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Research Article

The Effect of Mental Mathematics on College Students' Problem Solving Skills

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ABSTRACT

The main objective of this study was to determine the effect of mental mathematics on students' problem-solving skills and determine the moderating effect of perception towards mathematics on students' problem-solving skills as they do mental mathematics-one group pretest-posttest quasi-experimental design utilized in this study. Purposive sampling was applied to select the study participants, which was composed of 46 first-year education students enrolled in a particular subject handled by the researcher. The result of the study showed that students got better test results after mental mathematics was introduced. Based on the post-test result, students got high scores and spent less time answering the test. It means that the use of mental mathematics was effective in improving the problem-solving skills of the students. Moreover, the study found that students' perception had a significant relationship with students' accuracy, and removing the effect of perception will weaken the effect of mental mathematics. This study concluded that mental mathematics enhanced students' problem-solving skills and students' ability to solve math problems accurately and efficiently. Introducing mental mathematics from early primary education to secondary education and applying it in real-life is one of the techniques that students can develop mastery in solving problems mentally and is the best way to improve their problem-solving skills.

INTRODUCTION

How long do you spend time answering a math problem? Can you find the sum of 48, 65, and 13 using your mind only? This is a simple arithmetic problem which requires the reader to do the addition speedily. Nowadays, where technology like smartphones is ubiquitously accessible anytime and anywhere, it is adorable to see people doing mathematics on their heads only. Mastering basic mathematical skills is done at the elementary level. (Loveless, 2014). Students must acquire mathematical skills during their early years of academic formation, for these are essential to understand higher mathematics.

As commonly observed, for both students and adults alike, when they eat at the restaurant or go shopping in the mall, they usually use their smartphones to do simple calculations. Spending six years in primary school learning about the four fundamental operations - addition, subtraction, multiplication, and division – and decimals and fractions may not be enough time for the students to learn fundamental mathematical skills and solve problems using their minds.

The National Achievement Test result conducted to the sixth grades in 2018 showed a mean percentage score (MPS) of 37.44%. It is the lowest performance

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ever in the history of the standardized exam of DepEd (Albano, 2019). In 2019 Trends in International Mathematics and Science Study (TIMSS), the Philippines ranked lowest, 58th out of 58 countries worldwide, and one of the 21 countries to have lower mathematics achievement when compared individually to the other participating countries (Mullis, Martin, Foy, Kelly & Fishbein, 2020). Also, the Philippines ranked second to the lowest countries with poor performance in Mathematics based on the latest result of the Program for International Student Assessment (PISA) in 2018 (Schleicher, 2019). A poor mathematics performance is not an issue of one's country but a global academic concern (Chand, Chaudhary, Prasad, Chand, 2021).

One reason for weak performance in mathematics could be the students' poor mathematical understanding. In Philippine education, rote learning is commonly used by math teachers in teaching the subject. Both the teachers and the proponents of traditional math believed that basic skills should be practiced and memorized (Shields, 2011). Moreover, according to Finney (2016), "students should not be taught entirely on algorithms or formula to solve problems because these shortcuts lose their value when the student encounters a problem for which their algorithm is not appropriate." In the simple formula, where Percentage = Rate x Time, students used in rote learning will memorize the formula for Rate and Time without understanding that these formulae are derived from the Percentage formula.

Students are encouraged to use mental mathematics to develop the number sense and discover new ways of doing mathematics (Proulx, 2019). Mental mathematics is a mental computation process of solving problems using the mind only without using paper and pencil, calculator, and other means for the solution (Pourdavood, McCarthy, & McCafferty, 2020). Through mental calculations, students become familiar with rules and properties, which lead to their understanding of numbers. Likewise, mental calculations promote self-confidence and develop mental agility among students.

However, mental mathematics is difficult to apply, especially for those who use paper-and-pencil solutions. Mental mathematics sometimes causes a delay in discussing the lesson since students cannot perform mental computation.

The discussion of the teacher focuses on how to do mental math rather than discuss the main lesson (Proulx, 2019). Using calculators can solve the math problem quickly, and it allows the students to devote more time to understand the problem rather than computing numbers (Chiezugo, 2018). Nevertheless, allowing a calculator in math class will rob students' ability to do mental calculations (Arceña, 2016), and relying on it would result in a lack of fluency and recall of facts (Duczeminski, 2017).

