



Original Research Article

A Study On Efficacy And Perception Of Mind Map As Learning Tool In Information Retrieval.

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| Name of Author: | Abstract: <i>Background:</i> Medical students face challenges revising vast pathology syllabi under time constraints, limiting retention. <i>Objectives:</i> This study evaluates Mind Map technique efficacy for enhancing short- and long-term recall in pathology, plus phase-II students' perceptions of it as a learning tool. <i>Methods and Materials:</i> Concurrent mixed-methods study at Katuri Medical College (2024-2025) evaluated Mind Map (MM) vs. Standard Text Notes (STN) in 128 phase-II MBBS pathology students. Groups underwent baseline, short-term, and 6-month retention MCQ tests (independent t-test, $p < 0.005$), plus validated Likert-scale analysis. Mind Map demonstrated superior retention. <i>Results:</i> MM showed superior scores (Quiz-1: 12.7 ± 1.96 vs 9.7 ± 2.7 , $p = 0.0001$; Quiz-2: 10.3 ± 2.4 vs 8.5 ± 3.6 , $p = 0.001$). $>76\%$ found MM engaging, concept-enhancing despite time concern. <i>Conclusion:</i> Mind Map boosts pathology recalls and student satisfaction. |
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INTRODUCTION

Medical students are confronted with the challenge of revising an extensive syllabus within a limited timeframe. (1) This pressure to cover large volumes of information in a short period may compromise the depth of understanding and retention. As a result, students must seek effective learning tool to organise their revision, helps in memory retention and recall during this critical period. (2)

While various study techniques have been developed to support learning, their effectiveness has often been constrained to specific types of information. Many of these techniques have demonstrated the ability to boost memory performance in the context of immediate recall, the challenge of achieving sustained, longer-term

improvements in memory retention persists. This limitation highlights the need for more comprehensive learning tools that can aid both immediate and long-term recall, especially in subject like pathology, that require the assimilation of large volumes of detailed information. (3&4)

Among the various strategies available to students, the 'Mind Map technique' stands out as an effective approach for learning and revising complex subjects developed by Tony Buzan. (5) Mind Map consists of creating a central image to represent the main topic, from which key themes radiate outward. These branches are composed of essential images and keywords, which together form a connected nodal structure. Unlike traditional, sentence-based

notetaking, Mind Map encourages learners to represent information through visual diagrams, fostering a more engaging and interconnected method of organising knowledge (Figure:1). This visual representation enables students to condense vast amounts of information onto a single page. (6) As a result, learners can review and refresh their understanding of key concepts quickly and efficiently. By transforming complex texts into simpler, more accessible diagrams, Mind Map promotes self-directed learning and is gaining increasing attention in educational contexts for its ability to streamline the revision process. Evidence suggests that Mind Map supports improved memory and recall of facts, confirming its value as a tool for effective learning. (7&8)

Furthermore, the impact of retained Mind Map abilities on long-term learning outcomes in medical students is yet to be firmly established.

This study aims to assess the efficacy of the Mind Map technique as a learning tool for improving retention and recall in the pathology subject among medical students. Additionally, it seeks to explore the perceptions of phase-II medical students regarding Mind Map as a learning tool.

MATERIALS AND METHODS

Study Design and Setting

Prior to the commencement of the study, clearance was obtained from the institutional review committee. The research adopted a concurrent mixed method design, utilising convenient sampling. The study was carried out during the 2023-2024 academic year and focused on phase-II M.B.B.S students at Katuri Medical College and Hospital. The sample comprised second-year medical students enrolled in the pathology subject, with participation being voluntary.

RESULTS

A total of 128 students (N=128) were included in the study. All the students were 2nd year students who is studying pathology with no prior exposure to Mind Map. All students were grouped into two groups based on baseline test scores. The STN group consist of 64 students and MM group consist of 64 students. It was found that in the baseline test, the mean score of MM's is 7.7, which is slightly lesser than the mean score of STN group 8.4, but the difference is not statistically significant ($p=0.176$) as found in table-1.

