McCarthy Model-Based Learning Design: Enhancing Mathematics Achievement and Self-Confidence

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ABSTRACT
Many students struggle with math because they find it tough and boring due, to the emphasis on learning and outdated teaching techniques that lack engagement and progress. Nowadays, education calls for teaching styles and revamped content that promote student involvement rather than passive absorption of information. As a result, the researchers undertook this study to assess how effective an educational program based on the McCarthy model is in enhancing math skills and boosting confidence in learning among grade students at Al Razi School. The study divided students into two groups; one was taught using the McCarthy model, while the other received instruction through methods. Both the program and research tools were tailored to gather data on math performance and learning self-assurance. The findings revealed that students in the group showed higher achievements in math as well as increased confidence in their learning compared to those in the control group. The study wraps up by recommending the adoption of the McCarthy model in math education and providing training, for math teachers, on how to implement it.

Keywords: Interactive teaching, Educational strategies, Student engagement, Pedagogical improvement, Cognitive development, Instructional effectiveness.

1. INTRODUCTION

Mathematics is one of the core subjects in the education systems and has the mandate of developing thinking capabilities and other related problem-solving skills, a society must have. As the world continues to evolve, individuals that are able to comprehend and acquire mathematic skills will stand higher chances of charting their respective destiny. Mathematical competence revolves round promising graded futures and therefore all students should be given chances and assistance to learn profound mathematics with conceptual knowledge (NCTM, 2000; Hamdan, 2005). Hence, there is the need for a change in the roles of mathematics teachers since these teachers are one of the critical components that influence the process of learning and the attainment of learning objectives with their experience and knowledge in the profession as well as the traces they leave behind them (theirs impact) on students and learning environment, including the environment that Grouws and Hiebert (2007) have described. The update of the mathematics curriculum in Iraq in the meantime still provocates difficulties in this subject. The transmission methods have not been modified significantly, as an analysis of the approaches used by educators' shows they do not correlate with the modern curricula (Al-Harbawi, 2014). The effects of traditional teaching methods are experienced in mathematics classes, specifically as dull classes that are unresponsive to the students' needs and preferences (Al-Khazaali & Faris, 2022). As a result, the practice of modern timely and effective teaching methodologies in congruence with active teaching pedagogy appropriate for the teaching of the important subject is necessary (Al-Waeli, 2021).
Effective education require purposeful use of differentiation in instructional procedures as well as use of educational evidence to meet the goal of teaching mathematics, learners' active participation and efficiency in the learning process, as well as motivation and desire to learn. These calls for those leaders involved in the teaching process to make radical changes to the teaching environment that can befit the learner's ability and needs to make education a level playing ground as stated by Abu Zeina (2010) and Al-Kanaani & Issa (2018). Kajander; Mason (2007) indicated that some real difficulties could be experienced by the teachers in the event that they were called upon to enhance the teaching of mathematics. These include one's values, experiences, self-efficacy, and individual attitude to change and development regarding their complex role in determining a person's capacity for and preferences regarding change in facets of teaching.

This status of education alone amounts to a factor that determines the enhancement of potential and capabilities of any nation in the present and future. Mathematics success fosters self-confidence, which is an important aspect (Parsons, 2014). From different research works recently conducted in different countries, it becomes evident that the current trends of teaching mathematics do not support active and creativity. Learners are still very much the audience that receives information with little regard for their personality and emotional well-being or interests, which, in turn, militates against a positive attitude towards learning. This means that to help learners achieve better understanding in mathematics, the approaches that are used in the classroom must be in sync with learners' basic and extensive skills; fun and engaging, the active and interactions strategies must be employed. This entails the identification of best practices of teaching aimed at attaining the intended learning outcomes (Yi, Ying & Wijaya, 2019; Towers & Simmt, 2007; Badawi, 2003).

