

EXPLORING VIRTUAL ASSIGNMENTS IN SLOODLE MEDICAL COURSE

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Abstract: The paper provides a new approach of using Sloodle environment in medical education through 3D virtual classroom. Sloodle course "Spine-function and deformities" includes variety of teaching topics which are designed by appropriate Sloodle tools such as Presentation, Webintercom, Quiz Chair and Assignment Drop Box whose application is described. Within the course, virtual assignment are designed to contribute to self-assessment of medical staff in clinic and pre-clinic practice. The paper describes in detail the process of creating assignments consisting of creating models and defining the required tasks.

Keywords: e-learning, Second Life, moodle, sloodle, medical education, spine, virtual assignments

1. INTRODUCTION

After the completion of medical school and formal residency training, medical education does not stop. The science of medicine advances at such a rapid rate that much of what is taught becomes outmoded, and it has become obligatory for physicians to be lifelong learners. [1] Self-assessment is a vital aspect of the lifelong performance of physicians. Self-monitoring requires that individuals are able not only to work independently but also to assess their own performance and progress. [2]

Over the last few years, there has been growing interest in the medical and public health communities in using virtual environments for education and training. A pioneer in the use of virtual environments for learning medicine is Ann Myers Medical Center. [3] The center is placed in Second Life [4] virtual world, and includes a number of students, animators who invest time in the development of virtual scenarios. In [5] Second Life is used to simulate the emergency room where small teams of students can learn about appropriate ways to diagnose and treat patients whose condition requires urgent intervention. In [6] pilot study was conducted to explore the potential of using a virtual world platform for medical education through the development of a one-hour, interactive seminar for postgraduate primary care physicians on the topic of insulin therapy for type 2 diabetes. In [7], through comprehensive literature review, authors have found 68 relevant sites in Second Life. According to [8], these application examples are categorized in the top 10 of the cases. Some of the most interesting are related to neurology, as well as the virtual space for people with disabilities.

Recently, integration of Second life with Learning Management Systems Moodle [9] led to Simulation Linked Object Oriented Learning Environment (Sloodle) [10], which contains necessary functions for learning from environments. Sloodle is software package and provides a new range of educational opportunities.

There have been a small number of descriptive case-studies published on the use of Sloodle, [11] describe Sloodle application in the field of programming language, and [12] uses same environment for Computing Graphics course. We didn't find any published research regarding Sloodle application in the field of orthopedics.

The main focus of our current work is preparing 3D virtual classroom. In our previous work [13] we have explained in detailed course preparation and its implementation. We have also conducted internal evaluation to analyze possibilities offered by Sloodle environment concerning course preparation. Results can be seen in [14]. The main novelty of our current work is preparation of 3D classroom and design of virtual assignments that could be used as self-assessment for medical staff in clinical and pre-clinical practice in orthopedic.

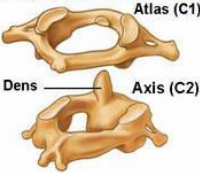
The rest of the paper is organized as follows: in section 2 (Overview of course structure) we give overview of the main course element and their purpose; in section 3 (Model creation) we explain in detail how to create and implement complex vertebrae models in Second Life; in section 4 (Assessment requirements) we provide example of virtual assessment; in section 5 (Conclusion) we conclude with the summary and future work.

2. OVERVIEW OF THE COURSE STRUCTURE

The course “Spine – functions and deformities” (image 1) has been created for the purpose of training medical staff in pre-clinical and clinical practice. The course is set within avatarclassroom.com [15] moodle web site, which is automatically connected to 3D classroom in Second Life.

The topics within Moodle site are designed to systematically guide users through learning materials. Firstly, users are introduced to Second Life virtual world, secondly they recall their knowledge of the detailed structure of the spinal column, and finally through series of activities are focused on the different spinal deformities from which the emphasis is on scoliosis, kyphosis and lordosis.

