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Original Research Article

Carousel Brainstorming – An Innovative Small Group Teaching Method to Augment Anatomical Knowledge of MBBS Students

S. Priyadharshini [1], N.B.S Parimala [2], V. Nagaguhan [*3], Kanaka Sreenivasulu [4], Sanjay Joseph Fernandes [5].

[1] Professor & Head, Department of Anatomy, Alluri sitaramaraju academy of medical sciences, Malakkapuram, Eluru,west Godavari, Andhra Pradesh, India.

[2] Professor & Head, Department of Anatomy, NRI medical college, Mangalagiri, Andhra Pradesh, India.

[*3] Associate Professor, Department of Biochemistry, AIIMS Mangalagiri, Guntur, Andhra Pradesh, India.

[4] Professor, Department of anatomy, Alluri sitaramaraju academy of medical sciences, Malakkapuram, Eluru,west Godavari, Andhra Pradesh, India.

[5] Professor, Department of Anatomy, Alluri sitaramaraju academy of medical sciences, Malakkapuram, Eluru, West Godavari, Andhra Pradesh, India.

ABSTRACT

Introduction: This study investigated the impact of Carousel Brainstorming, a collaborative and interactive teaching method, on student learning in anatomy education. Emphasizing active participation and knowledge exchange, Carousel Brainstorming aims to enhance critical thinking, teamwork, and the comprehension of complex medical concepts. The research addresses the need for objective measures in real-world settings and explores the effectiveness of Carousel Brainstorming compared to traditional Tutorials.

Methodology: Phase-1 MBBS students (n=100) in the academic year 2023-2024 participated in the study through simple randomization. The research spanned four months, and after a didactic lecture on Mammary Gland, students were divided into two groups: Group A (Tutorials) and Group B (Carousel Brainstorming). The latter engaged in a structured session involving pretests, subgroups, and rotating discussions. Post-tests were administered, and a questionnaire assessed students' perceptions.

Results: Statistical analysis revealed significant differences in pre-test, post-test, and difference scores between Carousel Brainstorming and Tutorials groups ($p < 0.001$). Carousel Brainstorming exhibited higher post-test mean scores (7.6) compared to Tutorials (5.0). Students strongly agreed (56.8%) that Carousel Brainstorming was effective.

Conclusion: Carousel Brainstorming emerges as a well-received and beneficial teaching method in anatomy education. Its collaborative and interactive nature positively influences knowledge acquisition and retention, fostering active learning. Future research may explore long-term impacts and diverse applications of Carousel Brainstorming in educational settings, offering a promising avenue for innovative pedagogy.

KEYWORDS: Carousel Brainstorming, Anatomy education, Teaching-learning methods, Student perception, Learning gains.

Corresponding Author: Dr. V. Nagaguhan, Associate Professor, Department of Biochemistry, AIIMS Mangalagiri, Guntur, Andhra Pradesh, India. **E-Mail:** guhan.nagu@gmail.com

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INTRODUCTION

Carousel brainstorming promotes active participation and engagement among learners. This hands-on approach encourages them to think critically, collaborate with peers, and express their thoughts and opinions. They can share their knowledge, perspectives, and experiences related to the topic at each station. This collaborative environment fosters teamwork, effective communication, and the exchange of diverse ideas. As they move around, students were exposed to multiple ideas and perspectives which enhances critical thinking skills, broadens their understanding of complex medical concepts, and encourages them to consider alternative viewpoints [1].

By actively participating in discussions, learners are more likely to remember and understand the content [2] so that the learning gain among students following Carousel Brainstorming were measured and also students' perceptions towards the Carousel Brainstorming strategy as a teaching-learning method also assessed. So the primary goal of this research was to explore the impact of Carousel Brainstorming on student learning in anatomy education.

METHODOLOGY

The study targeted Phase-1 MBBS students enrolled in the academic year 2023-2024. Participants were selected through a simple randomization process, with a total of 100 first-year MBBS students included in the study. The research was carried out over a period of 4 months, spanning from September 2023 to December 2023, following Institutional Research & Ethics Committee approval. Phase-1 MBBS students who were willing to give consent were included, while students who were absent for the session were excluded.

