that are produced by dint of real-filmmaking techniques in a studio-like environment (mostly in an interactive multi-user virtual world) where software tools and resources are available to help to develop original digital content. Machinima are able to "represent any conceivable object or sequence or event, while incorporating rich narrative structures, as well as graphical and text-based content, using visual and aural modalities through images, music subtitles and voice-overs" (Morozov, 2008, p. 9). Machinima, whether they are seen as new media genre, a form of digital literacy or semiotic (e.g., symbolic, representational) domain, can be seen as a

medium of creative expression where “anybody can record and edit unique visual experiences incorporating 3D character models and objects, set designs, graphical textures, camera angles, special effects, weather filters, custom lighting … with unlimited variations on plot, settings, and characters (Morozov, 2008 p. 5899).

Dellario defines machinima as “filmmaking within a real-time, 3D virtual environment. In an expanded definition, it is the convergence of filmmaking, animation and game development. By combining the techniques of filmmaking, the flexibility of animation production and the technology of real-time 3D game engines, Machinima makes for a very cost- and time-efficient way to produce films” (in Spiller, 2004, p. 3). The term is also defined by machinima.com as “a portmanteau of ‘machine’ and ‘cinema’ and refers to the process of creating real-time animation by manipulating a video game’s engine and assets. This classic form allows users to explore, create, and connect with their favorite games in new ways. In the same vein, machinima is devoted to taking entertainment to all-new levels and capturing fans’ imaginations”.

Machinima production first emerged in 2001 in the gaming community and has since been featured in film festivals and other public presentations. Films are made by orchestrating and recording avatars and objects in real-time. The avatars, animated 3D representations of people or other beings, are manipulated as virtual puppets (Lowood, 2006) by real people through computer interfaces. Regarding machinima as a kind of media which is produced in virtual worlds, the term encompasses the re-use of existing media objects as well as the production of new objects by staff, students, technicians, or external suppliers. The value of the media is found in its currency, authenticity, specificity, repeatability and occasionally in its constructionist value (Kafai, 1996; Papert, 1986), rather than in its production value. The asynchronous nature of the machinima produced in virtual worlds heightens their potential learning impact by letting the student-user determine their timely application (Middleton, 2008). In this respect, machinima could be used to enhance new ways for language instructors to create their own learning materials. Lombardi (2007) notes that developing authentic learning activities enriches learning and that such activities need not be limited to real-life locations and practice, as authenticity can also be found through the design of blended learning environments, an area which Yoon and Lim (2007, p. 475) describe as “a purposeful mix of delivery media” (in Middleton and Mather, 2008, p. 207).

Many of the factors and methods used for the production of machinima are based on the traditional art and science of cinematography. The traditional medium of filmmaking is an elaborated art form and diverse factors affect the final product. Factors include “the visual

attention of the viewer, the appearance, facial expression and gestures of the characters when they are talking, the duration and placement of each scene in the overall composition, the camera angle and focus, lighting, the mood of the surroundings, the soundtrack and considerations relating to ambient noise (Morozov 2008, p. 5906).

According to Kelland, Morris and Lloyd, (2005) the four most common machinima production techniques are: straight recording, the puppetry approach, recamming and scripting. The first one merely involves recording the activities of the avatars. The second one entails the manipulation of avatars to perform actions based on a screenplay. Recamming is based on a puppetry approach involving re-recording the actions by adding additional avatars, changing lights or moving cameras. Scripting is programming avatars to perform in specific ways.

Machinima could be used for teaching “less commonly taught languages” which often lack multimedia materials for instruction. Machinima can be created and combined with other media with little time and effort. Furthermore, it could be used for the attainment of fluency by enabling the visualization and contextualization of cohesive narratives involving climax and resolution, as much as a focus on traditional areas of language instruction such as grammar and vocabulary.

3.1. An overview of the history of machinima

The first machinima appeared in the mid-1990s (Marino, 2004). Machinima production first emerged in 2001 (Middleton Mather, 2008) but the term itself was not acknowledged until 2002 when the *Academy of Machinima Arts and Sciences* was formed (Marino, 2004). Machinima has its roots in the creative pursuit of videogame players, in particular their use of software features called demo recording (which was developed by id Software and was available for the video games *Quake* and *Doom*) and enabled the user to record sequences of game action. These movies then became more elaborate when shot from the player’s perspective (Morozov, 2008). Improvement in 3D engine software, new games with more sophisticated graphical environments, the increase in the processing power of PCs and affordable professional grade video editing software have combined to present users with more opportunities to create, record and edit machinima. Current machinima-making tools can create models of objects or places from scratch. These tools enable custom scripting of object behavior and allow anyone to sit in a virtual director’s chair.

Machinima is related to a number of other *semiotic domains* like videogames, filmmaking and animation. Gee (2003) defined semiotic domains as “any sets of practices that recruits one or more modalities (e.g., oral or written language, images, equations, symbols, sounds,

gestures graphs, artifacts, etc. to communicate different types of meanings" (quoted from Morozov, 2008, p. 5901). If regarded as a *semiotic symbolic representational domains* machinima could be used to develop learners' digital literacy skills, as well as 21st century literacy skills. This digital literacy depends on understanding the multiple media that make up our high-tech reality and developing skills to use them efficiently (cf. Jones-Kavalier & Flannigan 2006). The "New Media Consortium the following characteristics of 21st century literacy: multimodality, inclusion of creative fluency as well as interpretive facility, learning a new grammar with its own rules of construction implies the ability to use media to evoke emotional responses, transforming the way we learn" (The new Media Consortium, p. 5, cited from Morozov 2008).

3.2. Educational applications of machinima for learning and teaching

Machinima production in the virtual environment of Second Life® (SL) results in objects that have an asynchronous value. The lessons in Second Life® enable students to learn "procedural language, problem solving, discussion, social pragmatics, storytelling, and code-switching between different genres of writing" (Lansiquot & Rosalia, 2008, p. 2661). The multi-user virtual world Second Life® offers the freedom to "customize sets, props and camera angles that can be found" in-world (Middleton, 2008, p. 207). Second Life® "offers a range of functionality that makes it better suited than either 'pure gamers' or 'pure machinima' platforms for machinima development in games such as The Sims. Key activities to be performed in Second Life are collaborative groups role-play, using paper-slip stories and point of view activities (Lansiquot & Rosalia, 2008, p. 2661) and theme-based instruction rather than merely conventional step-by-step lesson).

