Abstract

Virtual worlds provide unique opportunities for innovative distance learning arrangements and are particularly suitable for transferring experiential knowledge. Nowadays, numerous universities are exploring potentials of virtual worlds for distance learning purposes. Virtual worlds offer new possibilities for computer-mediated communication and cooperation because of their immersive character and because interaction techniques such as Voice over IP can be applied. Virtual worlds are expected to become a powerful tool for distance learning when combined with other technologies such as Web 2.0. This paper presents a theory-based framework for the arrangement of distance learning courses with virtual worlds.

An analysis of activities of German universities on Second Life depicts that the potentials of virtual worlds for distance learning arrangements are not exploited sufficiently today. Structured implementation of learning arrangements in virtual worlds in combination with other technologies such as Web 2.0 was hardly observable.

1. Introduction

Virtual worlds have attracted millions of participants since 2005 and became one of the biggest technology hypes in 2007. Nowadays, virtual worlds have entered the "trough of disillusionment" [1] because they failed to meet market expectations, became unfashionable, and the press abandoned virtual worlds. However, experts proclaimed that the current technological development will lead to massive changes in graphical design and navigation of the Internet in the near future [2].

Virtual worlds are defined as 3D environments where the user is represented by an avatar and is able to navigate, act, and communicate. In comparison to online games, virtual worlds don't have a certain goal to be achieved or a start-finish-character, in comparison to Web2.0-technologies such as wikis, podcasts, or blogs [3,4], virtual worlds have a higher degree of immersion, that is, the user has the sensation of a real environment [10]. Through combined use of innovative Internet features such as three-dimensional (3D) designs and voice communication (VoIP) and because of their immersive character, virtual worlds offer new possibilities for computer-mediated communication and cooperation. Hence, virtual worlds offer new veins for distance learning arrangements, too.

Recently, more attention was drawn upon different virtual worlds such as “Second Life” and “Active Worlds”, because it was recognized that they may offer high potentials for educational purposes. In order to attract new users, the providers (e.g. LindenLab, etc.) started to investigate needs of trainers and learners for distance learning arrangements. Different concepts have been developed in order to make educators and students acquainted with advantages of virtual worlds. For example, the virtual world “Active Worlds” has launched a so-called „educational universe“, which is particularly dedicated to learning purposes. The open source initiative SLOODLE (simulated linked object oriented learning environment) links Second Life with the e-learning platform Moodle (http://www.sloodle.org/moodle/). Moreover, also non-professional people are engaged in researching possibilities for educational uses of virtual worlds. There is a large spectrum of different support initiatives, including web 2.0 applications such as wikis, mailing lists, blogs as well as a pilot program for educators. However, other virtual worlds, such as “Twinity” and “There” still focus primarily on leisure purposes.

In order to use virtual worlds in the context of different educational settings most effectively, its characteristics and new features have to be analyzed in respect to appropriate didactic concepts. So far very little research exists in this area [5].
The goal of this article is to close this research gap and to present a structured framework, which helps to develop effective didactical concepts for distance learning with the usage of virtual worlds. To aim this goal we analyzed recent literature in this research field. Key characteristics of virtual worlds such as immersion, interaction, and innovative functionalities for example for non-verbal communication play a pivotal role in this framework. An already existing approach describing an experiential learning life cycle is explained and discussed to better understand potentials of virtual worlds for educational purposes. Based on these theoretical studies, we conducted an explorative analysis to receive insights about activities of universities in virtual worlds. We focused on activities of German universities in Second Life. The article ends with a summary and conclusion.

2. Background

A bibliometric analysis about research on virtual worlds sourced from the ISI Web of Science databases Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), and Arts & Humanities Citation Index (A&HCI) in May 2007 showed 2200 entries in the mentioned databases for articles with phrases that are related to virtual worlds [6]. Articles from more than 5000 authors in 875 journals were published since 1990. Adhering to computer-mediated communication is a reduction of the transmitted information [7; 8]. The reduction of the richness of the transmitted content is the result of a lack of possibilities in regards to body language, para-verbal content (voice level, volume, and tempo) and other non-verbal information such as look, clothing, or behavior which all are not transferred over traditional computer based communication channels. In this context Kroeber-Riel and Weinberg explained that activation of multiple senses increases efficiency in communication and collaboration processes [9]. In order to fill this information gap, numerous expression forms such as symbols, pictograms, emoticons, or disclains are in use for communication over the Internet.

