



A RETROSPECTIVE STUDY ON EVALUATION OF FIRST AND SECOND-YEAR UNDERGRADUATE MEDICAL STUDENT'S FEEDBACK IN SELF-DIRECTED LEARNING METHOD AS PART OF COMPETENCY - BASED MEDICAL EDUCATION.

Medical Biochemistry

Dr Lincy Jacob*	Associate Professor, Department of Biochemistry, GMERS Medical College, Panchmahal, Godhra. *Corresponding Author
Dr Jigar A. Parmar	Associate Professor, Department of Biochemistry, GMERS Medical College, Gotri, Vadodara.
Dr Pawan Toshniwal	Professor, Department of Biochemistry, Parul Institute of Medical Sciences and Research, Vadodara.
Dr Liggy Andrews	Professor, Department of Biochemistry, GMERS Medical College, Dharpur, Patan.

ABSTRACT

Aim and Objectives: This study explores the perceptions and feedback of undergraduate medical students regarding the implementation of self-directed learning (SDL) in biochemistry, introduced as part of the competency-based medical education (CBME) curriculum. The objective was to assess how SDL impacts student engagement, comprehension, and independent learning skills. **Methods:** A retrospective mixed-methods design was employed, involving first- and second-year MBBS students at GMERS Medical College, Godhra. Quantitative data were gathered through a structured questionnaire using a five-point Likert scale, while qualitative insights were obtained from open-ended responses. Descriptive statistical analysis was conducted for quantitative data, and thematic analysis was applied to the qualitative feedback. **Results:** For this study, a total of 60 students who actively attended and engaged in this session were selected. Out of the 60 students, 27 (45%) were female and 33 (55%) were male. The mean $\pm$ SD for Self-directed learning response score (SDLRS) for learning skill in biochemistry was above average 3.9 ± 0.95 in the study group ($n=60$). Also the mean $\pm$ SD for SDLRS for awareness on the topic was 3.9 ± 0.73 which was also found to be above neutral response. Quantitative results indicated that most students found SDL sessions to be beneficial, particularly in enhancing conceptual clarity, promoting self-motivation, and fostering group learning. Qualitative analysis revealed several recurring themes: increased academic interest, improved understanding through peer discussions, and the need for more structured guidance during SDL. Students expressed appreciation for the autonomy offered but recommended a balanced integration with conventional teaching methods. **Conclusion:** SDL, when structured and supported appropriately, is an effective learning strategy under the CBME framework in biochemistry. It fosters learner autonomy, critical thinking, and engagement. However, initial orientation and faculty mentorship are crucial for optimal implementation. A blended teaching model may offer the best outcomes in early medical education.

KEYWORDS

Self-directed learning (SDL), Competency - based medical education (CBME), retrospective study, student feedback

INTRODUCTION:

CBME itself has evolved globally over the past few decades. It was first adopted in postgraduate medical training in the United States (early 2000s) and later in countries like the UK, Australia, and Canada. By the 2010s, CBME principles were permeating undergraduate curricula as well. In India, for example, the Medical Council's Vision 2015 document envisaged a new competency-based curriculum, and the National Medical Commission (NMC) officially implemented CBME for MBBS students in 2019 (1). Concurrent with CBME's rise has been a growing emphasis on Self-Directed Learning (SDL). Importantly, modern CBME frameworks have deliberately incorporated SDL as a key component. CBME's goal of producing self-motivated, adaptable physicians aligns closely with the principles of SDL. In Indian CBME guidelines, for instance, SDL is specifically highlighted. The curriculum includes dedicated hours and explicit competencies for SDL, reflecting the view that students must learn to direct their own learning to achieve the Indian Medical Graduate (IMG) roles (2).

Self-Directed Learning (SDL) in Medical Education:

SDL is broadly defined as a process in which learners take initiative to identify their learning needs, set goals, locate and use resources, and assess their own progress. The teacher-led teaching strategies used in traditional medical education did little to support students' development of lifelong learning abilities. Group collaboration, a practical learning emphasis, self-expression, and the development of self-directed reading skills are all requirements of competency-based medical education, or CBME (3,4).