Many mathematics teachers require such methods mainly because they are in sync with their lifestyle; therefore, mathematics continues to be a conservative subject that is far from its proper concept and designation. Several papers containing synthesis or meta-synthesis about teaching and learning mathematics have supported low achievers or low learning results through using strategies and teaching methods that do not achieve ambitions but only focus on the knowledge aspect and the lower orders of it, hence paying no attention to the emotions and skills aspects and not considering the cognitive characteristics of mathematics and its learning patterns (Ayada, 2013; Al-Kubaisi & Al-Amili, 2016 Furthermore, low success rates locally (Al-Sarai & Hafati, 2018) and poor mathematical learning performances in many developing countries as observed by the OECD (2019). As it has been indicated by NCTM (2000, 16), good math teaching must involve the identification of the students' past learning and future learning needs and proactively engaging the students in mastering good learning.

Research carried out by the authors among teachers, parents, and students identified several obstacles to mathematics education. Among them, one could single out the ineffective application of traditional teaching methods that do not address the needs and features of student's learning. These methods are not flexible and creative in their approaches. The stresses and changes in the mathematics curriculum lately, in Iraq especially, require a higher level of professionalism. To alleviate this educational issue, the study recommends the incorporation of motivational and lively strategies of learning which help in creating an environment to enhance problem-solving, experimentation and teamwork. This approach shifts the learner from the background and centralizes him, depending on learning style and cognitive abilities. Thus, the purpose of this study is to select a progressive view on mathematics education and introduce the required changes.

Based on the above, the research problem can be formulated as follows: Is it possible to raise mathematics achievement levels and the desire to learn mathematics for first-year intermediate students through an educational program based on the McCarthy model?

2. LITERATURE REVIEW

Lee, L. T., & Hung, J. C. (2009): This study examined the impact of the 4MAT teaching model on retention and academic achievement in accounting education. The model was found to improve learning retention across different student performance levels and showed a significant positive effect on students' attitudes and achievement compared to traditional teaching methods.

Uyangör, S. M. (2012): This research investigated the effectiveness of the 4MAT teaching model on 7th-grade students' achievement and attitudes towards mathematics. The study found that the 4MAT model was more effective than traditional methods, leading to higher academic achievement and more positive attitudes towards mathematics.

Ovez, D. F. T. (2012): This study focused on the impact of the 4MAT model on 8th-grade students' algebra achievements and their ability to reach specific learning objectives. The results indicated that students taught using the 4MAT model had significantly higher achievement scores and better attainment of learning objectives compared to those taught with traditional methods.

Cengizhan, S., & Özer, S. (2016): This study aimed to assess the effect of the 4MAT learning style model on academic achievement and learning retention among 7th-grade students in mathematics. The results demonstrated that the 4MAT model significantly improved both achievement and retention compared to traditional teaching methods.

Şeker, B. S., & Övez, F. T. D. (2018): This research combined the 4MAT Teaching Model with an interdisciplinary concept model to develop the I4MAT model, which was tested on primary school students in mathematics and social studies. The study found that the I4MAT model significantly improved student achievement and effectively met learning objectives, particularly in the experimental group.

Erşen, Z. B., & Güven, B. (2018): This study explored elementary mathematics teachers' views on the application of the 4MAT teaching model. The findings revealed generally positive attitudes towards the model, with teachers suggesting improvements for more effective implementation.
Bagheri Sheykhloo, S., Beyrami, M., & Vahedi, S. (2018): This study evaluated the impact of the McCarthy model on mathematical problem-solving performance and self-efficacy among 8th-grade students in Tabriz. The results showed significant improvements in both problem-solving skills and self-efficacy for the experimental group compared to the control group.
Hussein, E. A. A., & Ibrahim Al-Tunisi Al-Sayed. (2019): The study evaluated the 4MAT model's effectiveness in enhancing mathematical proficiency among 6th-grade students. The results indicated significant improvements in both mathematical proficiency and motivation for students in the experimental group compared to the control group.
Alanazı, F. H. (2020): This research examined the effect of the 4MAT teaching approach on 7th-grade female students' understanding of electricity in physics. The study found that students taught with the 4MAT approach outperformed those taught with traditional methods in terms of conceptual understanding.
Mohamed, F. M. (2021): The study assessed the impact of the 4MAT model on the development of analytical thinking skills and conceptual understanding among first-year prep students in Fayoum Governorate. Results showed significant improvements in the experimental group, with a strong correlation between the development of analytical thinking and conceptual understanding.
Aliustaoğlu, F., & Tuna, A. (2021): This chapter discussed the use of the 4MAT model for teaching geometric transformations in a middle school setting in Turkey. The results highlighted the effectiveness of the model in accommodating different learning styles and improving students' understanding of geometric concepts.
Ibrahim Hassan Awad, A. (2022): This study focused on the effect of a 4MAT-based program on creative reading and self-efficacy among English Majors at Women's College, Ain Shams University. The program was found to be effective in developing both creative reading skills and self-efficacy among the students.
Derya, A. A. (2022): The research aimed to evaluate the impact of the 4MAT model on the acquisition and retention of mathematical concepts among 1st-grade intermediate students. The findings showed that the 4MAT model significantly enhanced both concept acquisition and retention compared to traditional teaching methods.