3.3. Learning effects in digital semiotic domains

As mentioned above, Machinima can be viewed as a digital semiotic domain. To analyse engagement with machinima, it is useful to identify a set of characteristics for effective learning in a given semiotic domain. Originally developed for video games, four characteristics can be formulated:

1. Learning and experiencing the world (seeing and acting on it) in a new way;
2. The potential to join and collaborate with a new affinity group;
3. Developing resources for future learning and problem-solving in the semiotic domains to which the game is related;
4. Learning how to think about semiotic domains as design spaces that engage and manipulate people in certain ways and, in turn, helping to create certain relationships in

society among people and groups of people, some which have important implications for social justice (Morozov, 2008).

3.4. Implications for learning styles

The technology of machinima facilitates apprenticeship-style learning in the classroom (Muldoon & Kofoed 2009). The characteristics of this learning model are:

1). engagement in domain related practices;

2). ownership of inquiry;

3). coaching and modeling of thinking skills;

4). collaborative and social learning;

5). motivating learning context. (Barab & Duffy, 2000, pp. 31-33)

Watching a linear story told via the audio-visual narrative of machinima can enable "the embedding of critical stages of apprenticeship in a classroom environment and at the same time minimize the risk of extraneous cognitive load, the stages of apprenticeship are creatively entwined in the story, i.e., modelling, scaffolding and fading" (Muldoon & Koefoed, 2009, p. 2246). Second Life® Machinima in MUVES provide an ideal platform to identify all the key principles of the apprenticeship model. It can also provide space for practice and enables "authentic learning conditions that are hard to cultivate in traditional classroom settings" (Dieterle & Clarke, 2007, p.7, cited in Muldoon & Kofoed, p. 2245).

3.5. Projects employing machinima in education

Butler (2012, para 1) postulates that "a traditional approach centered on weekly lectures, perhaps supported by tutorials, still predominates in modern legal education in Australia. This approach tends to focus on the transmission of knowledge about legal rules and doctrine to students, who adopt a largely passive role. Criticisms of the traditional approach have led to law schools expanding their curricula to include the teaching of skills, including the skill of negotiation and an appreciation of legal ethics and professional responsibility." However, in a climate of limited government funding for law schools in Australia, innovation in legal education remains a challenge. In his article, the successful use of Second Life® machinima in two interactive multimedia programs is considered, *Air Gondwana* and *Entry into Valhalla*, and their part in the creation of engaging, effective learning environments. These programs not only engage students in active learning, but also facilitate flexibility in their studies as well as providing other benefits. The programs yield important lessons concerning the use of machinima innovations in curricula for academics involved in legal education as well as those

in other disciplines, especially those that rely on traditional passive lectures in their teaching and learning approaches

The research reported in the paper by Muldoon and Kofoed (2011) covers part of an ongoing investigation into the design of a technology-enhanced learning environment that draws from approaches embodied in situated learning theory. In this learning context, Second Life® machinima are used as an anchor to mediate authentic learning experiences and facilitate apprenticeship-style learning in the classroom. The ultimate aim of the research is to address a long-standing educational problem in accounting education, namely, that of failing to help students to achieve higher order outcomes. Research in accounting education has shown that this problem is deeply rooted in the limitations of traditional delivery modes prevailing in higher education practices. Among other important findings in the current study, the paper reports that students appreciated the technology-enhanced learning environment, which resulted in a significantly increased level of engagement as well as active learning. Findings revealed that the development of higher order thinking skills were best facilitated in authentic contexts that represented the values and practices of the discipline.

Thomassen and Rive (2010) suggest a framework for understanding the specific requirements for a digital design class in Second Life®. By teaching and observing students who were asked to complete a machinima project, the research provided examples of the strengths and the weaknesses of using Second Life® for knowledge exchange. Both input and output of task processing is observed in the process of creating knowledge. A literature review of knowledge creation considering the exchange of both tacit and explicit knowledge exchange may be used to inform existing theory. Teaching occurred both remotely and, in person, in a media lab that included a physical presence of 33 students using networked computers while also allowing virtual presence in Second Life®. The students also experienced a mixed-reality environment in which they collaborated sometimes in close physical proximity and sometimes only together in the virtual space. The exchange of tacit knowledge in a shared physical environment was regarded as a benchmark for knowledge exchange in Second Life®, and they concluded the article with some suggestions on how that could be more closely simulated.

In Barwell, Moore and Walker's (2011) study the model of learning best suited to the future is one which in which learning is a process of managing the different kinds of participation an individual will face in complex social systems. Learning capability and engagement is thus dependent on the relationship between an individual's identity and social systems. They report on the incorporation of machinima and Web 2.0 technology as part of an

interdisciplinary and collaborative project where the focus was not on the mastery of the tools or the acquisition of predetermined knowledge, but on the development of learning engagement. They provided a case study of a pilot project involving students across two arts disciplines collaborating via the game, "World of Warcraft", to produce an animated adaptation of one of Geoffrey Chaucer's *Canterbury Tales*. Their contributions were differently assessed according to the pre-existing requirements of their home disciplines. They argued that the assessment in such projects, in conjunction with innovations and experimentation with Web 2.0 technologies, should shift from an emphasis on product to process. They believe that this has a sound pedagogical and theoretical foundation, while also fitting better with the increasingly digitalized, unfixed and interdisciplinary world that students will face when they graduate.

To Middleton and Mather (2008) the educational value of immersive virtual worlds (IVWs) seems to relate to their social qualities as an accessible simulation technology. In contrast to these synchronous applications their study discusses the use of educational machinima developed in IVW virtual film sets. It also introduces the concept of media intervention, proposing that digital media works best when simply developed for deployment within a blended curriculum to inform learning activity, and where the media are specifically designed to set challenges, seed ideas, or illustrate problems. Machinima or digital games offer a rich mechanism for delivering such interventions. Scenes are storyboarded, constructed, shot and edited using techniques similar to professional film production, drawing upon a cast of virtual world avatars controlled through a human–computer interface, rather than showing real-life actors. The approach enables academics or students to make films using screen capture software and desktop editing tools. In student-generated production models the learning value may be found in the production process itself. This study discusses six case studies and several themes from research on ideas for educational machinima including: access to production; creativity in teaching and learning; media intervention methodology; production models; reusability; visualisation and simulation.

