

## LEARNING IN TECHNOLOGY-RICH ENVIRONMENTS: SECOND LIFE VS. MOODLE

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### ABSTRACT

This paper approaches the area of learning in technology-rich environments. In the last decade, the development of information technologies has influenced all spheres of human life and education in particular. This has led to the emergence of a new specific field with plenty of concepts and methods. Now a great number of learning systems are available and research into better educational approaches continues. The paper presents a brief exploration of learning in technology-rich environments, aiming to answer the question where and which technology is appropriate to use. This is based on comparison of how two platforms are used for learning: Second Life and Moodle, addressing their theoretical groundings and methodologies.

### KEY WORDS

e-Learning, Virtual worlds, LMS

### 1. Introduction

Technology is an essential part of present-day education. The community of teachers and learners puts into practice more and more innovative tools and methods, but still technology-rich learning is a relatively new trend carrying both abundant opportunities and serious challenges. Learning theory has been rapidly developing over the last decades, proposing new approaches with new views on education and development. Approaches in the Social Constructivism tradition are the brightest examples of this. On the one hand, they propose effective learning methods, where people co-construct knowledge by group activities. On the other hand, these approaches are often used as a framework in software application design, for example, in the social software domain [1].

Learning in the technology-rich context has its own specifics and qualitatively differs from the one without technology. Information technologies have a great

potential in the area of education, but the improvement here to meet the needs of a learning community requires a strong research base that is tightly linked to practice.

Since there are many learning technologies and a great number of tools, it is often difficult for educators to choose one. Therefore, a problem arises – how to select an appropriate approach and a learning tool or tools to suit needs. There is a need among educators to increase understanding of what technologies exist and what they are good for, as many educational institutions are limited to using traditional tools, such as learning management systems, while this mismatches current trends in e-Learning that suggest a number of new effective technologies and platforms.

This paper presents a short overview of research in the area of learning in technology-rich environments. On the examples of two software platforms that are used for educational purposes, we show how modern learning theory is used in practice to help educators in choosing an appropriate technology. One of the platforms that are described in this paper is a free online virtual world Second Life, and a software package for producing internet-based courses and web sites Moodle is another one. Although these two platforms were made for different purposes, they both are used for learning. We compare these platforms in terms of their theoretical groundings and methodological approaches. We consider how they are used for learning, trying to avoid a direct comparison of two platforms. In this paper, we particularly discuss the benefits of using virtual worlds for learning. However, instead of trying to prove the excellence of this technology, we make an attempt to clarify where it is appropriate.

There is a lot of research done in describing learning with both virtual worlds and learning management systems and particularly Second Life and Moodle [2-6]. However, comparisons are done usually for a particular task like in [7], and educators are still often doubtful which technology they should use. Thus, more research in comparing methodologies of learning platforms is needed. This paper attempts to provide a general overview of learning with virtual worlds and Learning Management

System (LMS) technologies, though without much empirical underpinning.

The paper is structured as follows. The next section presents a short overview of the field of learning in technology-rich environments, including major theoretical approaches and their relation to the technology. In section 3 we compare two software platforms, looking particularly at the methodological approaches they use and their theoretical groundings. We investigate how one can learn using these systems and what learning tasks they are good for. Section 4 concludes the paper.

## **2. Learning in Technology-Rich Environments**

This section presents different views on learning and in particular the specifics of learning in technology-rich environments. We briefly describe major theoretical concepts, addressing their influence on practice. Another issue that is considered here is the impact of digital technologies on learning.

In the last 20 years, the development of information technologies has been influencing all the spheres of human life and education in particular. This has resulted to the notable changes in not only how people live and learn, but also how life and learning are understood. On the one hand, these changes were caused by the development of philosophy and epistemology as well as the research in several interconnected fields, such as pedagogy and psychology. This work is now represented by various learning theories, methods, and concepts [8-10]. On the other hand, the technological development (digitization) has influenced humans' life changing our conceptualization and values that raises particularly epistemological and ontological questions and issues [11].