The study conducted by Barham (2010) showed that teaching students mental mathematics is effective. Aside from enhancing students' mental ability, it builds students' positive attitudes towards mathe-

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matics lessons that encourage them to participate in class discussions. Students' views or perceptions play a vital role in achieving high academic performance. According to Kanafiah and Jumadi (2013), students' perceptions correlate with their academic performance. When students have positive perceptions of a particular subject, they have better academic performance.

This study is anchored on the theory of Cognitivism by Jean Piaget. Cognitivism or also known as Cognitive Learning Theory, is the study that focuses on mental processes, including how people perceive, think, remember, learn, and solve problems. Its goal is to fill in the "black box" of the human mind of the knowledge deemed necessary for learning to occur (Flippen, 2014). The change in behavior serves as an indicator of what is happening inside the learner's mind (Kelly, 2012).

The cognitive approach allows the students to fill into the "black box" the knowledge they gained from studying the relationship of numbers, recalling some mathematical rules, and using this knowledge as they do mental mathematics. The change in the students' performance - from slow to quick, from many mistakes to accurate answers, as they do mental mathematics- is a cognitivism approach.

According to Michaela (2018), cognitive learning focuses on how the students keep in mind, recover and store actualities in their memory. Learning is concerned not with what learners do but with what they know and how they obtain it. Doing mental mathematics allows the students to expand their mathematical abilities and increase their cognitive understanding of numbers (Proulx, 2019). The more students received and stored information in their minds, the more they can effectively perform a mental calculation to a math problem. In addition, according to Flippen (2014) the perfect way for a teacher to approach utilizing cognitivism within the classroom is to inquire questions to assist students in refining their thinking and recognizing where they may be wrong. Using flashcards helps learners promote problem-solving, analogies, imagery, and mnemonics, and critical thinking.

On the other hand, this study involves the role of perception towards mathematics. Hasa (2016) defined perception as the way people think about or understand someone or something. It is what people understand using the five senses. In connection to the cognitive approach, the role of perception is vital to the cognitive process. Based on what students perceived, and stored it in their mind affects their performance in mathematics.

Thus, the study aims to investigate how mental mathematics can help students improve their problem-solving skills, specifically in terms of speed and accuracy, and determine if the students' time in answering the test is correlated to its scores. Furthermore, this study measured students' perceptions of mathematics. The researcher wanted to determine if students' perceptions were correlated to students' accuracy and if the perception towards mathematics

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The researcher wanted to determine if students' perceptions were correlated to students' accuracy and if the perception towards mathematics positively affected their problem-solving skills as they performed mental mathematics. This study may encourage mathematics teachers to integrate mental math activities into their lessons and use its results to improve their strategies of teaching mathematics.

MATERIALS AND METHODS

This study used a quasi-experimental research design, particularly the single-group pretest-posttest. According to Campbell and Stanley (2015), quasi-experimental research design used one group of participants to determine the effect of a treatment or intervention done. The group was given a pretest, and a post-test was given after the treatment was done. The difference in the scores on pretest and post-test determined the effect of such treatment/intervention. The intervention given was mental calculation. Students were given tips/techniques on calculating numbers mentally and applying those techniques as they solved problems. For a month, students were required to use the mental calculation to solve math problems daily in their math class. They were restricted from using calculators, gadgets, and paper and pencil for computing the solution to a mathematical problem. The scores of the students in both pretest and post-test were studied, compared, and analyzed.

According to Seltman (2018), it is impossible to obtain 100% confidence in any research design, and there is always a chance for error. However, establishing causality through elimination is the easiest way to prove that an experiment has high internal validity. Thus, in this study, to ensure that the result was due to the effect of mental mathematics on students' problem-solving skills and not by any other factors, the researcher removed the moderating effect of students' mathematical perception to increase the study's internal validity. The participants of the study consisted of 46 first-year college students enrolled in a specific university. They gave their consent to be part of the study. Purposive sampling was employed to determine the participants of the study. An intervention was applied to the study's participants, who were the researcher's students in one subject.

There were two types of research instruments used in this study. One was the researcher-made test, and the other one was the Mathematics Perception Survey adopted from Code, Merchant, Maciejewski, et al. (2016).

A researcher-made test was developed to measure the students' problem-solving skills in terms of speed and accuracy. The table of specifications was constructed before writing the test items. Constructing the test items was carefully done to align it to the course outcomes in the syllabus. The mathematics professors of the university validated the test items with a high validity test result of 4.75, and it has undergone analysis before the conduct of the reliability test. Test-retest was determined for the consistency of students' answers, resulting in a 0.76 reliability test, which means "acceptable reliability."