The collection of studies on the 4MAT teaching model spans various subjects and educational levels, highlighting its widespread applicability and effectiveness. Here's a brief comparison and summary

Educational Levels:
Primary and Secondary Education: Most studies focus on the impact of the 4MAT model on students in primary (elementary) and secondary (middle and high) schools, particularly in mathematics and science subjects (e.g., Lee & Hung, 2009; Uyangör, 2012; Cengizhan & Özer, 2016; Hussein & Ibrahim, 2019).
Higher Education: A few studies explore the model's application in higher education contexts, such as with English majors (Ibrahim Hassan Awad, 2022).
Subject Areas:
Mathematics: The majority of the studies evaluate the 4MAT model's impact on mathematics education, with positive outcomes in terms of achievement, retention, and attitude (Uyangör, 2012; Ovez, 2012; Cengizhan & Özer, 2016).
Science and Other Subjects: Some studies explore its effectiveness in teaching science (e.g., electricity in physics, Alanazı, 2020) and in other subjects like accounting and English (Lee & Hung, 2009; Ibrahim Hassan Awad, 2022).
Academic Achievement: All studies report improvements in student achievement when using the 4MAT model, often outperforming traditional teaching methods.
Attitudes and Motivation: Several studies also assess changes in students' attitudes and motivation, finding that the 4MAT model generally fosters more positive attitudes toward the subjects being taught (Uyangör, 2012; Hussein & Ibrahim, 2019).
Retention: Some studies specifically highlight the model's effectiveness in improving retention of learned material (Cengizhan & Özer, 2016).
Positive Reception: Teachers generally view the 4MAT model positively, recognizing its ability to engage students with diverse learning styles, although some suggest areas for improvement in its implementation (Erşen & Güven, 2018).
The abstract: The 4MAT teaching model, which integrates multiple learning styles and emphasizes a structured yet flexible approach to instruction, has been shown to be effective across various

educational levels and subjects. The studies consistently demonstrate that the 4MAT model enhances students' academic achievement, retention, and motivation compared to traditional teaching methods. The model is particularly beneficial in mathematics and science education, where it supports deeper understanding and long-term retention of concepts. Teachers also perceive the model positively, though they recognize the need for careful implementation to maximize its benefits. Overall, the 4MAT model is a versatile and effective teaching approach that aligns well with diverse educational needs.

3. MATERIALS AND METHODS

3.1. Educational Program

To achieve the research objectives and as a result of reviewing a number of studies related to educational programs, there are diverse opinions, but they are not distinctive in the process of designing educational-learning programs. There is agreement on the main steps for building them, which will be detailed by the researchers as follows:

3.1.1: the analysis (planning) stage

This includes a set of procedures on which the construction of the educational-learning program is based. Through these procedures, the basic orientations and needs that should be focused on and followed are identified as fowled:

- Understanding Learner Characteristics: Learners exhibit diverse mental, physical, and psychological traits, values, attitudes, and abilities that significantly impact the educational process. Educational designers should consider these factors.
- Assessing Educational Needs: An open survey questionnaire was administered to 20 first-intermediate grade students who had previously studied the subject, revealing that over 90% of the students faced difficulties. Similar questions were asked to the subject teachers.
- Academic Content Analysis: The mathematics textbook for the second semester of the 2021-2022 academic year was redesigned based on the McCarthy model to address identified needs and challenges.
- Analyzing the educational environment:
  The educational program will be applied to the selected school, identifying it and determining the capabilities that will help in implementing the experiment and overcoming any obstacles, if any, so that the conditions are suitable for application.

