

## MOODLE: A TOOL FOR SELF- DIRECTED LEARNING IN FIRST YEAR MEDICAL STUDENTS

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### ABSTRACT

**Background:** Self-directed learning has been a central theme for decades. In medical education, the ability to direct and regulate student's own learning experience is crucial for their success. Skills learned by self-directed way learning are associated with life-time learning Modular Object-Oriented Dynamic Learning Environment (MOODLE) is an open-source software learning management system, developed on the principles of andragogy by Martin Dougiamas for educators to create interactive and collaborative courses. Because of its modular structure and dynamic nature it has been used for flipped classrooms, blended learning, and distance education self-directed learning in various educational institutes. **Methodology:** 41 first-year MBBS students were randomly divided into study and control groups. The students of the study group were enrolled for the MOODLE course on "Glycogen metabolism". On a prefixed day study group logged on to MOODLE course and in a parallel session the same topic was taught to control group as a didactic lecture. After cross-over of the group same exercise was repeated with another topic i.e. Biochemical basis of complications of diabetes mellitus after each MOODLE session students' feedback was recorded. The difference between pre and post-tests for both groups was analyzed. **Results:** The mean score in the study group (n=47) was 8.43 + 2.66 and in control group's mean score was 8.90 + 3.45. After crossover pre-test mean of study group was 7.00 +1.66 and post-test mean 13.24 +1.46 . The pre-test mean of the control group was 6.34 + 1.46 and post-test mean was 10.97 + 1.464. Students of the study group showed significant improvement in scores before and after the crossover of the groups. **Conclusions:** MOODLE is effective in promoting self-directed learning. Students preferred blended learning over e-Learning.

**Keywords :** Self-directed learning, MOODLE, Access restriction.

### INTRODUCTION

Lecturing is the most commonly used tool for information transmission in higher education. Despite being in used largely didactic lectures have shortcomings also. Over the past two decades, there have been many criticisms over the widespread use of traditional lecture methods in professional schools(1). The lectures may be less

effective when courses require the application of facts or critical thinking tasks(2). In the didactic lectures, students' involvement is very less. The duration of the didactic lecture is generally one hour but students' attention wanes quickly after twenty minutes of attending lectures.

The minimum prescribed teaching hours by Medical Council of India for are 240 hours; out of this about 160 hours are for tutorials and practical teaching, only 80 hours are left theory teaching(3) These 80 hours are not sufficient enough to complete the syllabus. A teacher cannot, in sufficient detail, discuss all subject matter to be learned. The teacher has to summarize the topic with focus essential information many times it becomes very difficult to decide how much to be covered in a lecture.

Self-directed learning can be viewed as a solution to this problem. Self-directed learning (SDL) is an instructional strategy where the students, with guidance from the teacher, decide what and how they will learn. It can be done individually or with group learning, but the overall concept is that students take ownership of their learning. Self-directed learning has been a central theme for decades(4). In medical education, the ability to direct and regulate student's own learning experience is crucial for their success. Self-directed learning skills are associated with lifetime learning. Students learn better through modern self-instructed methods than through conventional methods(5). These methods should be used more, as they also show good levels of student acceptance and higher scores in personal self-assessment of knowledge.

Modular Object-Oriented Dynamic Learning Environment (MOODLE) can be used as a tool for self-directed learning. MOODLE is a free and open-source virtual learning environment developed on the principles of andragogy by Martin Dougiamas to help educators create online courses with interactive and collaborative content(6).MOODLE is used to create private websites with online courses for educators and trainers to achieve learning goals. Because of its modular structure and dynamic nature it has been used for flipped classrooms, blended learning, and