Addressing the theoretical foundation of learning, it should be noted that there are four broad theoretical approaches associated with learning: Behaviorism, Cognitive Theory, Constructivism and Social Constructivism [12]. Without giving specifics, Behaviorism and Cognitive Theory are traditional approaches, where learners are passive recipients of knowledge dispensed by the teacher. Despite criticism, these approaches are still popular in practice.

Such innovative approaches as Constructivism and Social Constructivism are more interesting in the context of this paper. The term 'innovative' sounds strange in relation to the concepts that have their roots in the classical philosophy of the 18th century and were formed more than 50 years ago. However, the discussion around their application and the resulting effect is still active. Constructivism is a theory of knowledge which argues that "Knowledge is not passively received, but actively built up by the cognizing subject" [13]. Social Constructivism, put forward by Vygotsky [14], is a theory of knowledge which argues that learning occurs "first on an interpersonal level through social interaction" [12].

In [9], these two approaches are deeply analyzed in terms of ontology. Authors argue that "sociocultural and constructivist perspectives on learning presume different and incommensurate ontological assumptions," therefore these approaches cannot simply complement each other. They rather describe different parts of learning and, according to [9], can fit ontological change.

Since the Internet has become a powerful communication medium, social approaches to learning have moved online, enhancing the value of socio-constructivism. This led to a new challenge of designing technical environments to support different forms of learning [15]. Practical sciences (Human-Computer Interaction (HCI) [16, 17], Computer-Supported Collaborative Work (CSCW) [18-20] and others) were influenced by Activity Theory that assimilated many fundamental concepts of Social Constructivism [8]. The influence started with the idea of mediation that fit excellently for interaction design; and later the underlying principles of Activity Theory were used "to reconsider some of the most central concepts" of HCI and CSCW as well [8].

Affected by Social Constructivism, a range of various concepts rose in the field of education [15], including learning communities, knowledge communities [21, 22], [23], communities of practice [24], information ecologies [25, 26], etc. These concepts "attempt to characterize new forms of social/cultural learning," contributing to the view of learning with the emphasis on group activities.

Scientific studies showed that Vygotsky's social constructivist approach [14] is especially applicable for technology-mediated learning (using Wiki technology in language learning [27]). In the last several years principles of social software (using web as a platform, user-generated content, etc.) were adopted for learning [1]. Popular social software or Web 2.0 tools such as forums, blogs, content sharing, etc. turned out to be useful for educational purposes. This can be exemplified by the variety of learning-supporting systems that successfully use Web 2.0 tools or that are essentially Web 2.0.

Though new technologies affect the nature of all spheres of human life, "they tend to be mystifying" [26]. Understanding technologies can improve their effectiveness. Concerning education, it is proposed in [10] to "stop pitting morality against technology and rhetoric; and [...] do away with the idea that ICT in our schools will necessarily tear the fabric of education apart." But, as it is stressed in [26], much more discussion and analysis of technology is needed to adjust supporters and opponents.

## **3. Second Life vs. Moodle**

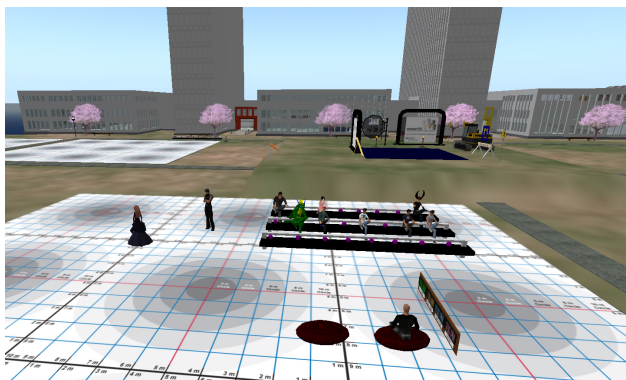
### **3.1 Platforms' Descriptions**

In this subsection, we present some general information about two platforms: Second Life and Moodle, focusing on their potential to support learning.

Both platforms provide online access for users, both exploit social software principles and both are very popular.

