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Intrinsic Motivation as Predictor of Students' Mathematics Problem-Solving Performance

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Abstract— Students' strategies and motivation play major roles in solving word problems in Mathematics. This study explored the students' problem-solving strategies and intrinsic motivation in relation to performance in Mathematics. This study used a descriptive – correlational design. The respondents were the 125 students chosen through convenient sampling. Problem Solving Strategies, Intrinsic Motivation Inventory, and Word Problem Test were the research instruments used in the study. This study used Mean, Standard Deviation, Pearson Product-Moment Correlation Coefficient, and Stepwise Regression Analysis were the statistical tools in treating the data gathered. Results revealed that students had good problem-solving strategies, high intrinsic motivation, and very low performance in Mathematics. The students' strategies to solve word problems and motivation as interest, effort, and value contributed to the students' performance in Mathematics. The level of the students' intrinsic motivation was a predictor of students' performance in Mathematics. Teachers have to conduct drills and interactive activities using positive reinforcement to students' interest and effort in their activities.

Keywords— difficulties, interactive activities, motivation, problem solving, reinforcement.

I. INTRODUCTION

Mathematics is a significant subject and is known to be mind strainer and laborious. Teachers want to help their students develop a deep conceptual understanding of mathematical concepts and a positive intrinsic motivation. Hence, understanding and teaching Mathematics should be approached as a problem-solving domain. Problem-solving is often challenging for students because they do not understand the solving process (Yu, Fan & Lin, 2015).

Solving a Mathematical problem is very complex because it involves a multi-step process and involves understanding and mastering more complex strategies such as the ability to plan, monitor, and evaluate (Abdullah, Halim, & Zakaria, 2014). Thus, Mathematical problem solving is one of the most central aspects of Mathematics (Sepeng & Madzorera, 2014). The skill of problem-solving is a primary point needed by students to realize the importance of mathematics daily (Rahman & Ahmar, 2016).

The process of interpreting a problem and determining what operations must be performed tends to be the most difficult aspect of solving Mathematical word problems. (Sepeng & Madzorera, 2014). Mathematical word problems are the most common form of Mathematics problem solving implemented in K to 12 schools. Identifying keywords is a frequent strategy taught in classrooms in which students struggle with problem solving and show low success rates in Mathematics (Flores, Hinton & Burton, 2016).

Not only should students have the requisite Mathematical knowledge and a good range of different problem-solving strategies, but they should also know when and how to ue those strategies, and track and control their problem-solving processes using their metacognitive abilities (Erbas & Okur, 2012). However, for students with Mathematics difficulties, problem-solving is especially challenging (Morin et al., 2017; Ting, 2017).

Discovery-based learning is an educational technique found to be beneficial for students. It is an instructional technique based on students to engage students in problem-solving and self-directed learning. It is done when authentic, challenging, and ill-structured problems are given to students (Bergstorm et al., 2016). These are considered the most effective strategy that impacts students' performance in Mathematics (Taghipour et al., 2017).

Mathematical understandings of various big ideas are important ideas that students need to learn because they contribute to understanding the bigger picture of Mathematics (Maoto, Masha, & Maphutha, 2016). Learners construct knowledge as they become actively engaged in their learning for improvement and contribute a positive social change by promoting positive attitudes toward Mathematics, thus maximizing their overall success in Mathematics (Samuel, 2014).

A study revealed significant correlations between self-esteem, motivation, and achievement. Using regression analysis, in fourth graders' general self-esteem, in fifth graders academic self-esteem, in sixth and seventh graders intrinsic motivations, and in eighth-graders, Topçu & Leana-Taşcılar (2018) found the extrinsic motivation to predict academic achievement.

Intrinsic motivation is described as actions motivated by internal rewards. This means the motivation to engage in a behavior arises from within the individual because it is naturally satisfying to do. Academic intrinsic motivation is defined as enjoyment of school learning characterized by an orientation toward mastery, curiosity, persistence, task endogeny, and the learning of challenging, difficult, and long tasks (Gottfried,1985). Many students find Mathematics difficult, but those who are intrinsically motivated learn and do well even when facing obstacles (Heyder et al., 2020).

