Integrating Self-Directed Learning Into Pharmacology Curriculum: Insights From Activity-Based Learning And Student Feedback

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Abstract
Background: *Self-directed learning (SDL), prepares students for time management, problem-solving and self-motivation and has become a necessary component in medical education. The current study was planned to understand the students' perceptions of conduct and assessment of SDL activities in two unique ways.*
Methodology: *An observational, prospective study was conducted involving second year medical students of a college in western Maharashtra, India. SDL topics and their assessment method were announced well in advance along with the resource material to be used for preparation by students. SDL activities were conducted by small group discussion (SGD) and whole class quiz (5 teams) and the students were assessed for their performance during these activities. Feedback of the participant students were taken at the end of both SDL sessions.*
Results: *Total 111 students participated in the SDL activities and agreed for their as well as teachers' preparedness about these activities. 62.16% students explored learning resources, mostly online, other than those suggested by the teachers for their preparation. Though both the methods were equally beneficial for preparation of exams, most students enjoyed the Quiz activity (71.17%). They mentioned that during SGD, their efforts were more appreciated by the teacher facilitators (45.04%).*
Conclusion: *Students prepared well for both SDL activities and perceived them beneficial for exam preparedness, but the quiz session was more preferred and enjoyed.*
Keywords: *small group discussion, quiz, self-directed learning, assessment, feedback*

I. Introduction

Knowledge is continuously being added to the medical field, necessitating ongoing learning throughout a medical career. The new Competency-Based Medical Education curriculum aptly outlines one of the roles of Indian medical graduates – to be lifelong learners.[1] To ensure their competence, the curriculum introduced novel competency self-directed learning (SDL) for undergraduate medical students. In self-directed learning, students take control of their education by identifying their learning needs, setting goals, finding and utilizing learning resources, and evaluating their progress. The teacher serves as a facilitator during this process. [2]

SDL is a student-centered teaching and learning strategy requiring active student participation in the learning process. This approach aligns with adult learning theories, particularly Knowles's concept of andragogy, which emphasizes students' responsibility and self-motivation in their education.[3] It can be difficult for teachers to conduct and assess the SDL activity in a way that will help students develop the critical thinking and problem-solving abilities necessary for future medical professionals, thereby achieving the stated purpose of self-directed learning.

Standard methods for conducting/assessing SDL activities include seminars, online learning through platforms like YouTube, flipped classrooms, problem-based learning, group activities, and group discussions. It is the teacher's responsibility to create activities that are both impactful and engaging for all students, regardless of their achievement levels.[4,5,6]

The Self-Directed Learning Preparedness Scale (SDLRS), the Self-Directed Learning Instrument (SDLI), qualitative assessments like reflection writing, and tests like LAQs, SAQs, MCQs, and poster creation are some of the assessment instruments used to gauge SDL preparedness.[7] Teachers can use these tools to pinpoint their students' areas of strength and development and create interventions that improve their capacity for independent study.

In the transitional stage, second-year MBBS students strive to apply their foundational knowledge to clinical situations. To give this process greater significance, we aimed to create two novel SDL activities and assess them in distinct ways. We also analyzed students' perceptions of the activities and their evaluation process.

II. Materials And Methods

This was an observational, prospective study conducted involving second year MBBS students in a university medical college of western Maharashtra, India. After the ethics committee approval, the study was conducted in two SDL sessions.

Both SDL topics were announced 15 days before the actual session, and students received a briefing on the significance and how to prepare the topics. Learning resources were shared with students in the WhatsApp group and sessions conducted in small batches for the whole class of 150 students.

In the first SDL session, these 25 students of each batch were again divided into five smaller groups. The SDL topic was also divided into five subtopics, with each student randomly assigned a specific point for discussion. They had 15 minutes to organize their thoughts, and afterwards, everyone presented their assigned topic in front of their peers and mentor for 5-7 minutes. Students were encouraged to use chalk and board for explanations as last minute preparation of PowerPoint presentation was not possible. Following the presentations, there was a question-and-answer session where both peers and mentors could ask questions to the presenter relevant to that subtopic. The mentor then evaluated the students' ability to apply their knowledge to clinical scenarios, and marks were assigned accordingly. Immediate feedback was provided to each student regarding the performance.

