

# The Implementation of Guilford Learning Production Dimensions in Ninth Grade Students of SMP Negeri I Sipahutar Tapanuli Utara

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**Abstract**— *The aims of this study is to apply Guilford's production dimensions in mathematics learning, especially algebraic units in story problems and to find out whether the application of Guilford's production dimensions is effective for teaching algebraic units in the story problems. The subjects in this study is ninth grade students of SMP Negeri I Sipahutar Tapanuli Utara, while the object was student learning outcomes as a result of learning by applying Guilford's production dimensions to the algebra unit in the story questions. This research is classified as classroom action research, the results of data analysis show that learning mathematics by applying Guilford's production theory to the algebra unit has been completed, the level of student mastery in learning is 78.92%, this shows that the level of student mastery is still classified as moderate, the absorption of individual students is obtained by 32 people from 35 students or 91.42% of many subjects have completed learning, thus classical achievement has been completed, the achievement of specific learning objectives is all completely achieved (achieved in over 65%), during learning with the application of Guilford production theory in the algebra unit. From the results of the questionnaire given to students, it shows that students' responses to learning with the application of Guilford's production dimension theory are positive.*

**Keywords**— *Guilford's Production Dimension Theory, Story Problem.*

## I. INTRODUCTION

Mathematics education as integral part of the national education system very important role in development of science and technology. Throughout human civilization. Mathematics always contributes significantly to progress and development of human culture. Duray in Pangkey (1980) argues that mathematics is a golden key that can open all the veils of science. In Higgins (1973) argued that mathematics as a science ideas and relationships between abstract. Ideas in mathematics need specific physical objects or symbols. Mathematical concepts or principles are expressed form of statements. But mathematics doesn't the symbol system. Generally, mathematical ideas can be expressed in the form of symbols that have been agreed. For example, the symbol represents A subsets of B.

Mathematics especially algebra use of a letter to represent something that is not yet known is common. the

symbol system came into play. The use of these letters can indicate something that is not known is commonly encountered. The use of these letters can express something unknown in an equation, something arbitrary or state a general solution to a mathematical problem. The role of the symbol system becomes more visible when dealing with problems that require a mathematical model because a mathematical model is formed based on real situations involves symbolizing mathematical facts or ideas and it must be admitted, most algebra material involves mathematical models. Even Wilson (1971: 657) suggests that symbolizing a mathematical idea or forming a mathematical model is the essence of algebraic techniques.

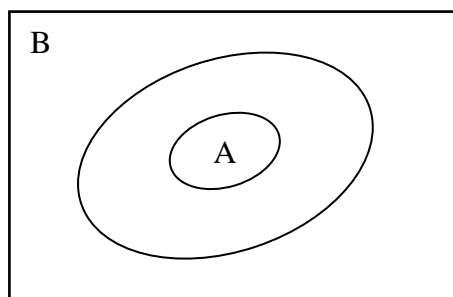
This research form of testing the application of ideas to make it easier for students to make mathematical models. The idea is based on the results of Guilford's

research which is better known as the Guilford production dimension.

## II. REVIEW OF LITERATURE

Guilford found as many 120 different factors that can enhance human intellectual. How these factors are reflected in math skills. In Higgins (1973) stated that Guilford's findings can be classified into 3 (three) aspects related to mathematical abilities. These three aspects which are better known as the Guilford dimension include the content, production and process dimensions. The Guilford content dimension identifies 3 (three) categories of ideas / information that are communicated, namely semantics, symbolics and graphs (figures). Semantic information is the form of verbal statements consisting of meaningful words. Information in the form of symbols usually uses certain symbols that have been mutually agreed upon. Meanwhile, figures or graphics are mostly found in the field of geometry.

In mathematics, the three categories can be used and even play a very important role. For example, if there is a statement A which is part of B (semantics), then this statement can be expressed in symbolic form. Also this statement can be expressed in figure form as follows:



Likewise in algebra which presents many problems in the form of a story such a problem means it is packaged in semantic form. Mathematical model is needed which means converting the information into symbols and the solution can be expressed in graphical form, as taught to students so far.

The dimensions of the Guilford process suggest that information received can be processed on 5 (five) levels, namely memory, cognition, convergent, divergent and evaluation. Memory is the lowest level because at this level the information communicated is only stored in the same form so that very little process occurs. Remembering, not process, is very important in this category. Mathematics

usually found in students who memorize formulas. Guilford's cognition discovery or recognition of information in various forms. Recognizing the problem "finding the price of 12 apples if the price of 1 (one) fruit is Rp. 150, - "as a multiplication problem, including the category of cognition. Whereas convergent and divergent in mathematics classes are usually applied in problem solving methods. The problems discussed, first use divergent thinking and then convergent. Finally, evaluation is the process of comparing the information received based on logical criteria to arrive at a decision. This level is the highest because in the process of comparing information, previous abilities are needed.

The production dimensions of the Guilford model, which are specifically discussed in this paper, consider the basic differences in information received. Guilford states 6 (six) categories of information products, namely as follows:

First: units is information can be seen as a form of unity about something, part of the whole, basic form or pieces. The concept units of information in mathematics can be viewed as a basic element of the mathematical system. Like numbers in arithmetic or variables in algebra.

Second: class. A class is a collection of objects with one or more of the same properties. For example, by identifying the set of even numbers with E, the whole number is divided into 2 (two) parts. These general characteristics make up the class idea. Conversely, it can also be simply defined mathematically by some numbers, for example  $B = \{8, 14, 20, 27\}$ . However, this set cannot necessarily be categorized as a class idea.

Third: relation, which is a type of relationship between 2 object , a kind of bridge or a chain of relationships and has its own characteristics. Statements generally express the relationship of ideas themselves or with others, such as the expression "higher than", "more than", "equal to" or "comparable".