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Using the researcher-made test, a pretest and post-test were given to measure the students' problem-solving skills in speed and accuracy. A period of one month was the interval between the two tests to ensure that there was no familiarity on test items in administering the post-test. Also, the one-month interval is good enough to properly implement the intervention, which is mental mathematics, since the students cannot learn it within a short period. To measure the students' problem-solving skills in terms of speed, a timer was reflected on the board during the administration of pretest and post-test. For every test, the students were required to put the time when they started and finished the tests. The time spent in both tests served as a basis to measure a change in students' speed in dealing with mathematical problems. If there was a decrease in time spent answering the post-test compared to the time spent answering the pretest, there was an increase in the students' speed. The shorter the time spent, the faster the speed. The longer the time spent, the slower the speed.

On the other hand, the problem-solving skills in terms of students' accuracy refer to the correct answer obtained by the students to answer the mathematical problems in the test using mental mathematics. The scores in the pretest and post-test served as the basis for comparison. If the post-test score was higher than the pretest's score, there was an increased inaccuracy. A high score means high students' accuracy, while a low score in the post-test indicates low students' accuracy.

The adopted Mathematics Perception Survey questionnaire from Code et al. (2016) consists of thirty–two (32) questions with one filter statement. These 32 questions were classified into seven (7) categories, namely, (1) Growth Mindset, (2) Real World, (3) Confidence, (4) Interest, (5) Persistence, (6) Sense-Making, and (7) Answers. The question is in the form of a Likert scale whose values are from 1 to 5. The value of 1 means strongly disagree, 2 means disagree, 3 means neutral or uncertain, 4 means agree, and 5 means strongly agree. This research instrument underwent factor analysis and model confirmation to come up with the indicators mentioned above. Reliability and concurrent validity were used in this test. The result of the test determined the level of students' mathematical perception and the moderating effect of perception on problem-solving skills as they do mental mathematics.

The statistical tools used in analyzing the data were the Mean, Standard Deviation, Pearson r, and Analysis of Covariance. The Mean and Standard Deviation were used to measure students' problem-solving skills towards Mathematics before and after the experiment in terms of speed and accuracy and to measure the students' level of mathematical perception. The t-test for paired samples was used to determine the significant difference of the mean gain scores in the speed and accuracy of the students before and after introducing mental mathematics. The Pearson r was used to determine the degree of relationship between students' speed and students' accuracy in solving problems and the degree of relationship between students' percep-

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tion and accuracy. Analysis of Covariance (ANCOVA) was used to determine the significant effect of mental mathematics on students' problem-solving skills while controlling students' mathematical perception. The following tables below are used in interpreting the mean values of the variables:

Table I. The Interval Time and the Corresponding Qualitative Description

Interval Time (minutes)	Qualitative Description
0.00 – 12.00	Very Fast
12.01 – 24.00	Fast
24.01 – 36.00	Average
36.01 – 48.00	Slow
48.01 – 60.00	Very Slow

In constructing the interval time, the researcher divided the sixty (60) minutes into five (5) categories: very fast, fast, average, slow, and very slow, to give the qualitative description of students' speed in answering the problem.

Table II. Range of Mean Score of Students' Accuracy and the Corresponding Qualitative Description

Mean Score	Qualitative Description
12.01 – 15.00	Very High
9.01 – 12.00	High
6.01 – 9.00	Moderate
3.01 – 6.00	Low
0.00 – 3.00	Very Low

In constructing the range of mean scores of students' accuracy, the researcher divided the difference of the possible highest score which was fifteen (15), to the possible lowest score, which was zero (0), into five (5) categories, namely very high, high, moderate, low, and very low. The categories were used for the qualitative description of students' accuracy in answering the problem.

Table III. Range of Mean Score of Students' Mathematical Perception with Rounded Mean and the Corresponding Qualitative Description

Mean Score	Qualitative Description
4.21 – 5.00	Strongly Agree
3.41 – 4.20	Agree
2.61 – 3.40	Neutral/Uncertain
1.81 – 2.60	Disagree
1.00 – 1.80	Strongly Agree

The computed means were rounded off in analyzing the students' mathematical perception, as shown in Table 3.

