Review Article:

An Academician's Perspective on the Effective Implementation of Self-Directed Learning (SDL) in Undergraduate Dental Education

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Abstract

Self-directed learning (SDL) serves as a learning modality designed to foster independent learning among students. The aim of this paper is to comprehensively grasp the concept of SDL and its associated advantages, acknowledge the pivotal role of student-teacher interaction within the learning-teaching continuum, enumerate the diverse methods accessible to both educators and learners to facilitate SDL, evaluate the students readiness, and identify the challenges inherent in promoting SDL within undergraduate dental education.

Key words:

Self-directed learning, Dental education, Andragogy, Learning methods, Student engagement, Teaching methods

INTRODUCTION:

The current era represents a period of rapidly expanding knowledge, where yesterday's best practices may become obsolete tomorrow. Dental schools ought not to solely emphasize knowledge acquisition and skill development in their students. Rather, the focal point of dental education should center on fostering lifelong learning, nurturing self-directed learners, and addressing the gaps present in dental education.[1] Given that students are anticipated to operate within varied contexts throughout their professional careers, it is imperative for future doctors to continually engage in learning and participate in continuing education initiatives.[2]

Dental education has undergone a transformation in the role of students, transitioning from passive recipients to active participants in the learning process.[3] Modern dental education focusses on the student as the locus of control instead of the teacher. The teacher now assumes the role of a "facilitator of learning," a "motivator," or even a "designer of learning," and at times, genuinely engages with students as a "continuing co-learner." This shift has resulted in the adoption of the concept of self-directed learning (SDL) to foster independent learning among students.[4]

Andragogy, also known as Adult Learning Theory, was proposed by Malcolm Shepherd Knowles, an American educator. This learning theory emphasizes SDL. The first principle of andragogy states that adults should be involved in the planning and evaluation of their learning process.[5] According to Knowles, SDL can be defined as a process in which individuals take initiative, with or without the assistance of others, to identify their learning needs, formulate objectives, identify necessary resources, choose and implement appropriate learning strategies, and ultimately evaluate their learning outcomes.[6] Therefore, SDL entails learning by the student, learning for oneself, and assuming the role of evaluator, making it a wholly learner-centered approach to education.[7]

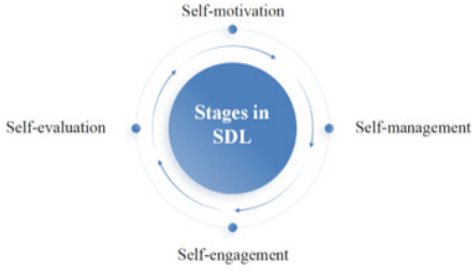
ADVANTAGES:

1. The primary advantage is motivation as learning occurs for the sake of learning itself.[8] The motivation for learning must originate from the student.
2. It promotes the development of time management skills and the ability to gather resources, as the learner is responsible for acquiring resource materials and devising a learning schedule based on available time.[9]
3. Self-assessment is also a significant aspect. In SDL, formal assessments are absent, but students have the freedom to utilize SDL as a learning tool since learning transpires for the sake of ac-

quiring knowledge.[9]

4. Many students have found this to be a valuable learning experience.[10]
5. SDL enhances critical thinking.[11] When students engage in independent learning, they can identify knowledge gaps, thereby fostering their research capabilities.
6. SDL familiarizes students with teamwork, which has been recognized as a positive outcome of SDL.[12]
7. There is enhanced retention of knowledge and skills as students have learned independently, empowering them to become lifelong learners.[13]

STAGES IN SDL (Fig. 1)



Self- motivation:

The first stage is readiness to learn. The student must evaluate themselves, their current situation, their study habits, and their support network, including family, friends, and teachers. They must tailor this evaluation based on past experiences with independent learning. Once the student has analyzed all these factors, they recognize signs of readiness, such as autonomy, organization, and self-discipline. After developing or believing they possess these skills, the student is then ready for SDL.[9]