Linden Lab's Second Life is defined by its developers as "a free online virtual world imagined and created by its Residents" [28]. This virtual world was not designed as a purely learning platform. In the scientific literature [2, 3] it is often identified as a Multi-User Virtual Environment (MUVE), with the emphasis on separating it from games. Nevertheless, education is just one of the major application domains in Second Life and in spite of some critique it is the brightest example of this type of platforms. Since it was opened for the public in 2003, an increasing amount of activity continues to be seen in investigating and trialing its potentials for learning. Educational projects in Second Life vary broadly, from full-scale, highly realistic campuses to individual classes taught in common areas. Over 500 universities and colleges have a presence in Second Life at the time of writing [28, 29]. Major universities already using SL include Harvard University, California State University, Ohio State University, Princeton University, New York University and Stanford University, just to mention a few. Other educational organizations that have a presence in Second Life include research organizations (for example, Biomedicine Research Labs), libraries (for example, Alliance Library System), museums (for example, International Spaceflight Museum) and so on.

Our institution – Norwegian University of Science and Technology (NTNU) has recently acquired an island in Second Life to build a virtual campus (Fig. 1). We plan to develop the campus as a framework for educational and social activities [29], using the advantages of virtual worlds.



**Fig. 1. Virtual Campus of NTNU in Second Life**

Second Life and other similar virtual worlds can be very effective learning spaces in many cases. These environments are "generalized rather than contextual which allows virtual worlds to be applicable to almost all disciplines" [30]. The number of Second Life users is counted by tens of thousands and it is growing in popularity because it has the key characteristic of social software or Web 2.0 [1, 31]: social networking, the ability to create and share media content, a feeling of presence

and a connection to the community. Besides that, the third dimension provides additional functionality and more possibilities for learning. Second Life allows creating any settings to pertain to any subject or area of study. This includes constructing realistic and detailed 3D landscape, buildings and artifacts, using inbuilt 3D editor, as well as assigning behaviors to objects and designing tools, using internal script language.

Of course, alongside their strengths Second Life and other virtual worlds have some limitations [2, 31] that affect the use of Second Life as a platform for learning. First, there are some technical barriers, for example, a student using this virtual world requires advanced hardware and a broad band Internet connection; and teachers managing learning activities in Second Life "require skills that most educators don't have" [30]. Commonly the cost is a barrier as well. While the participation can be free for students, an institution can establish a presence in a permanent area only on a fee-paid basis. Another Second Life weakness that is often stressed in literature [2, 30] is that it was adapted, but not created for educational purposes. This causes some problems for learning, such as a number of disturbing factors and the absence of specialized features and tools for supporting educational activities.

One of the features of Second Life as a learning environment mentioned in [2] is that it links externally to 2D web, including Moodle. Sloodle (Simulation Linked Object Oriented Dynamic Learning Environment) is an Open source project which integrates Second Life with Moodle learning-management system [32]. There exists a significant demand for integrating MUVEs with existing web-based learning systems [5], and Sloodle represents the first serious attempt to achieve this.

Moodle (Modular Object-Oriented Dynamic Learning Environment) is defined by its community as "a free web application that educators can use to create effective online learning sites" [33]. This platform is often referred to as Course Management Systems (CMSs), Learning Management Systems (LMSs) and Virtual Learning Environments (VLEs) [33-35]. The software supporting learning has improved significantly over the last 15-20 years and has led to increasing the usage of LMSs; first commercial (for example, Blackboard and WebCT) and later – open source (for example, ATutor, Claroline, and Moodle) [6]. Moodle stands out among other similar open-source platforms as one of the most popular and multi-purpose. According to the official statistics [33], over 28 million users take advantage of about 50 thousand Moodle systems in the world, ranging from fully online courses to blended learning courses, from single-teacher sites to large universities. Major educational institutions employing Moodle include Open University UK, University of Glasgow, Idaho State University, University of Canberra, etc.