In the study in Bethesda, United States, intrinsic motivation is correlated to female students' problem-solving skills only (Cortright, 2015). In India, hierarchical multiple regression analyses revealed the positive predictive effects of intrinsic motivation on academic achievement for both the Indian immigrant and Indian students (Areepattamannil, 2011). In Brunie Darussalam, if students' analytical comprehension is weak, to begin with, the problem-solving approach would not improve much during the exercise. It allowed students to have a strong grasp of conceptual information in advance to use a plan in solving the problem (Kani & Shahrill, 2015). Nevertheless, Thailand's "reflection" in teaching Mathematics in the classroom encourages students to learn mathematics independently (Sangpom et al., 2016). Background-based Mathematics tasks in Indonesia have shown a consistent result that low-performance students have made more mathematical resolution errors than high-performance students (Wijaya et al., 2001).

In a study conducted in Manila, the Philippines, 40 percent of respondents were below satisfactory problems (Cruz & Lapinid, 2014). In the first year, Galia (2015) found out that poor academic history exists in academic subjects, especially in Mathematics in the MSU-General Santos City study. The research on "Factors Affecting Underachievement in Mathematics" showed a significant relationship between academic performance in Mathematics and student influences. It concluded that research practices, behaviors and motivation in Mathematics and time management directly impact performance in Mathematics (Suan, 2014).

The study "Students' Difficulties in Translating Worded Problems into Mathematical Symbols" conducted in a private sectarian school in Manila revealed that 40 percent of the respondents were below satisfactory worded problems (Cruz & Lapinid, 2014). Poor academic background caused the first-year students to have difficulty learning academic subjects, particularly in Mathematics, as revealed in the study conducted in MSU-General Santos City (Galia, 2015).

Many studies mentioned the difficulties encountered by students in solving word problems in Mathematics. Still, few studies related the students' strategies and motivation style to their mathematics performance, specifically in problem-solving. At Misamis University, it has been observed that the students seem to lack strategies and inner motivation in solving word problems to arrive at the correct answers. They found the subject to be difficult and laborious. Some students do not participate in solving Mathematics problems which resulted in a very low grade. They become less involved in the activities given to them. These observations guided the researcher to conduct the study.

Mathematical problem solving is defined as any target-directed cognitive activity sequence (Robertson, 2016), which does not have a clear method of solution (Chapman, 2015) and involves multiple processes (Fernandez et al., 2015). Problem-solving has been seen as a key aspect of Mathematics, Mathematics teaching, and Mathematics learning. It has saturated Mathematics curricula worldwide with calls for problem-solving education and training in Mathematics (Liljedahl et al., 2016). One of the goals of Mathematics is that students should solve problems, including seeing the problem and creating a Mathematical model (Akhadya & Wijaya, 2017).

Mathematics comprehension is often related to the use of one's problem-solving skills. Although good conceptual understanding is important in assessing Mathematics, students also need to solve problems

(Kani & Shahrill, 2015) effectively. Mathematics is, by nature, full of abstract representations. This is a hierarchical system of concepts, expertise, and facts (Sarwadi & Shahrill, 2014). One study result showed that learning through problem-solving strategy was more effective than the scientific approach to students' mathematical abilities in communication, creativity, problem-solving, and mathematical reasoning (Tambunan, 2019).

Problem-solving in Mathematics is a complex network of interdependent skills (Chapman 2015). Problem-solving has been a central theme in education for several decades (Bahar & Creator, 2015). Also, the use of purposeful Mathematical practice preparation has affected the perceived effectiveness of teaching Mathematics through problem-solving, including the need to match the content of the Mathematics method Ccourses with the professional development opportunities offered to teachers (Baker, 2014).

Problem-solving can be described as a challenge that needs to be overcome or a newly encountered and complicated issue requiring a mental focus that a person cannot foresee how to find a solution to it at first (Arikan, 2016). When it comes to solving Mathematics problems, students are suffering in primary grades in particular. Students struggle with difficulties because they have trouble creating correct schema or problem representations that allow them to recognize the necessary solutions to solve problems effectively (Ayllon, Gomez, & Ballesta-Claver, 2016; Schoenfield & Sloane, 2016). Problem-solving skills are the primary point that students need to be successful. Thus, they need strategies and techniques to solve these problems.

