Original Research Article

Concept maps as teaching learning tool in ophthalmology for undergraduates

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Abstract

Background: Medical education is an everchanging field in terms of quantity of knowledge needed to be learned and how this knowledge is imparted to the students. The students sometimes cannot form concepts or apply them from the current way of teaching. Hence there is a gap which need to be filled between teaching and interpretation and concept maps can bridge the gap between teaching and effective learning. Concept maps are a strategy that focuses on creating linkages across bodies of knowledge and linking theory to practice.

Materials and Methods: Concept Maps were introduced in Phase 3 medical undergraduates in Ophthalmology discipline. Each student designed a concept map which was assessed by two assessors based on a pre-validated evaluation checklist. A pre-validated pretested feedback questionnaire was collected to know the perceptions of students as regards to the concept maps.

Results: The data obtained from feedback questionnaire revealed that Concept maps are useful learning tool and beneficial for short term as well as long term learning. Almost 92% of students said that the new teaching learning tool of Concept maps is a favorable method of learning. The students find it interesting, useful, and innovative way of learning. Few students (8%) found Concept Maps time consuming and complicated. The students find concept maps feasible and applicable to other disciplines as well.

Conclusions: Concept maps are useful, feasible and acceptable learning tool for medical undergraduates.

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1. Introduction

Medical education is an ever-evolving field in terms of quantity and quality of knowledge imparted to the students. There is always scope to introduce new teaching learning methods in new CBME based curriculum.[1] The students sometimes cannot form concepts effectively from the current way of teaching. Hence there is a gap which needs to be filled between teaching and interpretation.[2] Fostering meaningful learning among medical graduates is the key to the realization of forming an effective physician.

Learning in a meaningful way means that medical students, residents, and practicing physicians actively seek out ways to link new information and experience with what they already know, thus creating an organized knowledge base leading to the development of adaptive expertise in medical practice.[3] Concept maps are a strategy that focuses on creating linkages across bodies of knowledge and linking theory to practice.[4] It leads to meaningful and independent learning amongst other metacognitive learning techniques.[5] Through diagrammatic depiction of a variety of concepts and their specific connections with other ideas, concept maps provide a unique perspective into learning and performance that can complement other assessment methods commonly used in medical schools. Making concept maps will also give us insight into the student's cognitive framework and offers understanding of the topic.[6] Concept maps have been explored as a teaching learning tool in medical education in various other disciplines.[4] Some studies have reported concept maps as an assessment tool.[7] Aiming to transform the student into critical and reflexive learner and form meaningful concepts in discipline of Ophthalmology, the authors conducted this study using introduction of concept maps in MBBS phase -3 students in discipline of Ophthalmology.

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2.   Materials and Methods

This prospective study was conducted in the Department of Ophthalmology in our institute for a duration of one year in department of Ophthalmology. After obtaining approval from Institutional Ethics Committee and Institutional Review Board, 125 students of MBBS Phase 3 students were enrolled in this study after taking their written informed consent.

The faculty of the Ophthalmology department was sensitized regarding introduction of concept maps in MBBS Phase 3 students, by conducting one day workshop. Topics were selected and finalized after discussion amongst the faculty members. An Evaluation Checklist for assessing the quality of concept maps was developed and validated

Feedback questionnaire in the form of google form was structured and pre tested and validated by the faculty members to know about the students' perception regarding the Concept maps. It consisted of 13 questions (10 closed ended and 3 open ended) based on various aspects of their perception as regards to implementation of concept maps as learning tool in their curriculum. The closed ended questions were rated on a five-point Likert scale. A retrospective pre and post feedback form was also made to evaluate the perception of students on a liker scale of 1-5 as regards to understanding of the topic, satisfaction achieved for learning using concept maps for the topic and effectiveness in learning process and better retention of the topic

A total of 125 students of MBBS final year part 1 agreed to participate in this study by giving written informed consent. The students were sensitized regarding the Concept maps by showing them examples in the theory class. Following the sensitizing session, pre-decided topics (Refractive errors and Cornea) from the subject were taught via didactic lectures. After completion of each topic, students who consented to participate in the study, were given the assignment to design the Concept maps for the topics. The assignment was submitted using online portal Microsoft Teams. Assignments were submitted within 5 days of completion of each topic in theory classes.

