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Translation-Based Instructional Material in Mathematics and Problem-Solving Abilities of Grade 5 Pupils

Myda Rose P. Ocampo[1], & Anna Liza P. Del Rosario[2*]
[1]Department of Education, Plaridel Elementary School, **Philippines**
[2]College of Teacher Education, Laguna State Polytechnic University, **Philippines**
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Abstract

Problem-solving skill refers to the ability to solve difficulties efficiently and without hindrances. It entails identifying and defining the problem, developing a strategy, creating different solutions, evaluating and selecting the best alternative, implementing the chosen solution, and re-checking the solution by reviewing the process. Learning how to translate situations, tables, graphs, and formulas (symbolic) is a big help in creating differentiated activities that will help students improve their problem-solving skills. To back up this claim, this study included the use of translation action in a prepared instructional material and evaluated its impact on increasing students' problem-solving abilities. During the academic year 2020-2021, thirty (30) Grade five students participated in the study, which used a one group pre-test and post-test research design to achieve the study's aims. The results revealed a substantial difference between the student-respondents' pre-test and post-test performance, implying that the translation activity aided students in improving their problem-solving abilities. This means that they were able to reach suitable mastery to mastery level of performance from the beginning to the end of the problem-solving process. In addition, in this time of pandemic, the usage of the designed instructional material encourages students to participate in more activities. Teachers should utilize the translation-based instructional material as an additional worksheet, according to the study, because it can assist students improve their mathematics skills and talents in answering word problems.

Keywords – Translation Action, Problem-Solving Abilities, Translation-Based Instructional Material, Situations, Table, Graph, Formula

1. Introduction

Problem-solving has been and will continue to be a valuable skill not only in mathematics, but also in everyday life. According to the National Council of Teachers of Mathematics (2011), one common difficulty in converting words into symbolic language is that people end up recalling items that are only consistent with their previous schemas. They also discovered that students' ability to convert sentences to symbols influences their problem-solving abilities.

The translation of word problems into mathematical equations is required for problem solving. Word issues are difficult for students to evaluate and interpret, especially in primary school. Students, particularly those in primary school, can easily implement a suggested technique; however, when knowledge is delivered orally, students must first understand it. Before putting it into a mathematical statement, you can interpret it to figure out what operation is involved. After you've completed the operation and obtained the correct result, the fourth step is to analyze the finished solution. Chapman (2015) defines problem solving as a practical skill. By observing and imitating the actions of others, students will learn how to solve problems. As we change our perspective on a situation, our perception of it changes. In their research on teaching thinking and problem solving, Chukwuyenum (2013) discovered that students' ability to distinguish words is critical to reading. Being able to see the problem may help you solve it successfully.

Today, translating presented difficulties is one of the most challenging duties for a student, especially at the primary level. It is seen as a significant impediment to mathematical learning. The act of translating words to symbols is one of the most fundamental aspects of word problem solving. Bardillion (2004) discovered that first-year high school students' problem-solving abilities and attitudes are linked based on his research on symbolic translation in students exposed to Filipino verbal translation.

Secretary Leonor Magtolis Briones and other Southeast Asian education ministers presented their varied education options in response to the COVID-19 global issue, remaining committed to their goal of ensuring that learning must continue (Bayod & Bayod, 2020). The method was employed this school year when the new coronavirus infection (Covid-19) pandemic temporarily prohibited face-to-face sessions. As a result of this condition, distance learning was also supported. This is a type of learning delivery in which learning occurs between a teacher and students who are geographically separated during the teaching process (Aliazas *et al.*, 2021). This modality is available in three forms: modular distance learning (MDL), online distance learning (ODL), and television/radio-based instruction. SDO Math Group created the SDO Laguna Mathanong Challenge in the midst of the global pandemic. It is a fun online Mathematics project for all public and private school students and teachers. It is a year-round activity with three seasons: two semestral and one summer (Tindowen *et al.*, 2019). Each season lasts 8 weeks, during which time the top five winners and perfect scorers are honored. At the end of each season, one champion from each category with the highest total score for the whole season will be declared. In response to the current call for a new normal set-up, the SDO Mathanong Challenge aims to engage students in fun-filled, creative, and challenging Mathematics activities in a different modality; to challenge and enrich teachers' and learners' mathematical skills, allowing them to develop their creativity and critical thinking skills as they learn more problem-solving techniques (Andrade & Pasia, 2020).

