



# Scope and Challenges of Self-Directed Learning in Undergraduate Medical Education: A Systematic Review

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## Abstract

**Context:** Self-directed learning (SDL) is an individual's ability to effectively use various strategies to reach his/her learning goals. We conducted this systematic review to explore the different methods, advantages, and challenges in SDL.

**Method:** A systematic and comprehensive literature search on PubMed, Scopus, and Google Scholar databases was carried out using keywords such as "self-directed learning", "self-regulated learning", and "medical undergraduate curriculum" among articles published between 2010 and 2020. Original articles having methods, advantages, and challenges were included. The data were summarized and analyzed thematically.

**Results:** Out of the total number of 1781 screened articles, sixteen eligible studies were included in the systematic review. Flipped classrooms, problem-based learning, case-based scenarios, video lectures, and e-learning were the commonly used methods. Self-assessment, time management, motivation, teamwork, and critical thinking were the advantages. Faculty guidance, time constraints, distraction due to technology, lack of organizational skills, and difficulty to learn complex topics were the common challenges of SDL.

**Conclusions:** Most of the articles in recent years explain the growing interest in SDL in the medical curriculum. Despite numerous advantages of SDL, there are several challenges and limitations due to the lack of specific and defined guidelines for its implementation. Further research is required for structured methods and strategies for SDL effective implementation.

**Keywords:** Self-Directed Learning, Self-Regulated Learning, Medical Curriculum, Undergraduate, Systematic Review

## 1. Context

Self-directed learning (SDL) is a type of learning in which the learner is primarily responsible for planning, implementing, and evaluating self-efforts (1). Introducing SDL in the undergraduate medical curriculum can help the students master this skill which can help them become life-long learners (2, 3).

SDL is defined as "a process in which individuals take initiatives, with or without the help of others, to identify their learning needs, formulate their learning objectives, identify resources required for learning, choose and implement appropriate learning strategies, and finally evaluate learning outcomes (4-6).

The term self-regulated learning (SRL) has been used as a synonym for SDL. The subtle change in terminology is defined as an active and constructive process in which learners set goals for their learning. The learners attempt to monitor, regulate, and control their cognition, motivation,

and behavior (7). A variety of perspectives on SRL exists where researchers have attempted to model how cognitive, metacognitive, motivational, and contextual factors influence the learning process (7, 8).

The specific learning objectives of SDL should be structured and well understood by the students so that they do not face challenges while trying to learn it by themselves (9). Readiness for SDL is the degree to which an individual possesses attitudes and abilities necessary for SDL (10).

The success of SDL depends on the learning strategies provided by the teachers and the self-motivation of the learners. The new competency-based medical education (CBME) initiated by the Medical Council of India (MCI) has mentioned SDL as one of the teaching-learning methods. Therefore, SDL has become an integral part of medical education.

Several systematic reviews have been found in English literature on SDL, but the articles specifying methods, ad-

vantages, and challenges for medical undergraduate curriculum have not been found. This systematic review aims to focus on various methods of SDL used by undergraduate medical students and faculty, as well as their perceptions about the advantages and challenges of different methods.

## 2. Methods

**Study Design:** A systematic review was carried out in 2020 using the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement (11).

**Data Basis and Search Strategy:** On a preliminary basis, the search question was defined in terms of population, interventions, comparisons, outcomes, and study designs (PICOS).

**Population:** Undergraduate students, medical education, medical students, faculty.

**Intervention:** Assessment, evaluation

**Comparison:** Not applicable.

**Outcome:** Methods, advantages, and challenges of SDL

### 2.1. Study Designs

Mixed method approach;  
 Randomized studies;  
 Non-randomized studies;  
 Prospective and retrospective studies;  
 Cohort studies;  
 Case-control studies;  
 Cross-sectional studies;  
 Before and after comparison studies;  
 Observational studies;  
 Surveys.