Morozov (2008) proposes that machinima is a new form of filmmaking which utilizes 3D video game engine technology to create animated films within virtual environments. Representing the convergence of filmmaking, animation, and videogame development within an interactive virtual space, machinima is an exciting emerging digital media, and a new frontier in technologies for designing and communicating compelling audiovisual narratives. This exploratory study is one of the first efforts to systematically evaluate the educational potential of this new media form. Drawing upon Gee's research on semiotic domains, the study

addresses questions such as: What can be learned from producing machinima content? How can instructors facilitate such learning? Emphasis is placed on the feasibility of machinima as a tool for teaching and learning digital literacy skills.

Meyers (2014) argues that understanding children's digital play in immersive virtual spaces, specifically those with limited communication affordances, demands new methods and approaches that move beyond interviews and participant observation. This study illustrates the process of creating machinima videos of scripted play scenarios as "cultural probes" to elicit young users' insider knowledge of communication and socialization practices. He discusses the ongoing development and use of these videos, supplementing other qualitative methods to develop a richer understanding of information sharing, particularly non-verbal communicative action.

Lacasa, Martinez and Mendez (2011) discuss innovative educational practices when commercial video games, combined with other new or traditional technologies are present in the secondary education classrooms. The major goal of the project was to generate new knowledge about how to *design scenarios*, using commercial video games as the starting point, which may contribute to the development of new literacies when students work with specific curriculum contents. Their data was explored machinima productions in order to analyze the relationships between the video productions, the game and the gamer's perspective about his/her own activity. To examine these strategies several dimensions were considered in order to compare different approaches to machinima.

Conkey (2010) discovered that multimedia training methods have traditionally relied heavily on video based technologies and significant research has shown these to be very effective training tools. However, the production of video is time and resource intensive. Machinima technologies are based on video gaming technology that allows them to be manipulated into unique scenarios based on entertainment or training and practice applications. Machinima involves the conversion of these unique scenarios into video vignettes that tell a story. These vignettes can be interconnected with branching points in much the same way that education videos are interconnected as vignettes between decision points. This study addresses the effectiveness of machinima-based soft-skills education using avatar actors versus the traditional video teaching applications using human actors. This research also investigated the difference between using avatars to produce video vignettes compared with human actor produced video vignettes. Results indicated that the difference in training and/or practice effectiveness is statistically insignificant for presence, interactivity, quality and the skill of assertiveness. The skill of active listening presented a mixed result indicating the need for

careful attention to detail in situations where body language and facial expressions are critical to communication. This study demonstrated that a significant opportunity exists for the exploitation of avatar actors in video based instruction.

Jones and Munro's (2009) project developed a machinima animation promotional film for the Department of Computer Science at Heriot-Watt University, and evaluated whether the promotional material was more engaging and entertaining than traditional materials; more informative about the provider (its values and facilities); promoted *Computer Science* as relevant to students' lives; used media immediately recognizable to the student; and was innovative and differentiated the provider from others in the marketplace. Interviews with current students relating their likes and dislikes of the university were coupled with computer game animation to create an entertaining and informative multimedia advertisement. The multi-stage evaluation with potential applicants showed that these students responded positively to the content and presentation of the innovative multimedia film.

Fujimoto (2010) conducted a project where a short, educational machinima featured the story of the Japanese American 522nd Field Artillery Battalion's liberation of Holocaust survivors from a sub-camp of Dachau during World War II. The irony of the 522nd's encounter with the Dachau inmates was that while the 522nd men were helping to free the Holocaust survivors, many 522nd soldiers' family members were being incarcerated in segregated camps in the United States. The *Go For Broke National Education Center's* machinima project was unique in that each machinima featured oral histories as the main narration. The study described *Go For Broke National Education Center's* machinima creation process and the organization's plan to utilize its machinima in educational lesson plans.

Harwood (2011) examined the past, present and future of machinima, hereby defined as an art *form in transition*. Although both socially and culturally embedded in gaming cultures, machinima could expand well beyond gaming, as it represents a successful example of convergence of filmmaking, animation and games development. Although the medium has a strong artistic potential, the future trajectory of machinima will remain indelibly tied to games development, reflecting gaming and internet cultures. The author predicts that machinima will further *evolve* in line with developing *curatorial expertise* in its presentation to wider audiences and positioning within the *digital arts movement*.

According to Catak (2010) machinima that uses game technologies has already become an art form and an independent film making method. Following in the footsteps of computer games which have evolved as the most dynamic and controversial form of new media,

machinima has now been accepted as a genre by several festivals worldwide. Because of its hybrid structure, based on the game technologies and tools, it can cover the language of film and the techniques of animation. The study discusses and focuses on the potential use of machinima in film and animation education as a supporting course which the students could benefit from as a cheap and easy way to shoot their films or pre-visualize their ideas by making moving storyboards. Developing their 3D modelling and animation skills is another benefit the students could acquire from machinima. Bridging the educational gap between games and cinema in entertainment business could also lead to new synergies and connections worthy of further investigation.

Another focus emphasized in the study is the usage of machinima in architectural education as a representation tool. It is widely discussed that a ‘fly-through’ or a ‘walk-through’ presentation of a construction does not give the feeling of space. Lack of narration has already lead architects and game editors and to do some experiments with them. Machinima as an architectural course could also be a useful and supportive method for filmic representations of space both for customers and architects. In conclusion, the study proposes a hybrid course and its syllabus for both architecture and cinema (which includes animation) education.

In Wendt (2013) the use computer games and consoles are considered in the context of social work. The research explores a seminar in which aspects of group dynamics, as well as artistic and social aspects were targeted, triggered and implemented. Project work with computer games and consoles, such as educationally guided LAN parties and the creation of machinima films, etc. were investigated and their background explained. In the practical part of the seminar, students had the opportunity to work in small groups and develop similar projects themselves. Some small projects were implemented in multi-generation houses, retirement homes, youth centers, and reception centers, as well as in other areas. The students were able to implement the theoretical content of the seminar in their projects and relate this content to practice. Above all, Wendt explored the advantages of the use of new media within existing fields of work and links games with real socio-educational experiences.

