



# Using the mind map method in medical education, its advantages and challenges: A systematic review

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## Abstract:

Mind mapping stands as a contemporary approach to education, introducing an innovative means of teaching and learning. In current times, this technique is embraced due to its ability to enhance the learning and retention process. This investigation explored the imperative nature of adopting novel educational methodologies such as mind mapping, while also examining its benefits and constraints. During the timeframe spanning from 2000 to 2023, the terms “mind map,” “medical education,” and “thinking skills” were employed as keywords to conduct searches across nine databases: PubMed, Cochrane, Web of Sciences, Science Direct, ProQuest, CNHL, Springer, Wiley, and Google Scholar. After conducting searches across the aforementioned databases, a total of 63 articles were retrieved. Following the elimination of duplicated entries and articles that did not align with the predefined inclusion criteria, the examination focused on 10 relevant articles. This analysis adhered to the guidelines outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol, available at [www.prisma-statement.org](http://www.prisma-statement.org). The examination revealed a multitude of notable advantages associated with the implementation of mind maps which are classified into three groups (Enhancing Memory and Comprehension, Fostering Intellectual Growth, Streamlining Learning and Teaching). Additionally, two challenges of the studies were mentioned. Considering the positive ratio of merits to challenges, it is anticipated that this educational methodology will be increasingly incorporated into medical education, owing to its paramount importance and potential.

## Keywords:

Education, medical, mind map, thinking skill

## Introduction

Education is a dynamic process that must be constantly updated and modified.<sup>[1]</sup> Today, the educational methods are pleasant and attractive for students to be able to work in the classroom. In other words, the class participation of students should be high.<sup>[2]</sup> In a division, teaching learning methods for medical students can be divided into two categories: teacher-centered and student-centered.<sup>[3]</sup> A very important and difficult move in the process of education in medical sciences is the shift from teacher-centered to student-centered teaching methods.<sup>[4]</sup>

One of the important ideologies in contemporary education is encouraging the delegation of responsibility from the teacher to the student.<sup>[5]</sup> The passivity, apathetic, and boredom of students in teacher-centered classes have made it more important to use student-centered educational methods.<sup>[6,7]</sup> In these methods, students have more autonomy and power in choosing subjects, learning methods, and speed of education, and this is an important motivation for their participation.<sup>[5]</sup> In these methods, the professor is not only an obstacle for the student's independence, but also plays the role of an educational facilitator.<sup>[8]</sup> Student-centered learning is associated with flexible learning, self-

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directed learning, and experiential learning.<sup>[9,10]</sup> Student-centered methods have a high diversity, which can be mentioned as problem-based, case-based visual methods (concept map and mind map), etc.

The mind map is an innovative learning method that increases student participation and consequently leads to meaningful learning.<sup>[11]</sup> For the first time in the mid-1970s, Tony Buzan introduced the mind map method.<sup>[12]</sup> In this learning method, a graphic image can be designed with the help of words, images, colors, and symbols, so that the student can remember the material more easily.<sup>[13]</sup> In fact, the mind map is a visual educational method in which the main topic is in the middle of the page and ideas, words, pictures, symbols, etc., are placed around it in a branching and free-form manner.<sup>[14]</sup> In the mind map, long texts are removed, which allows the user to synthesize, creates the best arrangement of information, increases the level of cooperation and participation within and between groups, and ultimately promotes ideation and critical thinking.<sup>[15]</sup>

The mind map actually expresses the relationship between attitudes and ideas that are described visually. The use of this method has caused medical students to memorize a large amount of information for a longer period of time and accelerate the learning process. As a result, the success of students increases.<sup>[16]</sup> The hemispheres of the brain have different functions, and these functions can be implemented in a unified way.<sup>[17]</sup> Employing mind maps results in an elevated degree of cerebral hemisphere functionality. This approach arranges thoughts, establishes connections between ideas and perspectives, and offers a means to uncover novel subjects that can fortify existing notions and concepts. In essence, this method hinges on connecting a central idea to multiple sub-ideas.<sup>[18]</sup>

However, there has been no systematic review of this method in the last few years, and on the other hand, this method is one of the new student-centered learning methods, which is of great importance. We intended to peruse the benefits and challenges of the mind map as a new educational method.