Self- management:

The next stage involves setting goals. This entails the facilitator or teacher communicating learning goals to the students and collaboratively devising a plan, including how to structure it and the sequence of events. They must establish timelines for completing activities and decide on resource materials.[9,12]

Self- engagement:

The third step is the students engagement in the actual learning process. Students need to understand their approach, which typically falls into three categories: a deep approach, a superficial approach, and a strategic approach. The deep approach involves understanding concepts independently and applying knowledge in new contexts, making it ideal for SDL. However, many students adopt a superficial approach, focusing solely on content reproduction and completing tasks without deeper understanding. The strategic approach, favored by most students, aims to achieve high grades with minimal preparation. In SDL, students should adopt a deep or lifelong learning approach, enabling them to apply acquired knowledge in everyday practice.[9]

Self- evaluation:

The subsequent step is evaluating learning. Given the absence of formal assessments in SDL, students must engage in self-reflection, asking questions such as: How do I know I have learned? Can I apply my knowledge effectively? Do I have the confidence to explain concepts to others or teach them? Have I acquired sufficient skills to practice independently or treat patients alone? When do I need to seek guidance from faculty members? Students must evaluate themselves to determine if they have attained these capabilities.[9]

STAGED SELF-DIRECTED LEARNING (SSDL) MODEL:

There are four stages in the staged self-directed learning (SSDL) learning model, as proposed by Gerald Grow (Table 1).[14]

Tabel 1:

Stage	Student	Teacher	Examples
I	Dependent	Authority, Coach	Coaching with immediate feedback. Drill. Informational lectures. Overcoming deficiencies and resistance.
II	Interested	Motivator, Guide	Inspiring lectures plus guided discussion. Goal setting and learning strategies.
III	Involved	Facilitator	Discussion facilitated by the teacher who participates as equal. Seminar. Group projects.
IV	Self- directed	Consultant, Delegator	Internship. Dissertation. Individual work or self directh ed study group.

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Stage I:

The student is dependent, and the teacher is expected to be an authority or a coach. Examples of this would be informational lectures, coaching with immediate feedback etc., essentially involving spoon-feeding, where information is provided to the student by the teacher.[15] A student who eventually becomes a self-learner may find themselves in this stage initially. While most students in this stage are systematic and well-disciplined, they lack relevant knowledge, skills, experience, and self-confidence. They require a teacher who is an expert in the subject and can help move them to the next stage. The teacher should emphasize that learning occurs due to the student's efforts and provide assistance and encouragement accordingly.[14]

Stage II:

The student is interested and seeks a teacher who acts as a motivator and guide. Examples of such sessions include inspiring lectures and guided discussions. After such sessions, students may become interested and respond with motivation. The

teacher not only brings enthusiasm and maintains excitement but also helps students progress to the next stage. To achieve this, students should be trained in goal-setting. They must understand their personality type and learning style in order to set goals accordingly.[14]

Stage III:

The student is actively involved and requires a teacher who acts as a facilitator. Examples of such sessions include seminars and group projects facilitated by the teacher.[12] The facilitator operates as one among the group. While clear goals are set, the facilitator ensures that students engage in their own learning and take responsibility for their education. Teachers must foster a happy and friendly working environment to ensure the success of this stage. Here, learners can develop critical thinking skills, take initiatives, and undergo a paradigm shift from their previous learning approach. The teacher's encouragement and empowerment push learners to progress to the next stage.[14]

Stage IV:

The student is self-directed, and the teacher must act as a consultant or delegator. Examples of this stage include internships, dissertations, individual work or self-directed study groups. Here, the teacher's role is akin to that of a mentor, aiming to maintain the students at this stage.[13] Unlike in previous stages, where the goal was to move students from a lower to a higher stage, in this stage, the teacher's goal is to support students in maintaining their self-directed approach to learning.[14]

METHODS AVAILABLE TO IMPLEMENT SDL:

