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RESEARCH ARTICLE

The Effectiveness of the Mind Mapping Teaching Method Combined With Cooperative Learning On Academic Achievement

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ABSTRACT

The study aimed to investigate the effectiveness of the mind mapping teaching method combined with cooperative learning on academic achievement. Utilizing the experimental method with a two-group design, a sample was selected from two cohorts of third-year middle school students at Al-Bashir Al-Ibrahimi Middle School in El Oued, Algeria, ensuring their equivalence in first-term academic performance. The experimental group, chosen randomly, was taught a portion of the natural sciences curriculum using the mind mapping method combined with cooperative learning, while the control group was taught using the traditional method. At the end of the experiment, an achievement test, validated for reliability, was administered to both groups. Statistical analysis using the t-test for independent groups and the Eta-squared coefficient revealed that the mind mapping teaching method combined with cooperative learning was more effective than the traditional teaching method in improving academic achievement.

INTRODUCTION

The decision to choose the most effective teaching method that significantly impacts students' academic achievement is a common challenge among those engaged in the field of education, particularly teachers. It is, therefore, essential to identify methods that foster the development of each student's unique abilities while promoting their emotional, physical, and social growth at different stages of life.

Modern and effective teaching methods have enabled learners to shorten the distance to acquiring, understanding, and applying knowledge. These methods simulate social and economic realities within classrooms, equipping learners with various tools to face and improve real-world challenges, ultimately fostering progress. This approach shifts schools from passive teaching to active teaching, from mere reception to self-directed and cooperative learning. Such a transition forms the foundation of the second-generation reforms in competency-based teaching, implemented during the 2016-2017 academic year.

These reforms focus on adopting social constructivist approaches that prioritize strategies allowing learners to construct knowledge through collaborative work. Consequently, teaching methods in our

schools have been designed to create scenarios that simulate learners' real-world contexts (Mahmoud, Sayed & Abo nagy, 2016).

Research has increasingly explored the effectiveness of modern teaching methods, such as problem-solving, cooperative learning, and brain-based learning, grounded in brain structure and functionality. These approaches help teachers understand brain mechanisms and activate teaching strategies to enhance learners' performance and critical thinking. This has led to the design of teaching methods based on social constructivist theory, a pedagogical approach already integrated into our educational system, to improve academic achievement among middle school students.

One such method is mind mapping. Studies like that of Harkirat & Makarimi-Kasim (2010) found that students taught using mind mapping strategies in a constructivist learning environment achieved higher results than those taught through traditional methods. Other studies, such as Al-Zubaidi (2012), highlighted the impact of brain-based learning strategies using mind maps on Arabic grammar achievement. Oujan (2013) demonstrated the effectiveness of a learning program utilizing mind maps in developing cognitive performance skills, while Al-Qaoud (1995) explored the impact of cooperative learning methods on academic achievement. Additionally, Hassan (2014) emphasized the use of cooperative learning in teaching Arabic grammar.

From this context, the research problem is framed in the following question: Does the mind mapping teaching method combined with cooperative learning effectively improve students' academic achievement?

It can be hypothesized that the mind mapping teaching method combined with cooperative learning has a significant impact on enhancing students' academic achievement. This study aims to test this hypothesis and assess the effectiveness of combining mind maps with cooperative learning in improving academic achievement among middle school students. The significance of this study stems from the importance of the teaching method that integrates mind mapping with cooperative learning, as it helps learners organize thoughts and information, stimulate creativity, actively participate, develop higher-order thinking skills, and enhance social skills, making learning more engaging and interactive.

Theoretical Framework

2.1 Definition of Cooperative Learning:

Abdel-Salam (2001) defines cooperative learning as a teaching method or model that provides students with opportunities to participate and learn together in small groups through discussion, dialogue, and interaction with one another and the teacher. This approach enables students to collectively acquire learning experiences, perform tasks and educational activities under the teacher's guidance and assistance, ultimately leading them to independently acquire knowledge, concepts, skills, and attitudes while achieving desired goals.

Bennouioua (2020) describes this strategy as a teaching model requiring students to work collaboratively, engage in dialogue regarding the subject matter, and teach one another. Through this effective interaction, students develop positive personal and social skills (Khetash, 2015).