## Materials and Methods

The present systematic study was conducted according to the written PRISMA [Figure 1]. Nine databases (PubMed, Cochrane, Web of Sciences, Science Direct, ProQuest, CNHL, Springer, Wiley, and Google Scholar) were checked. To determine the keywords, the mesh has also been used, keywords by two experts in the area of medical education, finding and searching for terms in databases. Two independent researchers have gathered the information. Search strategy was ((mind map\*[Title/Abstract]) OR (map\*[Title/Abstract])) AND (medical student\*[Title/Abstract])) OR (Medical education [Title/Abstract])) AND (critical thinking [Title/Abstract])) OR (thinking [Title/Abstract])) OR (thinking skills [Title/Abstract]) OR (problem-solving [Title/Abstract])) NOT (concept map\*[Title/Abstract]) [Box 1].

According to the search strategy, research was done and articles were extracted. The abstracts of articles have been reviewed to establish their relevance for the research area, first title after that the full text. It follows that reference to the place of birth; year of completion and topic and procedure shall be made to agree on the text. Each article's text will be carefully assessed by one of the researchers. To evaluate the quality of descriptive articles, a Strobe checklist has been applied. There are 22 sections in the strobe checklist, that are scored on the basis of the importance of each section. The part had

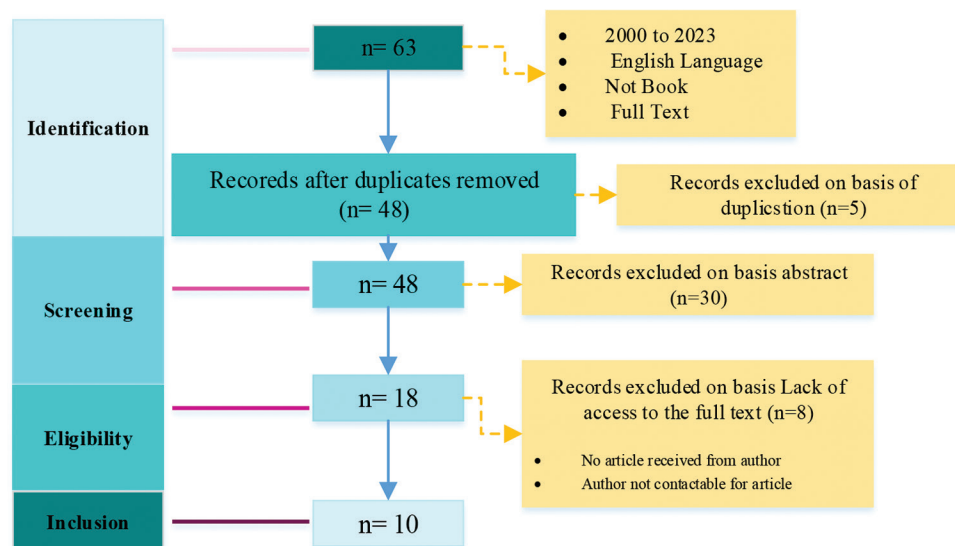


Figure 1: Flowchart of article selection process PRISMA 2020

**Box 1: Search strategy****Keywords relating to Mind map**

(mind map\*[Title/Abstract]) OR (map\*[Title/Abstract])

**Keywords relating to medical education**

(medical student\*[Title/Abstract]) OR (medical education [Title/Abstract])

**Keywords relating to Thinking**

(((critical thinking [Title/Abstract]) OR (thinking [Title/Abstract]) OR (Thinking Skills [Title/Abstract]) OR (problem-solving [Title/Abstract])))

Limits: [Date of Publication: 2000 to 2023- English Language- Not Book- Full Text]

been developed in accordance with the present study. The final score of the checklist was set at 30, out of which a score of 20 is considered satisfactory.

