ORIGINAL RESEARCH ARTICLE

Implementation and Evaluation of Self-directed Learning Activity in Biochemistry for Phase I MBBS Students

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Abstract

Aim and background: The teaching strategy, self-directed learning (SDL), is a very important and effective method used for teaching and learning that enables medical students for lifelong learning, enabling them to fulfill their learning requirements in self-directing way, identify ideal learning resources, identify objectives ideal for learning, and also assess the process involved in learning all through their career. The objectives of the present study were to compare the effectiveness of SDL alone and SDL blended with lecture and to study the perceptions of students about SDL as a TL method.

Methodology: A prospective observational study was conducted involving a total of 180 phase I MBBS students who gave voluntary consent for the study. Study protocol consisted of two sessions: Session 1: SDL alone, and Session 2: Lecture following SDL. A baseline pretest was conducted, and posttest was conducted after the completion of both sessions using a validated multiple-choice questionnaire, and students' perception forms were analyzed.

Results: There was a statistically significant increase in posttest scores compared to the baseline pretest scores, and further, there was a statistically significant increase in posttest scores of lectures following SDL sessions compared to posttest scores of an SDL session.

Conclusion: Overall performance of the students was improved when a topic was taken as SDL followed by didactic lecture, which has been indicative of an improvement in learning outcomes when adopting the SDL module. Our study strongly recommends a sensible combination of SDL and lecture, rather than implementation of SDL alone, for phase one MBBS students.

Clinical significance: Blended learning SDL combined with lecture has better outcomes as it enables the students to clinically correlate the topic learned in biochemistry.

Keywords: Lecture, Pretest scores, Posttest score, Questionnaire and phase I MBBS students, Self-directed learning.

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Introduction

The teaching strategy, self-directed learning (SDL), is a very important and effective method used for teaching and learning that enables medical students for lifelong learning, enabling them to fulfill their learning requirements in a self-directing way, identify ideal learning resources, identify objectives ideal for learning, and also assess the process involved in learning all through their career.[1] Knowles stated that it has seven main components and defined it as a learning process in which students take initiative, either taking or without taking guidance from others, to examine what all is required for learning, setting up and designing their goals and objectives, identifying all types of resources for learning, selecting and executing the learning strategies that are suitable and required for the process, and assessing the outcomes of the learning process.[2] Mezirow stated that "No concept is more central to what adult education is all about than SDL."[3] According to the recent guidelines of NMC, SDL is an essential TL method. As per the new CBME curriculum for Biochemistry, for phase I MBBS students, a total of 232 teaching hours have been allotted, out of which 10 hours are assigned for SDL.[4,5] In this teaching learning method of SDL, all the medical students must take the initiative to modify their learning method so as to take on an educational challenge personally and to adapt a very efficient methodology that will help in lifelong learning in their medicine career.[6–8]

The execution of the SDL method varies in different places in our country due to the fact that students have different cultural and social backgrounds depending on the different part of the country to which they belong.[1,5,8] So, if only the instructive lectures are conducted for the students with no active learning, it might lead them to lose interest in the initial part of their learning phase. The conventional lectures are widely considered less productive for those students that are not quick learners when combined with less trained faculty. Also, there is a concern among most of the medical faculty regarding the SDL method, like "when" it should be implemented and "which" topic should be selected for implementation. And "how" the implementation

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should be executed? So, for widespread acceptability and better implementation of the SDL method, additional clarification on this teaching-learning concept, how to execute its conduction, and its integration in the new curriculum is very important.[1,9–11] In a study done by Frambach et al., students were selected from three different medical colleges, and its results show that those students who belong to different cultures get gradually habitual and accustomed to the TL SDL method every year.[1,12] There are some particular modules in the curriculum that are very significant and promote SDL in the early phase of learning in medical education. Kidane et al. highlighted that learning-based and focused on problem-solving, discussion involving tutorials, and tutors are very significant and positively influence the SDL method, and on the other hand, other components of the curriculum, like conventional lectures and assessments, have a negative influence on students SDL unintentionally.[13] So, our study was undertaken to assess how much the SDL method alone is effective and also when blended with lectures. This study also focused on the perceptions of students regarding SDL as a TL method.