Furthermore, the DepEd Memorandum No. 001 series 2021, titled "Guidelines on the Evaluation of Self-Learning Modules for Quarter 3 and 4 of the School Year 2020-2021," is used as the criterion for the validation of the instructional material in terms of content, language, layout, and design (Diesta & Ferolino, 2021). The type of education delivered is reflected in the learning instruments used in schools. It is vital that learners and teachers have access to high-quality learning resources if quality education is to be provided. By adopting high-quality learning resources, teachers can better assist and lead students in mastering the skills, information, and experiences that will help them succeed in school and in life. The right of all citizens to a high-quality education is guaranteed under Article XIV Sections 1 and 2 of the 1987 Constitution. As a result, the state is responsible for ensuring outstanding education, just as it is responsible for providing quality learning materials to all instructors and students.

Objectives of the Study

This study aims to determine the relationship between the mathematical translation-based instructional materials in developing problem solving abilities. Specifically, it aims to answer the following questions:

2.1 How can the respondents' level of translation action be described in terms of:
   - 2.1.1 situations;
   - 2.1.2 table;
   - 2.1.3 graph; and
   - 2.1.4 formulae?

2.2 How can the expert respondents describe the evaluation of the developed instructional materials in terms of:
   - 2.2.1 content;
   - 2.2.2 language; and
   - 2.2.3 layout and design?

2.3 What is the student's respondents pretest and post test scores in problem solving abilities as to:
   - 2.3.1 identifying the problem;
   - 2.3.2 planning a strategy;
   - 2.3.3 solving the problem; and
   - 2.3.4 re-checking the solution?

2.4 Is there a significant relationship between translation actions and the problem-solving abilities?

2.5 Is there a significant difference between the pre-test and post-test scores in problem-solving abilities of the students' respondents?

2. Methodology

In this study, a one-group pretest-posttest design was used. It is a form of study methodology used by behavioral researchers to examine the effect of a treatment or intervention on a specific sample. Two characteristics distinguish this research design. This feature indicates that all participants are part of a single condition, which means they all receive the same treatments and assessments. The stratified purposive sample technique was used to select thirty (30) respondents from two parts of the grade five level of teaching at the aforementioned public elementary school in Nagcarlan District, Division of Laguna. Patton (Denieffe, 2020) defines a stratified purposive sample as a sample inside a sample and says that purposeful samples can be stratified or nested by selecting specific units or cases that vary according to a critical dimension. Suen & Ary (2014) states that stratified purposive sampling is commonly employed in qualitative studies. Researchers who employ this strategy carefully pick volunteers according on the study's aim, with the assumption that each participant will contribute unique and rich information that will be useful to the study. As a result, members of the available population cannot be interchanged, and sample size is determined by data saturation rather than statistical power analysis. The sample sizes in stratified deliberate sampling are likely to be too small for generalization, as opposed to stratified random sampling (Onwuegbuzie & Collins, 2007).

The researcher requested permission to conduct the study from the school head via an introductory letter from Laguna State Polytechnic University-San Pablo City Campus, as well as permission to manage the respondents' data. The letter described the goal and contents of the study while also ensuring the anonymity of their responders. When permission was obtained, the researcher administered the pre-test to the Plaridel Elementary School fifth graders. The researcher then created the instructional material, which was reviewed by five expert respondents, who were master teachers and teachers who were higher ranked than the researcher. In addition, the researcher continued with instructional delivery via Google Meet. She employed the generated instructional material, the topics of which were drawn from the Mathanong Challenge Season 1's least-answered competencies. At the investigating stage, where respondents had examples for each topic, translation actions were discovered. The procedure was explained at the next level, which was the explanation stage. In the meantime, the pretest was retrieved for verification. The researcher administered a posttest to the responders four weeks after the instruction was delivered. The posttest was retrieved, and the findings were counted, tallied, tabulated, evaluated, and interpreted.

