

Integrating Virtual Worlds and Virtual Learning Environments through Sloodle: from theory to practice in a case of study for teaching of algorithms

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ABSTRACT

Use of technology in education resulted in important changes on methods and techniques applied, as the use of virtual learning environments and virtual worlds, providing a high level of interactivity and immersion. This paper presents a summary of research that seeks to integrate two distinct technologies (VLE and Virtual World), through a solution called Sloodle. The main focus is to present the use of such a solution and its main features, as well as present a case study involving the teaching of algorithms and programming. Tools used in this research were: Open Simulator for metaverse; Moodle was chosen as AVA; IDEOne as an online tool for teaching algorithms and Sloodle. With the study, it was revealed that the use of virtual world added to Moodle through Sloodle tool, is a valid alternative to the process of teaching and learning, but also identified difficulties to be overcome in this type solution, as use of Sloodle and technological limitations of their resources.

Categories and Subject Descriptors

K.3.2 [Computer and Information Science Education]: Information systems education – *Computer Science Education and Information Systems Education.*

General Terms

Documentation, Design, Experimentation.

Keywords

Algorithms, Moodle, OpenSim, Sloodle.

1. INTRODUCTION

Use of technology in education has been explored continuously, among the alternatives available to enhance teaching and learning, both in classroom and activities in distance education; is the use of Information and Communication Technologies (ICT). Virtual Learning Environments (VLE) and Virtual Worlds (VW) have

been used to enhance the learning potential of students and teachers in order to obtain a more significant and collaborative learning.

Johnson [1] considered “Virtual Learning Environment” as an addition to the construction of knowledge, immersion, interactivity and education. These environments have been used principally in the preparation of activities outside the classroom environment, as a way to improve the quality education of students.

As for the paradigm of education immersive, this presents itself as an interesting resource for building transdisciplinaries contents, non-linear and dynamic, about a virtual world, available in the student's own computer. According to Bainbridge [2], Virtual Worlds are persistent online environments like computer generated, where people can interact in a manner comparable to the real world, either for work or for leisure.

Researchers like Livingstone et al. [3], emphasize the importance of integrating VLEs to other technologies, including the VW, as facilitators of the teaching and learning processes. One of the ways to integrate the technologies mentioned (VLE and VW), is the utilization of the tool Sloodle. According to Guomin et al. [4], Sloodle allows to bring an immersive world within an educational environment such as Moodle, improving interaction and perceptibility of users in online education.

Among the various educational areas in which these technologies can be applied to assist in the teaching and learning of students, is Algorithms and Programming (AP). An example of this difficulty is the teaching of the discipline AP, in which students face various problems in the development of activities (e.g., understanding of the issues listed) [5].

This paper presents a summary of a research that seeks to integrate two distinct technologies (VLEs and VW), through a solution called Sloodle. The main focus is to show the main features involved in this technologies, added to this, is the realization of a case study in a the discipline of Algorithms and Programming, in which lessons were held in the virtual world by Sloodle integrated with Moodle.

The paper is organized as follows: section two presented related work using the technology Sloodle in education; in section three we conducted a theoretical foundation regarding the use of

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technology in education, virtual worlds and Sloodle; in section four is the methodology developed and applied in the development of this work; in section six is presented the case study and the results obtained in relation to the experience of using the Sloodle by users is presented; finally, section seven presented the final considerations.

2. RELATED WORK

In order to develop this research project, related work was evaluated in order to use the know-how of other studies to validate this study. Following are descriptions of some relevant work:

In Silva et al. [6], is reported a research on the development of an environment that uses Moodle and hardware platform Arduino and Microserver, beyond the virtual 3D environment with access to real experiments using Sloodle and OpenSim. As a result, authors have made a remote access to a device located in the lab, visualizing forms of propagation of heat, providing study materials in Moodle environment and access them via mobile.

In Guomin [4] is explained the operation of the Sloodle module, its functions and its use educational, added to this was built a model of collaborative learning for English language teaching based on the Sloodle. The model for teaching English is explained in a detailed manner, which presents the roles executed by the students, teachers and their general functioning.

In Livingstone et al. [3] is reported the work of a project carried out by the authors, where they present the use of web learning environments to provide frameworks and planning activities to be performed in 3D virtual worlds, as well as demonstrating the use of web content directly into the virtual world through connection provided by it. Sloodle was used to perform the integration of the virtual learning environments and virtual worlds.