Aim and Objectives

Aim: to assess the outcome of adopting SDL for phase I MBBS students in biochemistry along with supplementing SDL combined with lecture.

Objectives

- To assess the effectiveness of SDL alone and SDL combined with lecture.
- To study the perceptions of students about SDL as TL method.

Methodology

The prospective observational study was conducted in the Department of Biochemistry at the National Institute of Medical Sciences, Jaipur, from October 2023 to March 2024. This study included phase I MBBS students of the batch 2023–2024. We included only those students who were interested in participating on a voluntary basis after sensitization about the project, and those who were not willing to give voluntary consent and students of other phases of MBBS were excluded from the study. This study was carried out after taking institutional ethical committee clearance proposal number IEC/P-430/2023.

A total of 180 students participated in the study on a voluntary basis. Study protocol consists of two sessions: Session 1: SDL and Session 2: SDL and Lecture. A baseline pretest was conducted in the Google Form questionnaire composed of 10 multiple-choice questions with one correct answer for each question. The SDL session was conducted as per NMC guidelines as laid out in Competency-based Medical Education (CBME).[4] After the completion of session 1, posttest 1 was conducted as similar to the pretest. After 1 week, lecture was taken on the same topic, following which posttest 2 was conducted as similar to pretest. The topic chosen for SDL was BI4.4 Structure and functions of lipoproteins and relations with atherosclerosis. The specific learning objectives for the SDL session and lecture included: (a) Describe the structure and classification of lipoproteins; (b) Outline the functions of lipoproteins and apolipoproteins; (c) Describe the metabolism of chylomicrons, very low density lipoproteins, low-density lipoproteins, and high-density lipoproteins; (d) Describe the relationship between the metabolism of lipoproteins and atherosclerosis. All the mean scores were compared between pretest, posttest 1, and posttest 2. Statistical analysis was done, comparison was done using the student *t* test, and *p* value <0.05 was considered statistically significant.

Table 1: Shows the distribution of students depending on the scores obtained in the pretest ($n = 180$)

Pretest scores	*Number of students*	*Frequency*
<50% (<5 marks)	162	90%
>61–70% (6–7 marks)	12	6.66%
>71–80% (7–8 marks)	4	2.22%
>81–100 (>8 marks)	2	1.11%

Self-directed learning session: For SDL session, 180 students were divided into 6 groups with 30 students in each group and one facilitator per group. For assisting and guiding the students to find good resources like standard textbooks, tutorial videos, research and scholarly articles, etc., all facilitators continuously maintained communication with all students.[1] All students were given guidance to mainly utilize the central library for resources. Group leaders were assigned, and they were communicated with the whole group for the given five days. All the students were encouraged to submit their topics as PowerPoint presentations, flip charts, skits, and debates after 5 days.[1] This session of submission lasted for 2 hours for 2 days. It was made sure by the facilitators that all the students of each group contributed to the presentation or other submission type. At the end of the presentation session, feedback was given by the facilitators to all the students on their learning outcomes according to how good their explanations were and also about some remaining knowledge gaps and how reliable the sources were that they had used for collecting that information.[1,14] After the end of the session, a posttest was taken.

Session 2: A conventional lecture was conducted for the students on the same topic for 2 hours for 2 days, and the posttest was conducted after the session. After both sessions 1 and 2 were complete, all the participating students were asked to fill out a perception and feedback form regarding the conducted SDL sessions. In the feedback form, there were ten questions that were closed-ended and related to the amount of assigned work, teamwork and collaboration, acquiring and learning new ways of learning and knowledge,[1] etc. The perception form consisted of a 5-point Likert scale rating ranging from 5-strongly agree to 1-strongly disagree, and it was related to the perception of the students about the SDL teaching learning method. All the students were asked about how these both SDL sessions had an effect on their perception of SDL, and a few open-ended questions were asked to know their opinion about it.[1] Evaluation of both pre- and posttest answer sheets was done without negative marking. After that, all the perception forms filled out by students were reviewed, and an Excel sheet was made.[1]

Results

In the present study, we included a total of 180 phase I MBBS students who gave voluntary consent for the study. Table 1 shows the distribution of students depending on the scores obtained in the pretest. The questionnaire consisted of 10 questions, each carrying 1 mark. A total of 180 students participated in the pretest on a voluntary basis; out of 180 students, 162 students had scores <50%, 12 students 61–70%, 4 students 71–80%, and 2 students >80%.