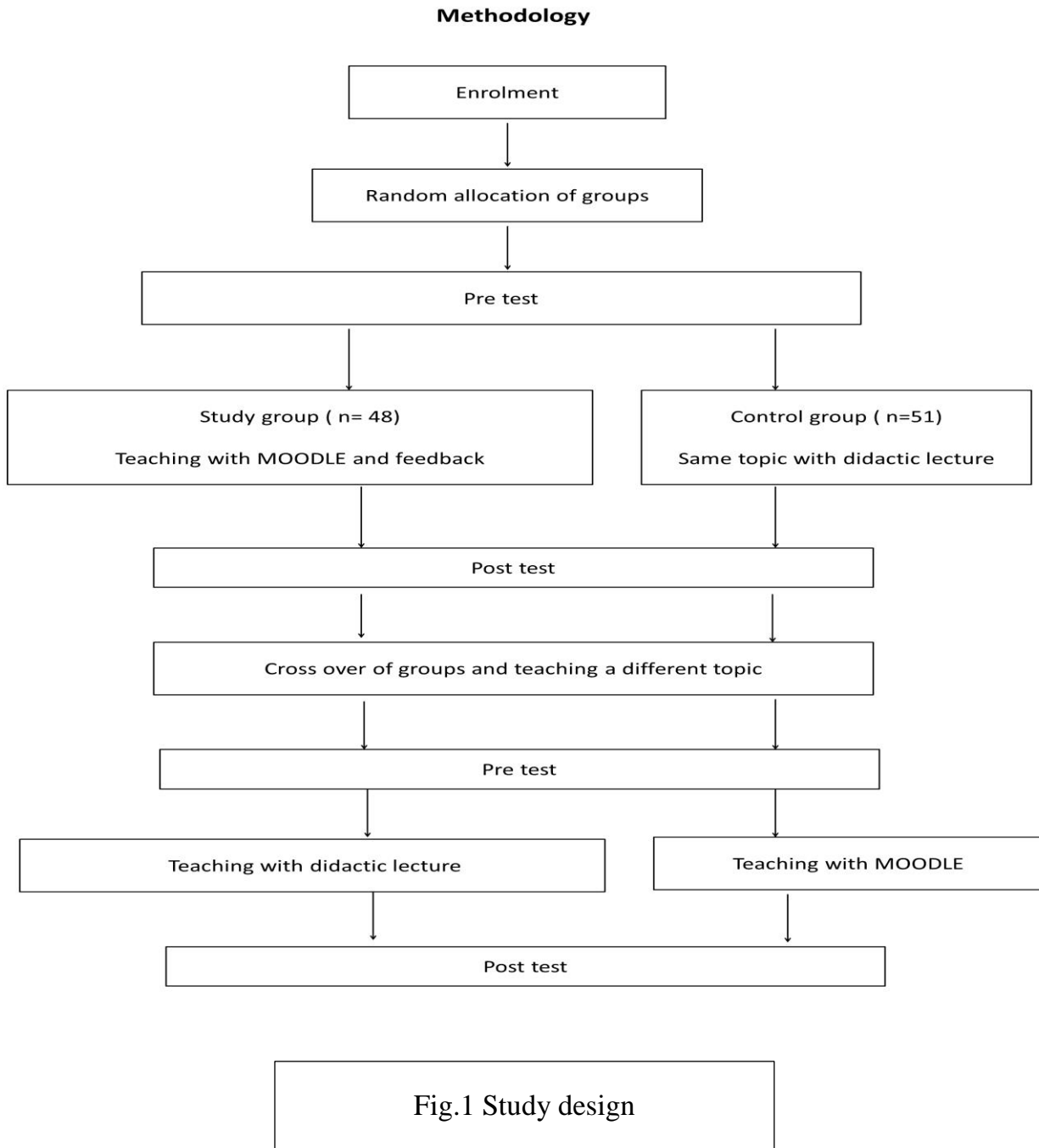
distance education self-directed and collaborative learning in various educational institutes. **Aim:** Evaluating the learning outcome and perception of first-year medical students for using MOODLE as a tool for self-directed learning.**Objectives:**1. To analyze the effectiveness of MOODLE as a tool for self-directed learning in first-year M.B.B.S students.2.To evaluate the perception of students for MOODLE as a tool for self-directed learning.