For data analysis and interpretation, the following statistical tools were used in this investigation. The scores for basic problems 1 and 2 related to the degree of translating action and the level of problem-solving abilities of the fifth graders of the aforementioned public elementary school in Brgy. Banago, District of Nagcarlan in Laguna were determined using frequency and percentage. The mean and standard deviation were utilized to demonstrate the respondents' perceptions of the usage of mathematical translation-based instruction as to the situation, table, graphs, and formulae. It was also utilized to assess the created instructional materials based on expert respondents' perceptions. Pearson-Product Moment Correlation was used to determine whether or not there is a substantial relationship between the translation action and problem-solving. As the foundation for assessing the null hypothesis, the paired t-test method was used to detect the significant differences in the mean and gain pre-test and post-test scores in Mathematics.

3. Results and Discussions

Table 1: Mathematical Translation-Based Instruction as to Situation

Statement	Mean	SD	Interpretation
1. I can identify the given facts and clearly label the unknown.	3.40	0.50	Agree
2. I can translate the word problem into mathematical equation.	3.30	0.60	Agree
3. I can solve the equation easily.	3.33	0.66	Agree
4. I can better understand the problem when I translate from situations to mathematical equations.	3.33	0.61	Agree
Overall	3.34	0.46	Agree

Legend: 1.00-1.49 Strongly Disagree; 1.50-2.49 Disagree; 2.50- 3.49 Agree; 3.50- 4.00 Strongly Agree

Table 1 showed the mathematical translation-based instruction for the case, which had an overall mean of 3.34, SD 0.46, and was regarded as agree. Statement 1 was interpreted as agree since it had the highest mean of 3.40, SD 0.498, and was translated as I can recognize the presented facts and accurately label the unknown. Statement 2 said that I can translate the word problem into a mathematical equation and had the lowest mean of 3.30, SD 0.60, and was read as agree. It demonstrates that the respondents have the ability to identify the problem. Similarly, it implies that word problems can be transformed into mathematical concepts/expressions employing models through scenarios or verbal description.

A situation, according to De Corte *et al.* (2005), is a description of a problem scenario in which one or more questions are addressed and solutions can be found by applying mathematical operations to information (usually numerical data) in the text. He also proposed that, in its most basic form, a word problem explains the aspects of a scenario that the solver is assumed to be familiar with. The learner is required to offer a numerical response to a specified problem using only the quantities provided–as well as the mathematical relationships between these values.

Furthermore, the findings of this study were validated by Alex & Roberts (2019), who suggest a combined approach using circumstances or verbal representations to improve conceptual understanding in geometry. To replace the content vacuum left by student teachers, this must be complemented and supplemented by scaffolding. As a result, as seen by respondents, they can easily identify the problem in a given situation. And they quickly grasp the nature of the issue.

Table 2: Mathematical-Translation Based Instruction as to Table

Statement	Mean	SD	Interpretation
1. I can identify the given facts.	3.37	0.56	Agree
2. I can translate the facts into a table.	3.30	0.54	Agree
3. I can find a pattern and solve the problem.	3.23	0.63	Agree
4. I can better understand the problem when I translate from word problems to table.	3.17	0.59	Agree
Overall	3.30	0.39	Agree

Legend: 1.00-1.49 Strongly Disagree; 1.50-2.49 Disagree; 2.50- 3.49 Agree; 3.50- 4.00 Strongly Agre

Table 2 presented the respondents' perceptions of translation action, with an overall mean of 3.27, SD 0.39, and interpreted as agree. Statement 1 had the highest mean of 3.37, SD 0.56, and was regarded as agree, whereas Statement 2 had the lowest mean of 3.17, SD 0.59, and was interpreted as agree. Statement 4 stated that translating word problems to tables allows me to better understand the situation. This implies that they require additional activities and conversation in order to solve a word issue utilizing a table.

According to Gradshteyn & Ryzhik (2014), a table allows for the presentation of even vast amounts of data in an appealing, easy-to-read, and ordered format. The information is divided into rows and columns. Because data tables are simple to create and interpret, this is one of the most used kinds of data presentation. Furthermore, according to Kuzle (2013), the use of tables enables students to organize material logically and critically in order to uncover a pattern and design a solution. Similarly, there is data connected with a specific category, it may be simply structured by creating a table. This implies that the respondents can quickly identify the problem and create a table with the data.

