Section: Biochemistry

Original Research Article

EFFECT OF IMPLEMENTATION AND PERCEPTION OF A SELF-DIRECTED LEARNING IN THE BIOCHEMISTRY DEPARTMENT AMONG FIRST-YEAR MEDICAL STUDENTS

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ABSTRACT

Background: The aim is to design, implement and evaluate the effectiveness of a structured Self-Directed Learning (SDL) in the biochemistry curriculum for first-year medical students, with the goal of enhancing student engagement, critical thinking, and lifelong learning skills. **Materials and Methods:** An educational interventional study was conducted to examine first-year MBBS students in Department of Biochemistry, Kiran Medical College, Surat. There were two sessions for the study. Lecture plus SDL was used in session one, while SDL alone was used in session two. Before and after the completion of both sessions, a pre- and post-test were completed. Students' perception forms and pre- and post-test response sheets were analysed. **Result:** The obtained data was arranged as mean ± standard deviation. Each session's pre-test and post-test data was statistically analysed using the paired t-test. An unpaired t-test was used to compare the post-test score differences between the two sessions. Both sessions showed a statistically significant improvement in post-test scores compared to pre-test scores. In the lecture + SDL session, mean scores increased from 4.7 ± 1.5 to 7.1 ± 1.4, while in the SDL- only session they improved from 4.3 ± 1.2 to 6.6 ± 1.2. Post-test scores were significantly higher in the lecture + SDL session than in the SDL-only session. A 5-point Likert scale was used to produce the students' perception form regarding SDL, and the percentage of students who agreed or disagreed with the statement was measured. **Conclusion:** Active student involvement is essential for successful SDL. Learning outcomes improved when SDL was preceded by a brief lecture. Students valued SDL as an engaging learning method; therefore, combining traditional lectures with SDL is recommended for first-year MBBS teaching.

INTRODUCTION

Self-directed learning (SDL) is an essential teaching-learning method for transforming medical students into lifelong learners, which enables them to identify their learning needs, allocate resources, formulate learning objectives, and evaluate the learning process throughout their medical career.[1] Vaines clarifies "Education must aim for a more subtle goal: the facilitation of change and learning. In our fast-changing world, reliance on process rather than upon static knowledge is the goal for education that makes sense."[2]

The goal of India's competency-based medical education system, which consists of theory and practical instruction over the course of nine semesters, is to produce medical graduates who are competent and self-assured enough to apply their newly gained skills to clinical settings as needed. Being a lifelong learner is one of the objectives for Indian medical graduates.[3] Students must be internally motivated to learn if they are to successfully become lifelong learners. The goal of self-directed learning [SDL] is self-motivation. Forty hours are dedicated solely to self-directed learning during the first proficiency year.

Aim & Objectives: To design, implement, and evaluate the effectiveness of a structured self-directed learning (SDL) in the biochemistry curriculum for first-year medical students, with a focus on enhancing student engagement, critical thinking, and lifelong learning skills.

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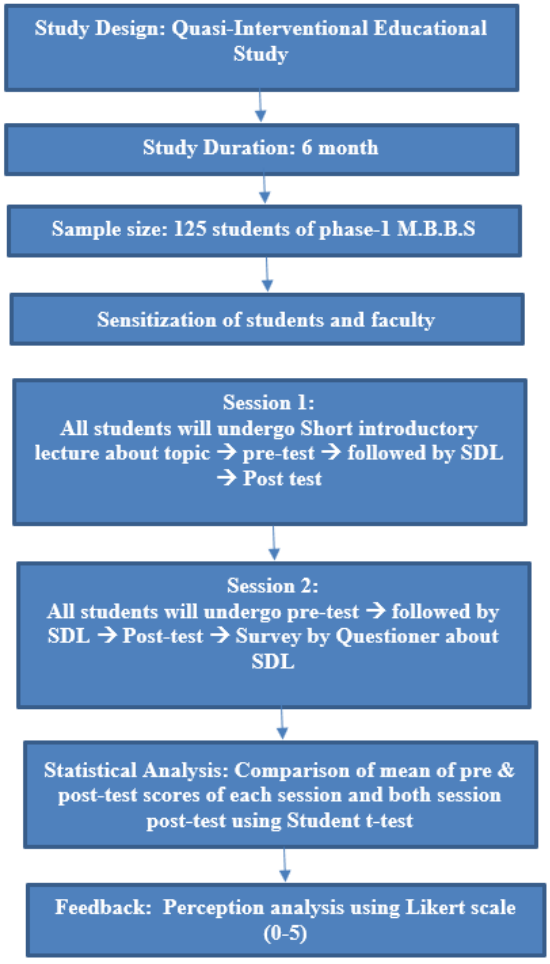
Objectives

1. To develop and integrate a structured SDL module as a part of the existing biochemistry curriculum using appropriate teaching-learning.
2. To compare the impact of the short Lecture followed by SDL versus SDL alone on students in Biochemistry.
3. To assess student perceptions, satisfaction, and engagement with the SDL approach through feedback and surveys.
4. To evaluate the influence of the SDL module on students' critical thinking abilities and lifelong learning skills.