## METHODOLOGY

After getting clearance from the Institutional Ethics Committee all willing students were registered for study (n=141). All registered participants were randomly divided into study and control groups. Inclusion criteria: All the students who gave consent for the study and participated in all the sessions. Exclusion criteria: The students who were absent in any sessions were excluded from the study. Finally, there were total of 98 participants 47 in the study group and 51 in the control group. Method: All enrolled students (n=141) were randomly divided into two groups by using MS Excel 2010 random team creator template. The participants of the study group were enrolled for a MOODLE course on "Glycogen metabolism". The course was prepared by the authors. The course was divided into certain sections namely introduction, Glycogenesis, Glycogenolysis, Regulation of glycogen metabolism. Each section had a resource page containing text, and videos, a quiz containing MCQs about the core concept of that topic. The course had conditional access to its contents. The participants needed to complete the previous activity to get access to the next activity. Students needed to read the resource page before attempting the quiz. The students were supposed to achieve score desired minimum marks as set by authors to complete the quiz activity. There was no restriction to numbers of attempts; the only

condition was to score the desired minimum score in the quiz to get access for the next section of course. The idea behind restricted access was to learn the concept before moving to the next segment of the course. A pre-test was administered in both the study and control group. The assessment questions were based on the text

given in the resource d page to test knowledge based on the key ideas, learning outcomes, and objectives established for the course. For the study group, an e-learning session was held in a Wi-Fi enabled lecture hall the duration of the session was two hours.



At the same time in a parallel session students of the control group were taught the same topic by a didactic lecture delivered by the first author. During the Didactic lecture, the author tried to reinforce the concept by asking questions intermittently. The post-test for both the group was taken after one week. We used the same set of questions for pre and post-testing so that we can maintain the same level of difficulty and comparable results. In the second phase after pre-test similar course on “Biochemical basis of complications of diabetes mellitus” was administered to the control group while the same topic was taught to the study group as a didactic lecture. Similar to phase one a post-test was held after one week.

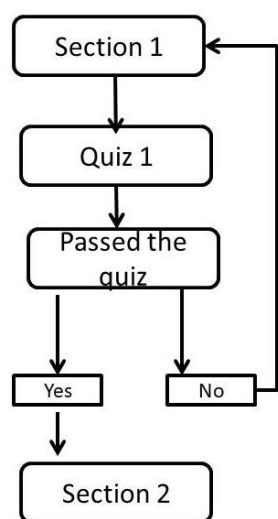


Fig.2 Algorithm to access MOODLE course

To know the effectiveness of MOODLE difference in mean of scores of pre-test and post-test was observed and to test the significance of mean independent ‘t’ test was done. A structured feedback having both open and close-ended Likert-scale based questions was taken from the study group. The questionnaire had seven close-ended Likert scale ratings (on a scale of 1 to 5 where 1 strongly disagrees and 5 strongly agrees

and for satisfaction 1 is not at all happy 5 is very happy and for one question option were YES/NO. Students’ feedback was also analyzed by calculating the average of responses of Likert scale.

## RESULTS

### Interpretation of t Test:

Table 1: Mean Scores Before Crossover

Group	N	Mean	SD	P Value
Pre Test				
Study	47	8.43	2.66	0.449
Control	51	8.90	3.454	
Post Test				
Study	47	15.91	2.644	0.000
Control	51	11.20	1.456	

As shown in Table 1, the mean scores of the students in both the study as well as control arms was found to be equal at pre-test, whereas the mean scores differed significantly after the intervention. We applied an Independent sample T test (SPSSver20) to test our hypothesis & found that our intervention improved the performance of the students significantly in comparison the control group. (P<0.000).