Virtual worlds have the potential to overcome this information transmission problem. Whereas traditional software focuses on productivity and process support, web 2.0 applications focus on the linking of individuals and groups. Social software is based on different services for establishing networks and supporting the distribution of information within the network. Internet forums, wikis, web logs, instant messaging, RSS, pod casts and social bookmarking are social software tools [2, 9]. In comparison to Web 2.0 applications such as blogs or wikis, virtual worlds are able to create new ways of communication, collaboration, and cooperation via Internet by applying 3D environments, voice over IP technologies and the personification as avatars [10] even if channels like body language or facial expression are still not supported sufficiently and therefore operating coarse.

Virtual worlds have an immersive and highly interactive character [11]. Immersion refers to becoming part of an experience and indicates the sensation of the realness of the environment [12]. Users are able to create their own environment and to move in three dimensions, to experience several senses. Interaction describes the possibilities to interact or communicate with objects, e.g. to display facial expressions and gestures. However, despite of the pivotal role of the immersive and interactive character of virtual worlds for imparting knowledge, only very few authors have introduced these aspects to scientific discussion [13].

3. Framework for Learning Arrangements in Virtual Worlds

Previous research found that communication in virtual worlds may enhance the perception of social presence and the degree to which a medium allows a user to establish a personal connection to other users [12]. Students are engaged to take part as active learners in virtual worlds.

Active learning is reflected in the parameters of interaction and immersion in our reference model for the analysis of existing learning arrangements (figure 1). Pine and Gilmore create a similar typology of experience realms based on the nature of experience factors and how they work and interact [14].

According to the paradigm of constructivism, a higher degree of immersion and integration correlate with a more effective progress of learning. Constructivist theories explain learning as a process of interaction and diverse experience, which requires a continuous evaluation by the learner [15]. In the context of building up knowledge structures by oneself, experience plays an important role [16; 17]. This includes contextual, visual and auditory, conceptualized, procedural, and experiential knowledge as well as content and media competencies. A high degree of immersion particularly supports learning through experiences and the capturing of complex contents. Existing learning platforms are not immersive and do not
integrate participants as virtual worlds can do. Therefore, it can be assumed that virtual worlds are able to provide complex knowledge more easily.

Beard and Wilson pointed out that experiential learning combines two dimensions: the action and the parallel or subsequent thinking about the action. Experiential learning is therefore able to build a bridge between action and cognition. Hence, they define experiential learning as “the insight gained through the conscious or unconscious internalization of our own observed interactions, which build upon our past experience and knowledge” [18].

Kolb identified four stages of learning (figure 1) to explain the process of experiential learning [19]. The starting point in Kolb’s model is the existence of concrete experiences by learners. These experiences are reflected by the learner within a stage of reflective observation. Theories and rules are then used to validate and conceptualize the experience. The next step is to construct ways of modifying the occurrence of the experience in active experimentation, leading to another concrete experience.

![Figure 1. Experiential learning cycle [20]](image)

Hudson [20] identified two different styles of thinking: convergent and divergent thinking. Kolb added both to his experiential learning cycle. Convergent, divergent, accommodative, and assimilative thinking styles are depicted in four quadrants, where each of these styles is paired with its diagonal opposite.

Concrete experiences regularly result in divergent knowledge, which strengthens creativity to find own solutions. The reflection of observations and active experimentation lead to assimilation and accommodation, which bring external knowledge and already existing knowledge into a relationship. Convergent knowledge bears a number of facts or principles on a single topic where problems have "right” and "wrong” answers (figure 1).

Despite some critics on Kolb’s model [21, 22] there is no doubt about the general importance and influence of this model for the specification of learning concepts.

For e-learning environments, the model serves as a basis to extract elements that can support experience, as well as it helps to explain the potentials of virtual worlds to develop effective learning arrangements. In this context, Kayes [22] highlights the role of language in constructing experience by considering the relationship between personal and social knowledge. Virtual worlds provide different sorts of metaphors for interaction to support verbal communication.

Social software such as wikis, instant messaging, discussion forums, feedback systems, and 2 dimensional virtual classrooms are employed in learning arrangements to enhance the efficiency of the communication process and to improve the exchange of information and the establishment of social structures [15; 23; 24]. The functionalities of virtual worlds are suitable to transfer visual and auditory knowledge, conceptualized and procedural knowledge, and, in particular, experiential knowledge. They provide a unique opportunity for an immersive experience, which likewise supports cost-intensive and time-consuming learning processes, in case presence of learners is required.

The framework for learning arrangements in virtual worlds depicted in figure 2 consists of four clusters. They are defined by the degree of interaction and the degree of immersion.