MATERIALS AND METHODS

Study design: Quasi- Educational Interventional Study.

Description of intervention: An educational interventional study was conducted to examine first-year MBBS students in Department of Biochemistry. There were two sessions for the study. Lecture plus SDL were used in session one, while SDL alone was used in session two. Before and after the finish of both sessions, a pre- and post- test must be completed.



Students' perception forms and pre- and post-test response sheets were analysed. Topics of SDL and detailed structure of SDL conduct were given at end of protocol.

The questionnaire was developed after a review of relevant literature and aligned with the study objectives. Content validity was established through review by subject experts from the department and medical education unit. Based on their feedback, necessary modifications were made for clarity and relevance. The final version was then administered to the study participants.

Study Population

Inclusion Criteria

Students who consent to participate in the study willingly and voluntarily.

Students who shall be present in both sessions will be included in the study.

Exclusion Criteria

Students who do not consent or withdraw consent at any point.

Students who will be absent in either one or both the sessions will be excluded from the study.

Operational Definitions

- Self-Directed Learning is a process where learners take the initiative to plan, choose, and manage their own learning. They decide what they want to learn, how they will learn it, and evaluate their progress themselves.
- A lecture is a teaching method where the teacher speaks or presents information to students, usually in a classroom or online. It is mainly one-way communication where the teacher explains a topic, and students listen and take notes. In this study, Teacher will take short introductory lecture about topic for half an hour.

Sampling procedure:

- The study population was include first-year medical students selected through purposive sampling. Students who willingly and voluntarily provide informed consent and were present for both study sessions were be included. Students who did not give consent or who withdraw their consent at any stage of the study was excluded.

Sample Size

- Based on a total class size of 150 students, using a 95% confidence level and a 10% allowable margin of error, the minimum required sample size is approximately 59. However, to account for potential absenteeism and to strengthen the reliability of the study, a sample size of 125 students will be selected using purposive sampling method

Method of data collection/procedure: Google form based MCQ and questionnaire

Study duration: 6 Months

Procedure for seeking and obtaining informed consent with participant information sheet (PIS): Permission shall be taken from head of the institute to conduct the study among the students.

Statistical Analysis

- Use of Excel Microsoft for all data analysis and obtained data will be arranged as mean ± standard deviation.

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- Each session's pre-test and post-test data will be statistically analysed using the paired t-test. A paired t-test will be used to compare the post-test score differences between the two sessions.
- A 5-point Likert scale will be used to produce the students' perception form regarding SDL, and the percentage of students who agreed or disagreed with the statement will be measured.

Human subject protection:

- Privacy and Confidentiality of the study participants: Confidentiality of participants' data will be maintained by anonymizing scores and feedback
- Management of Risks or injury: NA

Ethical considerations: HREC clearance was received on 22/08/2025 with letter no. KMC/IEC/034/08/2025. The study was commence only after obtaining approval from the Institutional Ethics Committee (IEC). Confidentiality and protection of participants' data was ensured throughout the study. Participation were entirely voluntary, with participants having the right to withdraw at any time without any adverse consequences.

Expected Benefits

- Early SDL training increases the likelihood that students will develop into more proficient learners.
- Students who have had SDL training are more likely to become adaptive and lifelong learners, which is an important quality for any medical professional.
- Improved Student Engagement and Motivation.

RESULTS

Pre- and post-test scores from both sessions were compared. A statistically significant improvement was observed in the mean post-test scores of both sessions when compared with their respective pre-test scores (Table 1). In the lecture plus SDL session, the mean pre-test score of students was 4.7 ± 1.5, which showed a significant improvement to 7.1 ± 1.4 in the post-test. Similarly, in the SDL-only session, the mean pre-test score increased from 4.3 ± 1.2 to 6.6 ± 1.2 in the post-test.

Additionally, post-test scores of session one were significantly higher than those of session two [Table 2]. The mean post-test score in the lecture combined with SDL session was 7.1 ± 1.4, which was higher than the post-test score observed in the SDL-only session (6.6 ± 1.2) among the 135 first-year medical students.

Table 1: Comparing the Means of Pre-test and Post-test Scores of Both Sessions

Sessions	Pre-test Score (n = 135)	Post-test Score (n = 135)	P-Value
Lecture and SDL	4.7 ± 1.5	7.1 ± 1.4	< 0.001
Only SDL	4.3 ± 1.2	6.6 ± 1.2	< 0.001

Table 2: Comparing the Means of Post-test Scores of Both Sessions

Sessions	Lecture and SDL	Only SDL	P-Value
Post-test Score (n = 135)	7.1 ± 1.4	6.6 ± 1.2	< 0.001

The combination of lectures with SDL resulted in better post-test scores compared to SDL alone, indicating that a blended approach may be more effective for enhancing learning outcomes among first-year medical students.