In the second SDL session, total students were divided into five groups, and a quiz conducted on the assigned topic among these groups. Two faculty members ensured that each student participated in the quiz, and marks were awarded accordingly. Immediate feedback was given to each student about his/her performance in the quiz.

At the end of both SDL sessions, students were asked to fill out a google questionnaire to reflect on their perceptions of the activities and assessment method.

As students are very familiar to online platforms, we tried conducting a test using google form on another topic of SDL to understand how well they can perform in such an assessment method. The preliminary information about this activity and resources were shared with the students in advance for this test too but we did not take any feedback of this activity from the students.

Statistical analysis: Data was analyzed and presented as frequency and percentages. Z test was used to compare the marks obtained by students in the assessment of both SDL methods - Small Group Discussion and Quiz.

III. Results

Total 111 students participated in these activities and out of them 95 (85.5%) students attended both the SDL sessions. Students agreed that the topics as well as method and time of conduction of the activity were declared in advance by teacher facilitators and 92.7% of them mentioned that the information regarding the learning resources for SDL topic was also shared with them in advance (Table 1).

Table 1. Self-directed learning (SDL) activity preparation by teacher facilitators and students

Question	Yes	No
Attended both the SDL activities	85.5%	14.5%
SDL topic was informed in advance before the teaching session	100%	--
Information regarding the learning resources for SDL topic was shared by the teacher facilitator	92.7%	7.3%
Teacher facilitator had informed the process of learning the topic from the suggested resources	85.5%	14.5%
Method & time of conduction of the SDL session was intimated in advance	99.09%	0.01%
Explored learning resources other than those suggested by the teachers	62.16%	37.84%

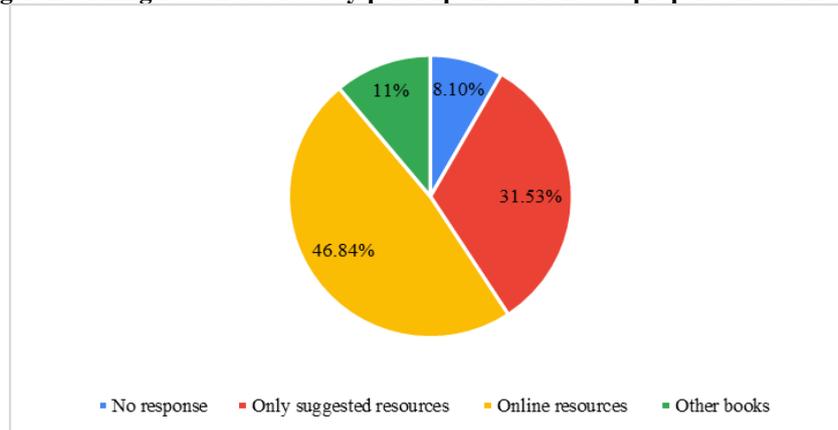**Fig 1. Learning resources used by participant students to prepare the SDL topic**

Fig 1 shows that majority of the students also explored learning resources other than those suggested by the teacher facilitators, of which online resources (46.84%) were most referred.

Majority (42.34%) of the students appreciated both Quiz and small group discussion (SGD) and when choice between SGD and Quiz was asked, very few opted for SGD alone (15.3%). According to students, they studied both the topics thoroughly for the SDL activities. Though both the methods were equally beneficial for the preparation of exams, students enjoyed the Quiz activity very much (71.17%). As there was one to one discussion during the SGD, they reported that during SGD their efforts were more appreciated by the teacher facilitators (45.04%).

When the marks obtained in both SDL assessments were analyzed, no statistically significant difference was found between them (z= -9.5).

After the feedback regarding both these SDL activities was taken, a 10 question google form test on another new topic was conducted and when we analyzed the test responses, it was found that students could answer the multiple choice questions correctly upto 74-85%. The open ended questions in this test were attempted by most of the students but it was observed that the drug names were incorrect or answers were incomplete. Some students even interpreted the question incorrectly and mismatched typing the answers against the appropriate question.