Problem-solving strategies help the students improve their achievement in problem-solving skills (Knox, 2017) and allow teachers to help students build the foundations in the education and become efficient learners (Echazarra et al., 2016). However, for students with Mathematics difficulties, problem-solving is especially challenging (Morin et al., 2017; Ting, 2017).

Mathematical understanding of various big ideas is important that students need to learn because they contribute to understanding the bigger picture of the subject (Maoto, Masha, & Maphutha, 2016). Learners construct knowledge as they become actively engaged in their learning for improvement and contribute a positive social change by promoting positive attitudes toward Mathematics, thus maximizing their overall success in Mathematics (Samuel, 2014).

Study findings indicate that content, accessibility, and interactivity significantly impact student motivation to learn (Deshpande & Chukhlomin, (2017). Engagement due to an activity's enjoyment is often called intrinsic motivation (Rheinberg & Engeser, (2018). Findings showed significant correlations between self-esteem, motivation, and achievement. Using regression analysis, in fourth graders' general self-esteem, in fifth grader's academic self-esteem, in sixth and seventh graders' intrinsic motivations and eighth-graders, extrinsic motivation predicted academic achievement (Topçu & Leana-Taşcılar, 2018).

Intrinsic motivation refers to the behavior that is driven by internal rewards. Since it is inherently rewarding, an individual's motivation to participate in activity comes from within. Academic intrinsic motivation (AIM) is the enjoyment of attending education and the success of tasks for their own sake, in which the task itself is rooted in pleasure. It is characterized by an inclination towards mastery, curiosity, persistence, task endogenship, and the learning of demanding, complicated, novel task (Gotfield, 2019). From childhood through adolescence, those with higher academic intrinsic motivation are more competent in school, generally evidencing significantly greater academic achievement, more positive perceptions of their academic competency, lower academic anxiety, and less extrinsic motivation (Fan & Williams, 2018).

Students' problem-solving performance is not simply the product of what the students know; it is also a function of their perceptions of that knowledge, derived from their experiences with Mathematics. Teaching problem solving is equivalent to providing set of perceptions for students' productive behavior. Thus, students are to be taught word problems well (Schoenfeld, 2014).

Low-performing students may already be stuck in the early stages of the modeling process. They cannot arrive at the Mathematical method of solving a context-based problem (Wijaya, Doorman, & Robitzsch, 2014). Yet, students who worked examples had fewer errors and had a higher cognitive load (Rao, 2017). Thus, students planning to teach intervention often participated in more metacognitive learning techniques and had higher problem-solving mathematics levels than students in management (Muis, Chevrier, & Lajoie, 2016).

Analytical results revealed that students exposed to the mathematical communication approach have significantly higher performance, conceptual understanding, and significantly reduced anxiety than the Dynamic Learning Program (Lomibao, Luna, & Namoco, 2016).

II. METHODS

Research Design

The study used the descriptive – correlational design. A descriptive study's purpose is to identify a phenomenon and its characteristics. This study is more interested in what happened rather than how or why it happened. The data may be obtained qualitatively in such a study, but it is often analyzed quantitatively, using frequencies, percentages, averages, or other statistical analyses to determine relationships (Nassaji, 2015). On the other hand, correlational methods often rely on statistical control to rule out the effects of extraneous variables, provide more accurate estimates of relationships among variables, or produce conservative tests of hypotheses (Becker et al., 2016). This study's design was deemed appropriate for determining the students' problem-solving strategies and intrinsic motivation in relation to their mathematics success.

Research Setting

This study was conducted in the Junior High School Department of Misamis University, Ozamiz City. The academe is a privately owned, non-sectarian, non-profit educational institution founded by Dr. Hilarion Feliciano and Doña Maria Mercado Feliciano in 1929. Misamis University is the only autonomous university granted by the Commission on Higher Education (CHED) in Northwestern Mindanao, an ISO 9001:2015 Management System Certified granted by Det Norske Veritas-Germanischer Lloyd Business Assurance.

Respondents of the Study

This study's respondents were 125 Grade 10 students of the Junior High School Department of Misamis University. Convenience sampling was utilized in selecting the respondents.

