Assessment of Perception and Effectiveness of Concept Mapping in Learning Epidemiology

Urvish Joshi, Sheetal Vyas

Department of Community Medicine, AMC MET Medical College, Ahmedabad, Gujarat, India

Abstract

Background and Objectives: Current programs in medical education technology concentrate mainly upon "how-to-teach." The focus is needed on learner's memory retention too. An innovative strategy like concept mapping might be a way forward. The study was carried out to assess its effectiveness and to know students' perceptions. **Materials and Methods:** During community medicine classes, a student-group was sensitized on how to make and use concept maps out of taught contents. At the end of epidemiology exercises sessions, this group was given additional minutes to prepare concept maps, interact, and brainstorm followed by quick QA session. Others were taught same contents in conventional way. Performances of both groups were assessed in one immediate (term-ending) and one distant (preliminary) exam. Feedback was also taken from study group. **Results:** Study group consistently scored higher in both exams. Difference in scored mean marks was highly significant in term-ending-examination ($P < 0.0001$, t = 5.754, df = 121.9). Largely positive feedback was received on utility of concept maps in memorizing, confidence-boosting, and understanding subject. Felt need for innovations in conventional teaching-learning (T-L) was palpable. **Conclusion:** Time has come to start focusing on enhancing students' learning. Performance-enhancing utility of concept maps is proven and should be integrated in regular T-L.

Keywords: Concept maps, innovation in teaching-learning, medical education, teaching-learning methods

INTRODUCTION

As the medical profession continues to change, there is need for alternative teaching-learning (T-L) strategies to retain vast amounts of information, integrate critical thinking skills, and solve a range of complex problems. Research has indicated that concept maps may be one such T-L strategy.[1]

One of the main utilities of the concept mapping (CM) in medical education is the possibility of integrating various concepts which are frequently fragmented in many cognitive compartments. Concepts are not static. They represent a web evolving in cognitive structure of student and provide a solid base to be used daily.[2] This well-elaborated knowledge net prioritizes a meaningful learning experience.[3-6]

CM is the proven technique in problem-based learning. Epidemiological problems in community medicine deal with public health concepts, mathematical calculations, and "applied" interpretations.

Purpose of this study was to introduce innovative T-L method of CM in a small section of community medicine-teaching to assess changes in students' exam performances and to assess their perceptions on subject understanding, memorization, retention, and confidence with regard to CM.

MATERIALS AND METHODS

Study population and study design

*As a part of the innovative T-L method, concept maps were asked to be drawn for memorizing content. Maps would be rough or structured. Use of graphics/text/flow charts, etc., was encouraged along with interaction and brainstorming. This was followed up with a rapid question-answer round by faculty [Figure 1].

Confidentiality and anonymity of subjects were maintained throughout the process. Absent students during classes and exams were excluded from the study.

Address for correspondence: Dr. Urvish Joshi,
12/A, Nikunj Society, B/H Sardar Patel Hospital, Rambaug,
Maninagar, Ahmedabad - 380 028, Gujarat, India.
E-mail: doc.urvish@gmail.com

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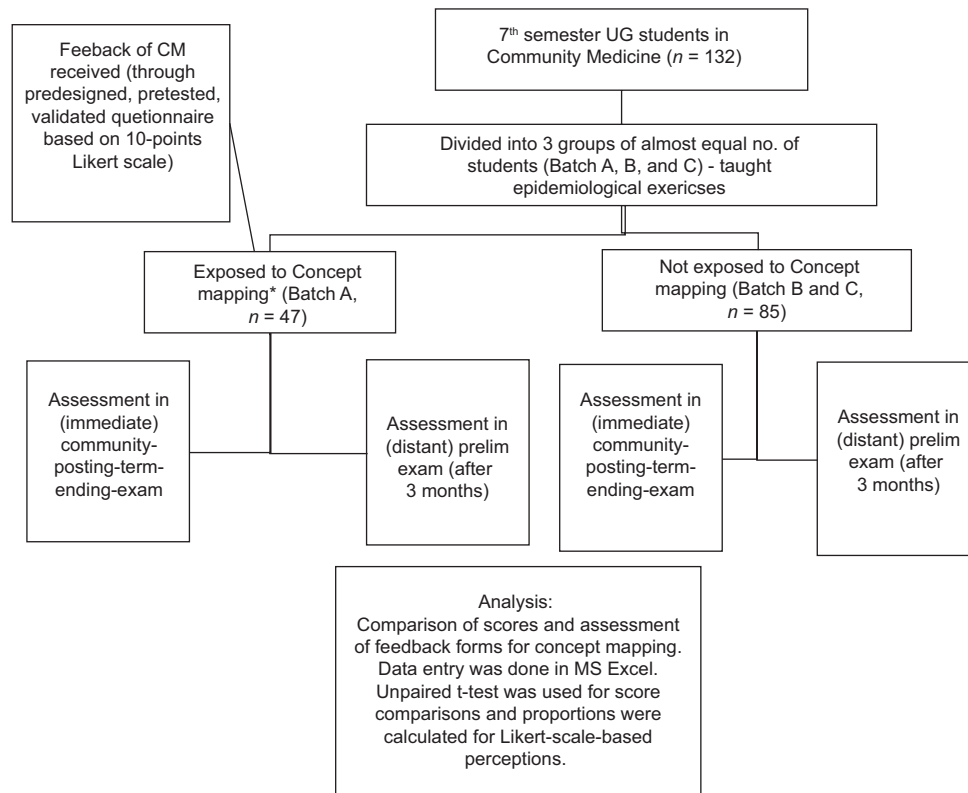
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Figure 1: Flow-chart on study design and methodology