Moodle and other LMSs can serve as an important learning assistant or even be an essential part of a learning system. This platform was created as an alternative for Blackboard, specifically for supporting learning

Table I  
Platforms' comparison

	Second Life	Moodle
Framework	The platform is adopted for learning and has functionality to design tools	The platform is created for learning and has special functionality supporting learning
Theory	Social constructivism	Constructivism, Constructionism, Social constructivism
Environment	3D environment providing the sense of presence, but a number of unnecessary features provide barriers and distractions	Interactive web-site
Engagement	Very high. Social environment, providing fun, 'live' communication, attractive 'game-like' graphics	High. Good complement to traditional lectures, social, fun experience
Interoperability	Well-established integration with 2D-web, including Moodle	Integration with other LMSs, allowing import/export of the content
Content	Supports 3D content	Supports well-structured 2D content
Tools	User-generated content was an initial and basic idea. All content is user-generated. Video, audio, graphic images, VOIP, public chat, private chat, slideshows, text-based information, etc. are supported	Supporting common social software tools and some special learning tools such as courses, tasks, questionnaires, etc.
Experience	The most 'realistic' experience, replacing real-life one	Complementing real-life experience
Technical challenges	Technical skills are needed to create and support a virtual place for learning activities	Technical skills are also needed
	Payment for land possession. Paid support is also often needed	Payment for hosting and support
	Hardware requirements can be a barrier	Lower (often acceptable) hardware requirements
	Open-source software	Open-source software

communities [6]. Moreover, Moodle is Open-source software that means it is free to use, configure to fit particular needs and even add new functionality, editing its code. The platform provides a collaborative medium, a place where users can all meet, communicate and learn [6, 36]. Moodle developers [33] define their mission as providing educators with the best tools to manage and promote learning, considering different approaches to it. Many users exploit some social software tools (such as forums, Wikis, etc.) that allow supporting collaborative communities of learning, while others prefer to use Moodle to simply deliver educational content to students and assess learning using assignments or quizzes.

Moodle also has some weaknesses in comparison with other learning platforms [6, 34]. It is noticed that several features do not function correctly (for example, content and quiz import procedures) and not always intuitive user interface leads to some difficulties. Nevertheless, the lack of a specific feature in Moodle "is not necessarily a permanent limitation, since the Moodle development community is extremely active" [37], constantly working on the system's improvement.

To conclude, in spite of their weaknesses, both Second Life and Moodle are very popular and are useful as learning platforms. Though they have different applications domains, we will try to make a comparison.

### 3.2 Methodological Approaches

This subsection contains a short description of methodologies that were used to design Second Life and Moodle, as well as a comparison of ways these platforms can be used, their strengths and weaknesses in support of learning (Table I).

The initial Linden Lab's idea was different from what Second Life is. In 1999 they started developing the hardware that would enable computer users to be fully immersed in a 360 degree virtual world experience [28, 38]. However, in 2001, influenced by the investors'

opinion, Linden Lab shifted the initial objective from gaming to a more user-created, community-driven experience. That effort would eventually transform into the better known, user centered Second Life [39]. These facts show that Second Life was originally designed based on the principles that could refer to the socio-constructivist tradition; and that formed such popular social software concepts. However Second Life's status as a virtual world, a computer game or a talker is frequently debated [28]. Second Life cannot be a game, because it does not have goals or rules; it can be a talker, because it contains an extensive world that can be explored, interacted with and be used purely as a creative toolset.

However, education has never been the main purpose of Second Life, and the majority of inhabitants use it primarily as an entertainment medium. Virtual clubs where users engage in generic chat, and sexually themed areas, are consistently the most populated in Second Life. These facts are considered as serious weaknesses of this virtual world as a learning environment [2].

Moodle was originally created by Martin Dougiamas, who has graduate degrees in Computer Science and Education. His Ph.D. topic was "The use of Open Source software to support a social constructionist epistemology of teaching and learning within Internet-based communities of reflective inquiry". This research has served as an arrival point for Moodle and strongly influenced its design, providing aspects missing from many other learning platforms.

The stated philosophy of Moodle [33] includes constructivist and social constructionist approaches to learning [9], emphasizing that all users (teachers and learners) can contribute to the educational experience in many ways. Moodle's functionality reflects this supporting collaborative work in a wiki, creating and commenting on entries in databases, etc. It also should be noted that the official Moodle community [33] does not force this way of using the platform, stressing system's flexibility to allow a full range of teaching modes.