Christison (1990) considers cooperative learning an indirect teaching method employed by teachers with their students by dividing them into cooperative workgroups. Within each group, individuals exchange ideas and opinions, evaluate proposed perspectives, and make collective decisions to understand the subject matter effectively.

2.2 Definition of Mind Maps:

A mind map is a strategy for organizing and visually representing information, using main ideas, branches, and details related to a specific topic. It is an effective tool for structuring thoughts and

organizing information, fostering holistic and creative thinking. A mind map consists of a central main idea placed at the center of a page or screen, from which main branches extend to represent sub-ideas. Additional branches can stem from the sub-branches to represent more specific details. Colors, symbols, and images are used to differentiate concepts, making the map clearer and easier to read.

Trevino (2005) defines a mind map as "an organizer containing a visual representation of a central topic surrounded by branches, subtopics, images, drawings, and patterns to represent ideas derived from the information provided during a lecture or classroom session."

Buzan describes it as a powerful visual technique that reflects radiant thinking and can be applied to all aspects of life. It is supported by the use of colors, images, codes, and dimensions to add excitement, beauty, and individuality, which in turn stimulates creativity, enhances memory, and improves the recall of information (Buzan & Buzan, 1996).

2.3 Concept of Teaching Method:

A teaching method is a form of organizing instruction in a way that aligns with the intended goals, the structure of the content to be taught, and the teacher's understanding of the learners' psychology. Its primary aim is to ensure the effectiveness and efficiency of teaching (Yenal, 2015).

It is also defined as the approach a teacher employs to facilitate educational activities, enabling students to acquire knowledge in the easiest, most time-efficient, and cost-effective manner (Yenal, 2015).

According to Al-Fawzan, a teaching method is a comprehensive plan utilized by teachers to achieve the desired objectives of language learning (Nasution, 2016; Jam et al., 2010).

2.4 Definition of the Mind Mapping Teaching Method Combined with Cooperative Learning:

This method represents a collective mind mapping strategy, an interactive tool employed in group work and collaboration. It aims to organize ideas and present them in a structured and logical manner. Collective mind maps are commonly used in meetings, workshops, and group projects to enhance interaction, communication, creativity, and innovation among group members.

The method typically starts with a central topic or idea that represents the group's primary goal. The branches of the mind map are then used to depict sub-ideas or related topics.

The collaborative mind mapping process enables the group to generate new ideas, stimulate creativity, and promote innovative thinking. It helps unify members' perspectives around a shared subject. The mind map is periodically updated to reflect ongoing discussions and new thoughts within the group, ultimately aiding in achieving shared objectives more effectively.

Mind maps created collaboratively allow a group of students to synergize and amplify their individual creative abilities. Teaching through cooperative learning combined with mind mapping is a group-based method where individuals are gathered into teams to prepare a collective mind map. In this process, the minds of individuals pool their energies to create a collective, independent intellectual entity (Buzan & Buzan, 1996 ; Saleekongchai et al., 2024).

Mind maps should remain neutral and objective, focusing on information rather than personal opinions. They can be utilized as an effective teaching tool in classrooms to stimulate discussion and facilitate the exchange of ideas among students. By promoting the flow of ideas and establishing connections between them in a mind map, students can enhance their understanding of the subject and develop analytical and critical thinking skills.

When used in teaching, mind maps should be clear, user-friendly, and designed to make it easy for students to share ideas and foster teamwork. The collaborative aspect helps students develop

communication, negotiation, teamwork, and problem-solving skills effectively. Using mind maps as a cooperative tool enables students to work together on group tasks and share mind maps easily to enhance communication and mutual understanding.

By leveraging free online study tools, students can collaborate and communicate efficiently, working together to complete group projects and tasks. Students who effectively utilize technology can learn better and faster, gaining broader opportunities for interaction and collaboration within a modern, innovative educational environment.

Additionally, teamwork helps students develop essential communication, collaboration, and leadership skills, which are critical in professional and social contexts. It can also enhance personal relationships and foster social cooperation.

Overall, the use of mind maps and collaborative learning techniques can be considered effective strategies for improving understanding, memory retention, creative thinking, and the development of personal and social skills.