Table 3. Mathematical-Translation Based Instruction as to Graph

Statement	Mean	SD	Interpretation
1. I can identify the given facts.	3.47	0.57	Agree
2. I can translate the given facts into graph.	3.27	0.64	Agree
3. I can interpret the graph to solve the problem.	3.13	0.63	Agree
4. I can better understand the problem when I translate from word problem to a graph.	3.33	0.55	Agree
Overall	3.30	0.46	Agree

Legend: 1.00-1.49 Strongly Disagree; 1.50-2.49 Disagree; 2.50- 3.49 Agree; 3.50- 4.00 Strongly Agree

Table 3 displayed the respondents' perceptions of translation action as a graph, with an overall mean of 3.30, SD 0.46, and interpreted as agree. Statement 3 had the lowest mean of 3.13, SD 0.63, and was evaluated as agree because it claimed that I can interpret the graph to solve the problem. In the meantime, Statement 1 (I can recognize the presented facts) got the greatest mean of 3.47, SD 0.57, and was evaluated as agree. It suggests that the respondents agreed that graphs may be used to translate the written problem into mathematical expressions or concepts, making the problem easier to understand. According to Janvier, as reported by Bossé *et al.* (2014), students were able to perform the process of translation from verbal representation to graph well at all stages of the translation.

Furthermore, this finding was reinforced by Shah *et al.* (2005) study, which stated that in order to interpret a graph or chart, read the title, look at the key, read the labels, and then analyze the graph to understand what it indicates. He also concludes that graphs help students organize and analyze data in a well-structured manner, making data interpretation easier. Similarly, Mueller *et al.* (2015) associates graphs with visual learners in particular, and they frequently aid in the comprehension of information better than pages of text. Respondents also believed that students may jump to interpretation without fully understanding the constraints, which is a drawback of graphs. Students who are unable to solve equations or draw graphs may use graphing calculators (Parrot & Leong, 2018).

Table 4. Mathematical-Translation Based Instruction as to Formulae

Statement	Mean	SD	Interpretation
1. I can analyze the problem and identify the given facts.	3.53	0.51	Strongly Agree
2. I can use symbols to translate the given facts into mathematical equation.	3.37	0.67	Agree
3. I can perform the appropriate formula to solve the problem.	3.30	0.60	Agree
4. I can better understand the problem when I translate from word problem using symbols and formula.	3.47	0.57	Agree
Overall	3.42	0.47	Agree

Legend: 1.00-1.49 Strongly Disagree; 1.50-2.49 Disagree; 2.50- 3.49 Agree; 3.50- 4.00 Strongly Agree

Table 4 indicated the respondents' perception of translation action according to formulae, with an overall mean of 3.42, SD 0.47, and interpreted as agree. Statement 1 had the greatest mean of 3.53, SD 0.50, and was evaluated as highly agree, whereas Statement 2 had the lowest mean of 3.30, SD 0.60, and was understood as agree. Statement 3 indicated that I can solve the problem using the suitable formula. This implies that utilizing a formula is a problem-solving method that may be used to challenges involving unit conversion or geometric object measurement. Real-world challenges involving formulas include tipping in a restaurant, determining the price of a sale item, and purchasing enough paint for a room.

Bardillion's (2004) research on the symbolic translation of pupils exposed to Filipino verbal translation is directly related to the problem-solving abilities and attitude of first-year high school students. One recurrent problem in translating utterances into symbolic language, according to Sweller (2011), is that individuals end up recalling items that are only consistent with their earlier schemas. It is apparent that the respondents have the ability to identify the problem and grasp it extremely well, which is one of the four abilities to solve a word problem. You must read the problem attentively in order to demonstrate understanding. Sounds straightforward enough, however some people jump the gun and try to solve the problem before reading the entire problem (Wickens & Carswell, 2021).

To summarize, perception of translation action is how you understand the process of converting a word problem into a mathematical equation, according to Koedinger & Nathan (2004). She also stated that it is the ability to recognize the problem, evaluate the supplied information, solve the equation, and then go back to see if the outcome is suitable. Furthermore, Bossé *et al.* (2014) observed that, while each translation operation from one representation to another is designated independently, it has been recognized that different translations necessitate a variety of proactive activities or processes.