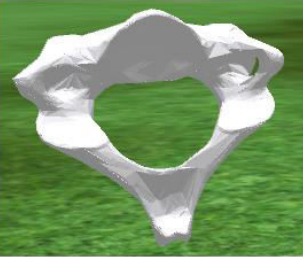
3 **CERVICAL VERTEBRAE- review of their position and role**



Atlas (C1)
Dens — Axis (C2)

Weekly guidelines
LEARNING MATERIALS
Cervical vertebrae
3D cervical vertebrae model in Second Life

PRACTICE
Test
Assignment
Discussion



ADDITIONAL MATERIALS
Useful links
Glossary

Image 1: Part of the medical course

Within the “Spine – functions and deformities” course, the following topics are created:

- Second Life – introducing to virtual world
- Spine column – basic concepts
- Cervical vertebrae – review of their position and role
- Thoracic vertebrae – review of their position and role
- Lumbar vertebrae – review of their position and role
- Sacrum and Coccyx – review of their position and role
- Scoliosis – diagnosis, types, treatment
- Kiphosis – diagnosis, types, treatment
- Lordosis – diagnosis, types, treatment
- Comprehensive self-evaluation

Unlike topic within Moodle site, 3D classroom is designed into 5 levels, where each level contains

particular activities that are connected to adequate resources within Moodle site.

First floor is set to be *Registration Area* (image 2). Here, users are expected to link their avatar to their Moodle account. This process is called "avatar registration". For the purpose of this course it is used Sloodle tool *RegEnrol Booth*. To register, avatars simply need to touch computer on the Front desk.



Image 2: First floor in 3D classroom

Beside *Front desk*, other Sloodle tools are placed in first floor, such as *Chalkboard* with welcome notice and *Sign* with notification which area avatar is on.

After registration, user can go to second floor, which is set as *Presentation Area* (image 3). At this floor we placed vertebrae presentations. Each presentation is about particular area of spine, i.e. Cervical vertebrae, Thoracic vertebrae, Lumbar vertebrae, Sacrum and Coccyx. We used *Presenter* slideshow tool to set up presentations. In order to use *Presenter* we first uploaded presentations to our Moodle website. Users can see presentations in Second Life or on Moodle course. Beside slide image, presentation can be video or a website.



Image 3: Second floor with Presenter tool

Below each presentation, we placed corresponding 3D vertebrae model. For the purpose of this paper only one of the vertebrae from particular group is presented. The process of creating 3D models will be explained in detail in the section 3. If users touch model, they can rotate it for certain angle and thus observe it from all sides.

Meeting Area is set on the third floor of 3D classroom. We placed circled sitting and in the center *Web intercom*, which is an opt-in chat logging tool. It is useful tool for recording users' chat during meetings and presentations. When the web intercom is turned on, users can opt-in to have their chat recorded. The web intercom connects with a Moodle chat activity in Moodle course. Therefore all chat typed into a Moodle chat activity will be routed into the virtual world of Second Life and vice versa. This feature increases accessibility for users wanting to participate in an in-world chat, but are unable to log into Second Life. If users are unable to attend meeting, they can go through Moodle chats that are archived on Moodle, and saw all important notes from that meeting.



Image 4: Application of Webintercom tool

After going through presentations and exploring 3D models, users can check their knowledge on the fourth floor. We used *Quiz chair* for that purpose. It is used for giving multiple choice quizzes to users in Second Life. Each quiz chair connects to a Moodle quiz which is created in our Moodle website. When a user's avatar sits on a quiz chair it prompts the user to answer a question. If the user answers correctly, the quiz chair will rise half a meter, and if the user answers incorrectly, the quiz chair will descend.

The quiz chair can also be configured to award users' points on the *Scoreboard*, which will display these points in order of highest to lowest. Quiz chair is suitable tool for self-assessment because users can see their results right after quiz is completed or later on the Moodle website.



Image 5: Example of Quiz chair and Scoreboard tools

The fifth floor (image 6) is set as *Assignment Area*. Here, users will have different assignments to accomplish. Beside quizzes, assignments are great way to check practical knowledge. Setting and requirements of the assignment that is on the fifth floor will be explained in detailed in section 5.



