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MOODLE BASED E-LEARNING RESOURCE FOR REVISING CLINICAL ANATOMY: AN INEXPENSIVE AND INTERACTIVE SUPPLEMENT FOR PHYSIOTHERAPY STUDENTS

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ABSTRACT

Background: Basic sciences like gross anatomy and physiology are the building blocks for all clinical courses. In the traditional physiotherapy curriculum, these basic medical subjects are covered in the first year of university course, whereas the clinical papers are pushed towards the final years, in conjunction with clinical practice. The time gap between these modules needs to be minimized to apply the basic science knowledge and achieve a strong understanding of the clinical conditions and treatment procedures. To bridge this gap, we tried to reintroduce these basic science concepts, including anatomy, imaging and biomechanics during the clinical modules.

Methods: An online pack of 'pre-clinical revision tasks' was created using the students' learning management system-Moodle for the 3rd semester physical therapy students in Universiti Kuala Lumpur - Royal College of Medicine, Perak. The students were asked to undertake a self-directed, learning and evaluation task before each clinical module. The online resource usage was monitored periodically within Moodle. A focus group interview was conducted and a 5 point Likert scale questionnaire feedback was obtained.

Results: 83 students from the third semester participated in the study. Overall, 87% of the students utilized the resource, mainly after regular class hours. The students felt that the resource was useful (79%), made the clinical concepts simple (72%) compared to previous semesters.

Conclusion: Such online resources tailor-made for each course and well integrated to the curriculum would definitely allow the students refresh their basic sciences knowledge essential for clinical practice.

Keywords: E-learning, anatomy, physiotherapy students, self-directed learning.

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INTRODUCTION

Teaching and learning has historically occurred in a face-to-face context. However, with the advent of internet and technology, e-learning has become a common mode of educational delivery [1]. The prime reason for its popularity among the students is that learning can be carried out at the learner's convenience and also it allows for revision of content [2] at any time. It provides flexible content delivery and appears to be cost effective. The benefits of using information technology as a teaching tool have already been acknowledged worldwide in various health related fields including medicine [3], osteopathy[4] [5] and nursing [6] [7]. However, to our knowledge, there is no dedicated e-learning resource for the physiotherapy students in Malaysia.

There is increasing evidence that online Learning Management System (LMS) has the potential to facilitate a more active approach to teaching and learning within the health-care education [8]. Blending technology and face-to-face engagement has been shown to help bridge the gap between theory and its application. But supporting the physiotherapy curriculum, there is no resource that engages the students to provide ongoing learning outside teaching hours, and to bridge the unavoidable knowledge gap created by the traditional curriculum plan. The aim of the study was to develop and test the efficacy of an online resource that could refresh the basic science knowledge gained by students in their earlier years of physiotherapy study, at the Universiti Kuala Lumpur – Royal College of medicine Perak, Malaysia.

MATERIALS AND METHODS

The study was conducted with permission of the Department of Physiotherapy, Faculty of Pharmacy and Health Sciences, Universiti Kuala Lumpur – Royal College of Medicine Perak, Malaysia. The study group included 83 students of second year (Semester 3) Diploma in Physiotherapy programme. The Students were included if they are willing to participate in the online study and had regular internet access. Participation in the survey was voluntary and students were informed that they could withdraw at any time with no negative consequences. All the students were completed the online module on time and there is no exclusion in the study. The questionnaire was developed based on our study objectives. The questionnaire consist of narrative response section with 10 open ended questions related to students overall experience with Moodle based e-learning.

An interactive online resource on the basic science related to physiotherapy practice was developed using Moodle LMS. The resource contains an interactive platform where students could solve a clinical case online by using their basic science knowledge, by following the guidelines and answer the relevant questions. We supplemented the existing teaching resources with this online Moodle resource and promoted student engagement. We also monitored the student participation and collected the user-usage data for analyses. Ethical clearance and students' consent was sought for this study, and all student data was kept anonymous.

Development of the e-resource

The Moodle LMS not only allows teachers to upload lecture material and audio-visual content, but also allows them to develop custom learning resources for their students, that includes interactive quizzes. We used a combination of these facilities and developed our own e-learning resource, tailor made for second semester physiotherapy curriculum. This includes a series of interactive questions, mainly of 'multiple choices' and 'true or false' format (Figure 1).