As depicted in Table 2, posttest 1 was conducted after the SDL session. A total of 180 students participated in the posttest following the SDL session; out of 180 students, 54 students had scores <50%, 24 students 61–70%, 36 students 71–80%, and 66 students >80%.

As depicted in the Table 3, posttest 2 was conducted after SDL and lecture session. A total of 180 students participated in the posttest following SDL session; out of 180 students, 17 students had scores <50%, 28 students 61–70%, 22 students 71–80%, and 113 students >80%.

Figure 1 represents the mean scores of the students in pretest and posttest 1 (SDL) and posttest 2 (SDL + Lecture). The mean scores in the pretest were 2.12 ± 1.22; in posttest 1, the scores were 6.856 ± 2.216, and in posttest 2, the scores were 8.265 ± 1.80. It is evident that the posttest 2 (SDL with lecture) mean scores were statistically significantly higher than posttest 1 (only SDL) mean scores ($p < 0.001$). Similarly posttest 1 scores and posttest 2 scores were statistically significantly higher than pretest scores ($p < 0.001$).

Figure 2 shows the students feedback about SDL sessions (no of students 180). The majority of students strongly agree that SDL is interesting, enabled students for active learning, should be implemented regularly, enabled students to learn in depth, time allotted was sufficient, facilitators guided for accessing the resources, improved the attention span, motivated students to learn, cleared the doubts, and improved their skills.

Figure 3 shows the students feedback about which TL method is better, i.e., SDL alone or SDL followed by lecture. The majority of the students strongly agree that SDL combined with lecture was a better TL method for the retention of knowledge (Fig. 3).

Table 2: Shows the distribution of students deepening on the scores obtained in posttest 1 ($n = 180$)

Posttest 1 scores	*Number of students*	*Frequency*
<50% (<5 marks)	54	30%
>61–70% (6–7 marks)	24	13.33%
>71–80% (7–8 marks)	36	20%
>81–100 (>8 marks)	66	36.66%

Table 3: Shows the distribution of students deepening on the scores obtained in the posttest 2 ($n = 180$)

Posttest 2 scores	*Number of students*	*Frequency*
<50% (<5 marks)	17	9.44%
>61–70% (6–7 marks)	28	15.55%
>71–80% (7–8 marks)	22	12.22%
>81–100 (>8 marks)	113	62.77%

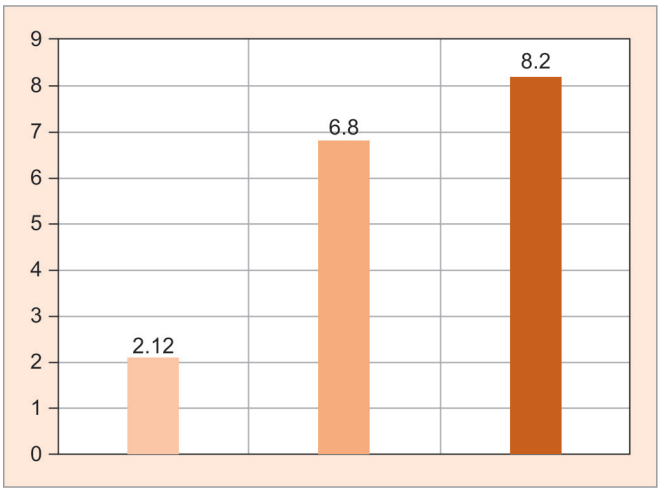

Fig. 1: Shows mean scores of pretest, posttest 1 (SDL) and posttest 2 (SDL + Lecture) $n = 180$