3.1.2: the design (preparation) stage

The structural formula that organizes the elements and tools of the educational-learning program in a sequence of steps is established:

- Organizing Educational Content: to meet program objectives, content was structured according to the McCarthy model, aligned with cognitive, skill, and emotional goals.
- Setting Objectives: Observable, and measurable behavioral objectives, along with 180 cognitive objectives spanning Bloom's six levels, were developed. Expert input was sought to ensure accuracy and coverage, resulting in final versions (Appendix 1, 2).
- Developing the Program: the three experimental chapters were meticulously designed in line with McCarthy's model, considering prerequisite knowledge and cognitive, skill, and psychological outcomes. Educational activities, teaching aids, and assessment methods were incorporated.
- Creating Lesson Plans: A set of 28 model daily teaching plans was crafted to facilitate seamless lesson execution, adhering to the format model (Appendix 3).
- Designing Educational Materials:Lesson plan and implementation guide for teachers, Various materials, including educational activities, worksheets, and posters, were developed.
- Test Specifications: A specification table was constructed for the mathematics learning outcome test.
- Preparation to research tools: The research tools required by the evaluation stage were prepared, which include:

1. Achievement of mathematics learning outcomes: The test represents the cognitive, skill, and emotional aspects. The aim of this study to verify mathematics learning outcomes according to the applied program. The paragraphs were formulated in all their fields according to the mathematical content and were (18) multiple-choice paragraphs according to the (0-1) system, the skill field paragraphs were (7) essay questions according to the rubric system (0-1-2), and the emotional field paragraphs were (17) according to the Likert scale.

2. Mathematical Confidence Scale: (20) emotional phrases were formulated with a five-point gradient that is compatible with the theoretical concept and reflects the extent of mathematical confidence that the students of the research sample possess.

Characteristics of Research Tools:

Validity: To demonstrate the suitability of the tools for the purposes for which they were created, includes:

The opinions of a group of experts and specialists were referred to, and the research tools were presented to a group of judges for verification. Agreement rate were unanimous except for some modifications.

Construct Validity: There are several ways to verify the construct validity of research tools through their exploratory application, and the internal consistency validity was as shown: To verify the construct validity of the test, find the correlation between the score of each paragraph of the test paragraphs and the total test score, because the total score is a criterion for the validity of the test, and the correlation relationship was calculated by Point Bacterial at a significance level of 0.05, indicating the internal consistency of the test paragraphs. These results are acceptable to the education literature and for all tools.

Reliability: According to the cognitive aspect's reliability by the split-half method and the rest of the tests according to their reliability using Cranach's alpha coefficient, the retest was used for the skill aspect, and the reliability coefficients were acceptable as, follows:

Math Learning Outcomes Test for the cognitive aspect (0.81), the skill aspect (0.79), and the affective aspect (0.86). The mathematical confidence (0.80).

Psychometric characteristics of test paragraphs: After exploratory application of research tools on a sample consisting of 75 intermediate students (Martyr Abdul Sahib) for boys affiliated with the Misan Education Directorate on Sunday, 8-12/4/2021, and after correcting answers, the scores were arranged in descending order to find:

Paragraph Difficulty Coefficient: The difficulty level of each test paragraph was determined separately. The values were within the statistically acceptable ranges as follows: Math Learning Outcomes Test: for the cognitive aspect (0.38–0.69) and for the skill aspect (0.43-0.62).