Carroll and Cameron (2005) designed a workshop that investigated the emergent online dramatic form of machinima, the co-option of video game engines or off-the-shelf software for dramatic production in a rapidly developing digital performance form. In the workshop the participants engaged with short examples of popular machinima productions. There was discussion and demonstration of the machinima production process. The nexus between dramatic conventions, gameplay and traditional video production techniques was explored

and participants worked with a short piece of machinima, in the form of a scene created using the Sims 2 game. Participants improvised scripts and performed dialogue to provide meaning for the action. The workshop applied the insights of *process drama*, a field well-developed in *educational settings*, to the development of machinima. It included demonstration and participation in dramatic roles, focusing on how the conventions of *Role Distance and Role Protection* apply to this developing field of digital game-based performance.

Brooks and Wicks (2011) discuss a project organised by Memorial University in partnership with the Miawpukek Conne River First Nations and Cupids 400 Year Celebration Committee focusing on the creation of machinima for use in educational environments. The project's outcomes included a 53 minute machinima of the *Muinji'j Becomes a Man Story* and the 18 minute machinima that represented the story of *John Guy* and the tradesmen who established the 1610 first English speaking settlement in Canada. Each machinima was divided into sections that educators in the K-12 and university could use. The purpose for developing machinima for educational environments, pre-planning, execution and distribution stages, and use of avatar and bots was highlighted in the project.

Brooks and Mercer (2011) investigated *The Cupids Project* which originated from the 'Cupids 400th Year Celebration' of the first English speaking permanent settlement in Canada. The story of John Guy and the tradesmen who established the 1610 Cupers Cove (Cupids) settlement was the focus of such project components an *Apple iPod touch and iPhone application*, *virtual Cupids Islands in Second Life®*, the development of 36 character bots, and animated machinima/video. The project outcomes, according to the education Cupids 400 committee, "resulted in … a lasting legacy and a lasting gift to the youth of Newfoundland" and the authors identified a range of lessons learned, benefits and challenges relating to digital video production.

Johnson and Runo (2011) did a study designed to show educators and others the potential of making machinima that moves beyond the mundane to a new level of storytelling that intends to captivate audiences. They explored the question: What is it that makes a good story, and how can that be expressed through machinima? The authors borrowed examples from their forthcoming book grounded in numerous interviews from the machinima community, as well as filmmaking research and experience, to reveal the nuances of this expressive medium that borrows from animation, cinema and television, but has emerged with its own character. This study also shared an overview of the state of machinima practice in virtual worlds. Also identified is the role of the Professional Machinima Artist Guild and The Second Machinima

Artist Guild and how they can serve as member showcases and archival learning resources for the machinima community.

Harwood (2013) proposes that machinima is a practice-based approach to learning digital creative practice. It features excerpts from key informant interviews with six prominent machinima artists and it is the first time they have been brought together to consider the role of machinima as a learning tool from their different perspectives. She presents a review of machinima as an example of digital creative practice, akin to mashup and remix genres. The nature of machinima is presented through interviews, providing an overview of its authenticity, roles of networks and communities of practice, transdisciplinary creative practice, transliteracy, transferability and accessibility as a learning tool in developing competency in digital creativity. It is suggested that machinima is a form of 'digital clay' that has the potential to add value to practice-based learning in a connected world.

Hui-Chun Hsiao (2013) explores how visual game scenes, actions and narrative, can produce machinima that can be seen as a storytelling form of artistic expression and creation. He offers a definition of machinima as animated films made by machines. Specifically, machinima is an *art form* involving videos created by using cinematic production techniques within computer software, usually games. Machinima differs from conventional computer graphic techniques because it allows creating films in real-time. Thus machinima can be understood as either the method of making animation through 3D game technology or the animations made through the method. In this research project, the authors planned and conducted a course called *Game Arts* at the University of Taipei. 18 non-arts majors were recruited and encouraged to use the video game *The Sims 3 (TS3) to tell a story*. At the end of the class, they were asked to present their animated story and then discuss it with classmates. Through class observation, a class survey, group discussions, and collection of students' personal artifacts (including their story script, sketches, characters, and animations), they gathered both qualitative and quantitative data. Most students enjoyed using TS3 to visualize and present their ideas, and indicated a desire to create more machinima in the future for telling and sharing stories. Moreover, making machinima not only provided non-arts majors with a convenient tool through which to express and visualize their stories, but the machinima process itself offered them a distinctive opportunity to discover and rethink meanings revealed in their stories.

Gregory, Gregory and Gregory (2013) used machinima to enable their students to grasp important concepts in accounting through a pilot project entitled, "computers@armidale". They employed authentic learning tasks to explore the use of machinima to explain important

concepts in a first year accountancy degree. In their study they described the learning concept, the creation of the machinima and how it can be used with first year accountancy students through a 'think out loud protocol'. In their work, they concluded that the students that had some work experience were at a significant advantage in working on the practice set and accounting in general because they had opportunity to better visualise what was going on behind the transaction.

3.6. Learners with special educational needs (SEN) and 3D virtual environments

3.6.1. Special educations needs

Special Educational Needs or SEN is a term that describes a variety of problems that can lead to difficulties in learning (Drigas & Ioannidou, 2013). The 2001 SEN Code of Practice defines areas of "needs" which are: communication and interaction, sensory and/or physical, cognition and learning, behaviour, emotional and social development. This review focuses on how the learning needs of a population with learning difficulties such as autistic spectrum disorders and dyslexia can be enhanced by virtual environments.

3.6.2. Autistic spectrum disorders

Developmental disorders known as Autistic Spectrum Disorders (ASD) are problems that affect social and communication skills. Smith (2010) mentions the Autism Society of America Island in Second Life® (SL) where an information library, a meeting room, videos, a bulletin board, students' artwork and scheduled events can be found. The island serves as a meeting point for parents and guardians who are raising a child diagnosed with autism. Island Brigadoon, in Second Life®, is designed to provide a safe environment to build confidence necessary to communicate and explore other parts of the virtual world.

Parson and Mitchell (2002) claim that probably the most important advantage of virtual environments for populations with ASD is that they can role-play in an environment designed to simulate real-world scenarios. The responses can be practiced in realistic settings in the absence of potentially threatening and frightening real-world scenarios. In this vein, Mitchell, Parson and Leonard (2006) used *Virtual Café* to teach social understanding to adolescents and the results demonstrated the potential of virtual environments to teach social skills to populations

3.6.3. Asperger's syndrome

Asperger's Syndrome is a subcategory of the pervasive developmental disorder autism (Parsons et al., 2000). People with Asperger's Syndrome may have highly functional learning skills but problems performing activities such as dating or interviewing for a job (Smith, 2010). Building on this, Parsons et al. (2000) claim that virtual environments may provide the ideal method for social skills training for people with these disorders. In their research they focus on user-centered design principles and aim to develop and evaluate the use of virtual environments to support learners with Asperger's Syndrome in improving their social skills. Furthermore, Smith (2010) explores how researchers believe that virtual worlds such as Second Life can provide more than mere opportunities for role-playing with a therapist. Virtual worlds allow people with disorders to communicate without forcing face-to-face interaction with another person and thus socialize in environments with less stress or anxiety.

