Performance Level, Least-learned Competency and Misconception on Linear Equation and Inequalities

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Abstract: *This study determined the performance level, Least-learned Competency and Misconception on Linear Equation and Inequalities of Grade 8 Students of Prieto Diaz Cluster such Prieto Diaz National High School, Calao National High School and Manlabong National High School. The study used descriptive method of research with the use of teacher-made test with the topics in Linear Equation and Inequality. The data were tabulated, checked, analyzed and interpreted using mean, performance level, Likert-scale and Item Analysis. The findings of the study revealed that the computed performance level of the grade 8 learners in the post-test is 33.6% and interpreted as low performance and did not meet the expectation of Department of education. The given competencies in mathematics were not familiar by the grade 8 learners. It has an overall mean of 0.41. The learners definitely found out that there are misconceptions in four selected topics in mathematics such as linear equation and inequalities, graphing and application. The learners reacted that "I' am confused on graphing linear equations because there are so many formulas to memorize and I don't know which one I should use". Based from the findings it was concluded that the performance level of Grade 8 learners in the post-test is significantly low and did not meet the expectation. All four selected topics in mathematics were all least-learned competencies based on the results of the post-test. The learners experienced misconception in for topics in Mathematics such as linear equation and inequalities, graphing and application. Based from the conclusions drawn, the following recommendations are made: the Strategic intervention Materials in linear equation and inequalities, graphing and application is submitted for further study and enhancement to ensure high mastery of the learning competencies. The SIM may not only focused on unlocking difficulties but also provide more activities during and after the mathematical problems. Activities that will help the learners master the prerequisites in mathematical problems like the fundamental operations, graphical presentations and mathematical application using numerical expressions and the like is provided.*

1. Introduction

Understanding Concept is one of the mathematical abilities that students must possess. Mathematics is usually regarded as a subject of great precision in which concept can be defined accurately to provide a firm foundation for the mathematical theory. Misconception on certain topics in mathematics is one of the common problems encountered by the teachers in teaching mathematics concepts which affect the performance level of the students. This may lead to a failure on a teaching learning process especially in better understanding some concept in mathematics. Addressing student misconceptions should be part of every lesson. If a student perpetuates place value misconceptions they will not be able to fully recognize and explain other mathematical ideas.

Students at all levels tend to have difficulties with inequalities (Rowntree, 2009). Some students treat inequalities as equalities (Vaiyavutjami& Clements, 2006; Blanco & Garrote, 2007). Others have a narrow understanding of the terms more or less (Warren, 2006). Finally, some students have major difficulties interpreting inequality solutions (Tsamir&Bazzini, 2004; Vaiyavutjami& Clements, 2006).

According to several studies, student's errors in solving the word problem in linear equation are largely due to their inability to understand and interpret sentences before facing the process and skills coding. It causes students making other mistakes as they have experienced difficulties in understanding the meaning of the question.

In other hand, Inequality in math is a fundamental concept; it is used in Algebra, Geometry, Trigonometry and Calculus. It is important for high school students not only to be able to solve inequalities but also to be able to explain and understand their solutions. Research studies have shown that students have difficulties with the concept of inequality.

Serhan and Almeqdadi (2015) stresses that students encountered different types of errors, the most dominant error that the students faced was multiplying/dividing by a negative number. Students used the solving strategy correctly, but when they multiplied or divided by a negative number, they did not reverse the inequality sign. In addition to that, the participants used the distributive method incorrectly and they made other arithmetic errors. These results indicate that the participants may have a conceptual misunderstanding of inequalities especially when dividing and multiplying with a negative number.

In Prieto Diaz National High School, the Grade 8 students experienced difficulties in some concept in Mathematics subject. As observed and experienced by the researcher and as a subject teacher most of the students don't have enough knowledge or idea on the concept teach by the subject teacher especially the step by step process on arriving in the correct answer/s on certain problem solving. The students really find it difficult to comprehend and understand the concept on what the subject teacher teaches them hence learning outcomes is affected.

Another is that the NAT results of Prieto Diaz National High in year 2014-2015 in Mathematics subject shows that it did not meet the satisfactory rating set by the Department of Education which is 38.83% only. The researcher wanted to know the performance level, least learned competencies and common misconceptions encountered by the students especially in solving linear equation and inequality. These motivated the researcher to pursue this study.

Statement of the Problem

This study aimed to determine performance level, least-learned and misconceptions on linear equations, inequalities, graphing and application of the students of Prieto Diaz National High School, Calao National High School and Manlabong National High School S.Y. 2019-2020.

Specifically it sought answers to the following questions:
1) What is the performance level of grade 8 students in pre-test and post-test along linear equation and inequalities, graphing and application?
2) What are the least-learned competencies from the identified topics?
3) What are the misconceptions encountered by the students from the identified topics?
4) What could be proposed based on the results of the study?

2. Methodology

Research Design
The descriptive correlation method of research was used in this study. According to Creswell (1994) the descriptive method of research is to gather information about the present existing condition. The emphasis is on describing rather than on judging or interpreting. The aim of descriptive research is to verify formulated hypothesis that refer to the present situation in order to elucidate it. Moreover, this method allows a flexible approach, thus, when important new issues and questions arise during the duration of the study, further investigation may be conducted.