Paragraph Discrimination Power: The power in each paragraph of the test paragraphs was calculated separately, and the values were within the statistically acceptable ranges as follows:

Math Learning Outcomes Test: For the cognitive aspect (0.31 and above) and skill aspect (0.29 and above), as well as the discriminative power of the affective aspect paragraphs through the extreme comparison, they were significant at 0.05.

Mathematical Confidence Scale: The discriminative power of paragraphs was calculated through extreme comparison and was considered significant at 0.05.

3.1.3: Implementation Stage

Here, the educational program is implemented and teaching begins for the two research groups according to the prepared program based on the McCarthy model, which includes determining the experimental research method and experimental design, determining the community and sample, controlling variables, applying the experiment, and then applying the post-measurement tools.

The research community and its sample: The research community consists of first-grade intermediate students and intermediate schools affiliated with the Misan Education Directorate, the center for the academic year 2021-2022, which has five branches. The (A) branch was randomly chosen with a total of 29 students ache control group, and the (D) branch with a total of 31 students as control group.

Experimental Design (Experimental Treatment): The researchers adopted the experimental design for the two equivalent groups, with the post-test. Refer to Table 1.

Table 1. Experimental Design (Experimental Treatment)

Experimental Design			
Group		Independent variable	Dependent variable
Control	Equivalency	McCarthy module	Achieveent test and confidence scale
Experimental			

Control Procedures: equivalency: These were represented through the internal control of the experiment and the procedures of equivalence and homogeneity between the two research groups in variables (chronological age, previous achievement in mathematics, and prior knowledge). The

differences between the arithmetic means of the two research groups were calculated, and it was found that there were no statistically significant differences in the variables, and the value of Levine's test confirmed the homogeneity of the research sample. The experimental extinction, random sample selection, accuracy of measurement tools, teaching material, the teacher, and the time duration were taken into consideration as external control procedures. Refer to Table 2.

Table 2. Experiment Application Procedures, * : Not Statistical significance about (0.05)

Group	Control		Experimental		T-test
Variable's –Group	M	SD	M	SD	
The chronological age of the students	156	11.2	0.48	10.3	0.48*
Previous achievement in mathematics	77.6	13.1	1.4	12.7	1.4*
Knowledge level in the new content	41.5	13	1.5	10	1.5*

Experiment Application Procedures: An agreement was made with the school administration to organize the weekly schedule for mathematics classes, where the experiment was applied to the students of the research sample in Al-Razi Middle School for Boys on Sunday, March 13, 2022, by teaching five classes weekly for each group, and the experiment application process continued until Tuesday, April 12, 2022. The collected data were organized and analyzed using SPSS version 23.

3.1.4: the evaluation stage involved assessing the educational process and program in, three types: Preliminary evaluation (before implementation), formal evaluation (during implementation), and final evaluation (after implementation). Continuous feedback and adjustments were made to enhance objectivity and achieve desired outcomes.

4. RESULTS AND DISCUSSION

After constructing the educational program based on McCarthy and applying it to the basic research sample, conducting the measurement process, monitoring the data to verify the validity of the research hypotheses, and discussing and interpreting the results.

4.1 Results

The first hypothesis is as follows:
Statistics of the mathematics learning achievement test, Table 3.

Table 3. Statistics of the mathematics learning achievement test

Research instrument	Group	M	SD	T-test	DF	P
Math learning achievement	Control	52.7	7.9	3.1	59	0.003
	Experimental	46	9			

From the results above, there is a significant difference in the value of the t-test, which leads to the rejection of the null hypothesis. There was a statistically significant difference between the average scores of the experimental group students who studied according to the educational program based on the McCarthy model and the control group students who studied according to the usual method for testing the achievement of mathematics learning outcomes (as a whole) and for the benefit of the experimental group.

Differences were also found in each axis or aspect of mathematics learning achievement: Statistics for each aspect of the mathematics learning achievement test for the primary research sample are presented in Table 4.