Immediately after completion of the topics i.e. Day-0 Post-test(quiz-1) was conducted. The mean score of the post-test (quiz-1) among in the MM group was 12.7 (SD= ± 1.96) and among in the STN group was 9.7 (SD= ± 2.7). The difference is statistically significant ($p=0.0001$). After, six months of first intervention second post-test (quiz-2) was conducted. The mean score of the post-test (quiz-2) among in the MM group was 10.3 (SD= ± 2.4) and among in the STN group was 8.5 (SD= ± 3.6). The difference is statistically significant ($p=0.001$) as found in the table-2.

There is slight decrease in the mean scores of second post-test (quiz-2) in both MM and STN groups, when it compared with first post-test(quiz-1) mean score. However, the difference between means of the post-test-1 and 2 in MM scores revealed significant difference when compared to means of the post-test-1 and 2 SNT group shown in Figure-2.

Student perceptions regarding the use of Mind Map were systematically assessed through quantitative measures, specifically employing a Likert scale as documented in table 3. For the purpose of statistical analysis, responses were grouped into three categories: disagree, neutral, or strongly agree.

Study Participants and Sampling

A total of 128 students were included in the study. These participants were divided into two groups: Group A (Mind Map group-MM group) and Group B (Standard Text Notes-STN group), with 64 students in each group. Group allocation was based on previous internal assessment test scores. The selection of participants was done using convenient sampling.

Data Collection Tool and Technique

To assess prior knowledge on the chosen topics, a baseline test was administered to both groups. Following this, all students attended lecture classes and were instructed to study the topics using Standard Text Notes (STN). Group A received an additional 20-minute session on how to apply the Mind Map technique (MM). After completion of three topics, both groups underwent the first post-retention test. Six months later, they participated in the second post-retention test. Short-term retention was measured using a set of multiple-choice questions (MCQs) immediately after the completion of the topics, while long-term retention was assessed with the same set of MCQs after six months.

Perceptions regarding Mind Map were collected through Likert scale-based questions. All questions were validated by subject experts.

Statistical Analysis

The mean and standard deviation of both short-term and long-term post-retention test scores were calculated. An independent t-test was used to determine statistical significance, with a p-value threshold set at less than 0.005%.

Perceptions of Mind Map, as measured by the Likert scale, were analysed using frequency and percentage.

A significant majority—more than 76% of the students—agreed that Mind Map contributed to a better understanding of concepts, facilitated easier retrieval of information, and was considered both effective and engaging as a learning method. Most students described Mind Map as a joyful and interactive experience, emphasizing its adaptability and its positive influence on reasoning skills and critical thinking abilities.

Despite the overall enthusiasm, approximately 60% of students indicated that they found Mind Map to be time-consuming. Nonetheless, the general response to Mind Map was overwhelmingly positive. Notably, 75% of students stated that Mind Map simplifies exam preparation, further highlighting its perceived value in academic settings.