The inclusion criteria for conducting research were: being in the fields of medical sciences, in the period 2000 to 2023, and the English language. Exclusion criteria were the book, lack of access to the full text of the article, and poor quality. To gather data on these articles, including sections about author specifications and the year of publication, a study's purpose, type of research, sample size, or sampling method shall be carried out by means of an extraction form. Use was made of the data and results. Once these were completed, the form of the results derived from a review of an analysis article was gathered and finally reported. Initially, the pool of identified articles, totaling 63 in number, underwent organization within Endnote X16. After eliminating duplicate entries, the count was reduced to 48 distinct articles. Subsequently, an evaluation based on titles and abstracts was conducted, leading to the exclusion of 30 articles. The authors of articles lacking full-text accessibility were contacted, and extensive endeavors were undertaken to procure the full texts. Ultimately, poor-quality articles, along with those devoid of full-text access, alongside conference lectures, were excluded from the study. Ultimately, the study's scope was narrowed down to encompass 10 selected articles [Figure 1].

**Results**

The present review article has examined 10 articles. In the reviewed studies, the volumes of the studied samples have been very variable, so that the minimum volume is 31 samples and the maximum is 1000 samples. The rest of the content extracted from the articles is listed in Table 1.

Following a thorough analysis of the articles and reviews, the enumerated benefits were systematically grouped into three distinct categories, while the challenges were consolidated under a single category.

Each set of advantages comprises three individual components.

- 1) Enhancing Memory and Comprehension:
  - *Organization*
  - *Integration of information*
  - *Memory Improvement (Retention and Recall).*

- 2) Fostering Intellectual Growth:
  - *Critical Thinking*
  - *Interaction*
  - *Creativity*
  - *Problem-solving.*

- 3) Streamlining Learning and Teaching:
  - *Teacher Empowerment*
  - *Cross-Disciplinary Applicability*
  - *Exploring User-Friendly Approaches*
  - *Offline/Online Accessibility.*

The category of challenges comprises a pair of items, which are:

- 1) Practical Constraints
  - *The Dynamics of Short-Term Critical Thinking Changes*
  - *Challenges of Implementing Mind Mapping for Large Groups.*

**Advantages**

The advantages of this student-centered method are divided into three distinct categories, with each category encompassing four elements.

- 1) Enhancing Memory and Comprehension: Organization, Integration of information, Memory Improvement (Retention and Recall)
- 2) Fostering Intellectual Growth: Critical Thinking, Interaction, Creativity, Problem-solving
- 3) Streamlining Learning and Teaching: Teacher Empowerment, Cross-Disciplinary Applicability, Exploring User-Friendly Approaches, Offline/Online Accessibility.

**1) Enhancing Memory and Comprehension**

- *Organization*

A mind map can be called an organizational tool. Organizing information through the use of the mind map technique involves creating a visual representation of concepts, ideas, and their relationships and making sure that the information is remembered in an organized way. Mind mapping is a powerful tool that aids in structuring thoughts and understanding complex subjects by illustrating the connections between various elements. In a mind map, a central concept or topic is placed at the center of the diagram, serving as the focal point. Branches radiate outward from this central point, representing different subtopics or ideas related to the central theme [Table 1].