With relation to the research conducted in this study, it differentiates itself from others by presenting in detail the technology Sloodle, its functionality and features. Furthermore, a case study in the area of Algorithms and Programming was also performed, differently from the knowledge areas adopted by the other studies reviewed.

3. THEORETICAL FOUNDATION

This section will explore concepts of Informatics in Education and virtual worlds. Furthermore, it is also performed an initial approach on Sloodle, to serve as a basis in subsequent sections.

3.1 Use of technologies to support learning

Use of computers in education directly influences the educational process by inserting a high level of interaction in these activities, which, can be promoted by tools and mechanisms provided by computing platforms, unlike a traditional classroom.

With the expansion of distance education, VLEs have been used continuously as a main technological resource for mediation of activities performed by users online. They are characterized by an area of interaction between teacher and students, used to perform different activities, enabling a set of students connect to a platform, to carry out activities, in order to stimulate the formation of collective intelligence, enabling the construction of knowledge, developing intra and interpersonal skills [7].

3.2 Virtual Worlds

Virtual Worlds, also known as Metaverses or Immersive Environments provide another interesting technological resource

to support the process of teaching and learning. Bell [8] combines the main elements of other definitions and emphasizes an essential element: people. Thus, the author defines VWs this way: "A synchronous, persistent network of people, represented as avatars, facilitated by networked computers."

According Reis [9], several platforms are available for the construction of virtual worlds that provide support for 3D modeling, with the ability to pre-programming the behavior of objects. We can cite as examples of metaverse Second Life, OpenSimulator (OpenSim) and OpenWonderland.

In general, the Virtual Worlds do not have an own Graphical User Interface (GUI) access, like the case of the Second Life and OpenSimulator (OpenSim), thus requiring a third tool to perform the connection and the correct presentation of the objects. This tool is called "viewer" and provides support for visualization, import and export of objects, and other resources related to the Virtual World. A wide range of viewers is available for both Second Life and OpenSim, thus, Nunes et al. [10] present a comparison with the basic features of the main tools available.

3.3 Sloodle

Sloodle can be considered as a mash up tool, which, in the computing area means the interconnection of two or more technologies. In this case, makes the connection between the virtual learning environments and virtual worlds, thus combining the various features available in the VLE with those offered by VW, making the environment more interactive and attractive to users.

According to Nakamura [11], the great contribution of Sloodle is to bring social networking features, in a fun and interactive way for Moodle. Thus, this event becomes more attractive to the course environment.

Users can add elements of Sloodle, noting that the activity should be placed initially in the learning environment Moodle so that it might be added into the virtual world. As for example of elements of Sloodle that can be added in Moodle, are the Chat, Choise, Presenter, Tracker, Glossary, Login, Change Passwords and Questionnaire. The corresponding elements that are added in OpenSim are respectively Web-Intercom, Choise, Presenter, Tracker Button, Meta Gloss, Reg Enrol Booth, and Password Reset Quiz Chair.

With regard to the problems and difficulties identified during this study, are listed the following: if the education environment is hosted on a server or the user does not have access to the file system, neither holds administrator privileges, the installation can do not occur or become too complex. Therefore, it is necessary that the user has access to the installation directory and have administrator privileges on the Moodle environment.

4. METHODOLOGY

First phase was characterized by a survey of the theoretical reference regarding the topics discussed, explaining about the use of information technology in education. Have also been introduced concepts about virtual worlds, the characteristics of each of these, viewers, as well as an initial explanation about Sloodle.

In a second step, we evaluated and tested the immersive environments in order to define the technological infrastructure for this research, as can be seen in Figure 1. The environment Moodle 2.5 [12] was selected for being compatible with the module Sloodle, free and open source, as well as OpenSim 0.7.5

[13] was chosen for the same reasons mentioned above. The module Sloodle 2.1 [14] was used to integrate two environments, for the visualization of the virtual world was selected Firestorm viewer [15], since it suits the needs identified in the construction of the virtual world, such as viewing and creating objects in the SketchUp and importing these in XML format.

Third step was marked by the completion of the case study, which was chosen a discipline of Algorithms and Programming ministered in an undergraduate course in a university, addressing one specific topic within this, which, was the part of Vectors and Matrices. Validation occurred in two classes ministered by a teacher to a group of 14 students, which were made available various activities to be performed into the virtual world, as viewing the slides about Vectors, chat conversion and development of exercises through an online tool integrated with OpenSim.