To keep up with the quick changes in the medical field, a health professional must pursue lifelong learning, which allows them to keep learning throughout their lives (5-7). Self-directed learning (SDL)'s guiding principle is that students are in charge of their own education. Malcolm Knowles (1975) described self-directed learning as a "process in which individuals take the initiative, with or without the help of others, in diagnosing their own learning needs, formulating goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating

learning outcomes" (8).

Advantages and Challenges of SDL in Undergraduate Training:

When effectively implemented, SDL offers several advantages for undergraduate medical students. Studies report that SDL can enhance student engagement, motivation, and learning outcomes. For example, systematic reviews note that students engaging in SDL curricula often show improved academic performance and report greater confidence and intrinsic motivation (9). The American Medical Association (AMA)'s Competency-Based Medical Education report also observed that CBME (with its emphasis on learner-driven progression) can "improve learner motivation" and "create a sense of autonomy," inherently linking CBME with enhanced SDL. In practice, SDL encourages students to tailor learning to their own needs and pace, which can foster deeper understanding and lifelong self-improvement. Over time, SDL cultivates lifelong habits: learners develop the ability to critically appraise new information, reflect on practice, and independently update their knowledge – all of which contribute to better patient care in the long run. (10)

At the same time, integrating SDL into undergraduate training is not without challenges. Many students are accustomed to teacher-directed instruction, and some struggle with the autonomy of SDL. Common barriers include difficulty initiating study without a structured syllabus, managing time effectively, and maintaining motivation without external oversight. Research in Indian medical students has identified specific deterrents: for instance, cognitive overload, heavy curricular workload, time constraints, and frequent high-stakes assessments can all impede students' willingness or ability to engage in SDL (2).

Methods:

The present study was conducted in Gujarat Medical Education Research society medical college in Godhra, Gujarat. Both first year and second year students attended the SDL session. The faculties were trained for the SDL prior to the session. The students were also briefed about the importance of SDL.

Data Collection Methods

The biochemistry topic "pre-analytical errors in clinical biochemistry"

was chosen for the SDL session and presented to the focus groups two weeks prior to the presentation. The study group was divided into two groups.

Group 1 comprised of those students who were present and attended the SDL session. Group 1 of study group were given a pre-determined close-ended questionnaire with topic-related questions. They were instructed before they filled the feedback form and written, signed consent was taken from the students before submission to the researcher (Table 1).

Group 2 of student group comprised of those students who presented the SDL topic. Group 2 students were given an open-ended, pre-made feedback questionnaire to complete. Before completing the feedback form, both the group 1 were instructed to provide written consent, sign it, and turn in the completed feedback questionnaire to the researcher (Table 2).

Medical education and medical education research commonly use Likert-type scales. Common applications include performance evaluation following an educational intervention, faculty evaluations of trainees, and end-of-rotation trainee feedback. Developed in 1932 by Rensis Likert (16) to measure attitudes, the typical Likert scale is a 5-point ordinal scale used by respondents to rate the degree to which they agree or disagree with a statement.

The study tools were filled out by the students in the study group using a Likert scale with a score range of 1 to 5. Likert scale is to measure the student's attitude to a particular question or statement. To analyse the data it is coded as 1- strongly disagree, 2 – disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree. The students in the study group have to sign and give consent before submitting the duly filled close – ended feedback questionnaire form.

Inclusion And Exclusion Criteria:

The study included only those students who attended and engaged in the SDL session and were chosen to complete the questionnaire. Students who did not take part in the SDL session were excluded from the study.

Statistical Analysis Plan:

The data was recorded using Microsoft excel. Statistical analysis was

done by using graph pad prism software.

RESULTS AND DISCUSSIONS

A total of 60 students who were actively present and participated in this session were chosen for our study. Out of 60 students, 27 (45%) were female students and 33 (55%) were male students. The research is based on direct observation and includes mixed type of study.