Expert Respondents' Level of Perception in the Evaluation of the Developed Instructional Materials

Table 5. Expert Respondents' Level of Perception in the Evaluation of the Developed Instructional Materials in terms of Content

Statement	Mean	SD	Interpretation
The instructional material…			
1. Has clear and concise directions	3.80	0.45	Strongly Agree
2. Is properly sequenced	4.00	0.00	Strongly Agree
3. Has accurate content	3.80	0.45	Strongly Agree
4. Is detailed enough for a student to progress through the instruction without an instructor	4.00	0.00	Strongly Agree
5. Provides opportunities to practice new concepts, skills	4.00	0.00	Strongly Agree
6. Can be shared across it's own academic discipline and/or others	3.80	0.45	Strongly Agree
7. Uses process questions and activities which require different levels of cognitive domain to achieve desired learning outcomes	4.00	0.00	Strongly Agree
Overall	3.91	0.13	Strongly Agree

Legend: 1.00-1.49 Strongly Disagree; 1.50-2.49 Disagree; 2.50- 3.49 Agree; 3.50- 4.00 Strongly Agree

Table 5 revealed the expert respondents' descriptions of the content evaluation of the developed instructional material. Four of the seven assertions had the highest mean of 4.00, SD 0.00, and were assessed as strongly agree by the expert responders. They stated that the instructional material is properly sequenced, detailed enough for a student to progress through the instruction without the assistance of an instructor, provides opportunities to practice new concepts/skills, and employs process questions and activities that require different levels of cognitive domain to achieve the desired learning outcomes.

It is also worth noting that the remaining three assertions, which were evaluated as having clear and simple directions, correct content, and the ability to be shared within its academic discipline and/or others, had the lowest mean of 3.80, SD 0.447, and were regarded as highly agree. It means that the prepared instructional material demonstrates straightforward communication that the person getting the information understands. It does, however, show some adjustment in terms of substance and throughout the field.

In general, the expert respondents' descriptions of the validity had an overall mean of 3.9140, SD 0.12915, and were assessed as strongly agree. It can be deduced that they believe the developed instructional material is ready to use in terms of content. It implies that the material is adhering to the standards that have been assigned to them. This is reinforced by Bugler et al. (2017), who detail how teachers utilized criteria to assess the quality of instructional materials. He also claimed that the professors were reviewing the content and making suggestions to improve it. Furthermore, the study of Rusticus & Lovato (2014) supports this result by stating that content validation, which is critical in the design of any new instrument, ensures the validity of the instrument by determining the amount to which it measures the targeted construct. They further claimed that, given the assessment objective, the content enables the instrument to be used to generate relevant and appropriate inferences and/or judgments based on instrument scores. Furthermore, content validation should be applied to all components of the instrument that have the potential to influence the scores received and the interpretations made.

Table 6. Expert Respondents' Level of Perception in the Evaluation of the Developed Instructional Materials in terms of Language

Statement	Mean	SD	Interpretation
The instructional material's…			
1. Instruction follows a hierarchy of skill and knowledge development	4.00	0.00	Strongly Agree
2. Content and text font are easy to read	4.00	0.00	Strongly Agree
3. Content and text are clearly written	3.80	0.45	Strongly Agree
4. Content engages the learner	4.00	0.00	Strongly Agree
5. Content has no spelling errors	3.80	0.45	Strongly Agree
Overall	3.92	0.18	Strongly Agree

Legend: 1.00-1.49 Strongly Disagree; 1.50-2.49 Disagree; 2.50- 3.49 Agree; 3.50- 4.00 Strongly Agree

Table 6 indicated the expert responders' descriptions of the language evaluation of the prepared instructional content. It can be seen that three of the five assertions had the highest mean, which was 4.00 with an SD of 0.00 and was evaluated as highly agree. This clearly demonstrates that the generated instructional material's training follows a skill and knowledge development hierarchy. Its content and text font are easy to read and engage learners in learning the topic, whilst the remaining two statements, which constitute the instructional material's content text, are clearly written and have no spelling problems. had the lowest mean (3.80, SD 0.45), and was assessed as strongly agreeing.

The aggregate mean is 3.92, SD 0.18, as shown in the above result, and is considered as strongly agree. It denotes that the generated instructional material is language-ready. It expresses how simple it is to use because the information is entertaining, clearly written, and simple to read. Linguistic validation, according to Piault *et al.* (2012), ensures that the translation conveys the same meaning in the target language as the original in the source language. It ensures that the build value of the instrument objects is the same for each culture, as well as providing translations that have the same meaning as the original source material. Furthermore, the study of Tsang *et al.* (2017) confirmed that linguistic validation is the process of having an instrument or questionnaire translated by multiple translators at the same time, whereas the entire language validation process includes steps such as preparation, translation, reconciliation, harmonization, cognitive debriefing, and finalization.

