Effectiveness of Moodle on E-Learning Platform in Medical Education - A Review

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ABSTRACT
Advances in medical knowledge and changing accreditation requirements present a challenge to fit a vast amount of new content within the curriculum. Various advanced learning methodologies have emerged to impart knowledge on the vast medical curriculum. As technology continues to advance, so does the demand for learning. Many educational programs have adopted various modalities to suit the needs of a diverse student population. Advancement in medicine has led to various new specialization courses being developed which are being delivered as online courses via a Learning Management System (LMS) that has software paired with the Internet to manage the interactions of students and teachers in delivering the course materials. Due to many competing demands on their time, academic faculty have less time for teaching and also physical distance among diverse health care delivery sites makes it a challenge for traditional face-to-face instruction. In such a scenario, one of the best e-learning platforms is Moodle. Many online programs have been designed with the Moodle LMS. Faculty need to develop a new comfort level using Moodle that they presently have with Blackboard and LCD screens as well as perfect their skills in using the system. It would be prudent to have a full-fledged training and tutorial on the Moodle LMS for the faculty as well as the students. The method of learning caters to adult learning principles and is designed to have an interactive instructional module which involves not only reviewing the instructional materials but also practicing through creation of similar activities. The present article gives a review on application of Moodle in e-learning platform of medical education and how to create a Moodle account and set up a course.

Keywords: Medical Education, Moodle, e-learning, Learning Management System.

INTRODUCTION:

Today’s net generations are interested in e-learning. Easy access to computers and the internet have given a wide scope for people to participate in the e-learning process. E-learning is independent of place and time, and the teachers determine the rules of conduct and access to classes. E-learning cannot replace traditional forms of education, but it can be used as a supplement tool to transfer knowledge widely.1,2,3 Many Online courses are delivered through a structured learning management system (LMS) by software pairing with the Internet which facilitates the interactions among students and teachers in delivering the course materials.

E-LEARNING:

E-learning can be instruction delivered in a digital format via a computer that is intended to promote learning or facilitate teaching.4,5 Some specific web-based applications are conceived for use as a
teaching resource. E-learning platforms allow educators to provide students with a variety of resources, as well as enabling interaction with them. They also allow teachers to follow the evolution of the learning process and help assess the performance of each student in specific tasks. Currently, more and more students think of computers as standard tools for learning.\(^6\)

E-learning has much to offer the learner in any educational system and has huge potential. It is important that the e-learning creativity has a perceived usefulness, and is not implemented for the sake of innovation.\(^7\) There is little point in introducing a technology just because it is available.\(^7,8\) The novelty factor can often cause us to be tempted to implement the latest and greatest technology, sometimes without thinking carefully enough about whether or not this is actually going to result in meaningful learning.\(^7,9,10\)

“Newer technologies such as computers...are not necessarily better for teaching or learning than older technologies...they are just different...the choice of technology should be driven by the needs of the learners and the context in which we are working, not by its novelty.”\(^11\)

Seven Principles of good teaching indicate how the technologies help in adding value, realizing the principles in practice and achieving educational outcome. Looking for answers to educational challenges will be more likely to result in the appropriate use of technologies. Appropriate utilization of e-learning may facilitate the necessary modernization of medical education.\(^11\)

**MOODLE:**

Moodle is a learning management system (LMS) and an acronym that stands for Modular Object-Oriented Dynamic Learning Environment. It is the doctoral work of Martin Dougiamas who built the software on four main concepts: Constructivism, constructionism, social constructionism, and connect and separate (www.moodle.org, 2012). The software is designed on a modular, object-oriented, open-sourced platform, which gives the educator more freedom with design.\(^12\) It is a computer program that facilitates teaching and the so-called e-learning.\(^4,5\) Such e-learning systems are sometimes also called learning management system (LMS), course management system (CMS), learning content management system (LCMS), managed learning environment (MLE), learning support system (LSS) or learning platform (LP); it is education via computer-mediated communication (CMC) or online education.\(^13\)

Moodle,\(^14\) Ilias,\(^15\) Sakai\(^16\) and Claroline\(^17\) are open source systems and free to download. The most frequently used of all of these is the Moodle platform; it is easy to use, and offers a wide range of Web 2.0-enabled capabilities (chat, forums, questionnaires, etc).\(^18\)