2.5 Key Stages in Developing the Mind Mapping Cooperative Learning Method:

Defining the Topic:

The topic is clearly and concisely defined, group members are identified, and all necessary information for constructing the learning process is provided.

Individual Brainstorming:

Each group member participates in the initial planning phase of the mind map, focusing on developing their own thoughts and contributing innovative ideas. Members may initially work independently, after which the group reviews and refines these ideas to produce the final mind map. This approach ensures full participation, promotes creative thinking, respects individuality, and leverages the diversity of ideas within the group.

Group Discussions:

Discussions are encouraged to foster interaction and communication among group members, stimulating creativity and innovation. Small group discussions help generate new ideas, promote creative thinking, and encourage collaboration. Members should be encouraged to respect, support, and understand each other's perspectives, even if those ideas differ or conflict. All ideas should be handled positively and constructively, motivating members to develop their ideas while benefiting from others' contributions.

Embracing Ideas:

This stage activates all mental capacities, offering opportunities for creative thinking and collective discovery. It helps connect different skills and enhances interaction among group members. Notably, collaborative mind maps do not exclude any mental skills; instead, they create opportunities to develop both creative and analytical thinking skills. Group mind maps can also be used effectively to manage time, organize ideas, and unify the group’s vision. Overall, they contribute to fostering creative and analytical thinking, improving team communication, and enhancing time management and interaction skills.

Group Analysis and Decision-Making:

At this stage, the group uses the final collaborative mind map to identify the necessary steps to achieve the defined objectives. Continuous evaluation is essential to determine whether the current plans are leading to the desired goals, and adjustments to the mind map should be made if necessary.

Successful group work using mind maps requires creating an interactive and open environment conducive to thinking and continuous learning. The focus should be on generating solutions and ideas rather than dwelling on problems and obstacles. When effectively implemented, collaborative mind maps can enhance innovation, creativity, and the successful completion of various tasks.

2.6 Applications of Mind Mapping in Cooperative Learning:

The mind mapping teaching method combined with cooperative learning can be applied in various suitable scenarios, including:

Collaborative Creativity: An interactive process where a group of individuals works together to develop new ideas or solve problems through creative thinking, idea sharing, and critical thinking.

Collective Recall: The ability of individuals to jointly retrieve information and knowledge through group work, enhancing deep understanding of the content and improving retention.

Group Decision-Making: Evaluating alternatives collectively to make informed decisions.

Collaborative Project Management: Planning, executing, and monitoring projects through shared group efforts.

Group Training and Learning: Allowing individuals to benefit from each other's knowledge and expertise.

2.7 Advantages of the Cooperative Learning Method with Mind Mapping:

This teaching method combines the strengths of mind mapping and cooperative learning, offering numerous benefits, including:

Improved Memory: By creating an interactive learning environment where students exchange ideas and information, enhancing their understanding of the material and solidifying it in their minds.

Enhanced Thinking Skills: Facilitates logical and visual organization of information, helping students understand relationships between different ideas.

Improved Organization: Enables logical and visual arrangement of information, making it easier to retrieve when needed.

Connecting Ideas: Helps identify links between different concepts, promoting a comprehensive understanding of the subject.

Application of Knowledge: Guides students in understanding how concepts are interconnected, aiding them in applying knowledge in new situations.

Time Efficiency: Reduces the need for extensive writing, saving students time.

Holistic Understanding: Provides a visual summary of the material, helping students see the whole picture and how parts interact, making review more effective and less time-consuming.

Easy Addition of New Ideas: Allows for the seamless incorporation of new ideas without the need for rewriting.

2.8 Academic Achievement:

Academic achievement refers to the level of knowledge, skills, and abilities an individual attains after acquiring education and training in various educational institutions. It can be determined by the academic degree a person holds, such as primary, intermediate, secondary, or university certificates, as well as by the individual's scientific, cognitive, and skill-based competence.

Academic achievement serves as an important indicator of the knowledge, skills, and abilities an individual possesses. It significantly impacts opportunities for employment and advancement in both

professional and personal life. Consequently, academic achievement is one of the key criteria used to evaluate individuals and determine their preparedness to face daily and professional challenges.