![Figure 2. Framework for learning arrangements in virtual worlds](image)

If immersion and interaction are low (cluster 1) auditory learning drives knowledge acquisition primarily. If immersion and interaction is high
(cluster 4), knowledge will be transferred via experiential, procedural, auditory, and/or visual learning. Furthermore, combinations of a low degree of immersion and high degree of interaction – or vice versa – are possible (cluster 2 and 3). E.g., animations being presented as ex-cathedra teaching provide a low degree of interaction and, at the same time, a high degree of immersion (cluster 2). Cluster 3 describes scenarios where learners are integrated in synchronous meetings, e.g. in virtual classrooms with VoIP, where they can experience visual and auditory effects (cluster 3).

As virtual worlds support experiential learning in particular, an applicable concept for experiential learning, which helps teachers and tutors to arrange their concept of teaching in a well-structured way, will be described in the next section.

4. Empirical Analysis of Second Life Activities at German Universities

Second Life is considered one of the most well-known virtual worlds in the Internet as it counted more than 13 million inhabitants with more than 50,000 daily visitors in average by November 2008. Second Life provides an economic system, which allows e-commerce applications. Second Life offers functionalities which help to organize learning arrangements such as free creation of 3D objects, VoIP, and presentation systems. To closer investigate currently used educational forms in virtual worlds, an empirical study on Second Life was initiated.

Our analysis, conducted in August 2008, examined the engagement of German universities in Second Life. At that point of time, 18 out of 104 German universities (17.3 percent) were active in Second Life and provided distance learning courses. None of the universities had used other virtual worlds than Second Life for educational purposes.

The analysis was conducted in three steps. First, websites, wikis, and blogs dealing with the topic “Second Life” were analyzed according to relevant information concerning activities of German universities. Second, we looked for given information about activities in Second Life on the websites of these universities. In the third step, the Second Life presences (islands) of the particular universities have been visited and analyzed.

Our analysis shows that existing learning environments are on a preliminary stage in respect to the reflection of didactic concepts and the integration into an overarching learning architecture. It turns out that the learning approaches are hardly integrated or connected to other learning environments, platforms, such as Moodle, or Web 2.0 technologies, such blogs or wikis. The analysis shows that most of the realized concepts can be attributed to the clusters in figure 1. Hence, they are not making use of the full didactical and technical potentials of virtual worlds for distance learning purposes. To elaborate a deeper understanding of existing learning concepts and their weaknesses, the potentials of each cluster of our framework (figure 2) are described and referenced to best case examples derived from our analysis of German universities.

4.1. Concepts with a low degree of interaction and a low degree of immersion

Virtual worlds such as Second Life provide technical functionalities, which help to realize a lecture or presentation of media content in an Internet based 3D environment. While a teacher presents learning content via voice, text, video, or presentation slide, students are enabled to listen, ask questions via chats or use additional internet services (e.g. Wikipedia) to get more information. These kinds of learning environments, which regularly do not make use of interactive elements and immersion, are described in cluster 1 (see figure 1). Hence, employing only virtual worlds for these settings is possible, but does not create real advantages for learners and teachers. However, a combined usage of virtual worlds with Web 2.0 technologies or the linkage to learning systems, e.g. over SLOODLE, enriches the functionalities and the possibilities. Thus, a mix of content and activity can be leveraged to support all learners.

Nine of the 18 analyzed courses can be assigned to cluster 1 (figure 2). Mainly introductory courses are offered as ex-cathedra teaching. The structures of these courses show a low degree of immersion and integration.

4.2. Concepts with a low degree of interaction and a high degree of immersion

The ability of virtual worlds in supporting immersive experiences can be actively used in educational settings. Even if learning scenarios do not require interaction between users, virtual worlds may provide some considerable benefits such as the exploration of specific environments, e.g. a museum [25].

The Technical University of Dresden rebuilt the “Dresdner Zwinger” to enable people from all over the world to explore the building and its paintings inside (http://www.dresdengallery.de/index.php).
Individuals and even groups can enter the building to get an impression of size, room structure, and the exposition without spending money and wasting time for travelling. This arrangement is based on immersive experiences of visitors. Furthermore, it allows a 24/7 experience. However there exist already 3D-simulations in the Internet which generate similar benefits, but do not use virtual worlds to realize that. In our analysis only the University Dresden with their Dresdner Zwinger project makes use of a high degree of immersion with a low degree of interaction (cluster 2).

4.3. Concepts with a high degree of interaction and a low degree of immersion

Avatars in virtual worlds are able to interact with other avatars or to express emotions by gestures, mimics, text chats, voice chats, and even movements of the virtual alter ego. These opportunities can support the communication and learning process for example in seminars or team meetings.