The study used this method to determine the performance level, least-learned and misconceptions on linear equations, inequalities, graphing and application of the students. The grade 8 learners of Prieto Diaz National High School, Calao National High School and Manlabong National High School (one section per school) were taken as respondents.

The Sample
A total of 200 grade 8 learners were taken as respondents. Simple random sampling was done for the sample selection. This sampling method is conducted were each member of a population has an equal chance of becoming a research participant, this is said to be the most efficient sampling procedure. In order to conduct this sampling strategy, the researcher defined the population first, listed down all the members of the population and then selected members to make the sample.

The Instruments
The instrument used by the researcher to gather the needed data is a teacher-made test which was used to determine the performance level, least-learned and misconceptions on linear equations, inequalities, graphing and application of the students. The researcher himself prepared the questions of the test. Before the final draft of the test was made, the researcher consulted his adviser for the some comments and suggestions. After the finalization, the test was subjected for a dry-run to determine its validity and reliability.

The test was administered to the grade 8 learners who were the respondents of the study. After the dry-run, the researcher conducted an item analysis for the refinement of the test items and be readied for its final draft to be administered to the target respondents. The answers to the questionnaires were analyzed. Some items, which were less relevance or interest to the respondents as reflected in their answers, were deleted. Improvement of the new and second set of questionnaires was done through the cooperative suggestions of the adviser and other consultants until the final set of questionnaire was completed.

To determined the index of difficulty and the reliability of the questionnaire the researcher devised a table of equivalent for the percentage equivalent and description and used the Cronbach's alpha score for the level of reliability.

Difficulty Indices	
91% - 95%	Very Easy
76% - 90%	Easy
25% - 75%	Average
10% - 24%	Difficult
5% - 9%	Very Difficult

Cronbach's Alpha Score	Level of Reliability
0.0 – 0.20	Less reliable
>0.20 – 0.40	Rather reliable
>0.40 – 0.60	Quite reliable
>0.60 – 0.80	Reliable
>0.80 – 1.00	Very reliable

Data Gathering Procedure
Before the study was conducted, the researcher prepared a letter request addressed to the Principal of Prieto Diaz National High School, Calao National High School and Manlabong National High School. After the approval of the request, the researcher prepared the questionnaire for administration. The researcher himself distributed the instruments. Distribution to the different respondents was coursed through the respective teacher-advisers. The administration of the questionnaires was done in the 3rd week of August 2019. Time allowance was arranged between the researcher and the teacher-advisers for the retrieval of the questionnaires.

After the retrieval of the questionnaires, the answers of the respondents were checked, tallied, analyzed and interpreted properly with the help of the statistician and the researcher's adviser. The results of the answers revealed the performance level, least-learned and misconceptions on linear equations, inequalities, graphing and application of the grade 8 students.

Data Analysis Procedures
The statistical measures and tools used in this study were the mean and t-test.
To determine the performance level, the mean was used with the following formula:

$$\text{Mean} = \frac{no.\ of\ correct\ responses}{Total\ no.of\ items}$$

$$Performance\ Level\ (PL) = \frac{Number\ of\ correct\ Responses}{\frac{Total\ number\ of\ respondents}{Total\ number\ of\ items}}\ x\ 100$$

To determine the descriptive interpretation of the level of performance, the researcher devised a table of equivalents for the percentage equivalent and description.

Performance Level	Qualitative Description
91 – 100%	Outstanding
86 – 90%	Very Satisfactory
80 – 85%	Satisfactory
75 – 79%	Fair Satisfactory
0 – 74%	Did not meet the expectation

3. Results and Discussions

Findings

Based from the data gathered, the following findings were revealed:

1) The computed performance level of the grade 8 learners in the pre-test is 34.33% and interpreted as low performance and did not meet the expectation of Department of education. The computed performance level of the grade 8 learners in post-test is 75.20 and also interpreted as fairly satisfactory.
2) The given competencies in mathematics were not familiar by the grade 8 learners. They did not meet the Department of Education expectation to perform excellently in Mathematics. It has a performance level of 34.33% total average mean of performance level.
3) The learners definitely found out that there are misconceptions in four selected topics in mathematics such as linear equation and inequalities, graphing and application. The learners reacted that *"I' am confused on graphing linear equations because there are so many formulas to memorize and I don't know which one I should use"*.
4) The researcher proposed a strategic intervention to address the difficulties of the learners in Mathematics. The title was "Strategic Intervention Materials in Linear Equation and Inequalities, Graphing and Application.

Conclusions

Based form the findings, the following conclusions are drawn;

1) The performance level of Grade 8 learners in the pretest is significantly low and did not meet the expectation. But the PL of Post-test is somehow pass the standard of the Department of Education.
2) All four selected topics in mathematics were all least-learned competencies based on the results of the pre-test.
3) The learners experienced misconception in for topics in Mathematics such as linear equation and inequalities, graphing and application.

4. Recommendations

Based from the conclusions of the study, the following recommendations are made:

1) The Strategic intervention Materials in linear equation and inequalities, graphing and application be submitted for further study and enhancement to ensure high mastery of the learning competencies.

2) The SIM may not only focused on unlocking difficulties but also provide more activities during and after the mathematical problems.
3) Activities that will help the learners master the prerequisites in mathematical problems like the fundamental operations, graphical presentations and mathematical application using numerical expressions and the like is provided.
4) Research parallel to this may also be conducted in other subjects and on wider scope.

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