Moodle is a Virtual Learning Environment enabling the creation of flexible and engaging online courses and experiences.\(^19\) Moodle has been installed at universities and institutions all over the world. Current development of Moodle is undertaken by a global network of commercial and non-commercial users, led by the Moodle Company based in Perth, Western Australia. E-learning was employed to 'scaffold'\(^20,21\) students' learning, by providing a common set of learning materials, links to library resources and by enabling group collaboration to occur without the need for teachers and learners to be in the same location, or work at the same time. Learners and teachers can work independently and communicate asynchronously through forums or emails.\(^22\)
Alternatively, teachers and/or learners may communicate in real time through instant messaging.

**Virtual Learning Environment (VLE) & Moodle:**

The introduction of a VLE may be aligned with Chickering & Gamson's Seven Principles of good teaching practice, the result of which:

1. Encourages contact between students and faculty
2. Develops reciprocity and cooperation among students
3. Encourages active learning
4. Gives prompt feedback
5. Emphasizes time on task
6. Communicates high expectations
7. Respects diverse talents and ways of learning

Moodle addresses each of the seven items either wholly or in part. The Moodle platform provides a scaffold from which students with different learning styles and abilities can draw on. In September 2005, the RCSI launched its new VLE, Moodle, for undergraduate school of Medicine. The Moodle platform placed greater emphasis on the students as active participants in learning rather than as passive recipients of teaching. The Moodle site facilitated the provision of a baseline uniform standard of academic teaching, providing support to clinical sites that had been described as 'less impressive'. There is limited published evidence on the implementation of a VLE within medical undergraduate programs. The efficacy of this new technology must be formally addressed prior to its widespread implementation if the high standard of trained doctors is to be maintained.

**Learning style theory and web based learning in Moodle:**

Lewin's Cycle of Adult Learning, a four-stage sequential cycle, commences with a concrete experience, which is followed by personal reflection on the experience. This is then combined with previous knowledge (abstract conceptualization), and finally new ways of adjusting to experiences are explored (active experimentation). Kolb's learning style model which is based on Experiential Learning Theory looks at grasping experience as well as transforming experience. From this, four learning styles have been devised - Converger, Diverger, Assimilator and Accommodator.

E-learning is seen as a new way of teaching and instruction that aims to educate graduates who are innovative, flexible, creative, and effective problem solvers. It is also viewed as being cost effective. Nilsson, in his study found no evidence supporting that students' learning styles influence the choice to use their web-based programme in a blended learning setting. This result is in accordance with those of Cook et al who found no association between scores and different web-based format preferences in medical residents. Nilsson web-based learning is a suitable learning tool for most medical students.

**Moodle in Medical Education:**

Various foreign medical councils have outlined significant improvements made and opportunities for development of Internet based educational technology. The WHO has advocated a continuous process of renewal in terms of medical education. Moodle, a virtual learning environment can help to address many of the deficits highlighted by national and international assessments. E-
learning, learning facilitated through use of technology, has been shown to be at least equivalent to traditional methods of teaching.\textsuperscript{34} It is grounded in learning theory and promotes active student participation facilitating deep learning.\textsuperscript{9,35} Moodle, provides an opportunity to objectively identify the failing medical student prior to landmark final examinations.\textsuperscript{32}

**Why Moodle in Medical Education?**

"Innovations in the delivery of Medical education and training are needed" – Buttmer report.\textsuperscript{36} The usage of Moodle platform regularly throughout the academic year seems to get better grades for students than those who rarely or never use it.\textsuperscript{13} Students have been able to determine a sense of how well they recalled the lecture material, but the true goal of competency still appears to be beyond the reach of VLE.\textsuperscript{37}

**Moodle in health care education curriculum:**

The use of a virtual learning environment (Moodle) in the delivery of an undergraduate curriculum, and its potential ability to identify students who are struggling with the course material prior to university examinations was found to have a high impact. Student activity within Moodle could be monitored, and the online activity correlated well with end-of-course examinations results.