Table 4. Statistics for each aspect of the mathematics learning achievement test

Math learning achievement	Group	M	SD	T-test	DF	P
Cognitive aspect	Experimental	7.2	1.8	3.01	59	0.004
	Control	6	1.4			
The performance-skill aspect	Experimental	5.4	1.5	4		0.001
	Control	2.9	1.7			
Emotional aspect	Experimental	40	5	2.2		0.003
	Control	37	6.4			

From the above results, a significant difference is observed in the value of the t-test, which leads to the rejection of the null hypothesis. There are:
1) A statistically significant difference between the average scores of the experimental group students who studied according to the educational program based on the McCarthy model and the control group students who studied according to the usual method in the cognitive aspect of the mathematics learning outcomes test is in favor of the experimental group.
2) A statistically significant difference was observed between the average scores of the experimental group students who studied according to the educational program based on the McCarthy model and the control group students who studied according to the regular method in the skill's aspect's of the mathematics learning outcomes test is in favor of the experimental group.
3) A statistically significant difference between the average scores of the experimental group of students who studied according to the educational program based on the McCarthy model and the control of group students who studied according to the usual method in the emotional aspect of the mathematics learning outcomes achievement test was observed in favor of the experimental group.
The second hypothesis is as follows:
Statistics on the mathematical desire and confidence scale of the basic research sample: refer to Table 5.

Table 5. Statistics on the mathematical and confidence

Research instrument	Group	M	SD	T-test	DF	P
Mathematical confidence scale	Control	50	5.7	3.5	59	0.001
	Experimental	43	8.2			

Through the results of the above statistical table, we notice that there is a significant difference in the value of the t-test, which leads to the rejection of the null hypothesis. There was a statistically significant difference between the average scores of the students in the experimental group who studied according to the educational program based on the McCarthy model and the students in the control group who studied according to the usual scale method. Mathematical confidence is in favor of the experimental group.
We try to obtain the practical significance to make the results more objective. This is done by finding the effect size, which represents the real differences that are due to the independent variable and not to other variables, where $d=2t/\sqrt{df}$. Refer to Table 6.

Table 6. Effect size

Level	Small	Intermediate	Large
Value of d	0.2	0.5	0.8

The effect size for the mathematics learning outcomes test was 0.78, and the effect size for the measure of confidence in teaching and learning mathematics was 0.88. From this, we conclude that accuracy and objectivity of the results are related to the size of the educational program's effect and the extent of its effect in improving mathematics learning outcomes, as well as in raising confidence in learning it, which are mostly large and moderate effects.

4.2 DISCUSSION
The results of the current study showed that there is a statistically significant difference of mathematics learning achievement between the experimental group and the control group whereby the experimental group performed better. These findings align with several previous studies: These findings align with several previous studies:
Lee & Hung (2009): I was able to prove that 4MAT model improves learning retention and performance among students.
Uyangör (2012): Demonstrated that 4MAT model has greater efficiency than conventional approach in enhancing academic performance.
Ovez (2012): Discovered that students, who were taught using 4MAT model achieved better academic results.
Cengizhan & Özer (2016): Pointed out that 4MAT model enhances on the scores as well as fosters long term knowledge retention.