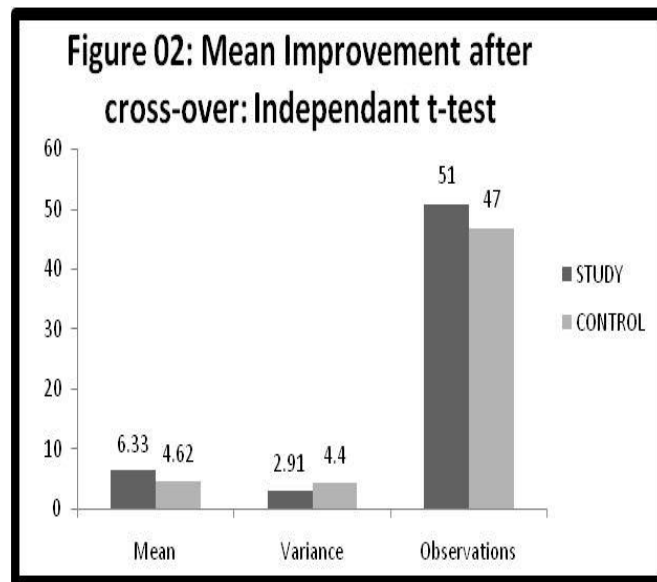
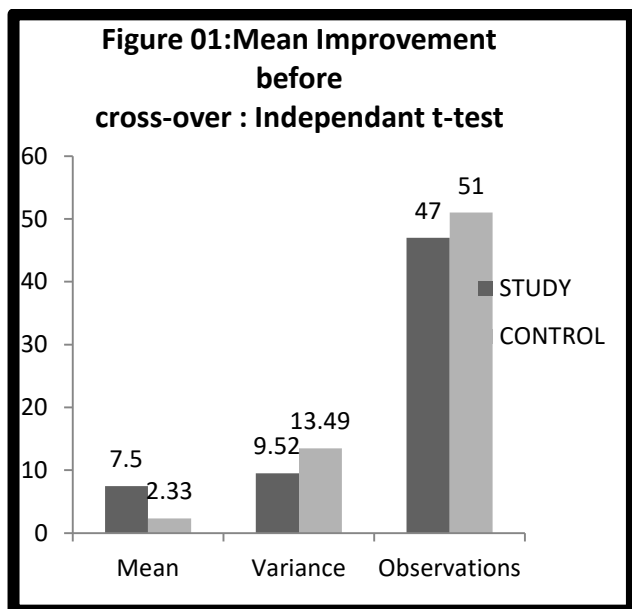
Table 2: Mean Scores after Crossover

Group	N	Mean	SD	P Value
Pre Test				
Study	51	7.00	1.661	0.040
Control	47	6.34	1.464	
Post Test				
Study	51	13.245	2.1503	0.000
Control	47	10.979	1.5107	

As can be seen in Table 2, crossover was done where both the study & control groups were interchanged. Although the groups were not comparable at pre-test because of the higher mean score of the study group, the scores differed significantly after the intervention, which further corroborated the effectiveness of our intervention both before and after the cross-over. (Figure 01)

In continuation of Table 1, we found an improvement of 7.5 marks in study group, in comparison to only 2.33 marks in the control group, & the difference was statistically significant by Independent t test ( $P < 0.00$ ).

The findings obtained before cross-over were also reproduced after cross-over as we found an improvement of 6.33 marks in study group, in comparison to only 4.62 marks in the control arm. ( $P < 0.00$ ) (Figure 02)



**Table 3: Analysis of feedback questionnaire**

Questions	Mean Score (Out of 05)
1. The course was effectively organized	3.93
2. The instructions (including, resource and video etc.) were clear	4.14
3. The course helped me understand concepts more clearly.	3.79
4. The quiz activity complemented my understanding of the course	3.88
5. Were you able to finish course in allotted time?	Yes, 93.02%
6. How satisfied were you with this course?	3.88
7. Rate the effectiveness of the MOODLE over traditional lectures	3.02
8. Moodle courses can be a substitute or additional for/ to didactic lectures	3.02 (Additional to Didactic Lectures)

## DISCUSSION

Although didactic lectures are most common method of teaching they are often subjected to criticism. Didactic lectures are poor in promoting critical thinking in students(7).