Table 7. Expert Respondents' Level of Perception in the Evaluation of the Developed Instructional Materials in terms of Layout and Design

Statement	Mean	SD	Interpretation
The instructional material's…			
1. Cover elements are correct and complete	4.00	0.00	Strongly Agree
2. Visuals used are simple, relevant and easily recognizable	4.00	0.00	Strongly Agree
3. Layout is visually appealing	4.00	0.00	Strongly Agree
Overall	4.00	0.00	Strongly Agree

Legend: 1.00-1.49 Strongly Disagree; 1.50-2.49 Disagree; 2.50- 3.49 Agree; 3.50- 4.00 Strongly Agree

Table 7 revealed the expert responders' descriptions of the layout and design evaluation of the created instructional content. Based on the overall mean of 4.00 SD 0.00, the table clearly illustrates that the experts-respondents have a common description of the evaluation of the generated instructional material. It indicates that the layout and design of the generated educational material are appealing to learners. It also draws the learner's attention because the cover page is visually beautiful.

A good layout, according to Oakley (2013), not only looks excellent but also helps the viewer understand what the design is attempting to express. In other words, knowledge layout must be innovative when it comes to generating user-friendly, engaging designs, particularly in the area of mathematics. Furthermore, in order to create a compelling composition, good layout improves the beauty of both the individual object and the objects as a whole piece of design. The layout's success is determined by the positioning of distinct visual components and the relationship — or visual hierarchy — that is created between them. Meanwhile, Reid (2016) defines layout and design validation as the process of examining a software product for the specific demands of end-users or stakeholders. According to Macky (2020), the layout and design process is the process of testing a software product after it has been built to ensure that it meets the criteria for applications in the user's environment.

Student's Respondents Pretest and Post Test Scores in Problem Solving Abilities

Table 8 illustrates the student respondents' pretest and posttest scores in problem solving abilities in terms of identifying the problem. According to the table, three out of thirty respondents, or 10%, were at the beginning and gaining mastery level, nine, or 30%, were nearing mastery, and fifteen, or 50%, had mastery of the skill in the pretest.

Table 8. Student-Respondents' Pretest and Post Test in Problem Solving Abilities as to Identifying the Problem

Score	Pre		Post		Interpretation
	f	%	f	%	
16 - 20	15	50	27	90	Mastered
11 - 15	9	30	3	10	Approaching Mastery
6 - 10	3	10	0	0	Developing Mastery
1 - 5	3	10	27	90	Beginning

According to the data in the table, 50 percent of the responders have already achieved mastery. It is apparent that the respondents possess comprehension skills, which they employ to examine and identify the problem. Furthermore, it is obvious that after employing the generated instructional material in translation action, mastery level increased by 40%, giving 90 percent or 27 out of 30 respondents. This demonstrates that the translation action process assists people in realizing that it is simple to identify the problem if they translate it to models, tables, or graphs. They understand how to identify the problem by employing translation-based instructional material, as evidenced by the absence of a novice level on the post-test data in the table.

The first stage in the problem-solving and decision-making process, according to Arbo & Ching (2022), is recognizing and defining the problem. A issue is a mismatch between the actual state and the desired situation. This means that in order to recognize a problem, individuals must first comprehend what the problem is meant to be and where it is now in relation to the perceived problem.

Table 9. Student-Respondents' Pretest and Post Test in Problem Solving Abilities as to Planning a Strategy

Score	Pre		Post		Interpretation
	f	%	f	%	
16 – 20	0	0	10	33.3	Mastery
11 - 15	0	0	16	53.3	Approaching Mastery
6 - 10	9	30	4	13.3	Developing Mastery
1 - 5	21	70	0	0	Beginning

Table 9 illustrates the pretest and post-test scores of the student responders in problem-solving abilities in terms of strategy planning. According to the table, 21 percent of respondents, or 70%, were at the beginning stage of strategy planning competence, while 9 percent, or 30%, were acquiring mastery. Table 9 illustrates the pretest and post-test scores of the student responders in problem-solving abilities in terms of strategy planning. According to the table, 21 percent of respondents, or 70%, were at the beginning stage of strategy planning competence, while 9 percent, or 30%, were acquiring mastery.