We provided information on basic and clinical musculoskeletal anatomy and neuromuscular physiology related to orthopedic conditions. We also included slides that help students interpret radiological images in a simpler way (Figure 2). All these material were related to physiotherapy treatment principles taught in second semester, in conjunction with their clinical postings.

They were mainly meant to revise the clinical and radiological anatomy of the musculoskeletal system, in three different modules- upper and lower extremities, and the spine. Parallel to this, we also uploaded the lecture material including power point slides, checklists and handouts in Moodle LMS, which could be accessed by the students anytime while accessing the e-resource. The e-learning resource was distributed midway during the lecture period of the corresponding clinical module. The students were encouraged to use the resource after the lectures and lab sessions, but before they attend the clinical postings.

Evaluation methods

Online activity logs- data regarding individual student's participation throughout the academic period were generated from the Moodle LMS page. This includes the student details, which are anonymized, demographic features, time and date of participation and the scores obtained at the completion of the task as a whole and in individual questions. These data were downloaded and analyzed offline using a Microsoft excel worksheet.

Finally, to evaluate the value of this Moodle based e-resource in improving student academic performance, the mean final practical rubric marks obtained by these students in third semester (academic session 2014/2015) were compared with their marks obtained in the previous semester (academic session 2013/2014). It should be noted that the same number of students appeared for both the practical rubrics, the teaching schedule and the curriculum scheme were similar. There was no change in our teaching staff during both the semesters.

Evaluation questionnaire

During the 14th week of their course, a set of questions in a standardized Likert scale format was distributed to the students at the end of the teaching period to get their feedback on the implementation of this resource and evaluation of the same. The questionnaire consisted of three parts: The first part collected the demographic information of the students- age, gender and academic background. The second part asked the students to evaluate content and quality of the anatomy resource and its accessibility in Moodle using a standardized Likert Scale. The third part allows the students to answer a set of open-ended questions related

to the overall experience with the e-resource and Moodle usage (Table 1).

Statistical analyses

The values were expressed as mean \pm SEM. The statistical analysis was carried out by using unpaired t-test. P values < 0.05 were considered as significant.

RESULTS

All students from the third semester of physiotherapy course (n=83) participated in the study. The students all had no previous degree in health sciences; they utilized the e-resource from September 2014 to December 2014. The entire resource usage was carried out after class hours (student learning time) during regular working days and at random hours during weekends. The entire resource modules were utilized by 87% of the students.

Finally, the value of this Moodle based e-resource mean final practical rubric marks obtained by these students in third semester (academic session 2014/2015) is 16.33 ± 0.25 when compared with their marks obtained in the previous semester (academic session 2013/2014) is 13.22 ± 0.35 (Figure 3). The total percentage of marks for practical rubric is 20 percentage of the total syllabus.

Responses from the Likert scale questionnaire and the open-ended answers were also statistically analyzed. The students felt that the resource was useful (79%), made the clinical concepts simple (72%) compared to previous semesters (Figure 4).

DISCUSSION

The basic medical sciences- including anatomy and physiology are taught in the first year, biomechanics and principles of physiotherapy practice in second year, the clinical papers in third year, while the students start their clinical postings and supervised patient treatment. As seen from the students' response, it was difficult for the students to relate the basic sciences and clinical concepts, as they were taught in different years of study.

The objective of this was double folded- firstly, it enabled us to develop and evaluate the e-resource on clinical anatomy for physiotherapy students. Secondly, it helps us understand the functional feasibility of using Moodle LMS to develop and distribute such an online resource [9]. This clinical anatomy learning resource is unique in a way that it stands different from routine online quizzes and web resources. It supplements the conventional classroom teaching with web based learning [10]. This is completely interactive and engaging in a way that it utilizes a combination of features used in other online resources [11]. At each stage, the students are provided by answers, clues and references to online study material, so that the resource acts as a complete guide to encourage learning, evaluation, critical thinking and decision-making.

The knowledge acquired by the students must be complemented by the advantages of online learning [12], and the resources must be brief, not taking up much of the students' learning time [13] [14]. It is a very useful and feasible method to promote student learning, especially the clinical concepts on top of the theoretical knowledge they

obtained in classroom teaching [15]. Our study also shows that the study material gets interesting when coupled with interactive questions and engaging with clinical concepts.

This study describes our initial experience of integrating a Moodle based E-learning resource for revising clinical anatomy to a group of second year Diploma in physiotherapy students. We assessed student feedback on the introduction of Moodle based E-learning. The results indicates significant ($p < 0.0001$) improvement in final examination marks in anatomy subject compared with the previous year that did not use it, indicates implementation of E-learning tool had a positive effect on student learning outcome. This system was beneficial for students in various ways.