Table 1: Analysis of students' performance in epidemiological exercises with regard to teaching-learning method in two exams

Students' performance in two exams	Teaching method	
	Conventional T-L	Conventional T-L with CM
In term-ending exam (immediate exam)		
Number of exam-taking students	83[#]	47
Mean scored marks±SD	5.3±3.2*	8.1±2.2*
P, welch-corrected t, df	$P<0.0001$, $t=5.754$ at df=121.9 (CI: 1.8-3.7)	
In preliminary exam (distant exam)		
Number of exam-taking students	77	46
Mean scored marks±SD	5.4±2.4*	5.5±2.4*
P, welch-corrected t, df	$P=0.7717$, $t=0.2909$ at df=95.28 (CI: −0.8-1)	

[#]Two students were absent, *Maximum marks=10. SD: Standard deviation, T-L: Teaching-learning, CM: Concept mapping

RESULTS

Students exposed to CM scored higher in term-ending exam compared to their conventionally taught counterparts. Mean marks scored were 8.1 ± 2.2 and 5.3 ± 3.2, respectively, (out of max. 10). Difference in performance was statistically highly significant ($P < 0.0001$, $t = 5.754$ at df = 121.9, confidence interval CI: 1.8–3.7) [Table 1].

In prelims, average performance of all the students went down for epidemiological exercises. However, mean scoring still remained higher among the students who were subjected to CM earlier. The difference in scored marks in prelims was not statistically significant. ($P < 0.77$, $t = 0.2909$ at df = 95.28, CI: 0.7564–1.016) [Table 1].

Feedback suggested that there was a strong felt need among students (95.7% respondents, Likert scale ≥7) for bringing in innovations in the conventional T-L methods. Majority of students also suggested that CM should be extended to other subject contents, in both theory and practical, not being limited to only epidemiology classes of community postings. Nearly 76.6% students found a definite difference in the newer method over the conventional one [Table 2].

It was strongly perceived by the students that the newer method was highly useful in memorizing (mean Likert score 8.9 ± 1.2) and retaining (8.5 ± 1.8) subject contents, in boosting their confidence for the subject (8.8 ± 1.4) and in performing better in exams (8.5 ± 1.9) [Table 2].

Table 2: Students' feedback on concept mapping

Likert score	Perceptions	
	Perceived difference over traditional method (n=47), n (%)	Felt need to apply CM in other content (n=47), n (%)
0-3	1 (2.1)	1 (2.1)
4-6	5 (10.6)	1 (2.1)
7-10	36 (76.6)	42 (89.4)
Did not answer	5 (10.6)	3 (6.4)
Mean score±SD	8.3±1.6	8.5±1.7

SD: Standard deviation, CM: Concept mapping

DISCUSSION

Medical education has always been treated as a side-job apart from being a doctor. Conversely, teaching itself is a profession requiring highest degree of dedication and innovation.

In India, while every other academic field demands mandatory pre-placement eligibility examinations and/or trainings on 'how to teach', it remains widely neglected in medical education. Very little emphasis is placed on innovation and on how to help the students learn.

Surapaneni and Tekian in their study reported the challenges pertaining to undergraduate medical education because of overly used didactic lectures and examination patterns.[7] Need for alternative T-L strategies to enable medical students retain, integrate, and reproduce vast amounts of medical information was widely acknowledged by Daley and Torre and by various other authors already. Previous research has indicated that CM may be one such simple T-L strategy.[1]

In the current study, students exposed to newer method of CM clearly performed better than their conventionally taught counterparts. However, this difference was remarkable in immediate exams and not so significant in the distant exams, i.e., prelims. However, even in prelims, their average performance was higher. The difference in performance in exams was remarkable even when students were exposed to CM only once. More research on these lines can be carried out to ascertain consistency.

In the present study, concept maps did not replace the conventional methods; they just acted in conjunction. Students' feedback on what they want to learn and how, is seldom valued in medical education. No reluctance for CM was observed among students. Conversely, they advocated generalization of CM to other course contents. Vink et al. reported in their study that participants really enjoyed CM sessions with significantly increased motivation which corroborates with findings of the present study.[8] In another study, the role of pre-constructed concept maps was identified in the development of integrated curricula.[9]

CM helps in making logical flow of retained information for better understanding of subject. A better understanding is directly proportional to performance and confidence. In the present study too, students have found the technique to be more useful in memorizing, retaining, and subsequently scoring more in exams.

CONCLUSION

In current medical education system, an objective shift from didactic knowledge-imparting to enabling student's memory-retention is imperative. Medical educators need to be proactive in addressing the gaps in conventional T-L methods. Innovative T-L methods like concept maps can go a long way. Performance analysis of students and their feedback can be the areas to build these innovations on.

Study limitation

The present study is done in one ongoing batch of community medicine students by internally comparing the results. Studies with larger and varied samples may bring about more validity to findings. In addition, pre-intervention assessment was not carried out. Study group and control group were assessed prospectively in their exams, which may be another limitation of the study.

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Conflicts of interest

There are no conflicts of interest.

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