Concept Maps submitted were evaluated by two assessors (A1 and A2) using Concept Map Evaluation Checklist. Each concept map was scored out of 10, based on how well-organized the concept maps were, relevant concepts are linked logically, text is clear and legible, concept map shows evidence of what was learned about the topic. Score of 9-10 was considered as excellent, 7-9 as good, 5-7 as moderate and <5 as poor understanding. Average of the scores given by each assessor was recorded.

Feedback questionnaire (google form link) was shared with the students via Microsoft Teams online portal. Data was entered in Microsoft excel and analyzed using SPSS 24 software. Thematic analysis of the Qualitative data obtained from Feedback form was done.

2.1. Observations and results

Before the commencement of the study, a written informed consent explaining the purpose and seeking voluntary participation in the study was obtained from the students who expressed willingness to participate.

A total of 125 students consented to participate in the study. Concept maps were submitted by 125 students (M=58, F=67). The concept map developed by the students were evaluated by 2 assessors (A1 and A 2) out of 10 marks, to assess their understanding and clarity on making Concept Maps. Average score given by A1 was 7.5 (Range 6.5-8.0) and A2 was 7.8 (Range 6.5-8.5) which indicated good understanding of making Concept Maps by the students. Example of a concept map made by student is shown in Fig 1.

Feedback on the implementation of the concept maps was taken from the students after submission of Concept Maps for both the topics and the results are reported as per Fig 2. A total of 125 students responded to the feedback questionnaire. A total of 25 students were exposed to concept maps as a teaching learning tool even before this study was conducted. Out of 125 students who responded, 115 (92%) of the students found this method favorable method of learning. Rest 10 (8%) students found it to be a time-consuming and complicated activity.

Results of retrospective feedback on use of Concept maps as a teaching learning tool are reported in Fig 3. Qualitative data was analyzed thematically and the results are shown in table 1.

Table 1: Thematic analysis of qualitative data

Themes	Frequency
Good method of understanding and learning the concept for a longer time.	38(30.4%)
Helps to summarize whole topic	32 (25.6%)
Made understanding and learning more interesting	45 (36.0%)
Time consuming and complicated exercise	10 (8.0%)

3.   Discussion

In this study, we demonstrate that Concept maps (CMs) are useful, feasible and acceptable learning tool for medical undergraduates. Student survey responses demonstrated acceptability of using Concept maps in Ophthalmology and other disciplines. Learning is a complex cognitive process that occurs in individuals of all ages. '*Meaningful learning*' requires an understanding of the various topics and concepts of the subject under study.88 Learning with understanding allows integration of new concepts with previously learned concepts and leads to retention of information in long-term memory in a usable manner.[9-10]

In our study, concept mapping was used as a learning tool by the medical undergraduates in Ophthalmology. Here,

the enrolled students were oriented to this mapping techniques by conducting a sensitization session. In concurrence with this, Suman Bala et al included a two-hour session of concept mapping using pre-prepared concept maps on general awareness and pharmacotherapy of HIV and AIDS.[11] Similarly, in the study by Farida Quadir et al, for test groups, two introductory sessions were held for sensitizing students to concept mapping.[12]

During the sensitizing session, participants were allowed to ask queries regarding the technique used to design concept maps. The evaluation of this session was depicted by the average scores (out of 10) given by two assessors (A1= 7.5 and A2= 7.8) during the evaluation process using Concept Map Evaluation Checklist. The scores obtained by the students is a direct indicator of how well they have understood the technique of designing the concept maps during sensitizing session. A study done by Choudhari et al emphasized the need for mandatory evaluation of such sensitization sessions, as the satisfactory training of the study participants is the prerequisite for the successful application of intervention in the future.[13]

In our study, the feedback from the participants favored the utility of the concept maps as a learning tool. Most of the students (92%) stated that these maps were a helping aid to studying, organizing, summarizing information learned and it promoted active & meaningful learning. They reinforced that they understood the topic well and long-term retention of the topic is an added advantage.

Similarly, the study by Farida Qadir et al explored the use of concept mapping as a facilitative tool to promote learning in Pharmacology and showed that the technique helped the students to conceptualize difficult topics in CNS pharmacology (86.36%).[11]

Another study done by Baliga SS et al concluded that Concept maps are found to be an effective teaching and learning tool for medical students. They can be used to enhance meaningful learning in students and can be practiced more in the students for better understandings of the concepts.[14]

Mukhopadhyay K et al did a study on medical undergraduate students in pharmacology and stated that Concept mapping encourages the students to actively participate and get a comprehensive and accurate overview of the topic, but the improvement in performance in the test was not evident.[15]

In our study, few students (8%) stated that designing concept maps was a lengthy, time-consuming, and complicated process. Harrison and Gibbons noted that students expressed negative feelings about concept maps when they did not fully understand the reason for creating the maps and when they felt that this new learning strategy was imposed upon them.[16]

Veronese et al conducted the study stating that creating CMs was occasionally described as time consuming, the time and effort used to construct CMs may have resulted in less time expended on tangential discussions.[17]

It is evident from our study that Concept Maps are favorable method of learning with few limitations that need to be addressed for effective implementation of the method in the newer curriculum.