There are various methods available to implement SDL, which includes:

I. Facilitated learning[16]

II. Self-paced learning[16]

III. Other learning modalities

I. Facilitated learning:

This method of learning involves the presence of a facilitator or teacher to guide the adoption of SDL.[16] There are several methods available for facilitated learning, including:

1. <u>Audio-video lectures or recorded lectures:</u>

This modality features pre-recorded voice-overs by teachers accompanied by relevant text and videos. However, a drawback of this method is the lack of student feedback, leading to potential cognitive overload from excessive auditory or visu-

al stimuli.[17] A study suggests that live lectures are more conducive to learning than audio-video lectures.[18]

2. Flipped classrooms:

In this approach, recorded lectures are assigned for students to watch at home, with subsequent classroom discussions centered on the lecture content. This approach allows for more hands-on learning, deeper engagement with the topic & more active learning outside the classroom.[19]

3. Small group lectures and discussions:

This method, regarded as highly effective in undergraduate dental education, involves teaching certain curriculum topics to small groups of students (typically 4-6 individuals) within a short time frame (5-7 minutes).[20] Known as the microteaching concept, this approach allows for equal participation among students, who are provided with topic-specific reading resources in advance to facilitate preparedness. The facilitator initiates discussions with open-ended questions, fostering brainstorming within the group.[21]

4. Problem-based learning:

In this method, small groups are presented with trigger materials or problems to solve collaboratively. These materials can include clinical scenarios, laboratory data, photographs, charts, or videos, promoting knowledge acquisition through collective effort and critical thinking.[22]

5. Case-based learning:

Similar to problem-based learning, case-based learning involves the presentation of cases to groups for analysis and discussion.[10]

6. Team-based learning:

Students engage in presenting seminars, conducting research, and working on projects relevant to their field of study.[21]

7. Doughnut rounds:

This concept involves small groups of students arranged in two concentric circles, akin to a doughnut. Students select learning material, prepare questions based on readings done at home, and pose these questions to other group members in a structured manner. The facilitator oversees the process, ensuring effective learning and healthy competition among participants.[16]

8. Open book examination:

Students are provided with argument-based questions during examinations, allowing them to refer to books for answers. While this approach encourages active learning and long-term retention, it can be time-consuming.[23]

II. Self-paced learning:

This modality primarily relies on the utilization of technology to implement SDL, which is particularly beneficial for the current generation of students belonging to Generation Z (Gen Z) or zoomers.[16] Research conducted among fourth-year undergraduate dental students at the University of Sheffield explored the learning preferences of Gen Z dental students and their potential impact on dental training.[24] Some notable conclusions from this research indicate that Gen Z students prefer online training and teachers should necessitate resources suitable for their training stage. They often seek access to digital libraries with the easy availability of e-books and journals. Teachers, who may belong to different generational cohorts such as baby boomers, Generation X or Y, possess varied learning styles compared to Gen Z. Regular meetings to discuss learning styles and past experiences can provide insight into the expectations of both teachers and students regarding teaching and learning. The various approaches to self-paced learning are based on the teaching and learning characteristics of the current generation of Gen Z students.[24] These include:

1. Digital library and web-based search engines:

These platforms offer convenient access to e-books, journals, and other resource materials.[25]

2. Online courses and learning management systems:

These software-based systems facilitate administration, documentation, tracking, and reporting of the learning process.[26] The application monitors student progress and identifies the need for retraining, providing learners with flexibility to understand their position and retake courses if necessary.[27]

3. Dental applications:

These serve as supplementary learning tools for undergraduate students, offering learning resources. Some useful dental applications are Bone Box Dental Lite, Tooth Morphology, Dental Prescribing, Dentistry ProConsult, and My Dental-Care.[25]

4. Dental blogs:

These platforms provide educational resources for dental professionals, covering various topics including dental subjects, practice management, patient education, staff development, advancements in dentistry, product updates, clinical practice advice, professional development tips, trends,

and best practices in dentistry.[25] Notable dental blogs include Dental Economics, Dentistry IQ, DemandHub, Ask Dr. Spindel, and Off the cusp.