3.6.4. Dyslexia

Dyslexia typically concerns problems with reading and writing, but it can also include problems relating to short term memory, concentration, distinguishing right from left, self-organization, language acquisition, mathematics and visual perception (Hall & Velez-Colby, 2011). Teaching methods that deal with dyslexia include conveying information through a variety of approaches such as:

- Videos
- Colour
- Stories
- Handouts
- Worksheets
- Multiple-choice questions
- Mind maps
- Close procedures
- Dyslectic methods for learning and recording information include for example
- Physical space (placing paper in different areas of a room according to the information represented).

The methods which make use of technology include e-learning tools that allow sharing ideas, support a healthy group dynamic, providing feedback, keeping records or involving media combination.

Hall and Velez-Colby (2011) investigated if the introduction of Simple Learning Technologies (SLTs) would enhance the learning experience and achievements of students with dyslexia.

Their research showed that the use of a virtual learning environments (VLE) that support multi-sensory approaches can significantly improve the overall student experience and grade attainment. Based on the significant findings on the usage of VLE for dyslexic populations, Kalyvioti and Mikropoulos (2012) designed a Virtual Reality Dyslexia Assessment-Memory Screening (VIRDA–MS) to detect specific memory characteristics in adults with dyslexia during their interaction with VLEs. The tests involving the VIRDA–MS proved that dyslexic adults can in some cases perform as well as non-dyslexic students in these virtual environments, thus demonstrating their potential. Moreover, Smith (2010) claimed that students with learning disabilities may benefit from more collaborative learning environments. For example, students who have difficulty understanding a concept presented in a standard text may have more success working through visual materials at their own pace (McKinney cited in Smith, 2010).

4. Evaluation

4.1. Drawbacks of ILS and machinima

Some challenges relating to learning via machinima in virtual worlds have been identified in the research literature. On the one hand, the “extraneous cognitive load” involved in producing the machinima may risk diverting the focus of learner attention away from the object of learning. On the other hand, ìnsufficient bandwidth or computational power may prevent instructors from engaging in machinima production (Lu 2011). Furthermore, Koenraad reported organizational problems (pupil online presence and teamwork) and technical issues (voice functionality, AW-interface skills) as obstacles to introducing virtual environments in educational contexts.

4.2. Diminishing drawbacks

To circumvent the “cognitive load” Lu (2010) proposes establishing a series of learning stages leading from beginner to expert user of virtual environments. Such a process may help to spread the cognitive load or prevent it becoming too onerous. ILS are not a tool to introduce new topics or apply new information; they are however a tool that can help enable instructors to master content across a diverse range of learners place in a wide variety of locations (Wilson 2011).

5. Task-based learning and machinima

Task-based approaches have been widely cited in language learning contexts (Ellis, 2003). In Skehan’s (1996) view, a task is “an activity in which … meaning is primary; there is some

sort of relationship to the real world; task completion has some priority; and the assessment of task performance is in terms of task outcome" (cited in Ellis, 2003, p. 4). Nunan (1989 cited in Ellis, 2003, p. 4) defines a task as "a piece of classroom work which involves learners in comprehending, manipulating, producing, or interacting in the target language while their attention is principally focused on meaning rather than on form. The task should also have a sense of completeness, being able to stand alone as a communicative act in its own right". Furthermore, though there are many different definitions, Ellis specifies six criterial features of a task in a definition that has become influential:

- A task is a work plan;
- A task involves a primary focus on meaning;
- A task involves real-world processes of language use;
- A task can involve any of the four language skills;
- A task engages cognitive processes;
- A task has clearly defined communicative outcome. (2003, pp. 9-10)

Elaborating on this list of key features, Ellis (2003) defines task as follows in a key passage:

> A task is a workplan that requires learners to process language pragmatically in order to achieve an outcome that can be evaluated in terms of whether the correct or appropriate propositional content has been conveyed. To this end, it requires them to give primary attention to meaning and to make use of their own linguistic resources, although the design of the task may predispose them to choose particular forms. A task is intended to result in language use that bears a resemblance, direct or indirect, to the way language is used in the real world. Like other language activities, a task can engage productive or receptive, and oral or written skills, and also various cognitive processes. (p. 16)

According to Thomas and Reinders (2010), "today's language learners are expected to be able to develop multimodal communicative and task competencies above and beyond the reading and writing skills required by previous generations" (p. 6). Chapelle (2001) has also argued that it is necessary to develop Ellis' definitions further and to apply them in the context of technology-mediated instruction. She argued that "anyone concerned with second language teaching and learning in the 21st century needs to grasp the nature of the unique technology mediated tasks learners can engage in for language acquisition and how such tasks can be used for assessment. … To meet the challenge, the study of the features of computer-based tasks that promote learning should be a concern for teachers as well as for

SLA researchers who wish to contribute to knowledge about instructed SLA" (Chapelle, 2001, p. 2 cited in Thomas and Reinders, 2010, p. 1).

In helping to establish links between this work and machinima, Middleton (2008, p. 216) defines machinima as "self-contained, highly granular digital videos". Machinima are digital visual narratives that are produced by dint of real-filmmaking techniques in a studio like environment (mostly in interactive multi-user virtual worlds) where software tools and resources are available to help to develop original digital content. This definition of machinima creation likens the process to a real life task that requires planning, focus on negotiation of meaning, real-life processing of language involving any of the four language skills, engaging cognitive processing and a clear communicative outcome (Ellis, 2003).

