

Original Article

Team idea mapping method: A brainstorming session for enhancing problem-solving skills in postgraduate medical biochemistry students as assessed by self-efficacy

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ABSTRACT

Objectives: The present study was conducted to evaluate the effect of Team Idea Mapping (TIM) sessions on the problem solving skills of postgraduate (PG) students of Biochemistry, as deduced from retro-pre self-efficacy questionnaire.

Materials and Methods: The study was conducted enrolling students pursuing PG-MD course in Medical Biochemistry in a premier medical college. First TIM session was preceded by sensitization of PG students and departmental faculty. In total, four TIM sessions were conducted. Retro-pre self efficacy questionnaire was administered 3 months after the last session. Feedback from the students was collected immediately after last session and satisfaction index was also calculated.

Results: The satisfaction index was highest (100) for items stating that TIM sessions promoted interactivity and participatory behavior and lowest (78) for item stating that TIM sessions promoted reflective behavior respectively. The students expressed enhanced self-efficacy in understanding Biochemistry concepts, clinical application of Biochemistry, problem solving skills in Biochemistry, interpreting laboratory reports, participation in group works and clarifying problems with peers and seniors. However, the sessions were not as effective in instilling technical skills like trouble shooting for analyzer breakdowns.

Conclusion: TIM is an effective tool for instilling problem solving skills in medical PG students, additionally fortifying their attitude to work in groups.

Keywords: Brainstorming, Team idea mapping, Self-efficacy, Problem-solving skills

INTRODUCTION

As aptly commented by Carvalho, not everything that is taught is learnt. It is essential to reinforce the passive learning in traditional teaching through different interventions that foster interactivity and deep learning.^[1] Classroom teaching does not involve all the students. Mostly the frontbenchers are involved albeit passively with the teacher, whereas the backbenchers are engrossed in their own reverie. This leads to decreased self-confidence of the slow learners as they are left behind and find it difficult to cope with the course material that has already been covered by the teachers. Small group teaching is a methodology for building active learning among students.^[2] Group discussion (GD) is one such avenue. However, it suffers from certain fallacies. Many a times GDs can be literally high jacked by the vocal participants. The silent members hesitate to participate with the

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fear of being rebuked on giving a wrong answer by the leader. Hence, they end up being passive disinterested spectators. The discussion is hence steered by the vocal participants and the focus often gets shifted. Studies carried out in nursing education have proven that students experience higher level of self-efficacy when they deduce that the teacher is friendly and supportive.^[3] The present educational system lacks novelty as well as creativity. Collective creativity is a concept introduced by Donna Shirley.^[4] If introduced in our educational process, it can yield valuable end results for both students as well as facilitators.

Brainstorming is a creative GD technique in a non-threatening and non-judgmental environment. Brainstorming is a group creativity technique by which efforts are made to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by its members. It was popularized by Alex Faickney Osborne as a tool for problem-solving in advertising sector in 1939. It comprises an open discussion among all team members about a given problem with equal participation by all ensuring welcome of all ideas without any criticism. The judgment is deferred till the discussion reaches a logical conclusion.^[5]

Brainstorming sessions can be conducted in different manners. Team idea mapping (TIM) method is one such variation. Team learning amalgamates theoretically-based and empirically-grounded strategies for ensuring the effectiveness of small groups. A collaborative and cooperative effort taken by different students using their individual creativity can be used to draw out a meaningful outcome.^[6] TIM is a variation of brainstorming which works by association and collective creativity. It augments associative learning among the participants. This method encourages all the participants to pool in their ideas ensuring active participation by all in a friendly learning environment. Idea Mapping is a powerful tool that enhances memory, note-taking skills, thought organization, planning, and communication.^[7]

A student's perceived self-efficacy has a significant influence on his academic performance as well as self-motivation. Strong belief in self-efficacy leads to a sense of self-accomplishment. This leads to a positive outlook and decreased stress fostering intrinsic interest and deep engrossment in activities ensuring success.^[8] There is a relative dearth of data on the effect of TIM on the self confidence, communication skills, and problem-solving skills of the post-graduate students in the long run. In this present work, we have attempted to evaluate the same subsequent to sessions of TIM with the students.