3.1. Limitations

Due to feasibility issues, the learning style and approach of the individual student was not assessed or considered for analyzing the utility of Concept maps as a learning tool, though these factors may affect the acceptance of this mapping techniques as a learning tool.

4. Conclusions

In this study, we conclude that Concept maps are useful, feasible and acceptable learning tool for medical undergraduates. Student survey responses demonstrated acceptability of using Concept maps in Ophthalmology and other disciplines. Designing the Concept maps for selected topics enhanced their learning ability and facilitated better retention of the knowledge gained. Concept maps foster critical thinking and develop clinical reasoning.

5. Source of Funding

6. Conflict of Interest

None.

References

1. Shah N, Desai C, Jorwekar G, Badyal D, Singh T. Competency-based medical education: An overview and application in pharmacology. Indian J Pharmacol. 2016;48(1):S5-S9.
2. Dolan EL, Collins JP. We must teach more effectively: here are four ways to get started. *Mol Biol Cell*. 2015;26(12):2151-5.
3. Park G.M, Hong AJ. Not yet a doctor: medical student learning experiences and development of professional identity. *BMC Med Educ*. 2022;22;146:
4. Daley BJ, Torre DM. Concept maps in medical education: An analytical literature review. *Med Educ*. 2010;44:440–8.
5. Kinchin IM, De-Leij FA, Hay DB. The evolution of a collaborative concept mapping activity for undergraduate microbiology students. *J Further Higher Educ*. 2005;29:1–14.
6. Edwards J, Fraser K. Concept maps as reflectors of conceptual understanding. *Res Sci Educ*. 1983;13:19–26.
7. Loizou S, Nicolaou N, Pincus BA, Papageorgiou A, McCrorie P. Concept maps as a novel assessment tool in medical education. Med Ed Publish. 2022;12;12:21.
8. Knollmann-Ritschel BE, Durning SJ. Using concept maps in a modified team-based learning exercise. *Mil Med*. 2015;180(4):64-70.
9. Slieman TA, Camarata T. Case-Based Group Learning Using Concept Maps to Achieve Multiple Educational Objectives and Behavioral Outcomes. *J Med Educ Curric Dev*. 2019;6:2382120519872510.

10. Kinchin IM. Concept mapping as a learning tool in higher education: a critical analysis of recent reviews. *J Contin High Edu*. 2014;62(1):39-49.

11. Bala S, Dhasmana DC, Kalra J, Kohli S, Sharma T. Role of concept map in teaching general awareness and pharmacotherapy of HIV/AIDS among second professional medical students. *Indian J Pharmacol*. 2016;48(1):S37-40.

12. Qadir F, Zehra T, Khan I. Use of concept mapping as a facilitative tool to promote learning in pharmacology. *J Coll Physicians Surg Pak.* 2011;21(8):476-81.

13. Choudhari SG, Gaidhane AM, Desai P, Srivastava T, Mishra V, Zahiruddin SQ. Applying visual mapping techniques to promote learning in community-based medical education activities. *BMC Med Educ.* 2021(21);210.

14. Baliga SS, Walvekar PR, Mahantshetti GJ. Concept map as a teaching and learning tool for medical students. *J Educ Health Promot* 2021;10:35.

15. Mukhopadhyay K, Mukherjee S, Dhok A, Chatterjee C, Ghosh J. Use of concept map as a reinforcement tool in undergraduate curriculum: An analytical study. *J Adv Med Educ Prof.* 2019;7(3):118-22.

16. Harrison S, Gibbons C. Nursing student perceptions of concept maps: from theory to practice. *Nurs Educ Perspect*. 2013;34(6):395-9.

17. Veronese C, Richards JB, Pernar L, Sullivan AM, Schwartzstein RM. A randomized pilot study of the use of concept maps to enhance problem-based learning among first-year medical students. *Med Teach* 2013;35(9):e1478-84.