

Self-Directed Learning to Augment Active Learning in Physiology; Through Innovative Methodology of “Physiology Concept Posters”

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Abstract: *Background:* Self-directed learning (SDL) in the Indian Competency Based Medical Education (CBME) curriculum is active learning signifying direct & active learner involvement. To develop medical expertise, students must be engaged in higher-order cognitive tasks such as application, analysis, synthesis, creation or evaluation. *Objectives:* The study was planned to evaluate and analyze perception of student to innovative learning methodology of “Physiology Concept Posters”, focusing on its usefulness and possible practical application in teaching physiology. *Method:* The students in small groups had produced “concept posters” illustrating physiological concepts, based on relatable analogies. At the end of the session students filled self validated questionnaire regarding perception of innovative SDL method. *Results:* Students were receptive to new methodology. The 20 posters created were highly representative & effectual in symbolizing physiological facts. The integrative character of the “concept posters” endorsed to reorganize theoretical physiological knowledge and transposed concepts to practically applied information. *Conclusion:* The design of concept poster sessions has been useful & effective as a learner centered approach & can be supplemented to didactic lecture to facilitate learning in physiology. It had successfully targeted the synthesis level of cognitive learning domain & encouraged enrichment of skills such as intellectual thinking, creativity, team work & communication in students.

Keywords: Active learning, CBME, SDL, Concept Posters.

Introduction

The launch of Competency-Based Medical Education Curriculum in India has imposed new standards for learning. Several novel elements are endorsed like electives, foundation course, early clinical exposure and self-directed learning (SDL). It emphasizes paradigm shift in the Indian medical education from teacher centered to student centered approach. SDL is an imperative, active learner-centered approach. Appropriate and timely incorporation of SDL approach will facilitate the undergraduate medical students to grow as lifelong learner and efficiently deal with ever expanding medical knowledge. Lifelong learner is one of the goals of an Indian Medical Graduate [1].

Malcolm Knowles had defined SDL as the process by which the students themselves take the initiatives with or without the help of others, to diagnose their learning needs, formulate their

learning goals, identify resources required for learning, select and apply appropriate learning strategy and finally evaluate their learning outcomes [2-3].

The traditional didactic teaching involves a single teacher delivering the lecture to generally a large number of students by means of support from audiovisual aids such as a blackboard or Power Point presentation. This approach has advantage of conveying large amount of content in less duration. However students are passive learners in this method.

On the contrary to lectures SDL is an active learning approach with core characteristic of SDL is that learners take considerable responsibility for their own learning, above and beyond responding to instruction of teacher. Teacher have important role to play as a facilitator in assisting students to attain the skills of SDL. Thus active learning

approach focus on students in inculcating more knowledge and enhancing retention of the subject [4].

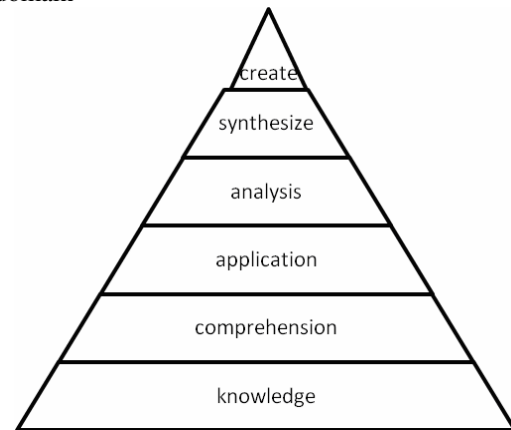
SDL has been advocated for efficient and effective training of undergraduate medical learners [5], as well as have established usefulness in terms of knowledge achievement for learning of physiology [6].

SDL has been conducted with diverse approaches like case based scenario, problem based learning, jigsaw method etc. This study was planned with the goal of implementing relatively new and innovative technique of “Physiology Concept Posters” to stimulate active learning in students. This idea is novel in sense that posters are hand drawn utilizing analogies for different physiological conceptual facts. Poster has advantage of profound impact on the quality of student involvement, knowledge, creativity, uniqueness and originality of expression.

Physiology has long been identified to be a subject with vast syllabus & lot of concepts that are difficult for students to master [7]. Thus it is a conceptual science which demands logical and critical thinking. Many students encounter problem in linking theoretical knowledge of normal bodily function and its application with practical clinical studies [8-9]. Being the basis of pharmacology and other medicinal subjects, in depth knowledge and lucid understanding of physiological concepts are mandatory.