Quantitative Analysis:

A pre- validated questionnaire was analysed using Likert score scale [1 to 5]. Table 1 shows assessment of descriptive statistical analysis of Self Directing Learning response score by students (n=60). The questionnaire comprised of ten closed end questions (table 1) focused on the topic “Pre – Analytical errors in clinical biochemistry” which was selected for SDL.

A. Learning Assessment:

The mean $\pm$ SD for Self-directed learning response score (SDLRS) for learning skill in biochemistry was above average 3.9 ± 0.95 in the study group (n=60). Also the mean $\pm$ SD for SDLRS for awareness on the topic was 3.9 ± 0.73 which was also found to be above neutral response.

B. Awareness Assessment:

The SDL session covered student's awareness on how to collect blood sample, recognizing haemolysed blood samples that should be rejected, and learning about the various types of color-coded vacutainers utilized in blood investigations. The student response mean $\pm$ SD for, “I understood how blood sample is collected in the laboratory with tourniquet application” was 3.8 ± 0.67 (table 1) which was above average.

The SDLRS mean $\pm$ SD on, “SDL session helped me to assess the normal sample from the haemolysed sample” was 3.8 ± 0.85 was also above neutral response. Also the SDLRS response mean $\pm$ SD for, “I understood different colour coded blood collection tubes in sample collection” was 4.1 ± 0.77 (table 1). The score rating scale agreed that the students in the study population were able to identify different colour coded vacutainers.

The student response mean $\pm$ SD for the question, 'I want more such sessions in the future' was 4.4 ± 0.72 which indicated that students agreed to attend more such sessions in the future.

Table 1: Descriptive Analysis Of Self Directing Learning Response Score By Students (n=60)

Questions	Mean $\pm$ SD	Std error of mean	CV	Median	Mode	Minimum	Maximum
The sessions helped me to improve my learning skills in biochemistry.	3.9 ± 0.95	0.12	24%	4.0	4	1.0	5
I got awareness of pre analytical variables in clinical biochemistry laboratory.	3.9 ± 0.73	0.095	19%	4.0	4	2.0	5
I understood how blood sample is collected in the laboratory with tourniquet application	3.8 ± 0.67	0.086	17%	4.0	4	3.0	5
SDL session helped me to assess the normal sample from the haemolysed sample.	3.8 ± 0.85	0.11	22%	4.0	4	2.0	5
I understood different colour coded blood collection tubes in sample collection.	4.1 ± 0.77	0.099	19%	4.0	4	2.0	5
The session helped me to understand the type of vacutainer tube used for blood collection depends on the test being performed.	4.0 ± 0.87	0.11	22%	4.0	4	1.0	5
Case study presentations helped me to understand different pre- analytical errors in the clinical biochemistry laboratory.	4.3 ± 0.84	0.11	20%	4.0	5	2.0	5
The SDL presentation was well-organized and easy to follow.	3.9 ± 0.77	0.10	20%	4.0	4	3.0	5
The resources and case studies provided improved my understanding of the SDL theme.	4.1 ± 0.67	0.087	17%	4.0	4	2.0	5
I want more such sessions in the future.	4.4 ± 0.72	0.093	16%	5.0	5	3.0	5

Table 2: Self-directed Learning Participant Responses For Open – Ended Questions

Open ended questions	Participant responses
Have you experienced this type of learning before?	No, I haven't experience this type of learning method before.
Do you find SDL useful? If yes, then why?	Yes, this session was useful as it helped me to boost my confidence level. SDL helped me to learn the topic in depth and also I was able to learn the clinical aspects of the topic.
How did you prepare for the SDL presentation?	My group members and I studied the subject using the first-year biochemistry textbook authored by Satyanarayan and D M Vasudevan. We also used internet as a resource and researched our topic. We had group discussions on the topic while preparing for the SDL presentation.
What did you learn from the SDL presentations?	I was able to improve my communicative skills with confidence. I acquired deep knowledge on the SDL topic.

What are the challenges you faced during the process?	The most difficult task was to face the audience as a speaker. Also while preparing for the presentation other team members did not equally contribute their time for the preparation. There was lack of communication among the group members.
Do you suggest any improvement for SDL sessions in the future?	I found that given time for presentation was not enough. More time should be given for presentation so that some of the sub topics could have been explained in detail. We also needed more guidance on resources and experience mentors for better presentation.