### 2.2. Search Strategy

The articles were searched through various databases, such as PubMed, Scopus, and Google Scholar, from January 2010 to June 2020. The search strategy was developed and performed in September 2020 (5 to 15 September 2020) independently by two researchers. The articles that appeared on the side panel (stating similar articles on this topic) were also screened. Simultaneously, cross-referencing was performed as well. It was rechecked in October 2020 (1 to 10 October 2020) by the third researcher and was further analyzed by all three researchers.

The abstracts were searched in all the above-mentioned search engines using keywords such as “self-directed learning”, “self-regulated learning”, “undergraduate students”, “medical education”, “methods of SDL”, “advantages/benefits”, “challenges/disadvantages”.

### 2.3. Study Selection

#### 2.3.1. Inclusion Criteria

The articles which had mentioned the SDL methods, advantages, or challenges and had focused on undergraduate medical students;

Only the original articles available in the full-text form and having open access;

Both qualitative and quantitative types of studies;

Articles that were written in English.

#### 2.3.2. Exclusion Criteria

The articles which had not mentioned methods, advantages, or challenges of SDL, or had been carried out on other health sciences or professional students;

Inaccessible articles, theses, articles having only abstract, case reports, editorials, and commentaries;

Articles that were written in languages other than English.

#### 2.3.3. Data Extraction

The article titles and abstracts were screened independently by two researchers using the inclusion and exclusion criteria. The abstracts of eligible studies were shared by the researchers, and duplicates were removed. The selected abstracts were then checked for the availability of their full texts. The full texts were also screened by two researchers independently, and the results were shared. After discussion on the articles, to avoid bias, they were also shared with a third researcher to review all the articles independently. A final list of the studies was prepared with the consensus of all three researchers.

Only published articles written originally in English were considered; hence, some of the eligible studies might have been missed, resulting in a selection bias.

A table was prepared, including author name(s), year of study, geographic distribution, type of study, participants, methods used, advantages, and challenges.

Thematic analysis of the advantages and challenges of SDL was carried out for the selected studies.

## 3. Results

The search algorithm yielded 1781 (n = 1781) articles, including 893 (n = 893) from PubMed, 704 (n = 704) from Google Scholar, and 184 (n = 184) from Scopus. After removal of the duplicates (n = 25), 107 (n = 107) articles were scanned based on their title and abstract, and a total of 107 (n = 107) articles were processed for full-text screening. Five theses, seven systematic reviews, and five review articles were excluded. Seventy-four (n = 74) original articles which

had no specific method, advantage, or disadvantage of SDL were excluded from data analysis. A total of 16 ( $n = 16$ ) articles were included in the analysis. The study selection flow diagram (Figure 1) depicts our search strategy in detail.

The articles which were included in the analysis were scanned, and their key points were summarized in a separate file. After analyzing each article, the findings were assembled in three major criteria: “methods”, “advantages”, and “challenges” of SDL.

Out of the total 16 selected studies, nine studies focused on SDL, and seven discussed SRL (Table 1). The majority of them have used SDL methods such as flipped classrooms and problem-based learning, and some focused on instructional videos and simulation techniques to study skills.

The methodologies of the included studies varied in the form of surveys/cross-sectional designs, before-after studies with feedback, and qualitative research methodologies.

Six studies were found to be from different zones of India and 10 from developed countries. Similarities were observed between the methods of SDL and its advantages and challenges.

Among the SDL studies, three used multiple SDL methods such as interactive seminar learning, case-based scenarios, flipped classrooms, and so on. The remaining six studies mentioned a specific SDL method (Table 1). Six studies took participants from the first-year bachelor of medicine bachelor of surgery (MBBS) students whereas Premkumar et al. (1) selected students from all four batches (1st, 2nd, 3rd, and final year) of MBBS as participants in the study. Three studies used a self-directed readiness scale in their methodology.

The advantages or scopes were categorized into various themes (Table 2).

SDL is an innovative method, so there are several challenges in its implementation. Studies have mentioned challenges either of the method/methods applied for SDL or based on the readiness scale, taking the perception of students, teachers' viewpoints, and the challenges faced by SRL studies. The challenges have also been categorized into different themes (Table 3).