The response rate for the students' perception and feedback survey was 100%. Students' perceptions of SDL, assessed using a 5-point Likert scale, were analyzed as percentages representing levels of agreement or disagreement [Table 3].

Table 3: Percentage distribution of student agreement for statements evaluated through closed- ended five-point Likert scale items

Question No.	Strongly agree -%	Agree%	Neutral %	Disagree %	Strongly disagree%
1. I understood the topic better through SDL than through traditional lectures.	21	45	21	9	4
2. The SDL session helped improve my critical thinking and problem-solving skills	27	47	20	4	2
3. I was able to identify my own learning needs effectively.	37	47	13	2	1
4. I was comfortable searching for and selecting relevant learning resources.	16	56	22	4	2
5. SDL helped me learn at my own pace.	24	51	17	6	2
6. Group discussion during SDL enhanced my understanding of the topic.	20	53	21	5	1
7. The facilitator provided adequate guidance and support during the SDL session.	30	50	15	4	1
8. SDL helped me become more confident in handling Biochemistry topics.	28	49	18	4	1
9. I would like SDL to be included in other topics of the Biochemistry curriculum.	27	48	18	5	2

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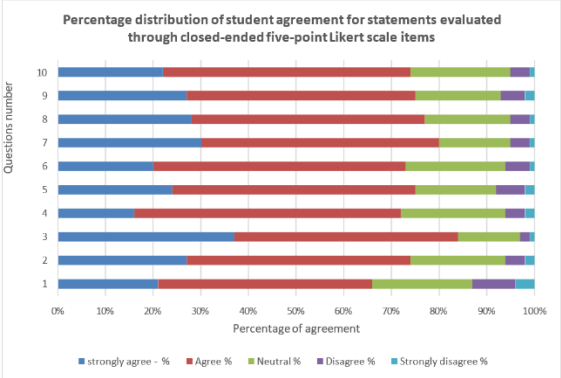
10. SDL sessions improved my communication and teamwork skills.	22	52	21	4	1



DISCUSSION

Self-directed learning has been recognized as a promising methodology for lifelong learning in medicine. In the present study, the mean scores of the post-test for both sessions ($P < 0.001$) were significantly higher than those of the pre-test, suggesting that SDL was an effective teaching/learning method. Comparing the mean post-test scores obtained in both sessions revealed a statistically significant increase ($P < 0.001$) in Lecture cum SDL session scores in comparison with scores from SDL session alone, indicating that SDL supplemented with an introductory lecture produced more favourable outcomes. Previous research has demonstrated comparable outcomes,[4,5] indicating that hybrid teaching approaches can effectively improve students' academic performance.[6,7] For first-year MBBS students, developing self-directed learning skills along with continuous faculty guidance is crucial. Such guidance is particularly important at the start of medical training, as students are generally unfamiliar with self-directed learning methods and remain largely dependent on teachers during the early phases of the MBBS course until they gradually gain independence.[7] Considering the findings of the present study, it can be highlighted that a well-balanced integration of traditional lectures with self-directed learning appears to be more effective than using either approach independently. These observations are consistent with the outcomes reported in earlier studies.

In the present study, a majority of students (66%) reported better understanding of the topic through self-directed learning (SDL) compared to traditional lectures, indicating improved conceptual clarity. Furthermore, 74% of students agreed that SDL enhanced their critical thinking and problem-solving abilities, highlighting its role in promoting active learning.

Group discussions during SDL were perceived as beneficial by 73% of students, suggesting that peer interaction contributed to deeper understanding of biochemistry concepts. A higher proportion of students (77%) felt more confident in handling biochemistry topics following SDL sessions, reflecting increased learner autonomy. Additionally, 74% of participants acknowledged improvement in communication and teamwork skills, emphasizing the effectiveness of SDL in fostering essential professional competencies.

CONCLUSION

Active student engagement was found to be crucial for effective knowledge acquisition through self-directed learning (SDL). Overall academic performance improved when SDL was preceded by a brief introductory lecture. Students perceived the activity as a meaningful learning experience and valued the advantages of active, self-directed learning. Hence, a judicious integration of traditional lectures with SDL, rather than SDL alone, is recommended for teaching first-year MBBS students.

Limitations & further recommendations:

- The sample size was limited to first-year MBBS students, and results may not reflect perceptions of students from other phases.
- The study assessed short-term outcomes; long-term retention of knowledge and sustained impact of SDL were not evaluated.
- Students' perceptions were measured using a self-reported Likert scale, which may be subject to response and social desirability bias.
- Longitudinal studies are recommended to assess long-term knowledge retention and development of lifelong learning skills.

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