The objectives of our study were:

1. To introduce TIM to enhance problem-solving skills of postgraduate (PG) students in Biochemistry
2. To assess the problem-solving skills by self-efficacy scores of students

3. To obtain the perceptions of students about TIM.

MATERIALS AND METHODS

The study was conducted in the department of biochemistry, of a premier medical college of North India with prior approval from the research committee of the institution.

Research questions that were formulated before initiation of the study

1. Whether TIM method of brainstorming is an effective tool for instilling problem-solving skills among medical biochemistry post-graduate students?
2. Whether TIM method is effective for fostering team spirit among the participants?
3. Whether this technique is perceived as an effective teaching/learning tool by the participants?

Sensitization

Sensitization workshop cum training on conduct of TIM for the two faculty members as well as two residents of the department was conducted. The faculty was involved in the selection of the problems on which TIM sessions were planned. The participants were explained about the methodology and were enrolled after their informed written consent. The total number of participants was ten post-graduate students of MD (Biochemistry).

Execution

TIM sessions

Four sessions each on thalassemia, alcoholic liver disease, inborn error of carbohydrate metabolism, and interpretation of external quality control data were conducted using the TIM method of brainstorming as described previously. Each session involved 3-day activity. The 1st day involved conduction of TIM session on a given problem. The team idea developed consequent to previous day deliberations was presented by the facilitator on day 2. Clinical problem-solving exercise comprising of 4-5 questions was administered on the third concluding day of each session.

Satisfaction index

Feedback on the teaching-learning strategy was collected from the participants through a validated, self-administered questionnaire at the end of the last session on five-point likert scale of strongly disagree = 1, disagree = 2, neither agree nor disagree = 3, agree = 4, strongly agree = 5, and satisfaction index was calculated for each item using the following formula:

$$\frac{[(n_1 \times 1) + (n_2 \times 2) + (n_3 \times 3) + (n_4 \times 4) + (n_5 \times 5)] \times 20}{(n_1 + n_2 + n_3 + n_4 + n_5)}$$

Where n is the total number of participants with score on likert scale for that item as mentioned in the subscript for that particular item; meaning if out of 10 students, three students have marked 3, three students have marked 4 and four students have marked 5 as their choice on likert scale for a particular item then n_3 will be equal to 3, n_4 will be equal to 3 and n_5 will be equal to 4 for that particular item.

Self-efficacy questionnaire

After a gap of 3 months subsequent to the completion of the 4 mandatory sessions, a self efficacy questionnaire was administered to the students, which was pre-validated with external help. The questionnaire comprised of questions that were meant to assess the fortitude of the students in the different aspects of academic excellence and personality enhancement. The self-efficacy was evaluated on seven-point likert scale where 1=Poor, 2=Below Average, 3=Average, 4=Satisfactory, 5=Good, 6=Very good, 7=Excellent scores on perceived efficacy, before and after conduct of the session. For comparison purposes, median values were used.

The process

The process began with a well-defined topic. Each participant was encouraged to create an individual brainstorm around the topic. All the ideas were then merged into one large idea map. During this phase, the ideas were inter-connected to develop a holistic picture through association.

RESULTS

The response of the participants for each item and the satisfaction index has been depicted in Table 1.

As is evident from Table 1, satisfaction index was highest (100) for items stating that TIM sessions promoted interactivity and participatory behavior. The satisfaction index was lowest (78) for item stating that TIM sessions promoted reflective behavior.

The response of the participants to the self-efficacy questionnaire is depicted in Table 2. The students expressed better comprehension of biochemistry concepts along with their clinical applications. Problem-solving skills improved dramatically after TIM sessions as exemplified by the improved scores in the questionnaire. The participants also revealed ease of communicating with peers as well as seniors for various official chores. The scores showed considerable improvement among the final year residents as compared to 1st and 2nd year residents, respectively.

DISCUSSION

TIM promotes interactivity and participatory behavior as evident from the satisfaction index. This can be perceived

Table 1: Satisfaction index calculated from the feedback of participants about the sessions on 5-point likert scale

Question	1	2	3	4	5	SI
TIM sessions were successful in achieving their stated objectives	-	-	-	2	8	96
Time organization and management of the TIM sessions was adequate	-	-	1	2	7	92
TIM sessions promoted participation by all	-	-	-	1	9	98
TIM sessions promoted interactivity	-	-	-	-	10	100
TIM sessions stimulated critical thinking for problem solving skills	-	1	1	2	6	86
TIM sessions motivated for self learning	-	-	2	1	7	90
TIM sessions promoted reflective behavior	1	1	1	2	5	78
TIM sessions promoted working in team	-	-	-	1	9	98
TIM sessions promoted participatory behavior	-	-	-	-	10	100
TIM sessions should be held for regular postgraduate training	-	-	1	1	8	94