Six of the analyzed universities use Second Life actively as a communication and collaboration platform for their students. These cases show how to contextualize the learning process. However, these concepts do not fully exploit the potential of virtual worlds as they are not providing an immersive environment. In these cases, most of the benefits can be realized to the same degree, or even more efficiently, by using Web 2.0 tools, video or VoIP conferences [25].

4.4. High degree of interaction and high degree of immersion

Innovative learning approaches in virtual worlds are based on a high degree of interaction as well as on a high degree of immersion. These concepts follow the principle of constructivism and enable students to gain knowledge by making experiences in groups. Therefore, not only theoretical but procedural and experiential knowledge can be transferred.

Only three out of the analyzed 18 universities (16.6 percent) have implemented innovative concepts with a likewise high degree of immersion and interaction (cluster 4). The educational arrangements of these universities on Second Life addressed mainly the own students of the particular university. Examples for best practices for this concept can be identified in the projects at German universities in Saarbrücken, Düsseldorf, and Potsdam:

The law school of Saarbrücken University offers a virtual „Moot Court“, where students can take over the position of the lawyer or prosecutor and defend their statements. The virtual moot court depicts in a quite impressive way how to make full use of the potential of cooperative learning opportunities in virtual worlds. Students overtake different roles and can interact freely in the virtual trial. Virtual worlds offer possibilities to simulate environments and situations in an easy way to activate and intensify the learning process.

The institute for medieval English literature and historic linguistic at Düsseldorf University established a course consisting of classical face-to-face courses as well as virtual classes. They rebuilt a medieval environment in Second Life. The students are able to experience the whole island, they can chat with each other, share information, and experience the way of working and living about a millennium ago. The immersive characteristics are of crucial importance in the simulation of the medieval ages. In this environment, students are able to feel themselves as a part of the virtual world. Students can directly imagine how people lived at these times, because of the history "experience" which enhances the learning process.

The University of Potsdam is currently establishing an innovative approach to train students from life-sciences, who have no experience in economics and law. It provides a platform, where these students can experience entrepreneurial activities in a risk-free environment with a real economy. Students are supported to invent virtual products, write a business plan, research on patents and intellectual property, and conduct competitor analyses. They should use the quasi-real economy of Second Life to sell their products to the visitors on Second Life. The virtual world activities are supported by Web 2.0 tools such as wikis for the knowledge management and blogs for documentation. This offers the students the opportunity to gain and exercise entrepreneurial experience within an authentic simulation without the risks of real market activities, such as losing a significant amount of money or relevant business relations. Therefore, this project of the Potsdam University is well integrated into a framework in accordance to the principles of the experiential learning cycle (figure 2).

4.5. Summary

Besides these examples, innovative arrangements that are based on interaction and immersion such as virtual career fairs were identified at German
5. Conclusion

Summing up, it can be said that virtual worlds offer high potentials for the computer-intermediated knowledge transfer on different levels as they are able to transfer different types of knowledge (contextual, visual, and auditory; conceptualized, procedural and experiential knowledge).

An in-depth analysis on courses in virtual worlds from German universities shows that even State-of-the-Art distance learning arrangements hardly made complete use of potentials offered by virtual worlds. It turns out that virtual worlds are still used as tools without activating significant advantages; they hardly ever go beyond the imitation of a “talk and chalk” situation. The framework systematically exposes lacks in the organization of learning modules and thus, provides ideas for an adequate reconstructing and rearrangement.

Moreover, the depicted cases, which employ high immersion as well as high interaction, lack a compatible framework to make full use of the potential of virtual worlds. These approaches in general focus on the step of experiential learning by addressing the active experience. Other stages can be supported by including blogs or wikis to reflective observation and abstract conceptualization.

It is important to conclude with a cautionary remark that this study - as every case study - suffers from the issue that it is not possible to generalize the findings due to the explorative character. Our investigation focuses only on German universities and their engagement in Second Life. However, this analysis shows a broad spectrum of different kinds of learning arrangements in Second Life is used for educational purposes. This is quite interesting as virtual worlds were not originally developed and constructed as learning environments. Furthermore, our findings depict that the development of distance learning courses and environments in technical and conceptual sense is still at very early development stage.

The goal of this paper is to initiate an academic discourse about adoption of virtual worlds in further education by providing a structural framework for developing effective distance learning arrangements on the basis of virtual worlds. However, further research is necessary. After the final launch of this project, quantitative data about the acceptance and usage of the learning arrangement will gathered by interviews and analyzed. This contribution may serve as a starting point for future research, which should consider also other virtual worlds than Second Life and a cross country study.

6. References