The Department of Obstetrics & Gynecology at the Royal College of Surgeons Ireland (RCSI) undertook an assessment of its innovative Virtual Learning Environment (VLE), Moodle, and observed the correlation between online student activity and end of final year examinations. A positive correlation was noted between the students' use of the Moodle based course formative assessment and the end of final year professional examination. It provided the foundation for a more rigorous assessment of its use as an adjunct to the traditional course and an opportunity to exploit the development of exciting new technologies, in the delivery of consistent high quality healthcare education. Good evidence exists to suggest at least equivalence between traditional medical teaching and computer assisted learning across medical specialties.\textsuperscript{37} There has been no evidence to date for the replacement of traditional didactic lectures with a virtual course. Many studies suggest that the best use of computer assisted learning [CAL] involves integration or blending with existing traditional models of teaching.\textsuperscript{38} CAL and highly structured teaching sessions have been shown to be superior to lecture based teaching in terms of students subsequent performance outcomes.\textsuperscript{39} The modular nature of Moodle facilitates a structured CAL process. International standards and national recommendations dictate that medical schools strive to provide an equally high standard of education to students across pre-clinical and clinical years which need to be provided irrespective of geographical location of their hospital rotations and using modern technologies that are founded in educational theory.

**Moodle resources and activities:**

Moodle has an adaptable array of methods for presenting educational resources to students.\textsuperscript{14} Moodle Resources and Moodle Activities refer to a wide array of functions and features combining Web 2.0-enabled interactive functionality as well as static traditional components.\textsuperscript{19} These components are limited only by the concepts of the administrator adopting the software, as all users are free to develop and reconfigure the source code to meet their needs.\textsuperscript{40} Moodle automatically records the activity of every logged in user within a given site as a component of a report system.\textsuperscript{19} The system...
records each user click within the site software and allows administrators and teachers to access the log files of each participant. These files can be exported as plain text files or as Microsoft Excel files. The log files can be sorted by participant, activity or time. Teachers and administrators can filter the log file data to determine activity within a given time frame, on a particular activity, and even to the level of discriminatory and non-discriminatory questions within a quiz. The data may be represented as a bar chart or a Microsoft Excel file time stamping specific activities.\textsuperscript{41}

**Moodle data:**

Moodle collects a vast amount of data about students' usage of the platform. This information can be obtained for a single person, for an entire group of people or even for all the students at a global level. On an individual basis, the teacher can determine all the activity carried out within the platform: number of visits, time spent on quizzes and their scores. Quantitative data can be retrieved directly via the Moodle application itself or downloaded in a file suitable to be used with a spreadsheet application (e.g. Microsoft Excel). This feature allows the teacher to extract useful information about the course. The facility exists to demonstrate activity for different days or given periods of time. Each user log is easily identified as the site is password protected and users have to log in to get access. All user sessions are identified to a particular user. This minimizes the amount of pre-processing usually associated with large databases.\textsuperscript{41} Quizzes are useful tools for students to test their level of knowledge.\textsuperscript{13} Moodle provides a variety of quiz types.\textsuperscript{14} The instructions are available within the Moodle site [Moodle.com], with explanatory notes for each technical step.

**Resource types of Moodle:**

Moodle supports a range of different resource types that allow you to insert almost any kind of web content into your course (Figure 1 & 2).

1. **Text page**
   This type of resource is a simple page written using plain text. A number of formatting types are available to help turn your plain text into nice-looking web pages. The page is stored in the database, not as a file, and you have a lot of freedom to do almost anything you like using HTML, including Javascript.

2. **Files and web pages**
   This resource type allows you to link to any web page or other files on the public web or the ones uploaded into your course files area from your own desktop computer. Normal web pages are simply displayed as they are, while multimedia files are dealt with more intelligently and may be embedded within a web page.

3. **IMS Content Packages**
   The content can be created and edited using a variety of content-authoring software. Content is usually displayed over several pages, with navigation between the pages. The content-authoring software produces a zip file, which can then be uploaded to your course in Moodle. The zip file is unzipped automatically in Moodle, and the content of the package displayed.