In 1956 Benjamin Bloom [10] and his coworkers had classified cognitive learning domain into six hierarchical patterns known as levels namely knowledge, comprehension, application, analysis, synthesis and create (figure-1). The lower levels of hierarchy are simple, but the higher levels are more complex and intellectually demanding. The cognitive domain focuses on knowledge acquisition. It comprised of recalling and recognition of specific facts and concepts which serve in the development of intellectual skills. The current study is an attempt to address higher levels in blooms taxonomy. The “concept poster making” concentrates on synthesize level in cognitive domain. The students have to prepare concept poster by framing their own analogy. They comprehend knowledge, apply, analyze, synthesize, evaluate, and create the poster.

Fig-1: Blooms taxonomy; levels of cognitive domain



Thus with objective to target higher levels of cognitive domain this study of “physiology concept poster” as a part of SDL was planned to enhance teaching pattern and to make learning an enriching experience. Literature search could not retrieve any study in Indian context that assesses this new idea of concept posters for promoting active learning in students. Aims of this study were to introduce novel idea of concept posters through SDL and to assess the student response to this methodology through a properly designed feedback questionnaire.

This session will add to critical thinking, logical reasoning and practical approach, among students to perform better in formative and summative university examination.

Material and Methods

The present study was conducted by the department of physiology during academic year 2020 to 2021. All 100 first phase MBBS students who gave consent and voluntarily participated in poster making were included in the session.

Planning of poster session: 20 groups of 5 students each were made. A power point presentation was shown to explain SDL methodology to the students. They were provided detailed information of how to draw or create concept poster. Each team had to produce one “concept poster” illustrating concept through various analogies. Groups were instructed that the posters must be hand drawn & analogies must be devised to

describe a particular physiological concept in details. They were encouraged to make use of the imagination. Students were motivated to explore the scientific literature on internet, to visit library to read different books. They were asked to choose any topic of their choice from the entire physiology syllabus covered in lectures. The topics were communicated to the faculty staff in advance to avoid duplicated topics. Even though the faculty did not decide topics for posters, but had lead and guided students to select the topic. The Instructor's role was limited to act as facilitator or guide of the activity. One week time was allotted for preparing poster. Presentation day was fixed and pre informed to all the groups and the assessor faculty (judges).

Posters development and assessment: The poster design was discussed, planned, conducted & created by the group members. On the presentation day, each group displayed the poster and presented it orally to judges. Presentation of three minutes was done on analogy, design and content of poster. The posters were judged by the faculty of physiology. At the end of oral presentation, time was allotted for questions by judges. The poster were assessed based on the; analogy used, oral presentation, content, creativity and answers to questions; each carrying 10 marks. The final evaluation of each poster was determined by the average score of the entire assessing faculty.

The feedback instrument: Self validated Close ended questionnaires was prepared to recognize the students perception regarding SDL. The questionnaire forms were distributed to the students on the same day after finishing the session. They were asked to give their response on a five-point Likert scale. The completely filled feedbacks were collected immediately. The data was collected, compiled, and analyzed.

Results

Along the lines of the proposed methodology, students were able to accomplish the task of concept posters. These posters had effectively and proficiently symbolized various type of physiological processes based on relatable unique analogies. Thus 20 posters were created addressing; general physiology, neuromuscular, blood, cardiovascular, respiratory, renal physiology and sensory nervous system.

Table I shows few posters topic with their analogies. The overall mean rating of posters based on the faculty-assessment is depicted in table II. The highest score was of content (9.6), followed by creativity (8.5), analogy (8.2).

Table-1: Few Examples of topics with analogies selected by the students for poster sessions

Topic	Analogy	System
Extrinsic and intrinsic clotting mechanism	Waterfall	Haematology
Innate and acquired immunity	Security Watchman And defense system	Haematology
Cardiac cycle	Pendulum Clock of 0.8 sec	Cardiovascular physiogy
Active transport	Underground water pump	General Physiology
Liver functions	Goods factory	Enteric system

Table-2: Overall mean rating of posters.