TIM: Team idea mapping, 1=Strongly disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree, 5=Strongly disagree

from the high satisfaction index of questions dealing with the amenability of TIM sessions for group interactions and team spirit. This is essential for collaborative learning and team building. The score was not so high for questions pertaining to the role of TIM in advancing reflective behavior. This implies that brainstorming- TIM method approach is so conducive for promoting self-observation and self-learning and experiential learning among participants.

Higher self-confidence is synergistic with heightened clinical reasoning and decision making.^[9] Our study also echoes the same finding. We observed an improvement in the academic performance of the participants as expressed by them in the self-efficacy questionnaire. The academic merit of brainstorming is corroborated by the affirmative response in reply to questions regarding increased confidence in appearing for written and oral examinations.

When the students join residency, barring a few, most of them are shy and desist from GDs due to lack of confidence and inhibitions in opening up in a group. However, we observed that brainstorming was able to bring about a profound change in their outlook. There was a significant increase in confidence in participation in extempore activities such as GDs and research work presentation. This may indicate that the brainstorming sessions might have helped the students to overcome their inhibitions and anxiety while interacting with others. The same may also be responsible for enhanced interaction with the clinicians while communicating critical values. It was observed that the confidence of 3rd year

Table 2: Median values on seven point likert scale before and after conduct of TIM sessions on retro-pre self-efficacy questionnaire administered 3 months after the last session.

S. No.	Questions	Median of response of self-efficacy questionnaire	
		Before attending TIM sessions	After attending TIM sessions
1.	Understanding biochemistry concepts	5	6
2.	Understanding clinical application of biochemistry	4	6
3.	Interpreting laboratory reports	5	6
4.	Communicating the reports to the seniors	4	6
5.	Diagnostic problem-solving skills	4	6
6.	Clinical problem-solving skills	3	5
7.	Troubleshooting for analyzer breakdowns with minimal assistance from engineers	3	3
8.	Initiating corrective action in case of abnormal quality control reports	3	4
9.	Interpretation and root cause analysis of outliers in external quality control results	3	3
10.	Day to day administration in lab	5	6
11.	Clarifying difficulties with peers and seniors	5	7
12.	Participating in group discussions	4	6
13.	Confidence to prepare for final examination	5	6

residents was highest when we considered fortitude involving academic activities such as appearing in written and oral examinations, clinical case solving, and interpretation of laboratory reports. This may be attributed to the exposure of the 3rd year residents to the finer details of the subjects as compared to the 1st and 2nd years. The collaborative learning during brainstorming sessions may have contributed to the residents' comfort level in approaching peers and seniors for clarification of doubts. AlMutairi conducted a study on students in a Kuwait School and concluded that brainstorming increases critical thinking skills.^[10]

In the present article, we have tried to evaluate the long-term effect of brainstorming sessions in bolstering student confidence in academic as well as managerial, and interpersonal communication skills. Socio-constructivist theories have stressed upon the necessity of interactive teaching for enhancing student motivation.^[11] The findings of our study also highlight that interactive learning in a non-censorious congenial environment adds to the self-confidence of the student, leads to multifaceted and holistic personality development, and promotes desirable attitude towards education.

CONCLUSION

Effective education is gauged by a permanent imprint on a student's psyche leading to a constructive change in all the three domains of learning: Cognitive, psychomotor, and cognitive. We may conclude from the findings of our study that brainstorming- TIM technique is an effective interactive learning tool for understanding biochemistry as well as impart confidence to the students in a holistic manner. It fosters the problem-solving competency by imparting creative problem-solving skills.

Recommendation

We recommend the inclusion of TIM as a teaching learning tool among post-graduate students in addition to the traditional means of PG training.

Limitations

The number of post-graduate students was less in the department as compared to clinical specialities.

Due to the paucity of time, only a few sessions could be conducted.

The long-term attitudinal transformation of the students could not be determined.

Contributorship statement

- Conceptualisation: BCK, RM
- Planning and execution: BG, AJ
- Manuscript preparation: BG
- Guarantor: BG.

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Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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