Study Procedure: After a didactic lecture on Topic 1 (Mammary Gland), a cohort of 100 students from the 2023-24 batch was evenly divided into two groups, designated as Group A and Group B. Each group, consisting of 50 students, was overseen by a faculty member from the Anatomy department who had been previously briefed and prepared regarding the methodology and execution plan. Group A engaged in conventional tutorial sessions, while Group B participated in brainstorming exercises. (Fig 1)

The brainstorming session for Group B was structured as follows: Before the commencement of the session, a pretest comprising multiple-choice questions (MCQs) related to Topic 1 (Mammary Gland) was administered. Following this, students were divided into 5 subgroups, each comprising 10 students. The chosen topic for the session was divided into 5 equal segments or sub-topics, which were then allocated to the respective subgroups. During a 10-minute interval, each subgroup collectively deliberated and brainstormed ideas regarding their designated sub-topic. They subsequently documented the key points and relevant facts pertaining to their sub-topic on provided charts, leaving behind their ideas for the next group to see. After the allotted time, the sub-topics and corresponding charts were moved to the next group in a clockwise direction. When the chart arrived at the new group, they reviewed the ideas left by the previous group, sparking new ideas or allowing them to build upon existing ones. This rotation mechanism ensured that every group had an opportunity to brainstorm and contribute additional insights to each sub-topic. This process continued for a total duration of 50 minutes, allowing for 10 minutes of brainstorming for each sub-topic by each group. Towards the conclusion of the session, the moderator facilitated a comprehensive discussion by summarizing the findings from each chart [3,4].

This exchange provided an opportunity for cross-group learning, enabling participants to learn from one another's perspectives and insights. To gauge the effectiveness of the session, a post-test was administered, and the results were compared with the pre-test scores. The same procedure was carried out with a lecture on Topic 2 (Radial nerve), with Group A using the carousel brainstorming strategy and Group B with tutorials. Furthermore, the students' perception of the Carousel brainstorming approach was

evaluated through a pre-validated questionnaire designed to capture their perspectives and experiences.

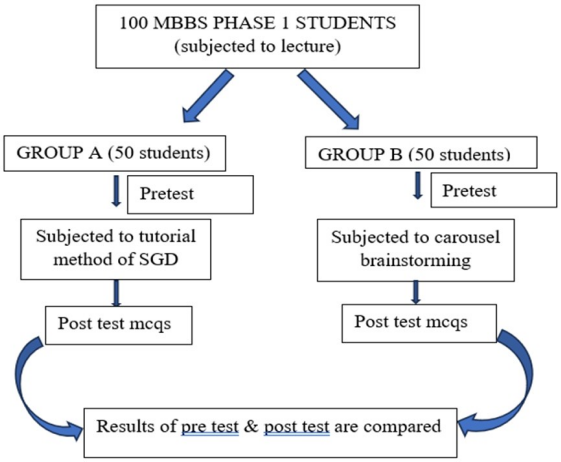


Fig. 1: Showing the Study Procedure.

RESULTS

Pre-Test Scores: The mean pre-test scores for the Carousel Brainstorming group (3.6) and the Tutorials group (3.4) were relatively close, with standard deviations of 1.25 and 1.19, respectively. This suggests that, initially, there was no significant difference in the baseline knowledge between the two groups. The similarity in pre-test scores indicates that any observed differences in post-test or difference scores are less likely to be attributed to initial disparities in knowledge levels (Table 1)

Table 1: Comparison of pre-test marks between Carousel Brainstorming and Tutorials groups:

Pre test	Mean	Std Deviation
Carousel Brainstorming	3.6	1.25
Tutorials	3.4	1.19

Post-Test Scores: The post-test results demonstrate a notable disparity in the mean scores between the two groups. The Carousel Brainstorming group exhibited a substantial increase in mean scores (7.6) compared to the Tutorials group (5.0). The lower standard deviation in the Carousel Brainstorming group (0.98) compared to the Tutorials group (1.37) implies greater consistency in learning outcomes within the former. This significant difference in post-test scores ($p < 0.001$) indicates that the Carousel Brainstorming method was more effective in enhancing the participants' understanding compared to the traditional Tutorials approach.(Table 2)

Table 2: Comparison of post-test marks between Carousel Brainstorming and Tutorials groups:

Post test	Mean	Std Deviation
Carousel Brainstorming	7.6	0.98
Tutorials	5	1.37

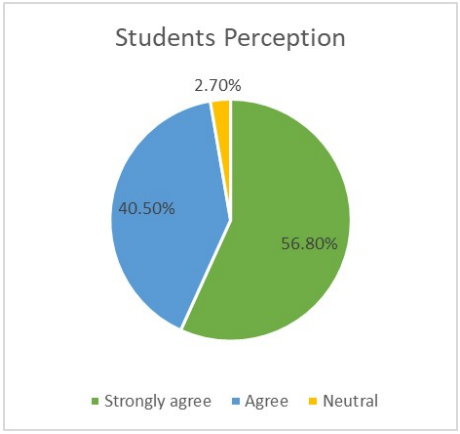
P value < 0.001

Difference Scores (Post-Test minus Pre-Test): Analyzing the difference scores, which represent the improvement from pre to post-test, further supports the effectiveness of Carousel Brainstorming. The mean difference score for the Carousel Brainstorming group (4.02) significantly exceeded that of the Tutorials group (1.55). Additionally, the standard deviation for the Carousel Brainstorming group (1.36) was lower than that of the Tutorials group (1.79). This suggests that Carousel Brainstorming not only led to a greater average improvement but also resulted in more consistent learning gains among participants. (Table 3)

Table 3: Comparison of difference in pre and post-test marks between groups:

Post test	Mean	Std Deviation
Carousel Brainstorming	4.02	1.36
Tutorials	1.55	1.79

P value < 0.001



Graph 1: Overall effectiveness of Carousel Brain storming – Student's perception:

DISCUSSION

The statistical results obtained from the pre-test, post-test, and the difference between pre and post-test scores for the Carousel Brainstorming and Tutorials groups reveal interesting patterns and insights into the impact of these teaching methods.