Parameters	Avgscore
Analogy	8.2
Oral presentation	7.7
Content	9.6
Creativity	8.5
Question session	6.5

Although 100 phase I students had participated voluntarily in concept poster making; only 87 returned the completely filled feedback Questionnaire. Student's Feedback reply to all the 17 questions was encouraging and in conformity with acceptance of this learning method. Particularly in response to question; "Helped me in depth & clearer understanding of topic"(Q.no.6) 49% strongly agreed, 45% agreed, 6 were neutral but none disagreed or strongly disagreed. Hence, majority of the study population (94%) were in favor of novel idea of SDL activity of concept poster making.

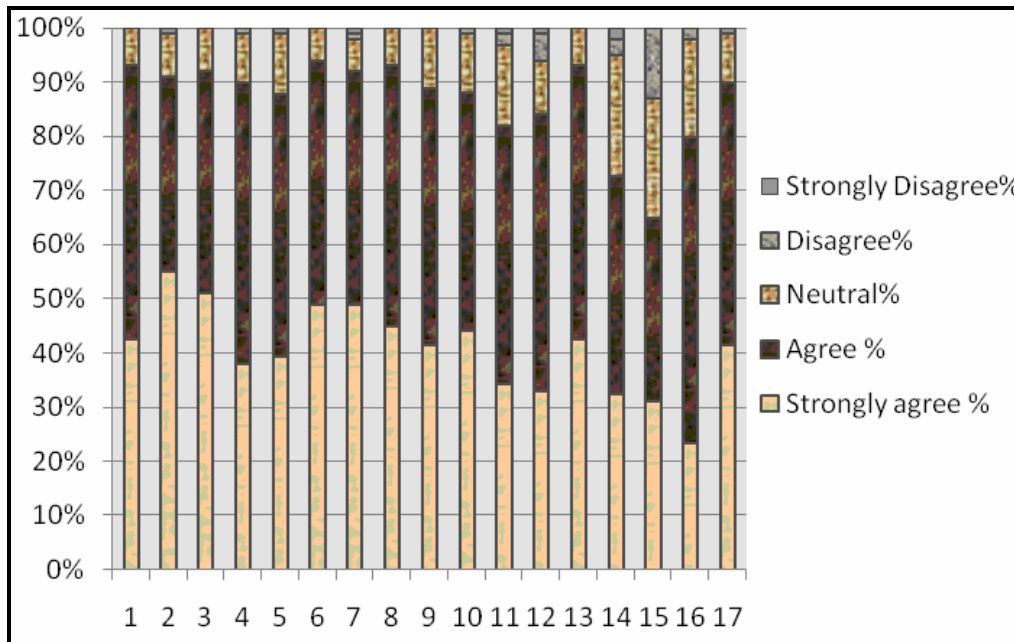
Moreover, 96% of the students strongly agreed or agreed to question no. 9 stated, “Encouraged me for active participation and interactive group discussion.” Likewise 94% agreed and strongly

agreed for teachers’ role as facilitator was helpful. The summary of questionnaire response is given in Table III and Fig-2.

Table-3: Likert scale rating of feedback questionnaire

Questions	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	Total
1. Aims and objectives of self directed learning (SDL) methodology of concept poster were explained beforehand.	43%	51%	7%	0%	0%	100%
2. The learning by this concept poster method was refreshing.	55%	36%	8%	0%	1%	100%
3. Concept poster used in teaching (SDL) was useful for developing interest in subject.	51%	41%	8%	0%	0%	100%
4. The academic content of the method was stimulating .	38%	52%	9%	1%	0%	100%
5. Had motivated me to read books , visit library , and search on internet.	39%	48%	11%	0%	1%	100%
6. Helped me in depth & more clearer understanding of topic .	49%	45%	6%	0%	0%	100%
7. Aroused curiosity about the topic and generated lot of new ideas.	49%	43%	6%	1%	1%	100%
8. Encouraged me for active participation and interactive group discussion.	45%	48%	7%	0%	0%	100%
9. Helpful in improving my learning skill.	41%	47%	11%	0%	0%	100%
10. Helpful in self judging my own learning standards.	44%	44%	11%	1%	0%	100%
11. Will be helpful to perform better in university examination.	34%	47%	15%	2%	1%	100%
12. Session was conducted in a systematic manner.	33%	51%	10%	5%	1%	100%
13. Presence of teacher as facilitator was helpful.	43%	51%	7%	0%	0%	100%
14. Many more topics shall be taught by SDL.	32%	40%	22%	3%	2%	100%
15. SDL was time consuming.	31%	34%	22%	13%	0%	100%
16. I found the method to be good for clearing doubts which i had after the traditional lecture	23%	56%	18%	2%	0%	100%
17. It gave me opportunity to understand effective team building	41%	48%	9%	0%	1%	100%

Fig-2: Students response to questionnaire



Discussion

This study outlines an innovative active learning methodology based on the use of analogical concept poster in physiology. In fact learners were capable of artistically and imaginatively creating posters with obvious representative of physiological concepts is the key outcome of study. Our results revealed that concept poster presentations were enjoyed and considered as refreshing activity by students. In addition, they perceived it as an innovative creative means of learning and were very receptive to the idea.