Actually, Moodle is very often used as a content delivery tool; it is feasible when more functionality is not needed.

The development of Moodle continues as a free software project supported by a team of programmers and an international user community. As there are no license fees or limits to growth, any institution can use Moodle to such extent as needed. For example, Open University UK (<http://www.open.ac.uk/>) is providing about 200,000 users with Moodle-based courses.

As we have shown, both Second Life and Moodle can be employed as learning platforms, but let's see how exactly they can be used.

Two platforms allow performing different activities and provide different experiences. From educational perspective, this has resulted in different learning and teaching categories and forms of knowledge that could emerge in provided activities. Moodle supports mostly 'Accumulation' (providing educational content and quizzes) and 'Assimilation' (providing group-work tools) categories of learning [22]. Second Life supports these two categories of learning in more varied ways (see the discussion below) and the third one – 'Accommodation' – to a greater degree (providing wider context for creativity). Further, Moodle deals mostly with explicit form of knowledge, which is information that "can be gathered and stored in remote databanks" [23]. It provides a variety of tools for working with 'knowledge about things' that give learners an 'observation experience'. Second Life in its turn supports constructing tacit knowledge as well. This form of knowledge can be seen as a process of 'doing things'. Second Life provides possibilities for simulations, role-playing and gaming activities that give learners 'action experience' [23].

Obviously, two platforms have principally different demonstration possibilities. They both support 2D content presentation, Moodle in more formalized and easy-to-use way. However, presentation in Second Life can be in the form of a virtual museum, art gallery, showcase, etc. Second Life "can offer learning experiences that go beyond presentation of material on flat screens and, due to its capability in augmenting reality can actually outstrip, in some cases, real world demonstrations" [2]. The International Spaceflight Museum (ISM) can be an example of excellence in learning in Second Life and its demonstration possibilities in particular. ISM is a large-scale virtual museum, which hosts exhibits and events about spacecraft, rockets, and space travel (<http://slispaceflightmuseum.org/>). For example, this museum contains an exposition of rockets where it is possible to fly around them, read about them, and take a rocket ship ride into space. It "offers a solar system simulation where visitors can stand in the middle of a model of the solar system, calibrate it to any date in history, and watch the planets revolve around them" [40]. Open University UK can be an example of supporting learning with Moodle where a huge number of students use this LMS in their course work. It should be said that both platforms allow users' creating and sharing content,

but in Moodle the content is only 2D and the process of creation usually has stronger moderation.

In addition to the demonstration possibilities, Second Life provides a "more immersive, time-based experience, with the capability to connect not just intellectually but on a directly emotional level" [2]. In this way Second Life can help learners to experience, for example, other people's realities like in 'Virtual Hallucinations site' (<http://slurl.com/secondlife/sedig/27/45/22/>). In this environment users can experience "a series of auditory and visual hallucinations based on the testimony of actual patients suffering from schizophrenia" [2]. Game-based learning and role-play continues the list of Second Life's specialties. In [41] benefits for the learning process within Second Life are described, though noting these benefits are mostly potential. In this virtual world, it is possible to simulate any learning context, for example, particular historical periods. Performing games or enactments allows students to become 'residents' of that age for some time, providing them with deeper degree of immersion. Another example of using Second Life for learning is simulating any expensive or dangerous learning or training context. In [42] several successful military simulations in Second Life that are used for training are presented.

As it was shown, in comparison to Moodle, Second Life has non-educational functionality and wider application field (it can be used for training, research experiments, etc.). Therefore, it provides varied experiences and can be used in several related areas. However, this can lead to distractions, and as our own experience with virtual worlds shows [43], it is a serious factor and should be considered in the design. Moodle in this case gets a more positive assessment, because all its functionality is designed for purely educational purposes. In addition, it has special tools for learning that Second Life lacks.

### 3.3 Theoretical groundings

In this subsection, we outline what theoretical approaches Second Life and Moodle are guided by and how this reflects on learning.