**Table 1: The implementation of mind map, its advantages, and challenges**

<i>n</i>	Title	Year	Authors	Country	Sample size	Target group	Result	Advantages	Challenges
1 [19]	Mind Mapping: A Learning Strategy to Promote Critical Thinking Skills for Respiratory Therapy Students	2022	Aisal A. Turkestani	Saudi Arabia	40	Respiratory therapy students	-Mind maps promote critical thinking in the intervention group of respiratory therapy students.	-Facilitate critical thinking, -Facilitate organization, -Enhance interaction, -Facilitate retention of knowledge.	–
2 [20]	Effect of Using Mind Mapping Learning Technique among Undergraduate Nursing Students	2022	Amel Ahmed Elsayed	Egypt	1000	Nursing students	-The mind mapping is superior than the other currently used study methods and that successfully helps students in learning subjects by overcoming issues with retention and recall.	-Helpful in recalling information. -Helpful in organizing Information. -Helpful for rapid revision -Good self-study tool.	–
3 [21]	Visualization of Learning and Memorization: Is the Mind Mapping Based on Mobile Platforms Learning More Effective?	2021	Irina Leontyeva	Russia	271	Medical students	-The results of the experiment showed that students, who studied in the traditional offline environment, performed better compared to those who used their mobile devices.	-Performed offline and online.	–
4 [22]	The PBL vs. Digital Mind Maps Integrated PBL: Choosing Between the two with a view to Enhance Learners' Critical Thinking	2021	Nurkhairo Hidayati	Indonesia	103	Biology students	-Integrated PBL is better at promoting students' critical thinking compared to conventional learning.	-Enhancing students' critical thinking. -Help to find the best solution. -Help to formulate the problems.	–
5 [23]	Qualitative analysis of the use of mind mapping in physician assistant students	2021	Genevieve Pinto Zipp	USA	74	Physician assistant students	-Findings suggest that PA educators can optimize learning that fosters CT using strategies like mind mapping.	-Assist in understanding, memory, analysis, organization -Integration of information. -Development of CT skills	–
6 [14]	Case study of mind mapping as an educational tool for a pharmaceutical course on drug formulation design	2021	Renata Miliani Martinez	Brazil	49	Drug formulation class	-Improved short-term performance and collective learning.	-Helpful for assisting busy students in understanding the big picture (hierarchical structures) -Enabling them to study deeply for each component. -Enabling them to be appropriately incorporated in the schedules.	–
7 [13]	Use of Mind Mapping (MM) as an Unconventional Powerful Study Technique in Medical Education	2017	Nahlaa A. Khalifa	Saudi Arabia		Medical students	-A teaching method can improve critical thinking in medical education.	-Promote creativity, -Augment memory, -Boost teaching confidence, -Empowering medical education, -improving long-term memory, -Improving problem-solving -Writing improvement, -Thoughts organization	–

*Contd...*

Table 1: Contd...

<i>n</i>	Title	Year	Authors	Country	Sample size	Target group	Result	Advantages	Challenges
8 [11]	The effectiveness of mind mapping as an active learning strategy among associate degree nursing students	2015	Annemarie Rosciano MSN	USA	30	Nursing students	-Mind mapping is an effective learning strategy in the population studied.	-Assisting in critical thinking -Easy recalling -Enhancing creativity -Encouraging collaboration -Being beneficial in other courses for note taking.	-May be difficult with large groups.
9 [24]	The Effect of Mind Mapping on Teaching and Learning	2014	Ying liu	China	40	Medical students	-The study shows that mapping has a positive effect on teaching and learning. -Country, field, and achievement can influence the results.	-Instrument differences -Subjects differences	–
10 [25]	Does the mind map learning strategy facilitate information retrieval and critical thinking in medical students?	2010	Anthony V D'Antoni	USA	131	Medical students	-This study demonstrates that medical students using mind maps can successfully retrieve information in the short term.	-Easy to teach for medical students who have no previous background. -Use it requires no cost or expensive equipment.	-As critical thinking takes a long time to develop, short-term changes in critical thinking were a limitation.

### • *Integration of information*

Mind map is an innovative learning strategy that aids in the integration of information. By using mind maps to integrate information, individuals can identify relationships, patterns, and connections between different elements. This approach encourages a holistic view of the subject matter, enabling the visualization of how various concepts interrelate. Information integration through mind maps is particularly useful when dealing with multidimensional or interconnected topics, as it allows for the identification of common threads and shared themes. By visually depicting the integration of information, mind maps promote a deeper understanding and a more comprehensive grasp of interconnected ideas. In Genevieve Pinto Zipp's study, about 42% of participants strongly agree and about 50% agree that MM can promote integration of information [Table 1].

### • *Memory Improvement (Retention and Recall)*

Mind maps provide a structured and organized way to represent information visually, making it easier for the brain to process and remember complex concepts.