They accepted that the session had helped them to develop interest and deeper understanding of the topic. Students appreciated the fact that this method had aroused curiosity about the topic, offered them chance to be creative with lot of new ideas, to organize and synthesize the new ideas. They concluded that the session had not only enhanced learning skill but also provided the opportunity to rate their learning standards. Furthermore the students strongly demanded that many more such SDL sessions must be planned for teaching different topics. Moreover, poster presentations had enhanced team work skills. Students agreed that SDL session was beneficial for better performance in university examination since it had enhanced memorization and organization of information in a concise manner.

While assessing the poster it was found that students were creative in bringing about and various analogies effectively, that promoted critical thinking. However the oral presentation of poster seemed to be weaker section. The reasons may be poor hold on English language, being introvert nature, inability to interact openly for discussion and possibly unwillingness to put their efforts.

The implementation of SDL has become mandatory because CBME curriculum has already allotted SDL hours to every specialty. An essential attribute of the SDL is that it can deal with problem of the exponential growth in knowledge in medical education. Indeed the course cannot educate entire information that doctors regard as relevant and continual additions can consequently lead to “curriculum hypertrophy” a term described by Abrahamson (1978) [11].

In the present study, SDL has established to be satisfactory approach for knowledge achievement in first phase medical training. Further, other studies also revealed self-learning and self-directed curriculum to be supportive in growing knowledge concern with clinical management and enhancing quality care of patients [12-13]. Our finding is

consistent with; Sadaf et al who documented similar finding that SDL is an effective strategy for learning physiology [14]. Likewise Girkar et al used jigsaw technique and strongly recommended that it can be incorporated in delivering important topics [15].

Thus SDL has been accomplished through variety of approaches; the decision must be based on the academic necessity and topic demands. One type of SDL exercise is case based study in which case-based scenarios are provided to the students in groups. Students organize knowledge about cases by using learning resources recommended by teachers. Finally students arrange systemically learned facts and knowledge to achieve in depth understanding of the case; with the intention of responding the leading questions appropriately [16]. Various studies had provided evidence that SDL is helpful approach for learning gross anatomy and physiology in medical institute [17-18].

Posters have long been used in different disciplines, like in an undergraduate ecology course [19] & presentation of case material by social work students [20]. The advantage of posters is that they target different learning styles in students. Students with diverse learning styles work together on the same item, although in different ways for smooth progress of poster making in team. Within team each students play diverse role in accordance with individuals learning style; some may be active (doing), some may pencil in ideas that are supplied to them by those with more conceptual (thinking) and reflective (watching) learning styles. Posters can provide a deviation from print focus work, augmenting to interest in their learning [21]. Disadvantage or challenge in poster-making is; focusing on visual appearance rather than content to grab the viewer's attention. Students work hard and expend more time merely to make their poster eye catching [21].

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Thus the integrative character of the concept posters endorsed to reorganize theoretical physiological knowledge and transposed concepts to practically applied information. Furthermore it had successfully targeted the synthesis level of cognitive learning domain among student. The excellence of the finally presented poster found to be driven by the motivation of the every group member and team-work was an obvious marker of a quality end product. Besides, this active learning method brought about good learning outcomes & had addressed effectively higher order cognitive domain with different learning styles. Similarly, this innovative activity encouraged augmentation and enrichment of skills and attitudes such as intellectual thinking, creativity, team work and communication among students.

Conclusion

The design of concept poster sessions endows with several lessons regarding the usefulness & effectiveness of this approach as an active learning tool. Besides, the suggested technique has proved to be a realistic, unique, feasible, reasonable, thought-provoking, interesting yet convenient and easy method to foster & facilitate meaningful learning while simultaneously integrating multiple learning styles.

Limitation: Analogies are purposeful if they are understandable and instinctively descriptive. It is thus exceptionally tricky to build up an analogy that can portray fully the exquisite detail found in most physiological systems.

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