Instruments

This study used the following research instruments:

A. Problem Solvin Strategies Questionnaire. It is a modified and adopted questionnaire by (Markland 1997), which was used in determining the students' strategies in solving word problems in Mathematics. It has a four-point Likert scale, with four being the highest and one being the lowest. The questionnaire consists of fourteen statements with four constructs, namely: (a) conceptual understanding with three items; (b) procedural knowledge with four items; (c) problem-solving skill with three items; and (d) communication with four items. The experts validated the contents of the questionnaire. A pilot test was conducted using students not included as actual respondents. The test yielded Cronbach's alpha coefficient of 0.87.

B. Intrinsic Motivation Inventory. It is an adopted research instrument from (Carbonell 2017). It consists of twenty-four statements used to determine the students' intrinsic motivation (Appendix B). It has four constructs, including interests or enjoyment with seven items, effort with four items, pressure and tension with three items, choice with five items, and value/ usefulness with five items. It has been faced and content validated by five experts in the Mathematics department of Misamis University.

C. Word Problem Test. This is a researcher-made problem-solving test that was used in determining the performance of the respondents in Mathematics. The test comprises three main topics for the third quarter: permutations, combinations, and probability. The word problem test was composed of 6-word problems with 30 points, as indicated in the Table of Specifications (Appendix C). The test underwent content validation through the research adviser and other Mathematics teachers. After the validation process, the instrument was subjected to a pilot test using students not included as the study's actual respondents. The research instrument yielded a Cronbach's alpha of 0.92. Hence, the test was considered valid and reliable for administration to the respondents.

Data Collection

In gathering the data, the researcher sought permission from the Dean of the Graduate School of Misamis University to conduct the study. After the researchers obtained the approval, the researcher asked permission from the vice president of the Academic Affairs (VPAA) for the study's conduct to the selected respondents and explained the importance of the study. The researcher in the school premises personally conducted the data gathering. This is to ensure complete cooperation from them and easier access for the retrieval of the data. Data tallying, presentation and interpretation followed.

Ethical Considerations

Bryman and Bell (2007) complied with the ten principles on ethical considerations within this study. The research respondents were not subjected to harm in any way. Full consent from the respondents was observed in the study. The researchers ensured the privacy of research respondents, an adequate level of confidentiality of the research data, and anonymity of the individuals participating in the research. The respondents have explained the aims and objectives of the research. Lastly, any communication concerning the study was made with honesty and transparency, and any misleading information and the presentation of the primary data findings in an unfair way were avoided.

Data Analysis

The following statistical tools were used in treating the data gathered:

- Mean and Standard Deviation were used in determining the students' problem-solving strategies, intrinsic motivation, and performance in problem-solving in Mathematics.
- Pearson Product-Moment Correlation Coefficient was used in exploring the significant relationship between the students' problem-solving strategies, intrinsic motivation, and performance in problem-solving in Mathematics.
- Stepwise Regression Analysis was used in identifying the independent variables predicting the students' performance in Mathematics.

III. RESULTS AND DISCUSSION

Students' Problem Solving Strategies

Table 1 shows that the students' problem-solving strategies perceived by the students themselves were good ((M = 2.58; SD = 0.60). However, the students perceived their communication in problem-solving as fair (M = 2.39; SD = 0.58). The findings mean that the students were good in conceptual understanding of the problem, procedural knowledge, and problem-solving skills, but fair in representing and solving the problem's unknown. The interpretation of the respondents resulted in fair means that the students use problem-solving strategies rarely. Overall, the students perceived their strategies in solving as good. This calls for teachers to help students identify strategies suitable to them to have very good problem-solving strategies.

Students often used diagrams and symbols in understanding the problem. They also use the step-by-step process and look for possible ways to solve the word problems. However, sometimes they feel difficulty in understanding the problem like the Mathematics vocabulary or terminologies. There is no chance of being able to solve a problem unless one can understand the term used. This process requires knowing what one has to find and the key pieces of information that need to be put together to obtain the answer (Siniguian, 2017).