Risks of bias across the studies:

The methodologies (study designs) of the selected articles were different in different settings, which could have contributed to information bias.

The method/methods applied for SDL also varied across the studies contributing to bias due to participants' opinions on the specified method/methods instead of the SDL strategy.

#### 4. Discussion

This is a systematic review to summarize various methods, advantages, and challenges of SDL in undergraduate medical education.

Currently, SDL is emphasized in medical institutions all over the world. The skills of SDL enable one to be a life-long learner, which is a necessity to cope with fast expanding medical knowledge (18).

The medical curriculum is very vast. Along with the traditional methods of teaching, innovative techniques should also be implemented. This emphasizes the scope of SDL in the undergraduate medical curriculum which will allow the students to learn independently and to be responsible for self-learning based on adult learning principles.

Most of the studies targeted initial professional year students, which helped in the early implementation of SDL. This benefits both students and teachers to get accustomed to the new method. Few studies included higher professional years for learning skills (26).

The different methods introduced and tried by various researchers include problem-based learning, technology-based learning/e-learning, seminars, flipped classrooms, case-based learning, videos, mixed methods, and recorded lectures. This proves that SDL is a complex tool for teaching-learning. Different methods used in different subjects and scenarios will help the students learn their subject more effectively and also concept-building and better retention of the knowledge. This emphasizes the need to understand the diverse methods in detail by faculty and students for effective implementation.

With the advancement in technology, many portals for e-learning are easily available to the students in the form of recorded lectures, videos, images, and flowcharts on the webpages, providing resources for SDL.

Team-based learning in the form of seminars, projects, and group discussions is also another method used for SDL. Premkumar et al.'s study (1) revealed that interactive classes via student-led seminars, tutorials, and topic-specific presentations by students, and also providing lecture topics ahead of the class promoted SDL.

In a competency-based curriculum, the flipped classroom has emerged as a novel concept. Here, students scrutinize the topic of learning by online reading and videos to prepare for their classroom-based activities, becoming a method of SDL (20). The implementation of the flipped classroom teaching poses significant challenges to both students and faculty in medical schools (12).

Bobby and Meiyappan (15) suggested ‘open book examination’ as a model of SDL. He found that the mentioned