Generally attendance of students in lectures is also very low. The minimum prescribed time for teaching biochemistry by MCI is 240 hrs(3).The two third of this that is 160 hours are for practical teaching and 80 hours are for theory teaching. Medical knowledge is expanding everyday and but there is a very little learning time for medical students. There is a very strong need for adaptation of methods to make lecture more compact and more understandable. In their study Peine et al observed that self directed learning can outperform didactic lectures (5) .Shokar et al also observed that the selfdirected learning helped students to performed better(4). In the medical profession, the ability to direct and regulate one's own learning experience is crucial to success. The MOODLE is a powerful e-learning tool , it provides opportunities for the teacheres to vary their teaching in a way that engages students and enhances their interest in self-directed participation in course activities. MOODLE increases the space for students to engage in SDL activities such as skill self-practice, student initiated collaboration with classmates on learning activities, continuous learning and sharing of knowledge everywhere anytime(8).MOODLE is a powerful e-learning tool it provides opportunities for the teacher to vary their teaching in a way that engages students and enhances their interest in self-directed participation in course activities. MOODLE has student oriented approach. A course on MOODLE has resources and

activities. Resources can be a page created with HTML editor, a book which is series of pages, a file, URL etc. Activities can be quiz, assignment chat, forum, workshop, wiki etc. In our study we used page as resource tool and quiz activity. Topic format of course was used in the study. Course was divided into 4 or 5 topics. There was a resource page followed by a quiz activity in each topic. Access restriction feature of MOODLE was used which allows the access to resource only when defined condition met. For getting access to quiz activity reading of resource page was compulsory and getting access to next topic scoring a creator defined pass grade was compulsory. In the quiz there were MCQs addressing learning of that particular topics like values rate limiting steps, names of important enzymes etc.

The pre test contained 20 MCQs with maximum score. The mean score in study group (n=47) was  $8.43 \pm 2.66$  and in control group mean score was  $8.90 \pm 3.45$  so these groups were comparable at base line.

On applying paired t-test the p value was 0.049 which is not statistically significant. The post test mean in the study group was  $15.91 \pm 2.64$  while post test mean  $11.20 \pm 1.45$ . on applying paired t-test the p value was 0.00 which is highly significant. It was observed that both the group showed improvement. To know which group performed better we calculated mean improvement (difference between scores of pretest) mean improvement

by study group was 7.5 marks while control group it was 2.33 marks which is statistically significant.

After crossover pre test mean of study group was  $7.00 \pm 1.66$  and post test mean  $13.24 \pm 1.46$ . Pre test mean of control group was  $6.34 \pm 1.46$  and post test mean was  $10.97 \pm 1.46$ . The difference between mean of pretest between study and control group p value 0.40 which is not significant when the difference in mean of gain in study and control group is observed p values was 0.00 which is statistically significant.

The outcome of the study is MOODLE is an effective tool for self directed learning. The access restriction feature and quiz activity in MOODLE helped students to understand subject concept better than traditional teaching methods. Students suggested that such type of e-Learning should be additional to didactic lecture.

One of the core elements of self directed learning is that learner learns at its own pace but in present study the time and duration of session was not under control of learner. This was done to prevent access of control group to e-learning session.

We feel that the duration of the study can be extended, students involvement using pattern and other things can also be studied. MOODLE has many features which can be used for collaborative learning we want to use those things in coming studies.

## CONCLUSIONS

It can be concluded from this study that MOODLE can effectively be used as tool for self directed learning. In addition to didactic lectures e-Learning can help students to learn better. Analysis of students' feedback suggested that the students preferred blended learning, so despite lot of criticism lectures cannot be spared.

## IMPLICATIONS

E learning is the present and future of medical education. Out of various virtual learning environments (VLE) MOODLE is most commonly used one because of being open source and more dynamic than any other VLE. Medical science is ever expanding and there is very less time for students. Courses on VLEs are reusable they are available every time with students they can refer it when they need it. Short comings of didactic lectures can be overcome with MOODLE.

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