Image 6: Fifth floor in 3D classroom

3. MODEL CREATION

Because of its complex structure, reflected in the large number of surfaces, graphic spatial models cannot be directly created or imported to Second Life. After the extensive research, we resolved this issue by introducing Blender application [16]. It is a professional free and open-source 3D computer graphics software product used for animated films, visual effects, art, 3D applications, etc. Among many Blender's important features is 3D modeling.

Models are first externally developed in some of the software packages for 3D modeling, such as Solid works, CATIA, etc. In order to import model into Blender, it needs to be in some of the following file formats: .stl, .3ds, .obj, etc. These formats are used as file formats for conversation between different 3D modeling software. After importing, we used Blender's Decimate Modifier option [17], to reduce number of triangles and vertices of the model. This option allows reducing with minimal shape changes (image 7).

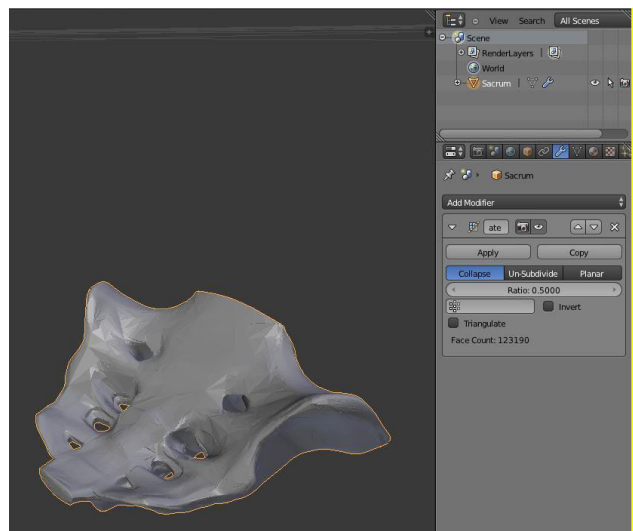


Image 7: Sacrum 3D model in Blender program

Process of uploading edited vertebrae model to Second Life than is same as any other object (image 8).

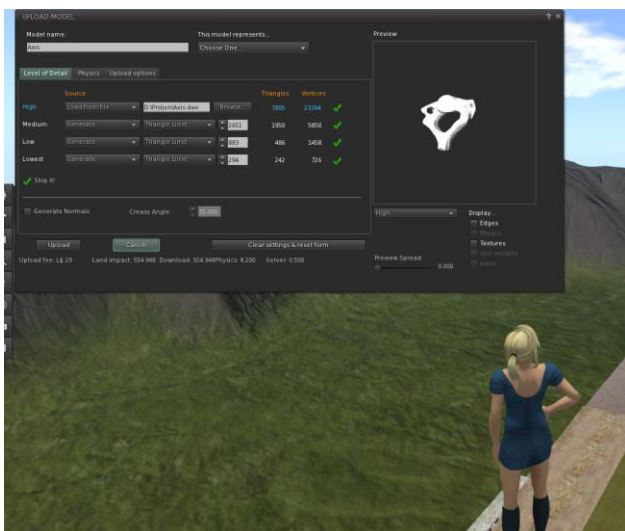


Image 8: Uploading third lumbar vertebrae 3D model from Blender to Second Life

Image 9 shows spine 3D model, which is imported to Second Life.



Image 9: Overview of spine 3D model in SL

In order to additionally enhance models' visualization we have used Linden Scripting Language (LSL), which is official Second Life programming language. The LSL functions are used to add functionalities to vertebrae models, such as appropriate actions and labels. Image 10 shows part of the LSL script used on vertebrae model. We wrote LSL script that will allow users to touch model, and

rotate it for certain angle and thus observe it from all sides.