RESULTS AND DISCUSSION

This section displays the analysis of the data gathered and was given significant interpretation. The following tables below answer the specific research questions of the study. Table 4 discusses the level of students' problem-solving skills towards Mathematics before the conduct of the experiment. Table 5 presents the level of students' problem solving skills towards Mathematics after the experiment. Table 6 shows the mean gain scores of the students' problem solving skills in terms of speed and accuracy. Table 7 shows the significant difference between the pretest and post-test scores of students' problem solving skills. Table 8 discusses the relationship between speed and accuracy. Table 9 presents the level of students' mathematical perception which is the covariate. Table 10 shows the relationship between students' mathematical perception and students' accuracy. Table 11 dis-

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discusses the significant difference between pretest and post-test while controlling the effect of mathematics perception.

Table IV. The Pretest Scores of Students' Problem Solving Skills

Problem Solving Skills	Sample	Mean	Standard Deviation	Qualitative Description
Speed (min)	46	29.87	7.34	Average
Accuracy	46	4.26	2.17	Low

The pretest mean scores of students' problem-solving skills in terms of speed and accuracy are shown in Table 4. With a sample of 46 students, the students' speed in solving problems before the experiment was 29.87 minutes with a standard deviation of 7.34 minutes. The mean indicates the "average" level based on the interpretations found in Table 1, while most of them finished the task at a range of 29.87 ± 7.34 minutes. The students' accuracy before the experiment was 4.26, with a standard deviation of 2.17. The mean indicates "low," as based on the interpretations found in table 2, and most of the students' scores range from 4.26 ± 2.17. The result implies that students had a weak ability to do mental mathematics at the beginning of the experiment. They answered the test based on their mathematical understanding. The result implies that students were not yet exposed to mental math activities and had no idea how to solve problems mentally. This result was similar to the study conducted by Quirk (2013). He mentioned that students exposed to the traditional way of solving problems have difficulty adopting new ways since they have been used to solving it with an algorithm.

Table V. The Post-Test Means Scores of Students' Problem Solving

Problem Solving Skills	Sample Size	Mean	Standard Deviation	Qualitative Description
Speed (min)	46	24.65	4.91	Average
Accuracy	46	10.52	3.07	High

The post-test means scores of students' problem-solving skills in terms of speed and accuracy are shown in Table 5. With a sample of 46 students, the post-test mean score of students' speed was 24.65 minutes with a standard deviation of 4.91 minutes. The mean indicates the "average" level based on the interpretations found in Table 1, while most of them finished the task at a range of 24.65 ± 4.91 minutes. The post-test mean score of students' accuracy was 10.52 with a standard deviation of 3.07. The mean indicates "high," as based on the interpretations found in table 2, and most of the students' scores range from 10.52 ± 3.07. The result implies that students had improved their skills in solving problems in terms of speed and accuracy after introducing mental mathematics. At this point, students already knew how to solve mathematics problems mentally. This result agreed with Barham (2010) who claimed that mental mathematics enhances students' mental ability. Learning different techniques in mental calculation helps them do mathematics quickly.

Table VI. The Mean Gain Scores of Students' Problem Solving SkillsS-

Problem Solving Skills	Pretest Mean Score	Posttest Mean Score	Gained Score
Speed (min)	29.87	24.65	- 5.22
Accuracy	4. 26	10.52	6.26

The mean gained scores of the students' problem-solving skills in terms of speed and accuracy are shown in Table 4. The pretest mean speed of the students in solving problems was 29.87 minutes, while 24.65 minutes was the post-test mean speed. Since students' speed on the post-test was less than their speed on the pretest, they spent less time solving the

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post-test problems than the pretest. Though these results fell on the same level of students' speed, which was average, the mean gained score was – 5.22 minutes, which indicates that students solved the problems quicker or faster in the post-test compared to the pretest. The negative mean gained score implies an increase in students' speed. As the students' time spent solving a problem decreases, their speed increases.

On the other hand, the pretest mean score of the students in terms of accuracy in solving problems was 4.26, while 10.52 was the post-test mean score. Since the post-test result of students' accuracy was greater than the pretest with a positive mean score of 6.26, it indicates an improved level of accuracy. Furthermore, these results on students' speed and accuracy indicate that mental mathematics enhanced the students' problem-solving skills. This is further proven with the data that students had better post-test results than pretest when it comes to the speed and accuracy in solving problems.