Selvakumaran et al., 2011 [9] reported that the students were improved their performance in physiology subject after using Moodle based E-learning when compared to traditional teaching method. Our results also well correlated and agreed with this study. From student's feedback, it is clear that students were generally satisfied with this E-learning tool. While e-learning has several benefits like ease of access, and allows less teacher participation, it provides more chances for students' independent learning [16].

CONCLUSION

This online resource uses advanced e-learning technology to supplement the pedagogical methods in physiotherapy education. To our knowledge, this is a first e-resource developed and evaluated for physiotherapy curriculum in Malaysia. It stands ahead from other resources in the facts that it is completely inexpensive and free to develop, distributed on the free LMS- Moodle, and provides immediate user-usage data for statistical analysis and evaluation. Timely discussion with staff, and immediate correcting or editing the content accordingly is also possible. This also provides more chances for staff to develop their own e-learning material with no previous experiences in computer programming.

In the future, such simple but effective e-learning resources might be developed for other modules across semesters, which might bridge the gap between basic science and advanced clinical topics. They could be tailor made for individual courses and institutions. As the resource is distributed via Moodle, it can be accessed via smart phones and tablets through regular browsers. They do not seem to suffer any issues from different browsers or operating systems. While supplementary e-learning cannot replace face to face teaching and hands on experiences, it definitely promotes independent learning among students.

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Q. No	Statement based on anatomy quiz	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Was easy to navigate and use.					
2	The materials on anatomy quiz were relevant and appropriate.					
3	The uploaded materials were useful.					
4	It helped me to further my understanding about the topic taught in anatomy.					
5	Does the online teaching Moodle improve performance of practical skills?					
6	It complimented traditional learning through lectures and tutorials.					
7	Picture and x-rays helped in better understanding to the anatomy subject					
8	Learning through it could replace some lectures and tutorials.					
9	I prefer to learn through Moodle e-learning rather than conventional classroom setting.					
10	I prefer to have test/quiz through Moodle e-learning.					

Table 1: Likert scale questionnaire used to obtain students' responses

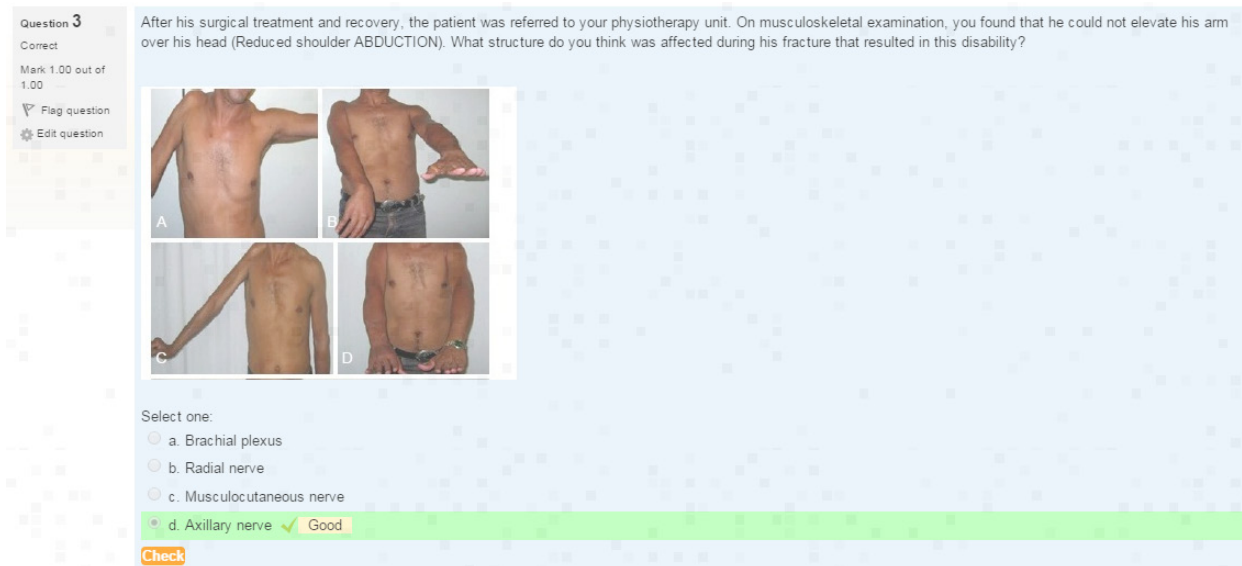


Figure 1: Screenshot from the university Moodle LMS page showing the interactive question format used to engage student participation.