5. Informative videos:

Trusted platforms like MEDtube and YouTube accounts of certain dental school departments offer videos that aid in studying complex techniques, which students may have learned in theory or may perform during their course.[25]

6. Videoconferencing, vodcasts and podcasts:

These modalities can also supplement SDL.[25]

7. Social media:

It should be used effectively and cautiously to supplement SDL. A study by Aldallal et al. concluded that YouTube served as a popular and influential self-directed learning resource for oral surgery among undergraduate dental students.[28] However, students should exercise caution as the material may not always align with the curriculum, and there is no quality assurance regarding educational content or learning outcomes.

III. Other learning modalities:

Additionally, there are several other methods that can be employed to implement SDL:

1. Creative research and follow-up:

This approach involves assigning assignments or research projects in the subject as part of internal assessment. Topics may extend beyond theory to encompass the latest advancements related to the course. Students are allotted ample time to complete these assignments, with resources either procured by the student or supplied if unavailable. They prepare the research through self-study and understanding, receiving feedback during follow-up until submission.[15]

2. Using assignments as resource material:

Students are provided with pictures of oral diseases, conditions, personalities, devices, instruments, or procedures, which they must research and compile into a concept poster or Google Slide presentation.29 This not only serves as an assignment but also enhances the learning experience and can be utilized as resource material for other students and the department.

3. Field visits for volunteering activities:

During such activities, students are divided into small groups and assigned responsibilities such as conducting oral

health talks, planning activity logistics, and participating in post-activity discussions to share information learned.[20,21] This method can be implemented in community camps, health programs, and exhibitions.

4. Pecha Kucha competition:

This competition is applicable to students and interns who present their case reports or research. Pecha Kucha, a Japanese term, involves a power-point presentation comprising only 20 slides, each displayed for 20 seconds. The slides automatically progress after 20 seconds, with the entire presentation to be completed within six minutes and 40 seconds. Presentations are evaluated, and outstanding performers may be recognized. In addition to enhancing subject knowledge, students develop communication skills and effective time management through this approach, enjoying the learning experience with each presentation requiring attention for less than seven minutes.[30]

5. Wikipedia Collaboration of Dental Schools (WCODS):

This student-led initiative aims to publish high-quality, evidence-based dental content on Wikipedia. Members utilize research, critical appraisal, and writing skills to create accurate content. While this method requires extensive training for effective implementation, it serves to develop critical thinking and research capabilities in undergraduate dental students.[31]

ASSESSMENT OF SDL:

There are no conventional methods to assess SDL. However, assessments may occasionally be necessary to monitor students' progress, identify any pitfalls, and intervene in their learning process.[32] Since deep learning occurs in SDL, it elevates students to a higher level of cognition. A suggestion is to incorporate a long essay question in examinations to gauge the depth of knowledge acquired through SDL.[33] Additionally, innovative methods such as pop-up questions or group quizzes, which may not contribute to grading or assessments, can help gauge students level of understanding and depth of knowledge.[34,35] This approach fosters an interest in the subject, encourages deep learning, and promotes SDL among students. Consequently, it empowers them to excel in future assessments that are assessed and graded.[36]

CHALLENGES IN THE IMPLEMENTATION OF SDL:

1. Not assessment-driven: Given that students are at varying levels and stages, implementing a uniform assessment method poses a challenge.[36]

2. Influence of students learning culture: At school and preparatory levels, students are accustomed to spoon-feeding. Introducing SDL may prove challenging as they adapt to this new learning modality.[37]

3. Distraction due to technology: Students entering dental school are often young and easily distracted by technology. Technology has significantly reduced student engagement times and attention spans, posing a challenge in refocusing them and integrating technology into SDL.[16]