Solving a Mathematical problem is very complex because it involves a multi-step process in understanding and mastering more complex strategies, such as planning, monitoring, and evaluating (Abdullah, Halim, & Zakaria, 2014). The skill of problem-solving is a primary point needed by students to realize the importance of mathematics daily (Rahman & Ahmar, 2016). The process of interpreting a problem and determining what operations must be performed tends to be the most difficult aspect of solving Mathematical word problems. Thus, problem-solving is one of the most central aspects of Mathematics (Sepeng & Madzorera, 2014). Teachers have to consider the unique styles of learning and the strategies they use in solving word problems. They have also to make sure that students have understood the word problem to overcome the difficulties. Enhancement of Mathematics vocabulary can facilitate in solving. Thus, teachers have to start their lessons by unlocking first of the difficulties or having vocabulary enhancement.

Table 1: *Students' Problem Solving Strategies (n =125)*

Constructs	M	SD
1. Conceptual Understanding of the Problem	2.67	0.66
2. Procedural knowledge	2.72	0.60
3. Problem Solving Skill	2.51	0.57
4. Communication	2.39	0.58
Overall Strategies	2.58	0.60

Note: Scale: 3.25-4.0 (Very Good); 2.50-3.24 (Good); 1.75-2.49 (Fair); 1.-1.740(Poor)

The Level of Students' Intrinsic Motivation

Table 2 shows that the level of intrinsic motivation was high (M = 2.55; SD = 0.57). However, they had low level of motivation in the interest/ enjoyment (M = 2.40; SD 0.37); and pressure and tension (M = 1.98; SD = 0.71). They were not intrinsically motivated to solve word problems. They did not feel enjoyment in class. They felt the pressure, and they experienced tension in Mathematics, especially when solving word problems.

The data imply that students highly seek out and engage in activities that they find challenging, interesting, and internally rewarding without the prospect of any external reward. However, the respondents found problem-solving as not so interesting activity in Mathematics. They were pressured and tense in doing the activity, especially when it involved careful analysis.

Students had less interest in solving Mathematics since, most of the time, they solved the problem.

Students who are intrinsically motivated are curious and focused on the task (Topçu & Leana-Taşcılar, 2018). The students' interest, effort, pressure and tension, choice, value, and usefulness were factors that need to be considered in measuring the students' intrinsic motivation as these measured the level of the students' intrinsic motivation in learning.

Mathematics teachers have to design activities that arouse the students' interest in solving problems since this was rated low in the study. Additionally, teachers have to use varied teaching strategies to feel not the pressure but the joy or fun present in the lesson. Thus, teaching interactive teaching strategies and games can help the learners become interested in the subject.

Table 2: *Level of Students' Intrinsic Motivation (n=125)*

Constructs	M	SD	Interpretation
1. Interest/enjoyment	2.40	0.37	Low
2. Effort	2.97	0.66	High
3. Pressure & Tension	1.98	0.71	Low
4. Choice	2.64	0.43	High
5. Value/Usefulness	2.78	0.66	High
Overall Motivation	2.55	0.57	High

Note: Scale: 3.25-4.0 (Very High); 2.50-3.24 (High); 1.75-2.49 (Low); 1.-1.740(Very Low)

Students' Performance in Mathematics

Table 3 shows the students' performance in problem-solving described as very poor as it does not meet the subject's expectations (M = 11.47; SD = 4.48). This finding implies that students have inadequate knowledge about specific topics in their third-quarter topics like problem-solving activities, namely: permutation, combination, and probability. Teachers have to look into the factors contributory to the factors affecting it.

Students found difficulty in solving word problems related to permutation, combination, and probability. Generally, they were confused about permutation and combination. The steps they used or the formula they followed were interchanged. However, in the probability, the respondents found it hard to identify the probable number of outcomes and the total number of outcomes per occurrence. Hence, teachers need to scaffold the students in those areas.

A study showed that students had difficulties in solving problems was comprehension (Hadi et al., 2018). The lack of students' understanding of the problem and their poor Mathematical skills constitute the major obstacles in the circle of difficulties that students experience in solving problems (Ogunleye, 2009). They experience semantic interference when changing word problems to Mathematical models and when interpreting the answers obtained. Students also experience procedural interference when choosing strategies to solve problems, resulting in incorrect answers (Irfan et al., 2018).