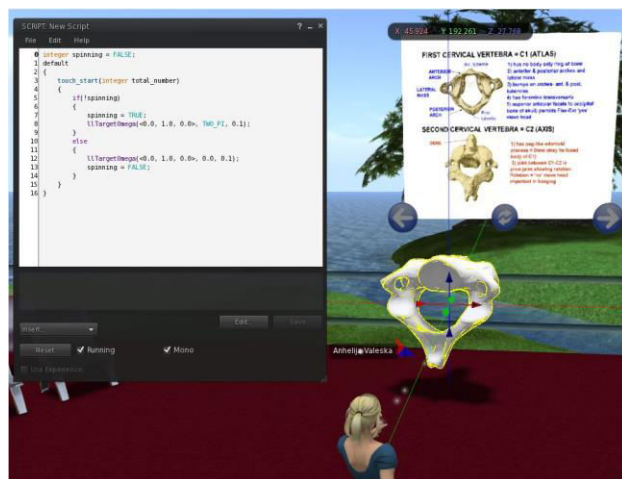


Image 10: Adding appropriate LSL script to 3D model

4. ASSIGNMENT REQUIREMENTS

On the Moodle course within Lumbar vertebrae topic we set assignment with defined requirements (image 11).

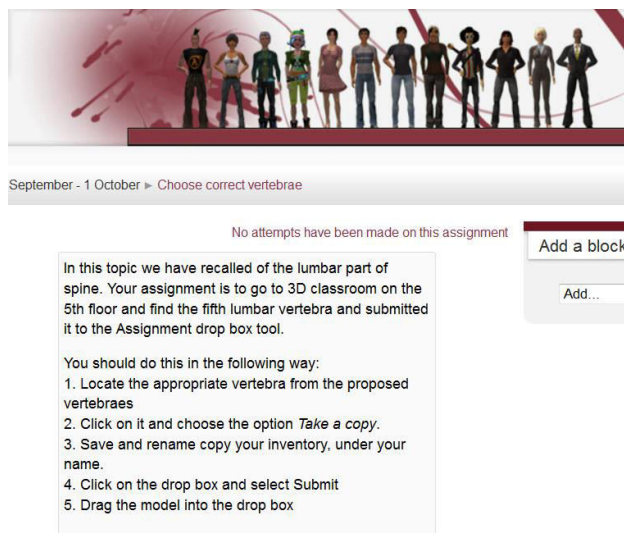


Image 11: Assignment requirements on Moodle site

In this example, assignment requirement is to find a fifth lumbar vertebra, which is placed among several different vertebrae models, and submit it. All models are placed on the fifth floor, and users have to find right one, copy it to their inventory and save under required name.



Image 12: Assignment Area of the fifth floor

The *Assignment Drop Box* is used for submitting 3D models. The drop box is linked to a Moodle assignment on our website, therefore, when an assignment is placed into the drop box, it can be graded using the Moodle grade book.

When users touch *Assignment drop box*, dialog box appeared asking them what they want to do next (image 13). In order to submit model, users need to choose *Submit* option, and drag their model to drop box.



Image 13: Submitting 3D model to Assignment Drop Box

At the time present this tool has no option for self-assessment, and tutor has to grade users work. On the other hand assignment can be configured so that the tutor gets notified by email when an assignment has been submitted. When the tutors views the Moodle assignment page, they will be able to view a SLURL which points to the drop box of where the assignment was submitted in Second Life. After teleporting to the drop box, the tutor can retrieve all submitted assignments from the drop box for review.

5. CONCLUSION

Although the physician practicing at a major medical center usually has no problem obtaining the required training, physicians who practice in rural areas or other more isolated locations may face considerable obstacles. [1] In order to enable interns who work in the field of pre-clinical to have opportunities for practice and lifelong learning we have created “*Spine – functions and deformities*” Sloodle medical course.

In this paper we provided the following:

- Referred to some related work of virtual environment application in medicine education and training.
- Described 3D virtual classroom of “*Spine – functions and deformities*” course
- Explained in detail implementation of complex 3D vertebrae models to Second Life.

- Used Linden Scripting Language to give appropriate actions to model, such rotation, which would help users to better understand 3D models.
- Explored opportunities to create virtual self-assessment tasks such as Quiz Chair and Assignment Drop Box tool

The importance of proposed approach is reflected in innovation of existing course in this area, as well as enabling users to practice and review cases that are currently not available in real world practice. Future work will be related to course evaluation by medical staff.

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