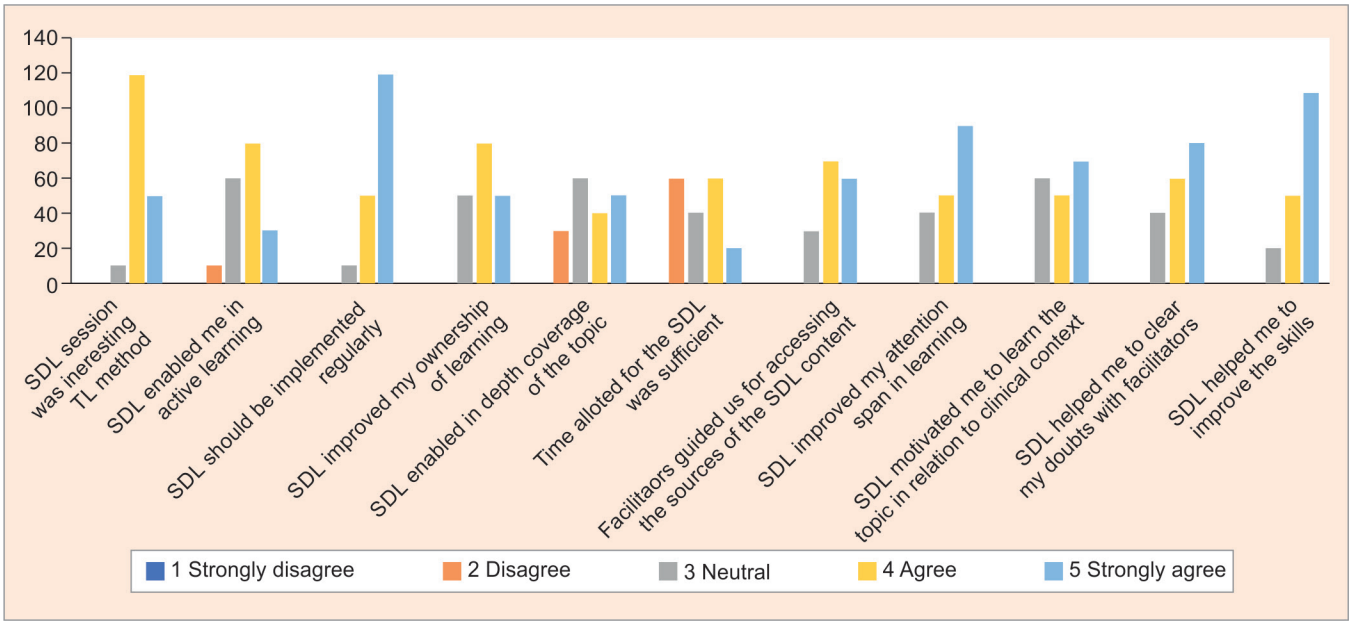

Fig. 2: Students' perceptions on SDL

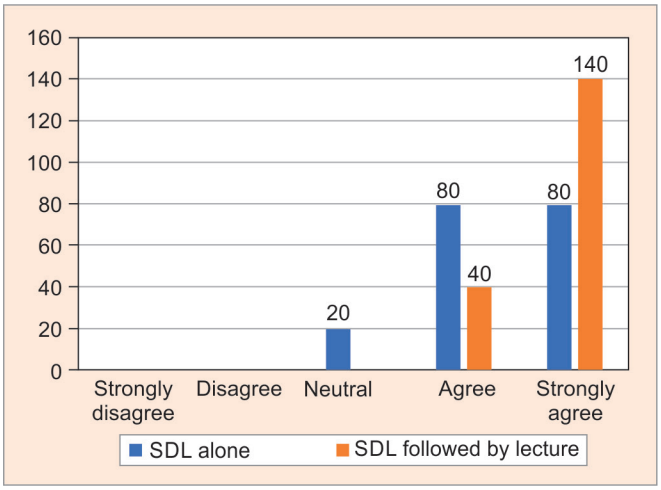

Fig. 3: Students' feedback on whether SDL alone is the better TL method or alecture following SDL is the better TL method