Qualitative Analysis:

The qualitative evaluation included an open-ended questionnaire given to the group – 2 participants, who were instructed on how to complete it and asked to respond to six open ended questions (Table 2). The open – ended questionnaire feedback were distributed after their presentation and duly signed feedback form was submitted to the researchers.

Upon being asked about their prior experiences with this type of learning method, the majority of participants in the SDL presentation reported never having experience of this type of learning method. Also, majority of participants who were questioned if they found the SDL presentation helpful stated that it increased their confidence and allowed them to fully comprehend the presentation's subject. Additionally, they were able to analyse the clinical aspect of the SDL topic (Table 2). These reflections suggest that SDL tasks can foster metacognitive awareness and a shift from rote learning to higher-order thinking. Student feedback also highlighted gains in collaborative skills: one student noted that working on an SDL project “allowed me to work from a team-based approach,” building “team work and leadership capabilities” including communication and collaboration (11).

Students' responses that SDL helped them understand the material in-depth were consistent with a study by Fatima et al. (2017) that found that while didactic lectures cover more ground in less time, SDL helps students acquire more in-depth information (12). Another study by Suryabhan et al. (2023) suggested that small group discussion-based self-directed learning can enhance learning outcomes when combined with traditional didactic lectures, even though the latter are crucial for teaching large groups and cover the majority of the material (13).

Our results are consistent with a related study by Nagesh et al., "Impact Study of Self Directed Learning on First Year M.B.B.S Students in Biochemistry Department," which found that the SDL learning approach engages students in active learning, which improves retention. This approach also had the advantage of assisting students in improving their communication abilities. Lastly, the researchers concluded that the SDL is required for first-year M.B.B.S. curricula to introduce preparatory procedures to increase students' confidence (14).

The students in the study group were asked about how did they prepare for the SDL presentation and most of them replied that they depended on first year textbooks in biochemistry as well as some resources they searched from internet (table 2). The study by Shersheva, et al. suggested that while following suggested textbooks is advised, additional learning materials such as reference book handouts and passages from online learning resources may be used into an SDL session (15).

When questioned about the difficulties they encountered during the procedure, the participants said that speaking in front of an audience was the most challenging assignment for them. Additionally, certain team members did not equally dedicate their efforts to the presentation preparation. Additionally, the members' communication was reduced (Table 2).

The participants' response to the question of how SDL may be improved for upcoming sessions was that the presentation time allotted was insufficient. More time should have been allotted for the presentation in order to fully explain some of the subjects. In order to improve their presentations, participants also required more direction about resources and experienced mentors (Table 2).

CONCLUSION:

The findings of this study demonstrate that self-directed learning (SDL), when implemented within a competency-based medical education (CBME) framework, is generally well-received by first- and second-year undergraduate medical students. Most participants perceived SDL sessions as effective in enhancing their understanding of biochemistry, improving their confidence, and fostering

independent learning. The structured format, clarity of objectives, and relevance of topics contributed positively to the learning experience. However, challenges such as time constraints, limited resources, and the need for better guidance were also highlighted.

Medical education necessitates that students understand the principles of self-directed learning, which helps graduates become lifelong learners. Self-paced learning, in which the student takes a more active role in selecting his study materials, learns at his own pace, and attends teacher-guided assessments, and facilitated learning, in which the teacher acts as a facilitator, plans the learning process, teaches when necessary, corrects when incorrect, and evaluates the student at the end (17). The types of facilitated learning include Audio-video courses, Small group discussions, donut rounds, flipped classrooms and types of self-placed learning including online courses and digital e books (17).

Qualitative insights revealed that students appreciated the autonomy and deeper engagement SDL offered, yet emphasized the importance of faculty facilitation and clear learning outcomes for maximizing its effectiveness. The integration of SDL into the CBME curriculum holds promise for promoting lifelong learning skills, provided it is carefully planned and continually refined based on student feedback.