Teachers have to identify first the factors that caused them to have low performance in the tests. After which, interventions have to be made, making sure that the learners are helped attain outstanding performance. Factors like strategies in solving word problems, learning styles and multiple intelligences, family background and interest, or even vocabulary and reading comprehension have to be considered by teachers.

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Table 3: *Students' Performance in Mathematics (n = 125)*

Performance	Frequency	Percentage
Outstanding	5	2.40
Very satisfactory	4	3.20
Satisfactory	8	6.40
Fairly satisfactory	17	13.60
Did not meet expectations	93	74.40
Overall Performance 11.47- Did not Meet Expectations		

Significant Relationship between the Students' Problem-Solving

- ***Strategies and Performance in Mathematics***

In determining the significant relationship between the students' perceived problem-solving strategies and performance in Mathematics, the Pearson Product Moment Correlation was used (Table 4). The data revealed that procedural knowledge (t = 0.26; p = 0.00) and communication (t = 0.27; p = 0.00) greatly related to the pupils' problem solving performance; while conceptual understanding (t= 0.19; p = 0.03) and problem solving skill (t= 0.20; p = 0.03) had significant relationship to their performance. This means that all the constructs affected the students' problem-solving performance in Mathematics.

The finding implies that when students apply steps or strategies in solving a word problem, and when they know the flow of the steps to be carried out, their performance greatly increases. Additionally, when the students understand the facts and the unknown and show a clear and organized solution, they also have high performance. The problem-solving ability of the students is dependent on the strategies they employ in solving problems.

Metacognitive strategies and automated processes that learners use to control their actions, reason, and reflect, are some of the main resources that influence their success in solving a Mathematics word problem (Vula, Avdyli, Berisha, Saqipi, & Elezi, 2017). Strategies help the students improve their achievement in problem-solving skills (Knox, 2017) and allow teachers to help students build the foundations in the education and become efficient learners (Echazarra et al., 2016). However, for students with Mathematics difficulties, problem-solving is especially challenging since strategies are not properly identified (Morin et al., 2017).

Teachers have to encourage students to apply metacognition in solving word problems. Students need to use their style of solving to discover the correct answers. Students should be guided through scaffolding on how they can solve and represent their understanding in a concrete way. Also, students need to evaluate if their strategies are effective or not to ensure success in the lesson. If the strategies used are not effective for them, then modification and enhancement be done to ensure their effectiveness in solving word problems.

Table 4: *Significant Relationship between the Students' Problem Solving Strategies and Performance in Mathematics*

Variables	r-value	p-value
1. Conceptual Understanding of the Problem & Performance	0.19*	0.03
2. Procedural knowledge & Performance	0.26**	0.00
3. Problem Solving Skill & Performance	0.20*	0.03
4. Communication & Performance	0.27**	0.00

Note: * means p-value ≤ 0.05; significant at 5% level

Significant Relationship between the Level of Students' Intrinsic

- ***Motivation and Performance in Mathematics***

Pearson Product Moment Correlation was used [n] to determine the significant relationship between the students' intrinsic motivation and mathematics performance (Table 5). The data revealed that among the five constructs, only pressure and tension (r-value = 0.06; p-value = 0.52) were not related to the students' performance in Mathematics. The remaining four constructs were related to the students' performance. These are interest/enjoyment and performance (r = 0.22, p = 0.01) ; effort and performance (r= 0.35 and p = 0.00) ; choice and performance (r =0.19 and p = 0.04) and value/usefulness and performance (r = 0.30 and p = 0.00).

The students' motivation for interest, effort, choice, and value greatly affected their mathematics problem-solving performance level. When the students perceive a high level of enjoyment, exert more effort, and believe that they choose to solve a word problem, their performance in solving word problems goes higher. The more the students are intrinsically motivated, the better is their performance in Mathematics.

Intrinsic motivation is the interest to do something for its own sake, for the sheer enjoyment of a task. It has been linked to the creativity of performance, longer-lasting learning, and perseverance. The fostering of intrinsic motivation is especially important (Hennessey, Moran, Altringer, & Amabile, 2015). Motivated students with a positive attitude in learning perform better and learn independently (Ariani, 2016). Students' motivation and engagements were significantly and positively related to perceived learning gains (Zilvinskis, Masseria, & Pike, 2017). The more the students engage in critical thinking, cooperative learning, and simulations, the more the students become motivated and the better is their performance (Riaz, 2015).