Table VII. Difference Between Pretest and Post-Test Results on Students' Problem Solving Skills

Problem Solving Skills	Mean Difference	t	Sig. (2-tailed)	Interpretation
Speed	5.22	5.10	0.00	Difference is significant
Accuracy	- 6.26	- 15.61	0.00	Difference is significant

Table 7 shows the difference between pretest and post-test results on students' problem-solving skills in terms of speed and accuracy. The p-values, denoted by Sig. (2-tailed) in Table 4 are all 0.00, and both are less than, which implies a significant difference in students' speed and students' accuracy in pretest and post-test; hence, the null hypotheses were rejected. The significant difference observed in students' speed and students' accuracy in pretest and post-test is enough to tell that mental math activities can improve students' skills in problem-solving in terms of speed and accuracy. The result of the study agrees with Pourdavood, McCarthy, & McCafferty (2020), who affirmed that mental mathematics develops the students' ability to make sense of numbers allowing them to perform a quick calculation.

Table VIII. The Relationship Between Students' Speed and Students' Accuracy

	Samples	Pearson r	Sig. (2 –tailed)	Interpretation
Speed and Accuracy	46	0.21	0.17	No significant correlation

As shown in Table 8, the correlation coefficient denoted by r is 0.21 with $p > 0.05$, indicating no significant relationship exists between students' speed and accuracy; hence, the null hypothesis was accepted. The result implies no substantial evidence to prove the relationship between the students' time spent answering mathematics problems and the number of correct answers obtained from the test.

Table IX. The Level of Students' Mathematical Perception

Categories	Sample	Mean	Standard Deviation	Qualitative Description
Growth Mindset	46	3.51	1.14	Agree
Real Word	46	3.89	0.86	Agree
Confidence	46	3.49	0.95	Agree
Interest	46	3.03	1.23	Neutral/Uncertain
Persistence	46	3.29	1.04	Neutral/Uncertain
Sense Making	46	3.03	1.13	Neutral/Uncertain
Answer Related	46	3.20	1.07	Neutral/Uncertain
Students' Mathematical Perception	**46**	**3.35**	**1.09**	**Neutral/Uncertain**

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According to Code et al. (2016), there were seven indicators to measure the students' mathematical perception. These are Growth Mindset, Real World, Confidence, Interest, Persistence, Sense-Making, and Answer. Out of these seven indicators used to measure students' perception, the result of this study revealed that four categories showed a qualitative description of "neutral" or "uncertain." In contrast, the remaining three categories had an "agree" description.

In the growth mindset category, the students got a mean score of 3.51 (SD = 1.14), indicating "agree." Students agreed that Mathematics develops one's ability to understand the concept if there is the willingness to work on it.

In the Real-World category, the students got a mean score of 3.89 (SD = 0.86), indicating "agree." Students agreed that learning mathematics is not about memorizing how the solution was presented but contextualizing the problems to see the connections of the mathematical concepts to the real-world application.

In the Confidence category, the students got a mean score of 3.49 (SD = 0.95), which indicates "agree". Meaning the students agreed that every time the teacher gave them a math problem, they can usually figure out an easy way to solve mathematics problems.

In the Interest category, the students got a mean score of 3.03 (SD = 1.23), which indicates "neutral" or "uncertain." That is, students were not sure of their level of interest in mathematics. They cannot precisely determine whether they enjoy answering a problem-solving question or learn mathematics because they are required to do so.

In the Persistence category, the students got a mean score of 3.29 (SD = 1.04), which indicates "neutral" or "uncertain." They were unsure of what to do when they feel stuck on a complex math problem if they would give up easily or call someone to help them solve the problem.

In the Sense-Making category, the students got a mean score of 3.03 (SD = 1.13), which indicates "neutral" or "uncertain." They were uncertain about what to do if there was a math problem. They will use a formula even if they do not know its purpose or try to make sense of the numbers first before applying any mathematical formula.

Lastly, in the Answer Related category, the students' mean score was 3.20 (SD = 1.07), which falls under "neutral." The students were uncertain whether solving mathematical problems has many possible solutions or offers only one particular solution. They were also unsure of the process of learning mathematics, whether they have to memorize the step-by-step solution of a sample problem presented in their textbook or understand only the process of getting the solution to the problem.