Şeker & Övez (2018): Used the 4MAT model in conjunction with other models which helped in the improvement of the academic achievement as well as the achievement of education goals.
Derya (2022): Substantiated the effectiveness of the model in promoting increase in learning and recall of mathematical concepts among the middle school learners.Additionally, the study found statistically significant differences in favor of the experimental group concerning confidence in learning mathematics, which is consistent with:
Additionally, the study found statistically significant differences in favor of the experimental group concerning confidence in learning mathematics, which is consistent with:Bagheri Sheykhloo et al. (2018): According to them, McCarthy model enhances performance when solving numerical issues and raises students' self-esteem.Mohamed (2021): This I achieved in order to show that the model positively influences analytical thinking and improves the ability to grasp concepts making learners more confident in their learning process.
While the current study focused on mathematics, the effectiveness of the McCarthy Model (4MAT) has been validated across various subjects and educational levels:While the current study focused on mathematics, the effectiveness of the McCarthy Model (4MAT) has been validated across various subjects and educational levels:
Alanazı (2020): Similar positive results of the model were obtained when its use in understanding electricity in the context of physics was investigated.Ibrahim Hassan Awad (2022): Explained how the model influenced the growth of creative reading skills and self confidence in the students.
Taken collectively, the results of the present study stand in favour of and supplement previous research carried out by the authors to prove the benefits of the McCarthy Model (4MAT) that aids in comprehending mathematical lessons, boosts the confidence levels of learning mathematics and raises educational efficiency across all subjects and every level of education. The flexibility and versatility of the model in different educational settings make it beneficial in raising academics achievement and raising students' self efficacy.
As Mentioned above, the aim of this current study is different from previous studies in that it seeks to establish whether or not the students' perceptions of teacher credibility influence the level of enjoyment they get from an online learning environment.
The current study stands out from previous research on the McCarthy Model (4MAT) in several ways:
The current study stands out from previous research on the McCarthy Model (4MAT) in several ways:
Focus on Multiple Dimensions of Mathematics Learning Achievement: While majority of the past research focused on academic performance as a single construct or some aspects of it like knowledge retention etc, the present study focused on three dimensions of learning performance in mathematics which include cognitive, psychomotor and affective. Such an approach makes it possible to get a rich understanding of how the 4MAT model affects learners' performance in various dimensions.
Advanced Statistical Analysis and Use of Effect Size: In contrast to prior research that pointed to group differences by using statistical analysis, the current study operationalized the strength of the 4MAT model by estimate effect size in relation to educational achievement. This approach makes the results more credible and offers a greater amount of evidence as to the efficiency of the educational program.
Focus on Confidence in Learning Mathematics: In some of the earlier studies self-confidence was addressed in generic terms or across disciplines while the current study focused on confidence in learning Mathematics. This focus brings a new perspective to assess how effective 4MAT model is especially in teaching Mathematics.

5. CONCLUSIONS

It provides empirical evidence supporting the effectiveness of the McCarthy model in improving mathematics achievement and student confidence. This adds to the growing body of research on innovative teaching methods in mathematics.The study examines multiple aspects of mathematics learning, including cognitive, skill-based, and emotional components. This holistic approach offers a more comprehensive understanding of the model's impact.
By focusing on first-year intermediate students in Iraq, the research addresses a specific educational context that may be underrepresented in existing literature. This contributes to our understanding of how the McCarthy model can be applied in diverse educational settings.
The study's use of both achievement tests and confidence measures provides insight into the relationship between instructional methods and students' attitudes towards mathematics. This is valuable for understanding how to improve both performance and engagement in mathematics education.The research offers practical implications for mathematics teachers and curriculum designers, suggesting ways to implement the McCarthy model to enhance student learning.

1. An educational program based on the McCarthy model significantly improved mathematics learning outcomes among first-year middle school students.
2. The model positively influenced conceptual, skill-based, and emotional learning in mathematics within the learning model.
3. The project effectively increased students' confidence in mathematics learning by addressing individual differences and learning preferences, thus enhancing the overall learning experience.
4. A dramatic improvement in student confidence in mathematics was observed, attributed to the revised approach to the McCarthy model.

6. RECOMMENDATIONS

1) Adapting the design of the learning environment in mathematics lessons to have positive impact on all elements of the educational process.
2) Interest in applying the McCarthy model because, it has all the necessary components for successful mathematics education.
3) Training of mathematics teachers by subject supervisors and experts in the field of teaching methods on what was mentioned above so that they can master the concept and apply them in a way that makes the mathematics learning environment effective and leads to achieving the desired goals.
4) Educational institutions must pay attention to mathematics learning outcomes in all fields and not be limited to the cognitive aspects.
5) Providing mathematical activities is one of the most important exercises for the mind, as is paying attention to everything that would generate self-confidence in learning mathematics because, most learners have negative attitudes toward it and fear it.

7. Limitations of the Study

This study faced several limitations, including a small and specific sample size, a short-term duration, variability in the implementation of the McCarthy model, and the impact of external factors. These limitations may affect the generalizability of the findings and the precise assessment of the McCarthy model's effects.

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