Furthermore, the table indicates how the respondents improved after using the developed instructional material. According to the post-test results, 4 or 13.3 percent were developing mastery, 16 or 53.3 percent were nearing mastery, and 10 or 33.3 had mastery of the abilities.

When planning a strategy, according to Wang (2015), come up with a solution to the problem (translate). Creating an equation, a diagram, or a chart are all possible solutions to your dilemma. Furthermore, Soto & Martinez-Cruz (2018) said that the process of developing a strategy is depicted through information translations and conversions into the form of image drawings. As a result, the data indicate that the respondents improved their capacity to design a strategy through translation acts such as circumstances, tables, graphs, and equations. These are the many translation techniques employed by the students in converting written problems into mathematical expressions (Zanibbi & Blostein, 2012).

Table 10. Student-Respondents' Pretest and Post Test in Problem Solving Abilities as to Solving the Problem

Score	Pre		Post		Interpretation
	f	%	f	%	
16 – 20	0	0	14	36.7	Mastery
11 - 15	0	0	16	53.3	Approaching Mastery
6 -10	11	36.7	0	0	Developing Mastery
1 – 5	19	63.3	0	0	Beginning

Table 10 displays the student respondents' pretest and posttest scores in problem solving abilities in terms of issue solving. The pretest scores were low in the start (19 or 63 percent) and increasing as expertise was gained (11 or 36.7 percent). The post-test scores improved, revealing that 16 or 53.3 percent were approaching mastery and 14 or 36.7 percent had mastered the abilities.

According to Soto & Martinez-Cruz (2018), the problem is solved through calculations employing reduction operations. According to Wang (2015), "resolving the situation is a major deal." This is the phase in which you solve the equation you devised in the previous phase and prepare a strategy." The table revealed a significant improvement in the responders as they progressed from the beginning and developing mastery levels to the approaching mastery and mastery levels.

Table 11. Student-Respondents' Pretest and Post Test in Problem Solving Abilities as to Re-checking the Solution

Score	Pre		Post		Interpretation
	f	%	f	%	
16 – 20	0	0	14	36.7	Mastery
11 - 15	3	10	16	53.3	Approaching Mastery
6 - 10	3	10	0	0	Developing Mastery
1 - 5	24	80	0	0	Beginning

Table 11 illustrates the student respondents' pretest and post test scores in problem solving abilities in terms of re-checking the solution. According to the pretest results, a high percentage of 80 or 24 out of 30 respondents were at the starting level, with 3 or 10% developing mastery and approaching mastery.

Furthermore, better post-test scores showed that 16 or 53.3 percent were approaching mastery and 14 or 36.7 percent had mastery on the provided abilities. As a result, they developed the ability to look back and check what they did in the previous step. According to Fatqurhohman (2020), the look back method is used to verify or clarify the results acquired based on the query information. According to Andrade & Pasia (2020), it is good to look back when solving a problem (check and interpret). Check to see if you used all of your resources and if your solution is logical. If your solution looks to be correct, make sure to label your final response correctly.

Table 12. Test of Correlation between Translation Actions and Problem-Solving Abilities

Problem Solving Abilities	Translation Action			
	Situations	Table	Graph	Formulae
Identifying the Problem	-	-	-	-
Planning a Strategy	-	-	-	-
Solving the Problem	.460**	.599**	.381**	.425**
Re-checking the solution	.552**	.605**	.448**	.519**

*Legend: ** Correlation is significant at 0.01 level (two-tailed)*

The results of a correlation analysis between translation acts and problem-solving abilities were provided in Table 12. As demonstrated in the table, issue solving abilities in terms of problem solving and re-checking the solution are strongly associated to the translation activity. The association between the respondents' problem-solving abilities and the utilization of translation-based instructional material was discovered. Translation actions assist them in resolving and re-checking the situation. According to the table of student respondents' pretest and posttest problem solving abilities in terms of solving the problem and re-checking the solution, there is a significant rise from the beginning and developing mastery level to approaching mastery and mastery level. Respondents learned more about how to translate word problems and solve and re-check them as they used the generated instructional material.