The discussion about the effectiveness of learning with technologies has a long history in the research society. When the role of learning systems was mostly the content delivering, the obvious disadvantage of learning was the lack of interaction and face-to-face experiences. However, the growing popularity of Social Constructivism in pedagogy and the development of the technologies in the way of accessibility of global communication have led to serious changes in learning.

Socialization of the Internet under the influence of social software ideas resulted in a great number of web services and tools; some of them have purely educational focus, for example, Wikipedia (<http://wikipedia.org/>). Both Second Life and Moodle are shining examples of these 'technological' changes in learning, because both consider the social aspect essential.

Since Second Life was opened for the public access, there has been written a lot about learning in this virtual world. Almost all theoretical approaches that are used in other technological contexts are mentioned in relation to Second Life as well. This fact forces me to consider how only one major theoretical approach – Social Constructivism – is applied in Second Life.

The major unique characteristic of Second Life is that almost everything in it was made by its residents. The developers provide only ‘clear land’ and a set of tools for doing and creating whatever users want. This initial idea fits very well the socio-constructivist approach to learning. Virtual experience in Second Life is not as rich as in real life, but often it is more accessible and motivating and allows something that is not possible in reality. Simple construction of a 3D object in Second Life can be extended to achieve educational goals. The object can be an artifact of the studying subject and the construction will include learning from the discoveries in some particular area. This activity (construction) can take place in any context relevant to the subject (for example, in a reconstructed ancient village), extending the learning experience with the immersion in the atmosphere of the subject. This can include the landscape, flora, buildings, artifacts, sounds, avatars, costumes, and other cultural aspects. The activity can be collaborative, involving a group of learners and experts working together, communicating, guiding, and learning from each other. In addition, the activity can be reflective, including annotating peers’ artifacts or the neighboring village constructed by another group. Educational activities can be also extended by performing any kinds of events in the created places. This simple example shows how major principles of Social Constructivism can be used for learning in Second Life.

The official web-site [33] said that Moodle is guided by three major theoretical approaches: Constructivism, Constructionism and Social Constructivism. Based on the constructivist approach, Moodle provides a number of possibilities for actively constructing new knowledge by the aggregation of tools like tasks and quizzes, reflection and participation functionalities, available learners’ personal information, blogs, etc. Constructionism asserts that learning is particularly effective when constructing something for others to experience. To support this type of learning, Moodle provides possibilities for contributing and sharing through forums, wikis, collaboratively created glossaries and databases, etc.

Social Constructivism is often called the main fundamental approach of Moodle [6, 33, 36]. It extends constructivism into social settings; it assumes knowledge constructed by collaborative activities in groups. Moodle provides several tools for collaborative work and learning (chats, forums, wikis, etc.) and facilitates the creation of learning community.

## 4. Conclusion and future work

This paper presents a short overview of the topic ‘Learning in Technology-Rich Environment’, presenting major theoretical approaches and technological challenges. In this paper, we have also compared the two platforms that are used for learning: SL and Moodle, particularly in terms of their methodological approaches and theoretical groundings. It was shown that multiuser virtual worlds as learning environments have many advantages, but not suitable for every task. Based on the literature survey made, the following list of cases was derived. It shows when this technology should be preferably used.

- Often when the Social constructivism is the main approach;
- when learning benefits from the sense of presence;
- when the high level of engagement is necessary;
- when 3D content explains the subject better than 2D;
- when synchronous activities are more important than asynchronous ones;
- when there is a demand to simulate various face-to-face activities;
- when there is a demand to replace real-life experience rather than to complement it;
- when potential learners have already got some experience in working with virtual worlds;
- when hardware requirements suit potential learners.

This list of recommendations is the first attempt to answer the question of helpfulness of virtual world technology for learning. Every item of this list could be challenged and improved or replaced. These items cannot be used separately, but they can rather generate a general sense that virtual world technology suits a learning task.

The future work will be the development of a specific framework that allows defining whether it is rewarding to use virtual worlds for a specific learning task or not.

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