Figure 2: Screenshot showing the questions that test the clinical concepts using basic anatomy and biomechanics knowledge.

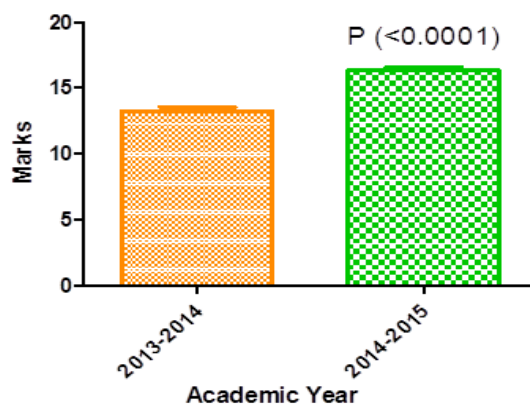


Figure 3: Graph showing the significant increase in the academic performance between two consecutive years, before and after assessing the e-resource.

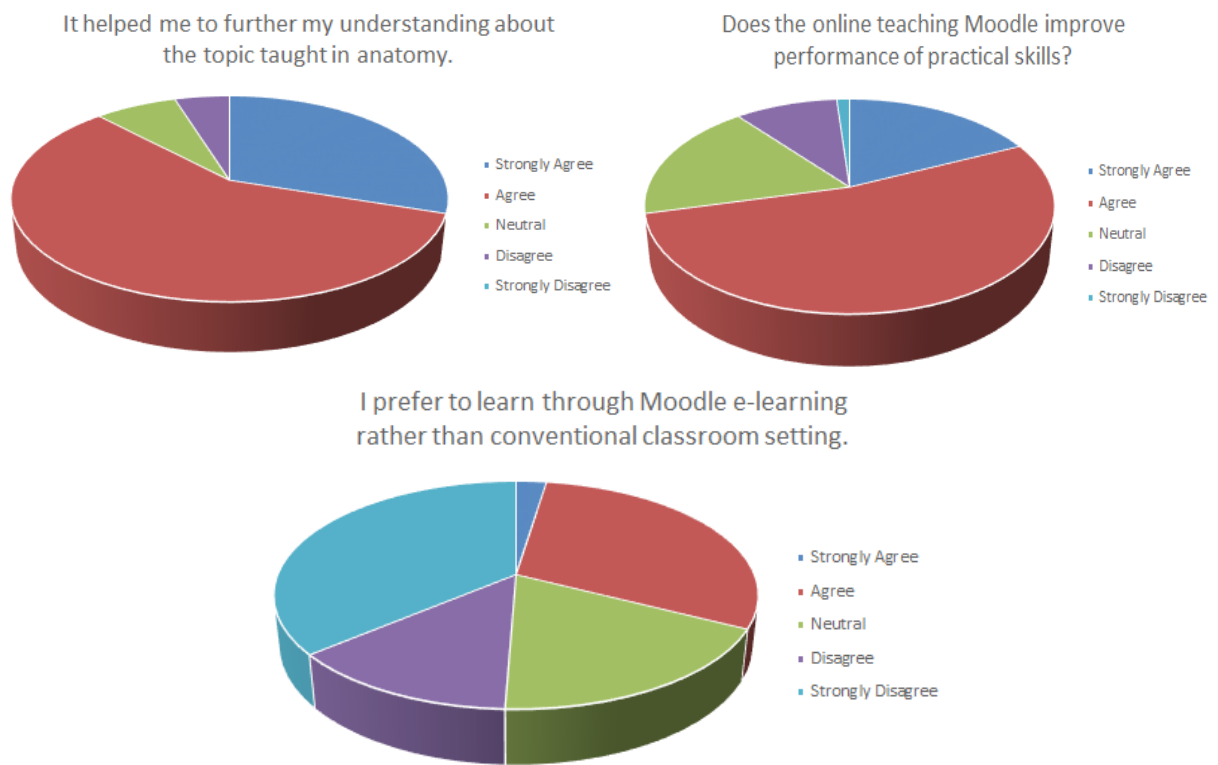


Figure 4: Graph summarizing the students' responses from the Likert scale questionnaire and focus group studies