Here is how mind maps can contribute to memory improvement:

1. **Visual Representation:** Mind maps offer a visual framework that mirrors the way our brain naturally

organizes information. By placing the main concept at the center and branching out to subtopics, mind maps create a visual hierarchy that aids in understanding and remembering the relationships between different pieces of information.

2. **Association:** Mind maps encourage the creation of associations between related concepts. When you link ideas together on a mind map, you are forming connections in your brain that help reinforce memory. These associations make it easier to recall information because you can trigger the memory of one concept by thinking of its association with another.
3. **Color and Images:** Incorporating color and images into mind maps can enhance memory retention. Visual cues stimulate the brain and make information more memorable. Associating colors and images with specific concepts helps create distinct mental markers for easier recall.
4. **Simplicity and Conciseness:** Mind maps promote the use of concise keywords and phrases instead of lengthy paragraphs. This concise format minimizes cognitive load, allowing you to focus on the core ideas and relationships. This simplicity aids memory by reducing the amount of information that needs to be processed.
5. **Active Engagement:** Creating a mind map is an active learning process that engages your brain in organizing, structuring, and synthesizing information. This active engagement promotes better



memory retention compared to passive learning methods.

6. **Review and Revisiting:** Mind maps serve as excellent study aids. Regularly reviewing and revisiting your mind maps helps reinforce memory over time. As you repeatedly engage with the visual representation of the information, you strengthen your memory pathways.
7. **Personalization:** Creating your own mind maps allows you to personalize the representation of information according to your learning style. This personalization increases the likelihood of remembering information since it is tailored to your preferences.

Overall, mind maps provide a multisensory approach to memory improvement. By engaging your visual, spatial, and associative thinking, they facilitate the encoding and retrieval of information, making them an effective tool for enhancing memory retention and recall.

Several research studies have pointed out that using the mind map method can improve memory [Table 1].

## 2) Fostering Intellectual Growth

### • Critical Thinking

In fact, critical thinking is being able to judge through the interpretation of existing materials, analyzing them, and finally making an opinion based on the available evidence [Table 1].

Critical thinking is a cognitive skill that involves analyzing, evaluating, and synthesizing information to make informed decisions and solve complex problems. Mind maps can be a valuable tool for enhancing critical thinking by facilitating the organization of thoughts, fostering deeper understanding, and encouraging the exploration of multiple perspectives.

Here is how mind maps can contribute to critical thinking:

1. **Structuring Thoughts:** Mind maps provide a visual framework that allows you to break down complex issues into smaller components. This structured representation enables you to see the relationships between different ideas, helping you identify the main arguments and supporting evidence.
2. **Linking Concepts:** Mind maps allow you to link related concepts together, showing how ideas are interconnected. This approach encourages a holistic understanding of a topic, helping you recognize patterns, themes, and causal relationships.
3. **Comparing and Contrasting:** Mind maps enable you to place opposing viewpoints or concepts side by side, making it easier to compare and contrast different

arguments. This visual representation aids in evaluating the strengths and weaknesses of each perspective.

4. **Generating Ideas:** Mind maps encourage brainstorming and the generation of new ideas. By allowing you to freely associate and expand upon concepts, they foster creativity and support lateral thinking, which are essential components of critical thinking.
5. **Identifying Assumptions:** Critical thinking involves identifying underlying assumptions and questioning their validity. Mind maps can help you visually represent assumptions related to different ideas, allowing you to analyze their implications and consider alternative assumptions.
6. **Visualizing Arguments:** Mind maps provide a clear structure for mapping out arguments. You can visually depict premises, conclusions, and the logical flow of reasoning, helping you assess the validity and soundness of an argument.
7. **Problem-Solving:** Mind maps are effective for mapping out the steps of a problem-solving process. They help you see the sequence of actions needed to reach a solution and encourage you to consider alternative paths.
8. **Synthesizing Information:** Mind maps allow you to synthesize information from various sources into a coherent whole. They assist in organizing diverse perspectives, evidence, and data, facilitating a comprehensive overview that aids in forming well-rounded conclusions.
9. **Reflective Thinking:** Creating and revisiting mind maps can encourage reflective thinking. You can use mind maps to capture insights gained from experiences, making connections between past events and future actions.