Finally, the fourth step is the realization of a questionnaire, in which, students answered a series of questions in the multiple choice format, about the experience of having participated in a class within the virtual world and use the resources available for teaching algorithms. Then, was performed the tabulation of results.

5. CASE STUDY

To validate the proposed described in this research, was designed and built an academic environment on the metaverse, in the format of the classroom, where they had been provided a set of resources to an activity towards the discipline of Algorithms and Programming. The initial sample of the experiment involved the participation of 14 students, beginners, of the course engineering computing. This content displayed on OpenSim discoursed on the implementation of vectors and matrices, using the programming language C. Necessary to meet the demands of this academic activity, students (avatars) had access to different connections to the Moodle course using the Sloodle, as shown in Figure 1.



Figure 1. Sloodle connections.

In addition to the Sloodle, in order to enhance the sense of immersion of the environment has been integrated into the virtual world an application called IDEOne [16], an IDE for the development of algorithms in different programming languages, including C. This software allows a high level of concentration of the student in the construction of their solutions, since there is a clear interface with simple controls, code compilation with just one click, and provides instant feedback, which is considered a motivating factor.

Several "Presenters" have been added for the visualization of content covered during the accomplishment of the school, as well the insertion of the tool IDEOne on several panels for its manipulation by users directly into the virtual world.

During the experiment, some points related to the structure of the virtual world could be observed: the environment OpenSim endured all connecting avatars, with answers to interactions very close to real time, even with the geographical distance between the server and the viewers; a interaction between students through chat, occurred automatically, even before the demonstration of the features of OpenSim to the students; the visual environment as well the ability to change the appearance of the avatars, fostered the initial interest of the students during the contact with the Virtual World.

The teaching material regarding the construction of vectors and matrices was available via Sloodle, throughout the class period, about two hours. After the study of the topic, a panel has been enabled for avatars, with a list of exercises to be performed into two, using IDEOne. At this time, avatars should talk to each, in order to define their peers and set of tasks, which, occurred smoothly.

At the end of the activities was made available to students some guided questions about the actions, activities and resources used during class. From the result of this instrument, it was possible to point out some considerations about the adoption of virtual worlds as a teaching strategy.

The observations regarding the amount of visual data, which disrupted the concentration of students, is known as cognitive overload, a common factor in multimodal environments. The fact that each individual has a tolerance level assimilation of different media simultaneously justifies the proximity of the indices reported in this issue. However, the percentage above 50% shows that the design of the environment, as well as the number of available resources should be reconsidered, in order to meet the needs of students and promote effective knowledge construction by them.

With regard to the reported experience of students for the class taught in OpenSim, through application of an questionnaire of evaluation, could verify in a general way that the vast majority of users had used the Moodle environment, and that half of the students had also had previously contact with some immersive environment, which may have facilitated the understanding and interaction of these with the virtual world. The results of the experiment conducted were positive, since the vast majority of students claimed to have interacted actively and constructively in carrying out activities, and virtual worlds held the students' attention and motivate them to perform the tasks.

Use of Sloodle was evaluated positively and that the immersion provided by the integration of the two environments, through interaction with the tool and the material of the class, was of great value to facilitate learning. Nevertheless, some problems were identified, such as restrictions on access to features of the Sloodle and distraction caused by the number of elements available in the virtual classroom.

6. CONCLUSION

The utilization of Sloodle for education can be positively exploited, in which the construction of activities into the virtual world can help to complement the process of teaching and learning of students. In the case of this study, elaborated more specifically to the area of Algorithms and Programming, can be added different elements into the virtual world, aggregated to the Moodle by Sloodle, to build a interactive and immersive laboratory in order to teaching Algorithms and Programming.

This study showed the use of Sloodle in a specific domain area, which, was initially described the whole installation process involved, difficulties identified and resources Sloodle that could be used. Subsequently, the construction of the scenario to conduct the lesson into the virtual world was developed, with the addition of features such as the "presenter" and IDEOne, an online tool for building algorithms directly into the virtual world.

In general, the use of Sloodle was evaluated as valid for the conduct of activities into the virtual world, and in this specific study, assisted in the construction of algorithms and motivated students more significantly than if they were performed these tasks in an environment of traditional classroom. As future work, is the construction of a laboratory for teaching algorithms taking into account the aspects observed by the students during this study, as well as the clarification and resolution of issues related to access to features of the Sloodle.

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