In a study, by Paulus, groups of four individuals engaged in a collaborative idea generation process. Participants were instructed to write down their ideas on slips of paper and pass them to the person seated on their right. The directive was for participants to read the ideas shared by others, contribute their own thoughts, and then pass the slips along. Upon completion of the cycle, the ideas returned to the original contributor and were placed at the center of the table. This method offers several advantages, allowing participants to freely generate ideas, observe others' contributions during pauses, and ensuring that all generated ideas are read by every participant, thereby enhancing the potential for cognitive stimulation [5].

Cognitive perspective suggests that group brainstorming could be an effective technique for generating creative ideas. Computer simulations of an associative memory model of idea generation in groups suggest that groups have the potential to generate ideas that individuals brainstorming alone are less likely to generate. Exchanging ideas by means of writing or computers, alternating solitary and group brainstorming, and using heterogeneous groups appear to be useful approaches for enhancing group brain storming [6].

A Study by Bradshaw, examined the effects of shyness on individual and group productivity and on participants' perception of their personal and group's performance within both interacting and nominal brainstorming groups. participants operated individually with the understanding that their personal ideas would later be amalgamated with those of fellow group members. Subsequently, groups were presented with a problem, and participants collectively engaged in brainstorming to arrive at a solution. The findings revealed that individuals with shy tendencies, irrespective of whether they collaborated in an interactive or nominal group, produced notably fewer ideas. Furthermore, they expressed lower levels of satisfaction with both their individual performance and the group's overall performance. Additionally, shy individuals reported experiencing more evaluation apprehension compared to their non-shy counterparts [7].

It is evident that various factors contribute to enhancing innovation within teams. Achieving high levels of innovation in teams seems plausible when the right individuals, coupled with appropriate supporting, motivational, and task-oriented contexts, as well as effective social and cognitive processes, are in place. While this outcome might seem self-evident, reaching excellence in teams is not a guaranteed result, given the added complexity that teamwork introduces. Effective coordination, efficient sharing and integration of relevant knowledge, selection of optimal ideas, and successful implementation all pose challenges that may require substantial training and experience for teams to master creative collaboration. There is a pressing need for studies that offer objective measures of processes and outcomes in real-world settings, including suitable comparison groups. Laboratory studies focusing on creativity within short-term groups suggest that, under less-than-optimal conditions for group idea exchange, groups often fall short and may only outperform non-interactive baselines when specific conditions are met. Nevertheless, the ability of laboratory studies to identify synergy in impromptu groups during short-term settings implies that teams composed of members well-suited for collaborative work, possessing prior teamwork experience, and offering diverse perspectives for problem-solving, should also achieve synergistic outcomes given the right conditions [8].

The results indicate a statistically significant difference in post-test marks and the overall effectiveness of Carousel Brainstorming. The interactive nature of Carousel Brainstorming led to improved learning outcomes, as evidenced by the higher post-test scores. Student perceptions further supported the effectiveness of this method, with a majority strongly agreeing that Carousel Brainstorming was beneficial to their learning.

CONCLUSION

Carousel Brainstorming, as a teaching-learning method in anatomy education, was well-received by students and demonstrated

clear benefits in terms of improved post-test performance. The collaborative and interactive nature of this approach fosters active learning and effective knowledge exchange. Future research could explore the long-term impact and potential applications of Carousel Brainstorming in various educational settings.

Implications and Considerations:

The findings from this study suggest that Carousel Brainstorming may be a more effective instructional method for enhancing the understanding of the subject matter compared to traditional Tutorials. The collaborative and interactive nature of Carousel Brainstorming appears to have positively impacted knowledge acquisition and retention.

However, it's essential to consider the context, participant characteristics, and the specific learning objectives when interpreting these results. Further research, including qualitative assessments and long-term follow-ups, could provide a more comprehensive understanding of the educational benefits associated with each teaching method.

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ORCiD

S. Priyadharshini: 0009-0003-8314-8341
V. Nagaguhan: 0000-0001-7091-1967

Author Contributions

S. Priyadharshini: Conceptualization, Methodology,
N.B.S Parimala: Data Collection.
V. Nagaguhan: Data Analysis.
Kanaka Sreenivasulu: Writing-Drafting the manuscript.
Sanjay Joseph Fernandes: Reviewing and Editing.

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