### • Interaction

In the student-centered mind map method, unlike traditional methods, students' participation increases. In the traditional method, the teacher plays the main role in the education process, while one of the important features in the mind map method is self-improvement, and the professor plays the role of a facilitator in the learning process [Table 1].

### • Creativity

Creativity means the use of new methods in solving a problem, considering that a mind map can create a general view of the subject and with the colors and images used, the relationship between the components is clearly and prominently determined, it causes the capacity of human thinking to improve and instead of using conventional solutions, new methods are used and several research studies have pointed out that using the mind map method can improve creativity [Table 1].

- *Problem-solving*

Problem-solving is one of the abilities that medical students are expected to achieve in this case. Solving the problem requires a correct understanding of the available evidence and information and determines the relationships between them to find the answer. By using new educational methods such as mind mapping, this ability can be improved among medical students.<sup>[22]</sup> Several research studies have pointed out that using the mind map method can improve problem-solving [Table 1].

### 3) Streamlining Learning and Teaching

- *Teacher Empowerment*

In education, there is a mutual relationship between teachers and students. Teachers need to be able to classify and prepare the materials needed for teaching in an efficient manner and convey it to students. The use of new methods, such as mind maps, can facilitate the transfer of materials from lecturers to students and, as a result, increase the self-confidence of lecturers to present course materials [Table 1].

Here is how mind maps can contribute to teacher empowerment:

1. **Effective Communication:** Mind maps aid in conveying complex ideas in a clear and concise manner. Teachers can use mind maps to explain concepts, making explanations more comprehensible for students.
2. **Student Engagement:** Teachers can design interactive mind map activities that engage students in collaborative learning, brainstorming, and problem-solving. These activities foster active participation and critical thinking.

- *Cross-Disciplinary Applicability*

The application of mind map is not limited only to clinical fields of medical sciences, such as medicine,<sup>[26]</sup> nursing,<sup>[27]</sup> anesthesia,<sup>[28]</sup> and operating room<sup>[29]</sup>, and nonclinical fields, such as biology,<sup>[30]</sup> biochemistry. It is also possible to use it in fields, such as mathematics,<sup>[31]</sup> statistics, and languages<sup>[32]</sup> [Table 1].

Various instruments, such as pencils, mobile phones, and laptops, can be used to apply this method [Table 1].

- *Exploring User-Friendly Approaches*

Another reason for the attractiveness of this method is its easy teaching and learning. A student, who has no background in using this method, can easily learn and use it [Table 1].

- *Offline/Online Accessibility*

Offline and online accessibility of mind maps refers to the ability to access and interact with mind maps both when connected to the internet and when offline. This dual accessibility offers flexibility and convenience for users in various situations [Table 1]. Among the reliable and good websites for drawing mind maps are: <https://www.mindmeister.com/>, <https://xmind.app/>.

### Challenges

#### *Practical constraints*

- *The Dynamics of Short-Term Critical Thinking Changes*

Improving critical thinking is a time-consuming and long-term process. Since the new method of mind mapping is often examined in the short term, it can be said that short-term changes in critical thinking are one of the challenges of this method [Table 1].

- *Challenges of Implementing Mind Mapping for Large Groups*

Considering that the mind map method requires training for all students in a class to learn and implement this method simultaneously to be able to use it as a formative assessment method, some studies concluded that it may be difficult to use this method for a class with a large population [Table 1].

To study more details, including article title, author, year of publication, country, sample size, target group, result, advantages, and challenges, refer to Table 1.