Machinima are able to "represent any conceivable object or sequence of events, while incorporating rich narrative structures, as well as graphical and text-based content, using visual and aural modalities (through images, music subtitles and voice-overs)" (Morozov 2008, p. 9). The machinima creation process could help language teachers and learners to engage in a meaningful conversation while planning a learning task (Ellis, 2003). During the production of any machinima the primary communicative focus would be on negotiation of meaning. Individuals who are involved in the task of creating machinima as a learning tool or as an instructional tool could incorporate any of the language skills (reading, writing, listening and speaking) to be able to complete the task. This process also requires these individuals to engage in cognitive processing in the pre-planning phase, while creating and editing, and in the post-production exploitation phase. The task of machinima creation would have a definite communicative outcome that communicates a message in addition.
The use of machinima as a task for language learning purpose may lead to successful language acquisition as Meskill (1999, p. 143) points out, given the importance of interaction by linking it with considerations related to task design: "The oral/aural negotiational aspect of teacher and task supported student–student configuration is seen as a powerful venue for second language acquisition to occur. Such configurations, in combination with well-designed and orchestrated language learning tasks, represent opportunities for learners to manipulate interdependent chunks of the target language in complex ways that see immediate, contextual effect" (cited in Hampel, 2010 p. 132).

6. CLIL and machinima

Content and Language Integrated Learning (CLIL) is not a new approach but has been used for decades with different names in different countries. Canada's immersion programmes or

the USA's bilingual education programmes are good examples of Content and Language Integrated Learning in action. As Dalton-Puffer, Nikula and Smit, (2010, p. 1) indicate

> Content and language integrated learning (CLIL) can be described as an educational approach where subjects such as geography or biology are taught through the medium of a foreign language, typically to students participating in some form of mainstream education at primary, secondary but also tertiary level. This means that, as far as classroom practices are concerned, CLIL resembles other forms of bilingual education programmes such as content-based instruction and immersion education as these exist in North American contexts.

According to Wolff (2007, pp. 15-16), CLIL differs from other content-based approaches in that "classroom content is not so much taken from everyday life or the general content of the target language culture but rather from content subjects, from academic/ scientific disciplines or from the professions" (cited in Dalton-Puffer, Nikula & Smit, 2010, p. 1). Recently, however, CLIL proponents have tended to stress the goal behind CLIL as "a dual-focused educational approach" that is neither exclusively language learning nor subject learning but rather a "fusion" of both (Coyle, Hood & Marsh, 2010, pp. 41–45 cited in Dalton-Puffer, Nikula & Smith, 2010, p. 2).

The following example can be cited to understand a common misunderstanding of CLIL. Some schools switch the medium of instruction of subjects from mother tongue to target language but the subjects are still taught by the same subject teachers. This is not CLIL because in this case, it is only the language of instruction has has been changed to the target language and there has been no attempt to integrate content *and* language; in this respect, it cannot be regarded as CLIL.

In an authentic CLIL instructional context students focus on the topic and often forget about the language. In this way students learn a language as a result of real experience. While learning geography, chemistry, physics etc. they use highly motivational topics and real terminology and learn the subjects as native speakers do. This approach provides a real reason for students to speak the target language. Marsch (2005, p. 6), for example, captures this understanding below: "In CLIL the learning of language and other subjects is mixed in one-way or another. This means that in the class there are two main aims, one related to the subject, topic, or theme, and one linked to the language. This is why CLIL is sometimes called *dual-focussed education*".

6.1. Characteristics of effective CLIL programs

For Naves (2002) there are 10 principles of a successful CLIL program. These include:

a) Respect and support for learners' L1 and home culture: A successful CLIL program should not ignore students' L1 and cultural background. CLIL programs should support L1 use and home culture allowing learners to use their L1 at early stages. Language arts (reading, writing, etc.) are introduced in L1 and at different stages content-subject matter is taught in the L1 as well.

b) Multilingual and bilingual teachers: In order to understand students' cultural and linguistic characteristics bilingual teachers are more effective in CLIL programs. Although the teachers mainly use the target language in the instruction they should also show their understanding of learners' L1 by responding appropriately and rephrasing learners' remarks made in their L1.

c) Integrated dual language optional programs: Effective CLIL programs are optional, not imposed (Swain & Lapkin, 1982). Parents in Canada viewed immersion as a right, not as an imposition. Parents felt they were entitled to ask that their children attend an immersion program and that it was the responsibility of the Council to provide such education.

d) Long-term stable teaching staff: CLIL programs are more effective if they are run on a long term basis. One of the key factors behind the success of these programs is that they must have continuity of the program and aim to guarantee the stability of the teaching teams involved (Navés & Muñoz, 1999).

e) Parental involvement: Parents' educational visions and decisions are important in establishing CLIL programs. Many parents think that bilingualism is a skill that must be gained by their children. Parents are resources in terms of culture and language for their children. Therefore the parental effect should not be ignored. They act as communicators, translators, cultural specialists and so on. Some of the most effective immersion and bilingual education programs were initially established because of strong parental interest in giving their children enriched language and culture education. The most well documented case of this is the Canadian French immersion programs.

f) Joint effort of all parties involved: Effective CLIL programs require the joint effort of all parties involved: educational authorities, parents and teachers at both district and school level are actively involved in planning the policy to implement such programs and the means by which they are sustained (Navés & Muñoz, 1999).

g) Teachers' profile and training: Montague (1997) noted that the most important aspect of any multi-lingual education program is teacher training in pedagogical and theoretical aspects of language acquisition. Additional research on teacher training in multilingual education suggests that teachers should have many attributes in order to work in a multilingual education setting: proficiency in the target language, knowledge of the principles of language acquisition and pedagogical skills specifically adapted for teaching foreign languages to young children (Van de Craen & Perez-Vidal, 2003).

h) High expectations and assessment: In their list of 25 features of effective BE programs, IDRA (2002) found that successful schools published and disseminated statements of expectations to the school community and created a vision and set of goals that defined the achievement levels of all students (Robledo & Cortez, 2002; Robledo & Goodman, 2002).

i) Materials: In CLIL materials design and materials selection is very important because CLIL tries to integrate the right materials with the foreign language. Oakes (2002) argues that there is a clear link between appropriate materials and curriculum and student academic outcome. CLIL learners need appropriate materials to learn English and content. Mahone (1985) conducted a need analysis in the United States to look at the appropriacy of the existing materials used in BE. The picture that he described unfortunately still applies to many CLIL contexts in which there are not enough teaching materials available and most of those that have been created by the teachers themselves.

j) CLIL methodology: Numrich (1989) focuses on five strategies to improve the comprehension of content in CLIL:

1). predicting on the basis of prior knowledge;
2). anticipating what will be read next;
3). using statements to check comprehension of a text during reading;
4). analysing text organisation by looking for specific patterns; and
(5) classifying to facilitate comprehension of similarities and differences.