4. Complexity of topics: Imparting skills, particularly in complex topics, can be challenging through SDL.[38]

5. Clarity of instructions: It is essential for teachers to provide clear instructions, especially to students in the early stages, regarding expectations and procedures.[37]

6. Time-consuming: Although SDL can be time-consuming, its value lies in its promotion of lifelong learning for students.[39]

7. Teamwork issues: Effective teamwork can facilitate SDL. However, challenges arise if there are conflicts within the teams, posing difficulties for teachers.[40]

8. Lack of organizational skills: As students are still evolving, they may lack organizational skills. Teachers may need to support students in identifying gaps and suggesting measures to improve their organizational abilities.[11]

SDL READINESS:

SDL readiness refers to the extent to which a student possesses the ability, attitude, and personal characteristics suitable for SDL.[11] Transitioning from the passive learning environment of school, students must adapt to the active learning approach of SDL. Therefore, significant preparation from the student is necessary, and assessing their readiness for SDL is crucial.[11] Factors influencing SDL readiness include:

1. Creativity: The students level of creativity plays a role in SDL readiness.7

2. Love for learning: A genuine passion for dentistry and a love for learning are essential. If lacking, these qualities can be cultivated, primarily influenced by teachers and the learning environment.8

3. Initiative and independence in learning: While some curricula may foster initiative and independence in learning during school, this is not commonly observed due to the prevalent

spoon-feeding approach. Students with innate or developed independent learning skills find it easier to become SDL ready.[8]

4. Responsibility for learning: Students must take responsibility for their own learning and possess a self-concept conducive to effective learning.[8] They should be prepared to enhance their problem-solving skills and maintain a positive outlook for the future.

Factors that promote SDL

1. The year of study holds significance in the SDL readiness assessment. Contrary to the notion that higher-level students are more prepared for SDL, it has been observed that first-year students exhibit greater readiness.[41-43] As students progress in their courses, their SDL scores tend to decrease. Few studies indicate that students readiness for SDL can be predicted based on their performance in basic sciences and grade point average.[36,44] Positive outcomes have been noted in subjects such as human anatomy, physiology, biochemistry, and microbiology.[15,33,35,45-47] However, conflicting results arise as some students prefer group discussions for learning, while others favor faculty-driven instruction methods, particularly in courses like dental biomaterials.[48]

2. A well-explained topic in class, particularly through interactive sessions, enhances students SDL readiness.[40]

3. Active questioning in class plays a pivotal role in motivating students and fostering critical thinking. Consistent questioning, even when students do not immediately respond, stimulates their thought process. It is essential to articulate the relevance of posed questions, encouraging students to engage in SDL outside the classroom.[20]

4. Practical case discussions serve as effective stimuli for SDL, surpassing mere theoretical instruction. Understanding the practical application of case scenarios in real-life situations enhances SDL engagement.[10]

Factors that deter SDL

1. Internal assessments and other evaluations deter SDL readiness. In these instances, students are primarily focused on achieving good marks or grades.[25] Genuine learning often takes a backseat, making assessment a hindrance to true education.[32]

2. Lack of questioning inhibits student engagement. Whether in the classroom, during clinical or outpatient

postings, it is essential to pose relevant questions. Failure to do so impedes the learning process.[20]

3. Age and maturity at the time of dental school admission also influence SDL readiness. Studies indicate that students who enter dental school later, after completing previous degrees or courses, tend to exhibit greater maturity and readiness for SDL.[37]

4. Learning culture and spoon-feeding practices from schooling serve as deterrents to SDL.[37]

CONCLUSION:

Learning is indeed a lifelong endeavor, essential for staying updated amidst change.[49] Therefore, teachers bear the paramount responsibility of educating individuals on how to learn effectively. The role of the teacher is to progressively render themselves unnecessary, fostering independence and self-sufficiency in their students.[7] This approach can be utilized to enhance the quality of dental education as a step toward educational development.[50]

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