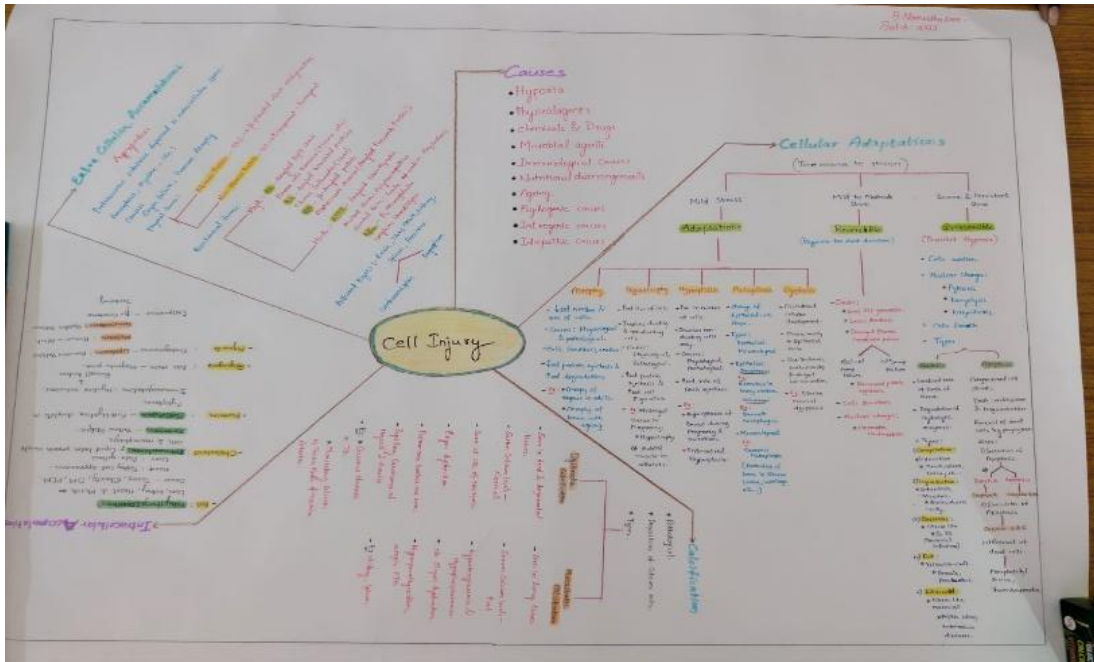


Figure: 1 Example of student Mind Map

Table:1 Analysis of characteristics of Mind Map study group and Self-selected study group

| Characteristics | Mind Map (MM) study group | Standard Text Notes (STN) study group |
|------------------------------|---------------------------|---------------------------------------|
| 1. Number | 64 | 64 |
| 2. Base -line test Mean ± SD | 7.7±2.3 | 8.4±3.3 |
| P- value | 0.176 | |

Table:2 Analysis of post-retention test scores between two groups

| TEST | Mind Map (MM) study group | Standard Text Notes (STN) study group | Un-paired “t” test and p-value |
|---|---------------------------|---------------------------------------|--------------------------------|
| 1. Post retention test-1 (n=) (Mean±SD) | 12.7±1.96 | 9.7±2.7 | 0.0001 |
| 2. Post retention test-2 (n=) | 10.3±2.44 | 8.5±3.6 | 0.001 |
| 3. (Mean±SD) | | | |

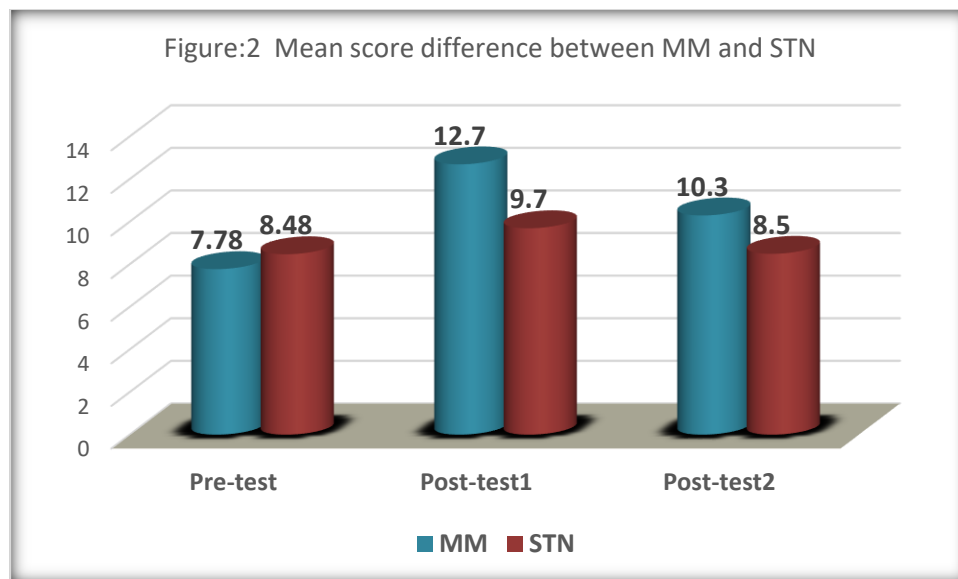


Table:3 Analysis of perception of students regarding Mind Map

| Question | Disagree(%) | Neutral (%) | Strongly Agree (%) |
|--|-------------|-------------|--------------------|
| Effective in summarizing the information | 8 | 7 | 85 |
| Helps in better understanding of the subject | 18 | 6 | 76 |
| Facilitated easier recall | 9 | 13 | 78 |
| Preparation process is time-consuming | 33 | 7 | 60 |
| Spark interest in the subject | 12 | 9 | 79 |
| Simplified the exam preparation | 14 | 11 | 75 |
| It can be applied to other topics of pathology | 14 | 12 | 74 |

DISCUSSION

An analysis of the collected data reveals that employing the Mind Map technique as a learning strategy can substantially enhance memory retention for written information. An initial comparison of the mean knowledge scores between the two groups at baseline revealed no significant difference. This finding indicates that both groups possessed a similar level of understanding regarding the selected topic prior to the commencement of the intervention.