6.2 Challenges in CLIL

The biggest challenge in the application of CLIL is the integration of subject and content knowledge. The problem arises when CLIL aims to teach two subjects at the same time. It aims to teach a content subject and language. Language teachers lack knowledge of the subjects while subject teachers have very little knowledge of teaching a foreign language. Sometimes teachers only focus on the content and forget the language part and sometimes teachers focus on grammar and language and forget about the content.

Another challenge of CLIL is the material. Many English language teachers worry about using CLIL materials because they feel they do not have the background knowledge of the subject. While this may be true to some extent, they should keep in mind that the material is only a 'vehicle' for the language. Moreover, content specific expressions in the L2 can be a barrier to the process of teaching and learning. Finally, the assessment of student performance can be also problematic in CLIL leading instructors to consider difficult questions related to what to evaluate and how to evaluate the learners.

6.3 CLIL in the European Union educational policy context

The European Commission's (2005, p. 5) report on foreign language teaching and learning claims that an excellent way of making progress in a foreign language is "to use it for a purpose, so that the language becomes a tool rather than an end in itself". The European Commission has funded research projects across Europe investigating the use of CLIL since the early 1990s, pulling together the threads of existing approaches such as CBI, immersion and BE.

Furthermore, in its publication, *Promoting Language Learning and Linguistic Diversity: An Action Plan 2004-2006*, the European Commission advanced the idea that language competencies are part of the core of skills that every citizen needs for training, employment, cultural exchange and personal fulfillment. Language learning is a therefore a lifelong activity which is required for mobility, multilingualism and sustainable development. The Commission therefore recognizes CLIL as a new methodology for language learning that is important for its strategic aims.

In this context, machinima may be used as a form of digital visual narrative production thus enabling a "fusion of content and language learning". Further research is needed to examine how teachers could employ machinima as a form of content instruction at the intercultural level by presenting different cultural aspects of the taught languages. Focusing not only on

the cultural aspect, machinima production could also engage with other topics like the history of the people who speak that specific language, the geography of the language, the literature that is created by this language or the daily activities of the people of that language, to enable students to produce powerful visual narratives in the target language.

7. Conclusion

Machinima is seen by some researchers as a stand-alone medium that can be used to stimulate original communication by users (Mozorov, 2008). Machinima should not be seen as an off-beat video game used for solitary amusement. Learning with machinima goes beyond conventional form-focused instruction involving vocabulary, language chunks and grammar patterns that is so often the staple of traditional computer-mediated learning technologies.

The digital technology of machinima facilitates the ability of learners to solve the educational dilemma that "the abstract knowledge taught in schools and University is not retrievable in real-life situations because traditional approaches (lectures and tutorials) ignore interdependence of situation and cognition" (Herrington & Oliver 2000, p.23, cited from Muldoon/Kofoed 2009, p. 2243). The results of applying machinima in various educational projects are encouraging:

Muldoon/Kofoed (2009) state in their investigation with accounting education that a "significantly increased level of engagement and active learning" (p.1) was possible. In the VITAAL Project it became apparent that "pupils were enthusiastic and they have noticed an increase in motivation, more time on tasks, and less inhibition (Muldoon & Koenraad 2013, p 3517). The NIFLAR project showed positive results as students reported "increased confidence and less inhibitions when speaking and acquisition of cultural knowledge" (Koenraad 2013, p. 3520). For teacher education the inclusion of computer-mediated communication in voice-enabled multi-user 3D virtual worlds in networked interaction projects can be considered as a powerful experiential learning opportunity. The modern digital semiotic domain is a fertile ground *par excellence* for internationalization, collaboration and project-based learning.

The digital semiotic domain of machinima possesses significant potential for enabling effective learning experiences. It can enable the development of digital and 21st century literacies. The technology of machinima is developing quickly and may soon be mature enough to invade the mainstream environment. As Philp pointed out, "machinima is a

stand-alone product, that we can sell" (OSCC 2013). Many existing machinima have been produced on a wide variety of scientific subjects (e.g., biology, medicine, architecture, archeology to mention a few). Utilising a project-based approach to language learning and building on the research on CLIL, machinima has the potential to offer teachers and learners an opportunity to engage in process-based learning that emphasizes learning creativity and engagement.

Appendix I: Other animation creation apps and programs

Aladdin4D: A software program for modeling and rendering three-dimensional graphics and animations, for the Mac OSX platform.

Alice: An innovative 3D programming environment (free).

Anim8or: A freeware OpenGL based 3D modeling and animation program.

Art of Illusion: A software package used for 3D modeling, texturing, ray tracing, and otherwise rendering computer generated imagery stills or animations (movies).Art of Illusion is capable of modeling and rendering photorealistic images and animations; it is also capable of non-photorealistic rendering as well. Art of Illusion has features, such as mesh editing, texture mapping.

Autodesk 3ds Max: Formerly 3D Studio Max, is a professional 3D computer graphics program for making 3D animations, models, games and images. It has modeling capabilities, a flexible plugin architecture and can be used on the Microsoft Windows platform. It is frequently used by video game developers, many TV commercial studios and architectural visualization studios. It is also used for movie effects and movie pre-visualization.

Autodesk Maya: A 3D computer graphics software that runs on Windows and OS X. It is used to create interactive 3D applications, including video games, animated film, TV series, or visual effects.

Autodesk Softimage: A 3D computer graphics application for producing 3D computer graphics, 3D modeling, and computer animation. The software is predominantly used in the film, video game, and advertising industries for creating computer generated characters, objects, and environments.

Blender: Excellent open source 3D content creation suite (free, must install).

Bryce (software): A 3D modeling, rendering and animation program specializing in fractal landscapes.

Cinema 4D: A 3D modeling, animation and rendering application. It is capable of procedural and polygonal/subd modeling, animating, lighting, texturing, rendering, and common features found in 3D modelling applications.

Clara.io: A web-based freemium 3D computer graphics software. Clara.io is developed using HTML5, JavaScript, WebGL and Three.js. Clara.io does not rely on any browser plugins and thus runs on any platform that has a modern standards compliant browser.

DAZ Studio: A 3D figure illustration/animation application. It is compatible with most files intended for use by Poser. It is available free of charge (registration required). DAZ Studio has a simple user interface allowing the user to add and manipulate models within the scene, add and manipulate morphs (body-shape changes), adjust the textures applied to models, add and adjust lighting and to fine-tune the render process.