Before the teachers start the mathematics lesson, they have to begin by motivating them first, making sure that their interest is sustained throughout the lesson. Also, teachers need to use activities that ignite their interest in learning. The lesson's value or topic has to be integrated by teachers in teaching to develop the value of love of the subject. A welcoming personality of the teacher is encouraged so that students feel that they belong in the class. The adoption of interactive and collaborative teaching strategies is a great help to encourage students to engage in activities that are challenging, interesting, and rewarding internally without the prospect of internal rewards.

Table 5: *Significant Relationship between the Level of the Students' Intrinsic Motivation and Performance in Mathematics*

Variables	r-value	p-value
1. Interest/enjoyment & Performance	0.22	0.01**
2. Effort& Performance	0.35	0.00*
3. Pressure & Tension & Performance	0.06	0.52
4. Choice & Performance	0.19	0.04*
5. Value/Usefulness & Performance	0.30	0.00**

Note: * means p-value ≤ 0.05; significant at 5% level | **means p-value ≤ 0.01; highly significant at 1% level

Predictors of Students' Performance in Mathematics

Table 4 shows that only one variable was found a predictor of the pupils' problem-solving performance. The intrinsic motivation ($\beta = 5.27$; $t = 3.95$, $p=0.00$). The other variable or the perceived problem-solving strategies did not predict the pupils' performance in problem-solving. It means that the students' inner interest in Math is a prerequisite variable to the students' problem-solving performance in Math. When students are intrinsically motivated to solve word problems, their performance in problem-solving also becomes better. It is not the strategies used by students in solving Math that contribute to their performance in Math.

The regression equation (Problem-Solving Performance = 6.91 + 2.68 Intrinsic Motivation) indicates that when the pupils' intrinsic motivation increases by a unit, the pupils' performance also increases by 2.68. The variation of pupils' motivation is explained by intrinsic motivation for only 5.64 percent ($r2 = 5.64$). This means that only 5. 64 percent of the students' performance in Mathematics is attributed to intrinsic motivation, while the remaining 94.36 percent is attributed by other factors which are not included in the study. This might be why students' performance in Mathematics is very low since only 5.64 percent of the strategies and motivation predict the students' performance. Hence, another research that looks into the other factors that predict performance is essential.

Intrinsic motivation has been linked to the creativity of performance, longer-lasting learning, and perseverance. The fostering of intrinsic motivation in students is important in creating knowledge (Hennessey, Moran, Altringer, &Amabile, 2015). Motivated students perform better and learn independently (Ariani, 2016).

Teachers have to look for ways that make the learners engage in the lesson without prizes or rewards. This is done by teaching to their minds the value of the lesson in real life. This may be done by building a good psychological climate where students feel a sense of belonging and integrate the topic's value or usefulness. Allowing students to work by pair or group may also help them learn better as they do buddy learning and peer teaching.

***Table 6:** Predictors of Students' Performance in Mathematics*

Predictors	Coef (β)	SE Coef	t- value	p-value
A. (Constant)	0.15	3.45	0.04	0.96
1. Intrinsic Motivation	5.27	1.33	3.95**	0.00
R2 =5.64 % Dependent Variable: Performance in Mathematics				
Students' Performance in Mathematics = 6.91 + 2.68 Intrinsic Motivation				

Note: *means p-value ≤ 0.01; highly significant at 1% level

IV. CONCLUSION AND RECOMMENDATIONS

Students can conceptualize their ideas on how to solve problems. However, they have to enhance their skills in understanding the key ideas presented in the word problem. This ability to solve problems leads them to be intrinsically motivated to solve equations because they do not feel the pressure and tension.

Based on the study's findings and conclusions, it is recommended that teachers in Mathematics have to use interactive strategies like drills and cooperative learning that promote students' active participation and motivation to improve their problem-solving performance. The lesson's value or topic has to be integrated by teachers in teaching so that students develop a love for the subject. Teachers have to motivate the students to exert more effort in doing the activities and drills to improve their performance. Students have to participate and cooperate actively in the activities designed by the teachers. Further studies are conducted to look into the other factors that predict the students' performance in problem-solving.

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