After the educational intervention was implemented, an improvement in average scores was recorded in the group that utilised Mind Map, as compared to the group that relied on Standard Text Notes(STN). Specifically, the mean score in the first post-test for the Mind Map (MM) group was 12.7 (SD = ±1.96), while the Standard Text Notes (STN) group achieved a mean score of 9.7 (SD = ±2.7). This outcome indicates that, immediately following the intervention, participants who adopted Mind Map techniques exhibited slightly superior retention of the subject matter in comparison to their peers who used Standard Text Notes (STN) approaches to learning.

This difference in performance was statistically significant, as indicated by the P value. Such findings

agree with the results reported by Bhat et al. (9) who similarly observed that immediate post-test scores were superior among students employing Mind Maps.

In contrast, studies conducted by D’Antoni et al. and Kalyanasundaram et al. (10&11) also noted a trend of higher mean scores in the immediate post-test for the Mind Map group; however, this increase did not reach statistical significance. The absence of a statistically significant difference in these studies was largely attributed to factors such as a relatively small sample size and the varying levels of proficiency among students in the creation of Mind Maps. These methodological differences highlight the importance of sample size and the skill level of participants when assessing the effectiveness of Mind Map as a learning tool. (12)

In order to evaluate the extent to which information was retained over time, participants underwent a follow-up assessment six months after the initial educational intervention.

The results from post-test 2 indicated a discernible difference in retention between the two groups. The Mind Map (MM) group achieved a mean score of 10.3 (SD = ±2.4), whereas the Standard Text Notes (STN)

group attained a mean score of 8.5 (SD = ±3.6). These findings demonstrate that, even six months after the intervention, participants who engaged with Mind Map techniques maintained a higher level of knowledge retention compared to those who utilised Standard Text Notes (STN). These findings indicate that students who utilised Mind Map demonstrated notable improvements in their ability to recall and organise study material. This suggests that Mind Map holds significant promise as an effective method for improving the efficacy of learning written content, supporting its use as a valuable educational tool to facilitate better understanding and long-term retention. (13)

The current findings are consistent with the observations made in earlier studies by D'Antoni et al., Kalyanasundaram et al., Farrand et al., and Wickramasinghe et al. (10,11,8 &14) These prior investigations similarly emphasised the effectiveness of Mind Map as a learning strategy, particularly in promoting prolonged retention of material. The collective evidence from these studies reinforces the view that Mind Map supports the sustained recall of information, validating its role as a beneficial tool for enhancing long-term learning outcomes. (15)

A significant majority of students in the Mind Map (MM) group regarded the technique as a valuable approach for summarising information. The students expressed a desire to apply it across different subjects, highlighting its versatility and adaptability in various academic contexts.

Furthermore, the use of Mind Maps sparked heightened interest and curiosity among the learners. They reported that the technique facilitated a deeper understanding of the subject matter and believed it could contribute to improved performance in examinations. Participants in the study perceived the Mind Map technique as highly effective for facilitating the understanding of concepts, aiding in information retention, and assisting with the organisation of content. This perspective is consistent with observations reported in previous research by Ravindranath et al and Vaddatti T et al. (16& 17))

However, when reflecting on their experiences, the only notable drawback identified by the students was the amount of time required to create these Mind Maps. Despite this, the overall perception remained positive, with students appreciating the benefits of Mind Map for both comprehension and exam preparation.

Notably, aspects such as the duration of the study and the sample size warrant attention, as they could affect the extent to which these results can be generalised to broader populations. Recognising these constraints is important when evaluating the overall impact of Mind Map on information retention.

CONCLUSION

The findings of the study underscore the effectiveness of Mind Map in enhancing both the retention and recall of the information when compared to traditional learning methods. This advantage is particularly prominent in the context of long-term retention, where students utilising Mind Map demonstrated superior recall of information over extended periods. This approach not only simplifies the revision process but also ensures that students can cover all essential topics thoroughly within the available time.

The perceptions of the participating students were overwhelmingly positive. Most students regarded Mind Map as a clear, engaging, and effective approach to learning, reflecting a strong preference for its use as a study strategy.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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