Furthermore, the overall level of students' mathematical perception was 3.35, which indicates "neu-

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tral." This means that students were uncertain about their views or perception of mathematics. They did not agree nor disagree with the statement that measures perception in this study.

Table X. The Relationship Between Students' Accuracy and Students' Mathematical Perception

	Samples	Pearson r	Sig. (2 –tailed)	Interpretation
Students' Mathematical Perception and Students' Accuracy	46	0.65	0.00	Correlation is significant

As shown in Table 10, the coefficient correlation denoted by r is 0.65 with $p < 0.05$, which indicates that students' mathematical perception is positively related to students' accuracy. It implies that a student with a higher score on a math test had higher math perception too, and a student with a lower math score had lower math perception. This result agrees with Mutodi & Ngirande (2014), who claimed students with good mathematics perception feel confident and motivated to achieve good performance in mathematics.

Table XI. Difference on Pretest and Post-Test Results while Controlling the Effect of Students' Mathematical Perception

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	238.926[a]	8	29.866	5.988	.000*
Intercept	216.297	1	216.297	43.364	.000*
Perception	81.164	1	81.164	16.272	.000*
Pretest	62.203	7	8.886	1.782	.120
Error	184.553	37	4.988		
Total	5516.000	46			
Corrected Total	423.478	45			

The Analysis of Covariance (ANCOVA) was used to determine the significant difference between the pretest and post-test results on students' accuracy while controlling the effect of perception. In Table 11, the p – value denoted by Sig (2 –tailed) was 0.12, which was greater than that. Since there is no significant difference in pretest and post-test results on students' accuracy after eliminating the effect of perception, the change in the scores of the students in the pre-and post-test cannot be attributed to the effectiveness of mental computation. It is also shown in Table 11 that perception was a significant covariate, $p < 0.05$ which means that the perception had a moderating effect on students' accuracy as they do mental mathematics. Removing the effect of perception weakened the effect of mental mathematics on students' accuracy.

Concerning mathematics teaching, the result of this study implies that mental mathematics improved students' problem-solving skills. The use of mental mathematics enhanced students' speed and accuracy in solving problems. Using mental mathematics to solve problems, students realized the relationship between numbers which developed their critical thinking and created their methods for dealing with math problems. Students became less dependent on technology through mental mathematics, and their new ways of computing increased their confidence in their mathematical ability.

Based on the results of this study, students' perception had a significant relationship with students' accuracy, and it was also a significant covariate on students' problem-solving skills as they do mental mathematics. It implies that students' perception of the subject has a moderating effect on their math

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performance. Thus, there is a need for math teachers to transform students' negative perceptions of mathematics. Teachers can prepare some activities, like mental mathematics activities, to stimulate students' attention and motivate them to study the subject.

CONCLUSION AND RECOMMENDATIONS

Based on the study results, there was a significant difference between the pretest and post-test scores of the students without considering their perception of mathematics. It means that the use of mental mathematics was effective in students' problem-solving skills. However, when mathematical perception was considered a covariate, it showed no significant difference in pretest and post-test scores. It means that the difference in the scores cannot be attributed to the effectiveness of mental mathematics. Hence, removing the effect of the perception will weaken the effect of mental mathematics on students' accuracy.

Based on the results, the researcher suggests the following:

1. Teachers may use mental mathematics as a technique to solve math problems. Through it, students may be encouraged to adopt mental calculations that will help them solve math problems mentally, efficiently, and accurately.
2. Mathematics teachers may incorporate the use of mental mathematics in their lesson planning. Exposing the students to mental calculations helps to improve students' ways of solving any mathematical problems.
3. Mathematics teachers might also focus on improving students' mathematical perception in Mathematics. By conducting a research study that addresses students' learning needs, appropriate teaching strategies can change students' behavior or perception towards Mathematics.
4. School Principals and Curriculum developers may conduct a study about mental mathematics for elementary and high school students to see if their use of mental mathematics will be effective in their problem-solving skills.
5. School Heads or Academic Program Heads may organize a seminar workshop for the faculty to enhance their skills in teaching math with the integration of mental mathematics so they can also be adept at training the students in mental calculation.
6. For future researchers, they may consider dividing the participants into two groups. In one group, the experimental group, the participants are exposed to Mental Mathematics, and the other group is the controlled group whose participants are not exposed to mental mathematics.
7. Future researchers may include other factors or variables that could strengthen or weaken the effect of mental mathematics on students' problem-solving skills.

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