Overall, the study underscores the potential of SDL as a powerful pedagogical tool in medical education, while also highlighting the need for ongoing faculty training and infrastructure support to address logistical and instructional challenges. Further longitudinal and multi-institutional research is recommended to validate these findings and guide best practices for SDL implementation in Indian medical colleges.

Acknowledgement

We acknowledge and sincerely thank all and student participants who attended the SDL session and showed their participation by filling up the questionnaire.

Ethical Approval

This research study does not require approval from the Institutional Review Board.

Declaration Of Student Consent

The authors certify that they have obtained duly signed and written consent from students on their feedback for this study.

Conflicts Of Interest

There are no conflicts of interest.

REFERENCES:

- Seetharaman, Rajmohan. Pros and Cons: Global Adoption of Competency-Based Medical Education. *Academic Medicine* 98(12):p 1346, December 2023.
- Usha Krishnan et al. Exploring the determinants of self-directed learning among medical undergraduates: A qualitative study. *J Educ Health Promot.* 2024 Jul 29;13:266. doi: 10.4103/jehp.jehp_1105_23.
- MCI. Competency Based Undergraduate Curriculum for the Indian Medical Graduate. New Delhi: Medical Council of India; 2018. Available from: <https://www.mciindia.org/CMS/information-desk/for-colleges/ug-curriculum>.
- Rege N. Towards competency-based learning in medical education: Building evidence in India. *J Postgrad Med* 2020; 66(1):9-10. doi:10.4103/jpgm.JPGM_749_19.
- Pai KM, Rao KR, Punja D, Kamath A. The effectiveness of self-directed learning (SDL) for teaching physiology to first year medical students. *Australas Med J* 2014; 7:448-53.
- Candy PC. *Self-Direction for Life Long Learning: A Comprehensive Guide to Theory and Practice*. San Francisco, CA: Jossey Bass 1991.
- Patra S, Khan AM, Upadhyay MK, Sharma R, Rajoura OP, Bhasin SK. Module to facilitate self-directed learning among medical undergraduates: Development and implementation. *J Edu Health Promot* 2020; 9:231. doi: 10.4103/jehp.jehp_125_20.
- Knowles M. *Self-directed Learning: A Guide for Learners and Teachers*. New York: Associated Press 1975.
- Gupta, Dharmendra Kumar, Chaudhuri, Arunima, Gaine, Dip. A Systematic Review of Self-directed Learning in Medical Education in Undergraduate Medical Students. *Current Medical Issues* 23(1):p 61-69, Jan–Mar 2025.
- American Medical Association (AMA). Report 7 of the council on Medical Education (A-16). The Implications of Competency-based Medical Education for Undergraduate Medical Education.
- Molly Hill, Megan Peters, Michelle Salvaggio, Jay Vinnedge, Alix Darden. Implementation and evaluation of a self-directed learning activity for first-year medical students. *Medical Education Online.* 2020 Feb 3;25(1):1717780.
- Fatima Shamsuddin, Laila Mohamed Ilias, Sily Sreedharan. A comparison of Didactic lectures to self – directed learning in medical education. *J. Evid. Based Med. Healthc.*, pISSN- 2349-2562, eISSN- 2349-2570/ Vol. 4/Issue 3/Jan. 09, 2017

13. Suryabhan L, Tripti S, et al. A small group- based self-directed Learning among undergraduate students in Biochemistry. International Journal of Scientific Research, January 2023 12(1):1-3
14. Nagesh A, Amrita, Sachin. Impact Study of Self Directed Learning on first Year M.B.B.S Students in Biochemistry Department. International Journal of Medical Sciences and Innovative Research (IJMSIR) 2020, Volume – 5 Issue - 5, Page No. 122 – 127
15. Shershneva MB, Slotnick HB, Mejicano GC. Learning to use learning resources during medical school and residency. J Med Libr Assoc. 2005; 93:263–70.
16. Likert R. A technique for the measurement of attitudes. Arch Psychology. 1932; 22 (140):55.
17. Madhurima K Nayak, Vijetha Shenoy Belle. Various Methods of Self-Directed Learning in Medical Education. MediSys J Med Sci 2020 Volume 1 Issue 1.