PROCEDURES

3.1 Study Methodology:

The study aims to explore the effectiveness of the mind mapping teaching method combined with cooperative learning on academic achievement, investigating the influence of the independent variable on the dependent variable. Thus, the experimental method is deemed suitable for such studies. A two-group design was adopted, comprising an experimental group and a control group, with post-testing applied to measure outcomes.

3.2 Study Sample:

The study sample consisted of third-year middle school students from Al-Bashir Al-Ibrahimi Middle School in Guemar, selected from two educational cohorts. The educational organization of the targeted grade was chosen as it aligned with the number of groups required for the study, considering the equivalence in academic achievement.

The academic performance of students in the first-term natural sciences exam for the 2021/2022 academic year was used as a baseline for ensuring equivalence across the four groups. Ultimately, two groups with similar average grades in natural sciences for the first term were formed, each comprising 17 students. Using random selection, one group was designated as the experimental group, which was taught using the mind mapping method combined with cooperative learning, while the other served as the control group, taught using traditional methods.

3.3 Study Tools:

The study utilized two tools:

1. The Mind Mapping Teaching Method Combined with Cooperative Learning:

This method was applied to a portion of the natural sciences curriculum for third-year middle school students through the following steps:

Providing Necessary Materials and Tools:

The teacher ensured the availability of essential materials such as large sheets of paper, a whiteboard, pens, or colored markers for each group.

Explaining the Lesson Topic:

The teacher identified and clarified the subject for which the mind map was to be used, ensuring students understood it thoroughly.

Offering Guidance and Support:

The teacher monitored students' progress, providing guidance and assistance as needed, along with necessary clarifications.

Generating Ideas Individually:

At the beginning of the session, the teacher encouraged each student to independently generate ideas and record them to share with their group. This approach fosters creativity and innovation within the group.

Group Discussions:

The teacher facilitated discussions within the group to enhance interaction, communication, creativity, and collaboration. Small group discussions were encouraged to introduce new ideas, stimulate creative thinking, and promote teamwork.

The teacher emphasized mutual respect and support among group members, urging them to consider and understand different or opposing ideas positively and constructively.

Members were motivated to add their own ideas while benefiting from others' contributions.

Sufficient time was allocated for group discussions, ensuring that all members could express their ideas clearly and effectively.

Writing and Drawing Based on Initial Explanations:

Each group began constructing a mind map for the topic, following the guidance provided during the initial explanatory session.

Documentation, Review, and Evaluation:

Once the mind map was completed, it was documented and preserved for future reference. The mind map served as a tool for reviewing and reinforcing concepts and relationships. At this stage, the group utilized the final collaborative mind map to identify the steps necessary for achieving defined objectives.

By following these procedures, the mind mapping method was effectively implemented within educational groups to organize ideas, foster creativity, and promote flexible learning.

Academic Achievement Test:

After reviewing some examples of tests prepared by teachers in the subject of natural sciences for third-year middle school students, browsing the study curriculum, and referencing the theoretical framework for constructing achievement tests, the researchers, in coordination with the subject teacher, prepared an achievement test.

It consisted of 20 questions representing the scientific material and educational content received by the students during the scheduled lessons. These questions covered the program's content and objectives, which were implemented within the framework of the study. The instructions for all the questions required the student to choose the answer as true or false.

One point was assigned for each correct answer, while zero points were assigned for each incorrect answer. The test instructions were clarified, considering simplicity and clarity to suit the students' level. The test's quality characteristics, including comprehensiveness, objectivity, validity, and reliability, were verified.

RESULTS:

The research hypothesis stating that "there is effectiveness in the mind mapping teaching method combined with cooperative learning in improving students' academic achievement" can be tested through the statistical hypothesis: "There are no statistically significant differences in academic achievement between the experimental group and the control group."