According to Riederer *et al.* (2018), translation in mathematics refers to transporting an item without affecting it in any way. Bossé *et al.* (2014)highlighted that the benefit of translation is that it may be used in both directions. We can convert mathematical expressions back into words in the same way that we can translate words into mathematical expressions. Meanwhile, Papadopoulos & Nettleship (2020) stated that math problems can be quite frightening to look at times, as there may be numbers, symbols, and parentheses everywhere, making equations/expressions practically unreadable, and one useful trick to try and understand math equations is to try to convert them to words. This is also applicable to algebraic expressions. However, as demonstrated in table 12, there is no significant relationship between translation action and problem-solving ability in terms of identifying the problem and creating a strategy. It was discovered that the respondents' pretest and posttest scores in problem-solving abilities in terms of identifying the problem and devising a strategy are slightly higher. It means that the utilization of prepared instructional material had a minor impact on the first two problem-solving abilities. According to Diesta & Ferolino (2021), recognizing the difficulty in the term problem is simple. The data imply that the respondents understand and identify the problem so quickly that they do not require translating activity to respond to it.

Table 13. Test of Difference between the pre and post test scores in Problem-Solving abilities of the Students' Respondents

Problem Solving Abilities	Mean	SD	95% CID		t	Sig.
			Lower	Upper		
Identifying the Problem	-4.767	3.104	-5.926	-3.608	-8.412	0.000
Planning a Strategy	-10.000	2.364	-10.883	-9.117	-23.174	0.000
Solving the Problem	-10.067	4.143	-11.614	-8.519	-13.307	0.000
Re-checking the Solution	-12.700	3.715	-14.087	-11.313	-18.723	0.000

Legend: p<0.05=significant p>0.05=not significant

The test of difference between before and post test scores in the problem-solving abilities of the students' responders is shown in Table 13 above. The table shows that the pretest scores in the problem-solving abilities of the students' respondents differ significantly on the post test scores, specifically in terms of identifying the problem (t=-8.412, p=0.000), planning a strategy (t=-23.174, p=0.000), solving the problem (t=-13.307, p=0.000), and re-checking the solution (t=-18.723, p=0.000).

This demonstrates that the respondents increased their ability to recognize what was asked and the facts presented in the challenge. Additionally, after employing the prepared instructional material, test scores improved. The ability to solve the problem was demonstrated as they simply provided a solution to the problem with the assistance of what they did on the second phase, which is creating a strategy. It is also simple to resolve the issue once it has been translated utilizing the translation activities processes. According to the findings of the study, the developed instructional material in translation action improves the respondents' abilities to solve word problems. According to Kuzle (2013), in order to solve a problem, we must first represent it algebraically. He also stated that in order to define a problem algebraically, we must examine the problem's language to determine the variables and constants that are present, as well as the relationships between them.

Meanwhile, Piault, *et al*. (2012) claimed that we must translate verbal phrases and statements to algebraic expressions and equations, and that we can employ translation acts such as formulae, diagrams, verbal descriptions, and tables to help us translate verbal expressions to mathematics. Furthermore, Marpa (2019)stated that an algebraic expression is a mathematical phrase that combines numbers and/or variables using mathematical operations, and that patterns may be described using phrases as well, and that these phrases can be translated into algebraic expressions. Furthermore, according to the findings of Soto & Martinez-Cruz (2018), mastering translation activities can assist students improve their degree of proficiency in solving word problems. This means that students should learn the translation actions in order to improve their problem-solving skills.

4. Conclusion

According to the study's findings, there is a significant relationship between translation actions and problem-solving abilities in terms of solving the problem and re-checking the solution. However, there is no correlation between the translation action and identifying the problem and developing a strategy. Furthermore, there is a considerable difference between the pre and post test scores of the student responders' problem-solving ability.

Teachers who teach Mathematics may use the developed instructional material in translation actions as an added worksheet to improve their mathematical skills and abilities in solving word problems, as it has been discovered that the developed instructional material is helpful in enhancing problem-solving abilities. They may also create additional instructional materials to assist learners in improving their problem-solving abilities.

Furthermore, because the students have already expressed an interest in using the translation action to solve word problems, the school principal may seek funding from the school treasury to supply supplies for printing the produced instructional material. Mathematics coordinators may offer in-service training or a learning action cell (LAC) that focuses on teaching and training methods and tools for teachers to enable collaborative learning through the use of various translation activities in solving word problems. Finally, future researchers can perform parallel studies to correlate the characteristics used to provide school-community collaboration support to the school.

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