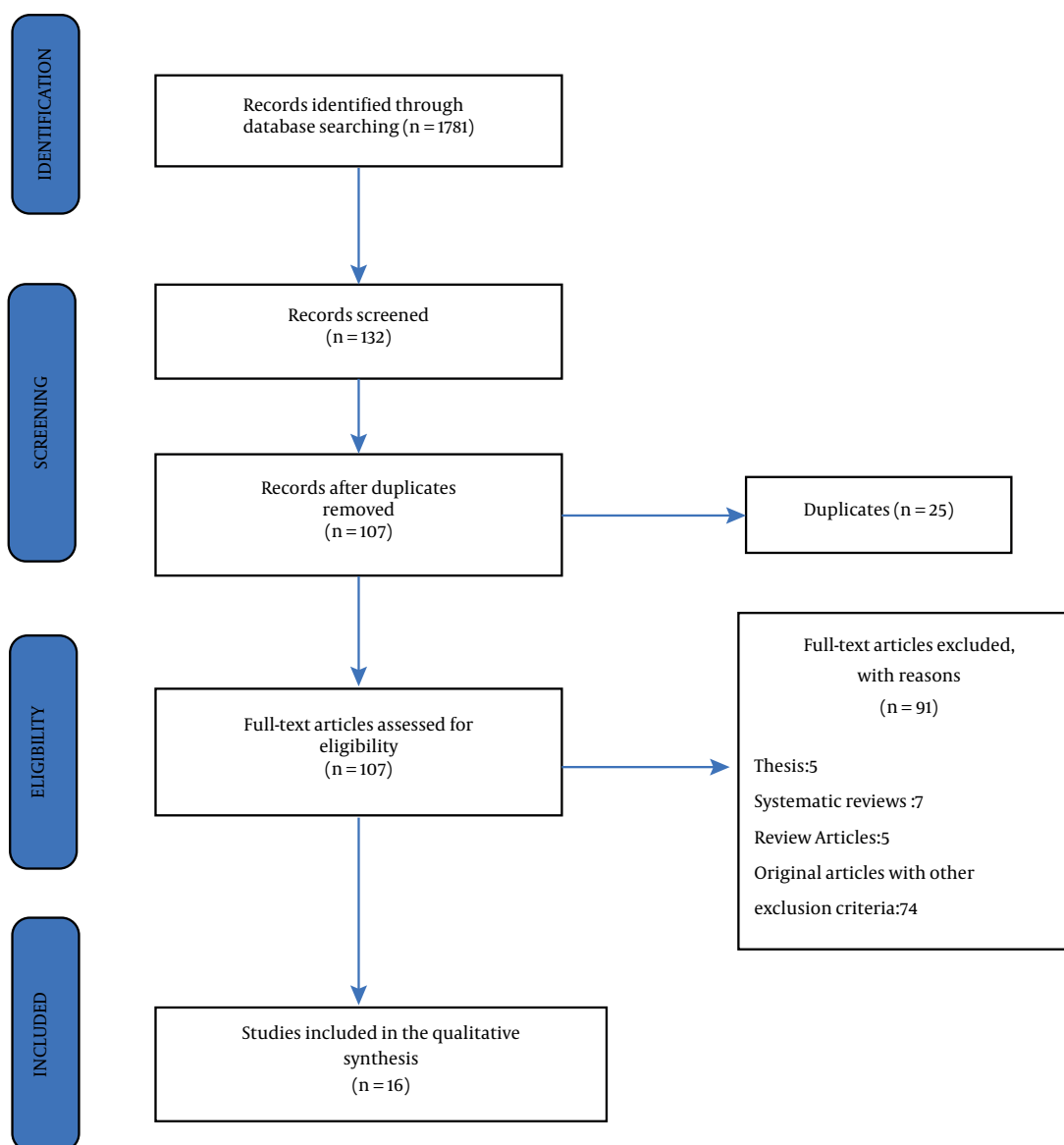


Figure 1. PRISMA flow diagram

model enhanced students' self-directed focused learning process. This was found to be more beneficial than "self-study" in reinforcing the learning concepts after regular didactic lectures.

Oleg Safir et al. (26) focused on the effects of self-directed or prescribed practice schedules on learning suturing skills. This contained a component of SRL as well. This was an example of SDL on skill development which is an important aspect of the medical curriculum (26).

Most of the research articles revealed many advantages of SDL. Self-assessment, identifying skills, and confidence-

building were the major advantages cited (1, 14-25). Various methods, such as problem-based learning, flipped classroom, and case-based learning, helped students work on themselves to gain knowledge, and analyze and interpret it with critical thinking, and also apply it leading to a definite diagnosis. This process helped them develop self-confidence and improve patient management. SDL helped students improve their presentation skills, communication skills, collaborated learning skills, and information handling skills revealed by authors who used self-directed readiness scales (1, 14). Teamwork was an important advan-