Electric Image Animation System: A 3D computer graphics package. It currently runs on the OS X and Windows platforms. The Electric Image Animation System is not a single program, but rather a suite of several programs designed to work together. Each of the primary programs handles a particular part of the production workflow: Animator, Camera, Renderama, Modeler.

Google Sketchup: A 3D modeling program for applications such as architectural, interior design, civil and mechanical engineering, film, and video game design. A freeware version, SketchUp Make, and a paid version with additional functionality, SketchUp Pro, are available.

Houdini: A high-end 3D animation application software. Houdini covers all the major areas of 3D production.

Iclone: A real-time, 3D animation and rendering software program that enables users to make 3D animated films. It is notable for using use a real-time "WYSIWYG" view to let animators see the results of their work immediately, and to play back animations in the viewport. This real-time feature is enabled by using a 3D videogame engine for instant on-screen rendering. Other functionality includes: full facial and skeletal animation of human and animal figures; lip-syncing; import of standard 3D file types including FBX; a timeline for editing and merging motions; a scripting language (Lua) for character interaction; application

of standard motion-capture files; the ability to control an animated scene in the same manner as playing a videogame; and the import of models from Google 3D Warehouse, among many other features. iClone is also notable for offering users royalty-free usage of all content that they create with the software, even when using the Reallusion assets library.

K-3D: A free 3D modelling and animation software. Despite its name it is not a KDE application; it uses the GTK+ toolkit via gtkmm. It features a plug-in-oriented procedural engine for all of its content. K-3D supports polygonal modelling, and it includes basic tools for NURBS, patches, curves and animation.

LightWave 3D: A 3D computer graphics software. It has been used in film, television, motion graphics, digital matte painting, visual effects, video games development, product design, architectural visualizations, virtual production, music videos, pre-visualizations and advertising.

Macromedia Flash: A multimedia and software platform used for creating vector graphics, animation, games and rich Internet applications (RIAs) that can be viewed, played and executed in Adobe Flash Player. Flash is frequently used to add streamed video or audio players, advertisement and interactive multimedia content to web pages. Flash manipulates vector and raster graphics to provide animation of text, drawings, and still images. It allows bidirectional streaming of audio and video, and it can capture user input via mouse, keyboard, microphone and camera. Flash applications and animations can be programmed using the object-oriented language called ActionScript. Adobe Flash Professional is the most popular authoring tool for creating the Flash content, which also allows automation via the JavaScript Flash language (JSFL).

Milkshape 3D: A Shareware low polygon 3D modelling program. MilkShape 3D has all basic operations like select, move, rotate, scale, extrude, turn edge, subdivide, among many others. MilkShape 3D also allows low-level editing with the vertex and face tool. Standard and extended primitives such as spheres, boxes, and cylinders are available. Milkshape 3D can export to over 70 file formats.

Minecraft: A sandbox indie game. The creative and building aspects of *Minecraft* allow players to build constructions out of textured cubes in a 3D procedurally generated world. Other activities in the game include exploration, gathering resources, crafting, and combat.

MMD: A proprietary freeware animation program that lets users animate and create 3D animation movies. The software allows users to import 3D models into a virtual space that can be moved and animated accordingly. The positioning of the 3D figures can be easily altered, the facial expressions can be altered (as long as the model has morphs to use), and motion data can be applied to the model to make it move. Along with these functions for models, accessories, stages, and backgrounds can be added to create an environment, and effects such as lens flares and AutoLuminous (an effect that makes things glow and light up) can be applied as long as the MikuMikuEffect (MME) plugin is installed into the interface. Sound and music can also be added to create music videos, short films, and fan-made stories. The motion data used to animate the characters and the pose data mainly used for making screenshots can be exported as .vmd (Vocaloid Motion Data) files and .vpd (Vocaloid Pose Data) files, respectively. The exported files can then be imported into other projects made with software that can use the file types. This allows users to share the data with other users.

Modo: A polygon and subdivision surface modeling, sculpting, 3D painting, animation and rendering package. The program incorporates features such as n-gons and edge weighting, and runs on Microsoft Windows, Linux and Mac OS X platforms.

Moviestorm: A real-time 3D animation software. Moviestorm enables the user to create animated movies, using machinima technology. It takes the user from initial concept to finished, distributed movies. Sets and characters can be created and customised, and scenes can be filmed using multiple cameras.

Muvizu: An animation software package. The software is aimed at people who wish to make 3D animations without using expensive software packages and without specialist training. It is a popular tool for educational purposes.

Nickelodeon 3D Movie Maker: Using this program, users are able to place 3D characters into pre-made environments, add actions, sound effects, music, text, speech, and special effects then show these movies off to friends, family, and the world. These are saved in the 3D Movie formats: ".3mm" and ".vmm".

PhotoSynth: A Microsoft web application that takes your photos, mashes them together and recreates a 3D scene out of them that anyone can view and move around in. Windows only (free).

Poser: A 3D computer graphics program optimized for 3D modeling of human figures. Poser comes with a library of pre-built, ready to use content including poses, materials, props, facial expressions, hand poses, hair pieces, lights, cameras and scenes. Poser includes a REYES based render engine called Firefly which supports material nodes for the creation of complex materials. Poser provides import of sound files, image files, video files, motion capture data and 3D content for the creation of Poser scenes or the creation of new Poser library items. Poser exports content in a variety of 3D formats, and rendered images and animation.

SketchUp: A desktop application from Google that allows teachers or students to create and share stunning 3D models from coffee pots to skyscrapers (free).

Source Filmmaker: A video capture and editing application that works from inside the Source game engine. Unlike most movie-making tools, which only create a small part of a movie, the Source Filmmaker merges all animation and effect workflows onto a single gaming PC. With the SFM, one can create movies and posters by using assets and events from the video game world, providing creators with a "'what you see is what you get' environment.

Synfig: A free and open source 2D vector graphics and timeline-based computer animation program. As a front-end and back-end application, it is possible to design the animation in the front-end, *Synfig Studio*, and to render it at a later time with the backend, *Synfig Tool*, on another computer without a graphical display connected.

Zbrush: A digital sculpting tool that combines 3D/2.5D modeling, texturing and painting. It uses a proprietary "pixol" technology (see below) which stores lighting, color, material, and depth information for all objects on the screen.

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