IV. Discussion

CBME emphasizes Indian Medical Graduates function as lifelong learners and have a continuous commitment to improve knowledge and skills.[1] Primarily SDL is an advanced level active learning method that improves cognitive skills and accelerates self-sufficiency in learning of the students where the responsibility of learning is inclined toward the students.[8] Goal achievement, autonomous behaviour, self-handling and motivation are a few of the personal attributes necessary for SDL to be effective.[3] Wang and Holcombe advise that the sustainability of self moderated learning relies considerably on the level of persistence and effort the learner devotes to achieve the assigned tasks.[9] Badyal et al. recommend that SDL if conducted appropriately, can have a high impact on medical education. The orientation of facilitators and the readiness of students must be considered well in advance to introduce SDL sessions efficiently.[10] Hence, SDL can be considered an effective method of learning in motivated learners.

This study was planned to explore the integration of self-directed learning (SDL) into the pharmacology curriculum through activity-based learning and student feedback. The teaching plan was well adhered to by the teacher facilitators as majority of the students (85-100%) agreed that the SDL topic was informed in advance, information regarding the learning resources for SDL topic was shared and also method & time of conduction of the SDL session was intimated properly. Some (14.5%) students said that the process of learning SDL topic from the suggested resources was not informed to them. This might be because either these students were absent for one of the SDL sessions or not attentive during the deliberation.

Students mentioned that they explored other learning resources other than those suggested by the teachers which shows that they were inclined towards learning and wanted to understand the topic from all perspectives. Nearly 50% of the students referred online resources (you-tube videos, online power-point presentations, online books or internet information) for their SDL preparation. Gupta et al. mention that digital tools greatly support SDL but their benefit depends on factors such as student motivation, continuous engagement, peer group study and defined resources.[11]

In the current study, students perceived both the SDL activities beneficial for studying further topics of the subject which would help them prepare for their exams. Patra et al. observed that 67% of the students in their study were satisfied, with the new learning module developed and 66% were driven to study further following the SDL session.[12] When asked about their preferred method for future SDL topics, the participants either opted for both SGD and quiz or quiz alone, which depicts their liking towards competitive activity.

On analyzing the assessment marks of both the SDL methods (SGD and Quiz), no significant difference was found between the students' performance. This explains the efforts put up by the students for both the SDL methods as well as their motivation and efficient learning achieved through them.

When it comes to appearing for university examinations during the course of medical education, students have to attempt different types of questions like multiple choice (selecting the right option), write answers as short notes and even long, descriptive ones. While writing such answers, particularly in Pharmacology, students need to remember correct drug names and a lot of concepts such as pharmacological actions, adverse effects, contraindications, therapeutic uses and drug interactions with these drugs. Focusing on the fact that there are drugs with similar sounding or similar spelling names called "sound-alike drugs', we as teachers reinforce on the students to remember correct drug names. When we conducted a google form test where students had to attempt multiple choice questions (MCQs) and also type the answers to short questions, it was found that students could not recollect correct drug names and concepts related to them (adverse effects, contraindications, therapeutic uses). Huxman et al in their study also concluded that students significantly perform better in oral exams compared

to written tests.[13] The results of our study emphasize that written assessment has its own advantages and should not be neglected.

All facts considered, SDL encourages independence and critical thinking, but its successful use necessitates a balance between student liberty and direction, as well as specialized support for a range of requirements. Although SDL promotes independent learning and conceptual clarity, students often exhibit better verbal recall than written accuracy, particularly in disciplines like Pharmacology where correct drug details is essential. This underscores the importance of balancing learner autonomy with targeted instructional support to enhance written expression and precision.

V. Conclusion

In the current study it was found that students prepared and performed well for both SDL activities which were assessed in the form of small group discussion and whole class quiz. The participants felt that both of these methods were beneficial to judge their exam preparedness, but the quiz session was more preferred and enjoyed. When it came to performing in written test, the students could not prove their learning ability for this type of assessment inspite of knowing that their final evaluation method would be similar.

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