**Table 1.** Characteristics of Selected Articles

Serial Number	Study: First Author, Year, and Country	Participants/Study Design	SDL/SRL Methods	Advantages	Challenges	Type of Research
T1	Premkumar et al. (1), 2018, India	1st, 2nd, 3rd, 4th year, and interns (n = 452); Mixed method study	Multiple methods: Student-led seminars, topic-specific presentations, tutorials, and providing students with lecture; topics beforehand	Motivational, time management, identifying your own skill and abilities	Useful only if assessment-driven, insufficient time, difficult for 'spoon-fed' students, distractions due to modern technology, result-oriented approach, difficulty in accepting a novel method	SDL
T2	Hill et al. (12), 2020, USA	1st year (n = 131); survey and thematic analysis of open-ended questions	Team-based learning	Enjoying the course helps critical thinking, time management, helps skill development, knowledge application,	Not mentioned.	SDL
T3	Peine et al. (13), 2016, Germany	3rd year (n = 244); before and after study	Mixed method: Lectures, seminars, e-learning,	helps active recall, teamwork	Complex subjects cannot be fully taught in classrooms, accustomed to concentrated individual work, limitations of precise instruction of the teachers	SDL
T4	Abraham et al. (14), 2017, India	1st year (n = 120); descriptive study	Technology-enhanced learning experience, Pecha Kucha PK talks (type of group discussion)	Improves presentation skills, collaborative learning skills, teamwork	Demands a lot of effort and time from both faculty and students	SDL
T5	Bobby et al. (15), 2018, India	1st year biochemistry, before and after study	Open-book test versus self-study	Better retention, critical thinking, helping the focused learning process	Vast knowledge, limited time frame	SDL
T6	Kershaw et al. (16), 2017, UAE	2nd year (n = 206); interventional study	Project-based learning	Promotes literature searching, writing skills, presentation skills, and teamwork	PBL is a novel method, requires planning and research skills, problems with team participation	SDL
T7	Pai et al. (17), 2014, India	1st year (n = 237); cross-sectional study	Case-based scenarios	Better knowledge acquisition	Role is reduced in first year settings	SDL
T8	Patra et al. (18), 2020 India	1st year (n = 160); cross-sectional mixed method	Discussions on case based scenarios, flipped classrooms, student led seminars, movie screening, panel discussions, role plays	Enjoyable, an innovative way, motivation, teamwork, confidence-building	Few active members in group, long duration, too much feedback	SDL
T9	Gune (19), 2018, India	1st year (n = 140); before and after study	Brain storming and presentation sessions	Improving understanding, promoting curiosity, generating new ideas,	Time consuming	SDL
T10	Zheng and Zhang (20), 2020, Midwestern United States	1st and 2nd year (n = 146); qualitative study	Flipped classrooms	Beneficial to stay engaged, obtaining better explanations, and asking better questions, lowering anxiety	Too little lecture-based teaching, too much independent learning, the large volume of information available, difficult to "staying organized", time management, difficult to obtain help	SRL
T11	Cleary and Sandars (21), 2011, UK	3rd year (n = 7); qualitative case description study	Venipuncture on a simulation mannequin arm	Self-regulatory processes	To judge poor performance is problematic, particularly for low achieving or at-risk students, negative effects, such as avoidance and anxiety	SRL
T12	Demiroren et al. (22), 2020, Turkey	3rd year (n = 257); cross-sectional study	PBL	SRL skills to understand their own ability	Not mentioned	SRL
T13	Demiroren et al. (23), 2016, Turkey	2nd (n = 286) and 3rd (n = 275) year; cross-sectional study	PBL	Motivation, planning and goal setting, strategy use and assessment	Difficulties in taking learning responsibility and teamwork, individual counseling and support, lack of group interaction, problem-solving	SRL
T14	Topale (24), 2016, Grenada	1st and 2nd year (n = 281); electronic survey	Lecture recordings	Controlling over time, critical thinking, skills gaining personal time, increasing study time	Hinders participation of medical students in live lectures, non-interactive, technical assistance is further required	SRL
T15	Vavasseur et al. (25), 2020, USA	4th year (n = 353); single site prospective study	Flipped classrooms and short videos	Enjoy, improving flexibility, allowing improvement in performance, satisfaction and engagement, improving knowledge	Not mentioned	SRL
T16	Safir et al.(26), 2013 Netherlands	1st and 2nd year (n = 38); before and after study	Instructional videos	Simple procedure can be mastered	Complex interaction of task difficulty and training conditions required for optimal learning	SRL

tage of SDL, which created opportunities to interact with peers and teachers (13, 14, 16, 18-20). In the medical curriculum, learning has to be enjoyable and motivating to help better retention and improve professional acumen. SDL proved to have these qualities (1, 12, 18-20, 23, 25, 26). SDL also helped students improve their time management (1, 12, 21, 23-25). Thus, SDL will have several advantages if ap-

plied with the proper direction of the methodology.