Discussion

The primary objective of Competency Based Medical Education as lied by the National Medical Commission, is to produce competent Indian medical graduates who gain global recognition.[4] There is still no doubt that Indian doctors do stand entitled to the best in the global health care system. The primary objective of CBME is to provide a platform for Phase I MBBS students to develop skills essential for the better management of health care system extensively dealing with patients. Self-directed learning activities in small groups for medical students of all phases designed by the National Medical Commission. Various methods have been employed for developing SDL skills among medical students by integrating the principles of SDL into team-based, case-based, or problem-based learning.

In our study, the mean posttest scores for sessions 1 and 2 ($p < 0.001$) were significantly more than the scores of the pretest, which was taken before the two sessions, which indicates that SDL is a very effective method for teaching and learning. After comparing the mean scores of the posttest taken after both sessions, it shows that there is a statistically significant increase in scores ($p < 0.001$) in SDL combined with post-SDL lecture as compared to SDL with posttest scores alone, showing that when SDL is combined with lecture, it gives more effective outcomes in terms of scores and learning. Previously conducted studies[11–13] have indicated that a hybrid teaching module could improve students' performance.[15,16] It is very crucial to teach the Phase I MBBS students to practice SDL effectively and provide them proper faculty support. Specifically, this help is required since, when they first enroll in the undergraduate medical program, the students are not accustomed to self-directed study and mostly rely on their lecturers to get them through the various stages of the MBBS.[17] Nonetheless, additional research on various MBBS stages has to be carried out nationwide to validate this hypothesis. When Lee et al. looked at the connection between curriculum components and SDL, they found that lectures had a positive correlation with SDL and, in turn, positively correlated with six curricular components. An Indian study by Pai et al. discovered no impact of didactic lectures on SDL.[10] They explained this result by pointing to the diverse group of students and variances in the learning environment.[10] However, the impact of SDL on pupils with varying learning capacities was not investigated in our study. Consequently, it was suggested that more research be done to examine the knowledge growth of pupils who had the greatest and lowest scores. In the present study the students perceptions were assessed and analyzed, which indicated that the majority of students strongly agree that SDL is interesting, enabled students for active learning, should be implemented regularly, enabled students to learn in depth, time allotted was sufficient, facilitators guided for accessing the resources, improved the attention span, motivated students to learn, cleared the doubts, and improved their skills. Students feedback about which TL method is better was also assessed, i.e., SDL alone or SDL followed by lecture. The majority of the students strongly agree that SDL combined with lecture was a better TL method for the retention of knowledge.

Conclusion

Our study shows that in general, the whole performance of the students was significantly better when the selected topic was conducted through SDL followed by a conventional lecture, indicating improved and better outcomes of learning when the SDL module is adopted and executed. The results of our study strongly suggest that a properly established and executed blend of SDL and a conventional lecture produces better learning and scores, as compared to conducting only SDL, for phase one MBBS students.

The majority of the students strongly agree that the SDL sessions are interesting, increased their attention span, and aroused interest in the subject. Also, students do agree that SDL combined with lecture was more beneficial as compared to SDL alone.

Active engagement of students is highly crucial in the learning process, particularly during SDL. Prior to the use of SDL, students who attended a brief lecture on the subject performed better overall. Students valued the opportunity to learn and recognized the advantages of actively learning through the self-directed method (SDL). Consequently, it was strongly advised that first-year MBBS students be taught using a suitable mix of lectures and SDL, as opposed to implementing SDL exclusively.

Declarations

Ethical Approval

Institutional ethical committee clearance was obtained from the Office of the Institutional Ethics Committee, NIMS University, Rajasthan, Jaipur, for this study entitled "Implementation and Evaluation of Self Directed Learning Activity in Biochemistry for Phase I MBBS Students" with the proposal number IEC/P-430/2023 and the Reference Number NIMSUR/IEC/2023/773(b).

Availability of Data and Materials

Data collected during the research study is available in the Excel sheet and shared in the supplementary files.

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