Fourth: system, which is a model or organization that is interdependent or parts that interact. In algebra, story problems are solved by creating a mathematical model with a certain system. At this stage, the mathematical system becomes its most important feature.

Fifth: transformation is a change, correction, definition or modification of an information product from one statement to another. The transformation of information products can be a function of operations in mathematics. Transformation is not only a special and isolated operation in mathematics, but also a map from one mathematical system to another.

Sixth: Implication is something that is expected, anticipated or predicted from the information received. In mathematics implication is generally logical thinking.

### The Application of Guilford Production Dimensions in Modeling

The results showed that the main difficulty of the students in solving the story problems was making the appropriate mathematical models that the author proposes the Guilford dimension theory.

The main reason the writer proposes this theory is because the problem that is packaged in the story problem can basically be seen as an information product and it can be divided into 6 (six) categories as suggested by Guilford. Particularly in the discussion of this paper, the categories that are considered important which can be directly applied in making mathematical models are units, relations, systems and information transformation.

Creating a mathematical model of a problem requires symbolizing the mathematical facts or ideas contained in the problem. Therefore modeling activities require prerequisite knowledge of the mathematical facts or ideas involved in the problem. This fact or idea according to Guilford can be viewed as a unit / unit of information. The introduction of this unit of information on a problem is very important for further activities. If a student is familiar with the unit of information in a problem, then it will be easier to determine the type of relationship between units of information and other information related to that unit. Because every information or mathematical idea / fact is associated with a certain "relation", then of course the entire information will form a system.

The Guilford dimension will also increase students' insight into a concept. Because with information transformation, students are not only fixated on the concept being studied, but can also see the relationship between these concepts and other mathematical concepts. In other words,

information transformation is the translation of a mathematical concept into another form of information.

### III. RESEARCH METHODOLOGY

This research is classified as classroom action research, because this study was designed based on the difficulties experienced by students in class and based on the teacher's difficulty in teaching algebraic units in the form of story questions. the place of this research is SMP Negeri 1 Sipahutar Tapanuli Utara while the object was student learning outcomes as a result of learning by applying Guilford's production dimensions to the algebra unit in the form of story questions.

### IV. FINDING AND DISCUSSION

#### The Result of Reliability

The results of the test reliability calculation, the test reliability coefficient is obtained,  $\alpha = 0.75$ . By referring to the test reliability criteria, it can be concluded that the test has a high degree of reliability.

#### The Result of Validity

Based on the calculation of the validity of the test items, it was found that the validity values for each item were as follows.

*The Value of the Validity of Research Instruments*

No	$r_{Count}$	$r_{table}$	Interpretation
1	0,4628	0,304	Valid
2	0,6478	0,304	Valid
3	0,7414	0,304	Valid
4	0,5894	0,304	Valid
5	0,8987	0,304	Valid

#### The Discriminatory Power test

Based on the calculation of the distinguishing power of the test, the following results were obtained.

*The Results of the Calculation of Distinguishing Power (DP) Problem*

No	DP Count	DB table	Interpretation
1	2,464	2,12	Significant
2	5,466	2,12	Significant
3	5,035	2,12	Significant
4	3,601	2,12	Significant
5	7,299	2,12	Significant

From the table, it can be seen that the five questions have significant distinguishing power, meaning that these questions can distinguish high-skilled, medium-skilled and low-skilled groups.

#### The level of difficulty of the test

Based on the calculation of the difficulty level of the test, it was found that the five questions had a moderate difficulty level, with the difficulty level of each question being as follows.

#### The Result of Calculation of Problem Difficulty Level

No	The Difficulties	Interpretation
1	0,7073	Sufficient
2	0,5915	Sufficient
3	0,4501	Sufficient
4	0,5529	Sufficient
5	0,3600	Sufficient

## V. DISCUSSION

Based on the results of the calculation and analysis of the research data in attachment the following results were obtained:

The average score of learning outcomes obtained by students was 78.92 with a percentage of the mastery level of 78.92%. This shows that the students' mastery level is classically good (moderate) and Completeness of student learning based Absorb individually

From the table in the appendix, it can be seen that there are 32 students who have completed their studies, while 3 students have not completed their studies and Classical absorption of the 35 students, 32 people have completed learning or 91.42% of the many subjects who have finished

learning, while those who have not finished studying are 3 out of 35 people or 8.58% of the many subjects. This shows that classically student learning completeness has been achieved then achievement of specific learning objectives (TPK) Achievements of specific learning objectives were all above 65.0%. Thus the learning has reached the completeness of the TPK Student activities. From the results of observations made on student activities during learning (which were carried out on 10 students) it was found that students played an active role during learning, the results of observations can be seen in the attachment.

## VI. CONCLUSION

Based on the discussion and data analysis the following conclusions are obtained that Mathematics learning with the application of Guilford production theory in the algebra unit in ninth of SMP Negeri 1 Sipahutar Tapanuli Utara has been completed. The level of of students mastery in learning is 78.92%, this shows that the level of mastery of students is still classified as moderate. The absorption of individual students obtained by 32 people from 35 students or 91.42% of many subjects have finished learning, so that classical achievement has been completely achieved and all of the specific learning objectives were achieved (above 65%). During learning with the application of Guilford's production theory in the algebra unit in class III of SMP Negeri 1 Sipahutar Tapanuli Utara 2019/2020 students play an active role. From the results of the questionnaire given to students, it shows that students' responses learning with the application of Guilford's production dimension theory are positive. All students said they were happy with the learning and wanted to take part in the same lesson at a later date. From the description of student learning outcomes above and positive student responses learning it can be said that learning with the application of Guilford's production dimension theory to the algebra unit in ninth grade of SMP Negeri 1 Sipahutar North Tapanuli has been effective.

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