SDL is a novel method in the medical curriculum; hence, there are several challenges faced by faculty and students. This systematic review reveals that there is a lack of proper instructions and training by the faculty to the students while conducting SDL (13-15, 18, 20, 23, 26). Teachers need to be educated and trained for planning, organizing,

**Table 2.** Thematic Presentation of Advantages of SDL

Theme	Studies (T Signifies Study Serial Number) in Table 1
Motivation	T1, T8, T9, T14, T15, T16
Improving time management	T1, T2, T11, T13, T14, T15
Identifying skill/self-assessment	T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14, T15
Knowledge application	T1, T3 T7, T9, T10, T13, T14, T15
Enjoyable experience	T1, T7, T15, T16
Critical thinking	T1, T2, T3, T4, T14
Teamwork	T2, T3, T5, T7, T8, T9

**Table 3.** Thematic Presentation of Challenges of SDL

Theme	Studies (T Signifies Study Serial Number) in Table 1
Not assessment-driven	T1, T11
Influence of culture	T1, T11
Distraction due to technology	T1, T14
Complex topics	T3, T10, T16
Instructions by teachers	T3, T4, T5, T8, T10, T13, T16
Limited resources	T10
Time consuming	T1, T4, T5, T8, T9, T10
Issues related to teamwork	T3, T6, T8, T13
Novel method (teething problems)	T1, T6
Lack of organizational skills	T10, T13

conducting, as well as evaluating SDL. Another major challenge was time management, as SDL sessions were long and endless (1, 14, 15, 18, 20). Since medical students are more accustomed to read and learn by themselves, they faced problems in teamwork. All members were not actively contributing (13, 16, 18, 23). Organizational skills were also absent (20, 22). SDL was effective in the simple topic; however, complex topic learning was a big challenge, especially in learning surgical skills (13, 20, 26). Most of the learning is assessment-driven and result-oriented. SDL without assessment was also a challenge (1, 21). Similar to any other new method, SDL has its teething problems for implementation in the traditional teaching-learning environment and “spoon-fed” culture (1, 16). Video lectures have their disadvantage of lack of personal interaction, technical issues, and distractions due to technology (1, 24).

#### 4.1. Limitations

This systematic review has encountered many limitations. The identification process undertaken during this

research was rigorous and thorough within a short time; thus, some studies were missed. Articles and methods developed in languages other than English were disregarded. After the first assessment, the systematic reviews as well as theses, dissertations, and review articles were excluded. Since this review focused on the importance of SDL in undergraduate medical students, studies including SDL practices in other fields like nursing were excluded. The evaluation was carried out by analyzing what different researchers have mentioned in their studies. Since all studies did not include the required fields, it further affected the review. SDL is a novel concept in the medical curriculum, hence limited information is available. The various types of SDL methods, which were studied during this review, had their specific pros and cons owing to their limited flexibility. SDL and SRL are very closely related terminologies with unclear conceptual bases, thus difficult to differentiate.

## 5. Conclusions

This systematic review has dealt with the methods, advantages, and challenges of SDL in detail. The commonly used methods were problem-based learning, flipped classroom, and e-learning. The important advantages were confidence-building, self-assessment, teamwork, and critical thinking with improved cognition. The challenges faced were lack of directions from the faculty, time management, and lack of organizational skills.

SDL is a newly introduced concept in the competency-based curriculum in India. This review will be a guiding tool for medical faculty across the country to implement SDL in their curriculum. There is limited literature on SDL methods, the actual plan of implementation, and assessment. This necessitates the need for future research regarding SDL.

## Footnotes

**Authors' Contribution:** Study concept and design: AB and HR. analysis and interpretation of data: AB, HR, and MN. drafting of the manuscript: AB, HR, and MN. Critical revision of the manuscript for important intellectual content: AB and HR.

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