### Discussion

According to the surveys, the use of mind maps has become prominent in many countries, including America, China, Saudi Arabia, etc., and in various fields, such as medicine and nursing. According to the obtained results, the advantages of this innovative method were mentioned in three groups, including: 1. Enhancing Memory and Comprehension, 2. Fostering Intellectual Growth, and 3. Streamlining Learning and Teaching. One of the important challenges of education in medical sciences is the large amount of material that is easily forgotten.<sup>[33]</sup> Mind map can be used as an innovative educational method for better organization of content, which causes Enhancing Memory and Comprehension. This is also going to result in deeper learning, the student Fostering Intellectual Growth by drawing a mind map and creating connections between its different parts. | This method provides the possibility of combining new materials with precious materials. This way streamlines Learning and Teaching, and consequently, meaningful and long-term learning

occurs.<sup>[34]</sup> Another challenge in medical fields is the ability to solve problems at the bedside. With the help of mind maps, students' ability of critical thinking and problem-solving can be strengthened in critical situations, which fosters intellectual growth.<sup>[13]</sup> One of the issues that causes professors to refuse to use new methods is the difficult application. This educational method is easy to use and increases student interaction and teacher confidence.<sup>[11]</sup> Therefore, it can be said that mind maps improve the learning and understanding

of medical science students. By contrast, it leads to simplified education and can be used as a teaching tool for complicated or memorizing lessons by teachers. They will be able to draw it, and their students will understand the logical link between the contents. It is easy for students to review, and they remember the figure of the mind map in their heads. As already mentioned, interactive relationships between teacher and student are needed to use the mind map method.<sup>[12]</sup> [Figure 2]. Our suggestion is that it is better to use the