4. **Labels**
   It is little different from other resources because they are text and images that are actually embedded directly among the other activity links in the course page.
5. **Moodle Activity Modules**
Moodle contains a wide range of activity modules that can be used to build up any type of course.12

6. **Assignments**
It allows the teachers to specify a task that requires students to prepare digital content and submit it by uploading it to the server. Typical assignments include essays, projects, reports and so on. This module includes grading facilities.

7. **Books**
It is a simple multipage study material.

8. **Chats**
The Chat module allows participants to have a real-time synchronous discussion via the web. This is a useful way to get a different understanding of each other's perception and the topic being discussed.

9. **Choices**
A choice activity is very simple- the teacher asks a question and specifies a choice of multiple responses. It can be useful as a quick poll to stimulate thinking about a topic; to allow the class to vote on a direction of course; or to gather research consent.

10. **Database Activity**
The Database module allows the teacher and/or students to build, display and search a bank of record entries about any conceivable topic. The format and structure of these entries can be almost unlimited, including images, files, URLs, numbers and text amongst other things.

11. **Forums**
This activity can be the most important - it is here that most discussion takes place. Forums can be structured in different ways, and can include peer rating of each posting. By subscribing to a forum, participants will receive copies of each new posting in their email. A teacher can impose subscription on everyone if they want to.

12. **Glossary**
This activity allows participants to create and maintain a list of definitions, like a dictionary.

13. **Journals**
This module is a very important reflective activity. The teacher asks the student to reflect on a particular topic, and the student can edit and refine their answer over time.

14. **Labels**
This is not a true activity – it is a “dummy” activity that allows you to insert text and graphics among the other activities on the course page.

15. **Lesson**
A lesson delivers content in an interesting and flexible way. It consists of a number of pages. Each page normally ends with a question and a number of possible answers.

16. **Podcast**
This activity allows participants to create and maintain a RSS feed for an entire course not just an activity. Included in this feed is a more streamlined way of adding video and audio Podcasts.

17. **Quizzes**
This module allows the teacher to design and set QUIZ tests, consisting of multiple choice, true-false, and short answer questions.

18. **Resources**
Resources are content: information the teacher wants to bring into the course. These can be prepared files uploaded to the course server; pages edited directly in Moodle; or external web pages made to appear as part of this course.
19. SCROM/AICC Packages
A package is a bundle of web content packaged in a way that follows the SCORM or the AICC standard for learning objects.

20. Wikis
A Wiki enables documents to be authored collectively in a simple markup language using a web browser. The Moodle Wiki module enables participants to work together on web pages to add, expand and change the content. Old versions are never deleted and can be restored.

21. Workshop
A workshop is a peer assessment activity with a huge array of options. It allows participants to assess each other's projects, as well as exemplar projects, in a number of ways. It also coordinates the collections and distribution of these assessments in a variety of ways.

22. Moodle QUIZ Hyperlinks
This module allows the teacher to design and set QUIZ tests, consisting of multiple choices, true-false and short answer questions.

Figure 1 Activities of Moodle courses

Why to choose Moodle course platform?
- It facilitates developing and delivering course material.
- It provides learners with all the facilities and learning opportunities they would experience in a face-to-face teaching situation.
- It is flexible enough to grow with you as the technological sophistication of your faculty and students increases with time.
- It empowers you to scale rapidly.

Limitations of Moodle:
* Moodle software has to be subscribed by institution or an individual has to purchase for running a course.
* Teachers and students have to be given more training for operating Moodle
* Students may not be sufficiently knowledgeable with the IT infrastructure to feel comfortable with using the online course material, given that the same material is probably available from lectures, and may have been discussed offline amongst the students, thereby eliminating the necessity for accessing the Moodle site.
* Students engage more with curriculum aspects that are part of formal evaluation than the quizzes as offered by Moodle.

CONCLUSION:
Learning Management Systems like Moodle supplement the traditional educational delivery as they help in administration by providing space for monitoring the proceedings, make documentation of student profiles manageable, aid tracking of student progression and simplify delivery of educational courses or training programs. However
while implementing such a system in higher educational Institutions like Medical Colleges, one needs to tread with caution and go ahead only if the infrastructure and other resources needed are consistently available and if it is feasible as a long term measure.

**Figure 2 How to set up a Moodle course**
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