By applying the t-test for differences between two independent samples and the Eta-squared coefficient, the following results were obtained:

Table 01: Results of the t-test for differences in academic achievement between two independent groups (Mind Mapping with Cooperative Learning vs. Traditional Method):

Groups	N	Mean	Standard Deviation	t-value	Significance Level	Decision	Eta Squared
Mind Mapping with Cooperative Learning	17	13.52	3.84	2.193	0.036	Significant at 0.05	0.131
Control Group (Traditional Method)	17	10.82	3.33				

From Table (1), it is evident that the significance level of the differences between the means of the experimental and control groups corresponding to the "t" value for the homogeneity case is significant at (0.036). This indicates the rejection of the null hypothesis and acceptance of the alternative hypothesis, which states that there are statistically significant differences between the experimental group, which was taught using the mind mapping method with cooperative learning, and the control group, which was taught using the traditional method, in the achievement test for natural sciences. The differences favored the experimental group, whose mean was higher, indicating the validity of the research hypothesis that there is effectiveness in the teaching method using cooperative learning and mind mapping. This shows that the mentioned teaching method had a positive impact on academic achievement in natural sciences for third-year middle school students.

The Eta-squared value of 0.131, when compared with reference values, is found to be large. Therefore, the impact of the mind mapping teaching method with cooperative learning was significant on academic achievement. This implies that the superiority was in favor of the students who studied the designated unit in natural sciences using the proposed method, demonstrating the effectiveness of teaching with cooperative learning and mind mapping.

DISCUSSION OF RESULTS:

These results can be explained by the fact that learning is fundamentally an active cognitive process. The tested method emphasizes the active role of students in learning, as they engage in various activities and express their ideas within groups or teams.

The intellectual participation in the activity contributes to learning and enhances the educational performance of students. This performance is based on understanding, enabling students to provide appropriate explanations for the educational situation. The method focuses on the content to be learned and the existing cognitive structures of the learner. This stems from the pedagogical interaction of students with mind maps during the lesson while incorporating cooperative learning as a teaching method.

Thus, it emphasizes the selection and organization of content experiences to facilitate the representation of the material to be learned and the construction of new cognitive structures. Consequently, the improvement in academic achievement can be explained on this basis.

The findings align with several previous studies, such as Al-Zubaidi (2012), which aimed to determine the effect of using the mind mapping strategy on Arabic grammar achievement; Oujan (2013), which sought to design a learning program using mind maps and assess its effectiveness in developing cognitive performance skills; Al-Qaoud (1995), which aimed to explore the impact of cooperative learning on the achievement of tenth-grade students; and Hassan (2014), which targeted the use of cooperative learning in teaching Arabic grammar.

The study by Ababneh (1995) aimed to investigate the effect of cooperative learning, represented by the Jigsaw method and the group learning method, compared to the traditional method, on the

attitudes of seventh-grade students toward mathematics. The study conducted by Waqad (2009) concluded that using mind maps can be effective in improving female students' achievement in biology topics. Similarly, the study by Mabrouk (2019) aimed to evaluate the impact of using mind maps in teaching on students' achievement.

These results align with the characteristics of the community in which the study was conducted. Modern teaching methods, introducing innovation, and renewing the pace of educational actions of various types and forms in the classroom are essential for both students and teachers. This was reflected in teachers' opinions, who confirmed that the more the learning environment and teaching process included dynamism and interactivity, the better the students' focus, responsiveness, and engagement with lessons and educational activities.

This experiment, which combined mind mapping and cooperative learning, fits within this context and has yielded positive and effective results. (Ahmed, 2010).

CONCLUSION:

The mind mapping teaching method combined with cooperative learning has demonstrated significant effectiveness in improving students' academic achievement. This effectiveness was evident in the interaction between mind mapping and cooperative learning when integrated into a single teaching approach. This method achieved the desired outcomes and proved to be an appropriate educational practice that contributes to solving some of the challenges faced by our educational system by offering an alternative strategy to enhance students' educational performance and academic outcomes.

Based on these findings, the following recommendations are proposed to provide further depth and address various aspects that could help resolve some educational challenges:

Raising awareness among teachers and students about the benefits of using mind maps and encouraging their application and practice.

Providing necessary support to those involved in the learning process to implement cooperative learning and mind mapping strategies effectively.

Ensuring the availability of required resources, such as educational tools and conducive learning environments, for applying cooperative learning and mind mapping.

Organizing cooperative activities within institutions and motivating students to participate actively.

Additionally, conducting similar studies on other educational subjects could help determine the broader effectiveness of mind mapping and cooperative learning techniques in improving students' academic achievement.

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