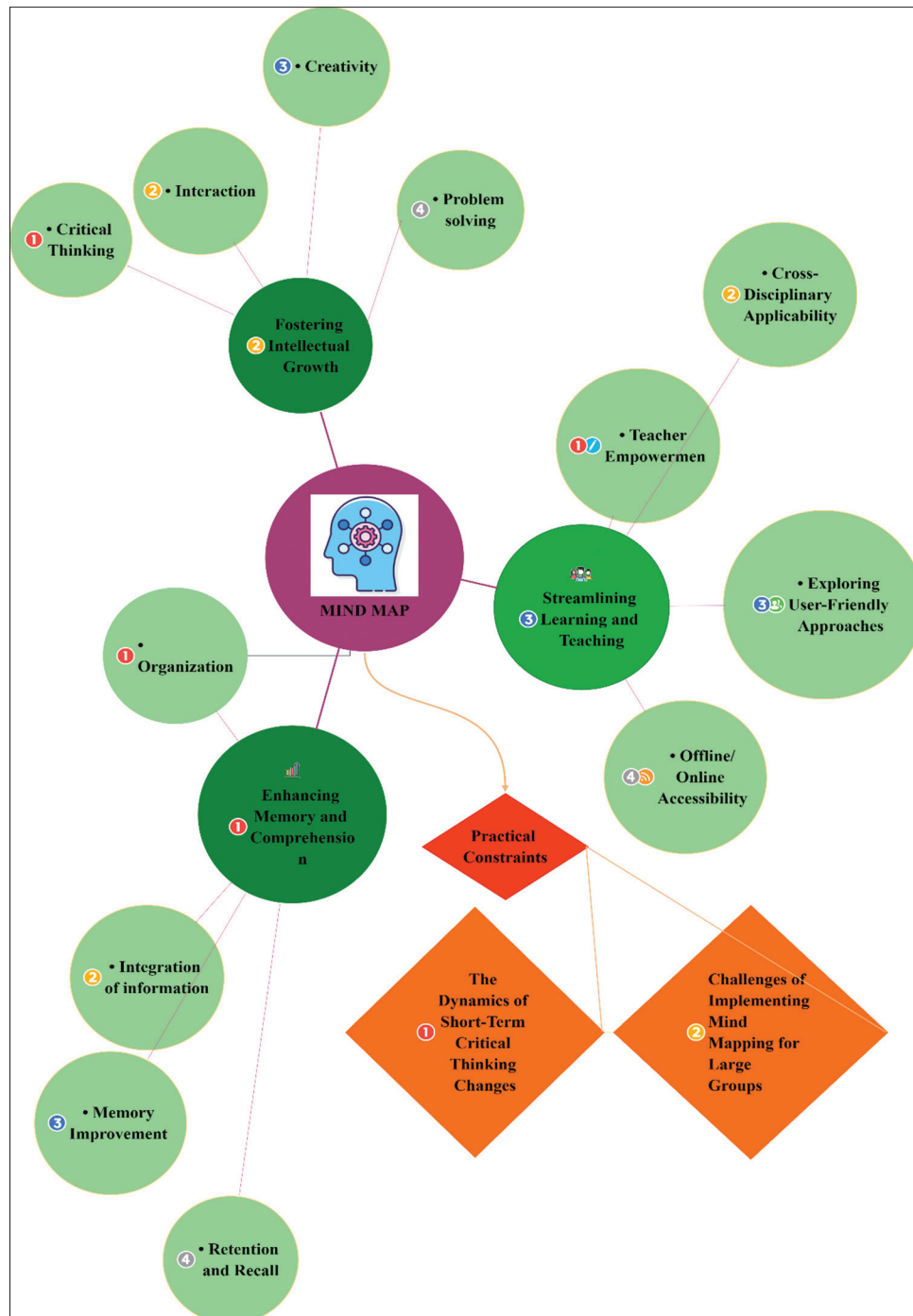


Figure 2: Organization of the advantages and challenges of the mind map



teacher-centered method in crowded classrooms and use the mind map method as an educational aid tool to express educational issues of high importance.

Practical constraints are an issue in mind mapping. The two subgroups of practical constraints shall include: 1. The Dynamics of Short-Term Critical Thinking Changes, 2. Challenges of Implementing Mind Mapping for Large Groups.

One of the approaches to the Dynamics of Short-Term Critical Thinking Changes is the PBL method. The method of PBL is one of the methods that organize theoretical information to find a solution for a problem and problems, which causes critical thinking skills.<sup>[35]</sup> Now there is a question of whether the simultaneous use of a mind map along with learning methods based on problem-solving could improve short-term changes in critical thinking?

The implementation of Mind Mapping for Large Groups is another challenge. An overcrowded classroom is actually a classroom in which the number of students is beyond the ideal limit, and this, in turn, can cause obstacles in the teaching and learning process of students.<sup>[36]</sup> As mentioned, the mind map method requires an interactive relationship between the teacher and the learner.<sup>[12]</sup> Our suggestion is that it is better to use the teacher-centered method in crowded classrooms and use the mind map method as an educational aid tool to express educational issues of high importance.

## Conclusion

In conclusion, mind maps offer significant advantages in medical education. They facilitate the visual organization of complex information, enhance memory retention, and encourage critical thinking by establishing connections between concepts. Mind maps also promote active learning and creativity, making the learning process more engaging and effective for medical students. Mind map also has negligible challenges. It is difficult to use this teaching method in large populations, and it is also challenging to examine its impact on critical thinking. Because the ratio of the benefits of this method to its challenges is much higher, undoubtedly, this learning and teaching method is an important and useful method in medical sciences.

Despite the numerous advantages inherent in this innovative approach, traditional techniques, such as lectures and PowerPoint presentations, remain more prevalent in Iran. The policy of the Ministries of Health and Universities of Sciences is toward student-centered methods and the use of new educational methods, such as simulation, mentoring, mind map, and educational

software as supplementary tools and educational aids. Therefore, this study has addressed this important matter. Recognizing that both instructors and many students are unaware of the existence and benefits of this method, it is recommended to first properly acquaint professors with this instructional approach and subsequently introduce it to students. This approach aims to enhance awareness about the method's existence and advantages, empowering individuals to willingly opt for one of the contemporary, student-centered techniques. Moreover, there exists a noticeable void for this novel method within the medical sciences curriculum. To address this, it is proposed that the method be included in the curriculum, thereby mandating professors to incorporate it.

Overall, while mind maps can greatly enhance medical education, educators should consider individual preferences and combine them with other teaching methods to create a well-rounded learning experience for all students.

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## Conflicts of interest

There are no conflicts of interest.

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