



TRENDS IN SCIENCE  
AND SCIENCE EDUCATION  
2017 State University of Medan  
November 14<sup>th</sup> - 15<sup>th</sup>  
Grand Mercure Hotel, Jl. Sutomo, No. 1, Medan, Indonesia



## Development of Mathematics Diagnostic Test For Elementary Student Class V of North Sumatera Province

Dian Armanto<sup>1</sup>, Elvi Mailani<sup>2</sup>, Chairunisah<sup>1</sup>

<sup>1</sup>FMIPA, State University of Medan, Indonesia

<sup>2</sup>FIP, State University of Medan, Indonesia

### ABSTRACT

This study aims to compare the results of diagnostic tests conducted in several urban districts located in northern Sumatra. Based on the results of the comparison of diagnostic tests, will be compiled a diagnostic test book that will be used by teachers in overcoming various problems in teaching mathematics. Diagnostic tests conducted in the city of Binjai, Deli serdang, Labuhan stone, Langkat, Medan, Tebingtinggi, Pematang Siantar and Sibolga. Based on the results of diagnostic tests conducted known equation problems encountered by students of class V. The same problem encountered is the students do not understand and still weak in the material addition of fractions, the story and the volume of space wake up. This research uses development research (Development Research). The subjects of this study are the students of class V SD / MI public and private in North Sumatra are taken at random proportional. This research is done 2 (two) stages. In the first stage a diagnostic test has been conducted in several schools located in two districts of the city. The first stage diagnostic test results were then developed in the draft diagnostic test book. In this first phase, researchers empower the analysis of mathematics and teacher education experts to produce solutions to problems faced by students in doing mathematics problems obtained from the diagnostic tests that have been done in two districts of the city in North Sumatra. Furthermore, in the second phase of the city districts that become the sample of research becomes more widespread when compared to the first stage. Results targeted at the second stage are diagnostic test books that can assist teachers in overcoming obstacles to teaching class V math materials at elementary and madrasah ibtidaiyah (SD / MI) levels.

**Keywords:** Books, diagnostic test, development research

**Corresponding Author:** Elvi Mailani, FIP, State University of Medan, Indonesia, E-mail: [elvimailani@gmail.com](mailto:elvimailani@gmail.com)

### INTRODUCTION

Curriculum 2013 is a curriculum that in the learning process not only emphasizes the addition of knowledge for students, but emphasizes the addition of insight attitudes and skills. This curriculum is a curriculum developed from the educational unit curriculum (KTSP). Education unit level curriculum (KTSP) has been developed and implemented since 2006. Each curriculum in principle has its own strengths and weaknesses. However, it is hoped that with the development of curriculum going on the quality of education in Indonesia will be better.

Mathematics subjects should be subjects that encourage students to be able to think and have a more systematic, efficient and practical ideas so that after the process of learning mathematics takes place students not only on the knowledge side that develops but rather in



the ability to communicate, solve problems, reason and develop also on aspects of attitude and personality. In reality let alone on the aspects of attitude and skills, on the knowledge aspect only mathematics ability of students in grade V SD / MI is currently still very low and far beyond expectations. This can be seen from the results of diagnostic tests conducted in several urban districts in the province of North Sumatra which includes the city of Binjai, Deli serdang, Labuhan stone, Langkat, Medan, Tebingtinggi, Pematang Siantar and Sibolga where the diagnostic test for math lessons is very low. Based on the results of diagnostic tests conducted known equation problems encountered by students of class V. The same problem encountered is the students do not understand and still weak in the material addition of fractions, the story and the volume of space wake up.

Based on the diagnostic test, the researcher can see and identify the weakness that make the student unable to solve the problems related to mathematics material for class V level SD / MI. Problems and obstacles faced by these students, if left unchecked and the solution will certainly have an impact on low learning outcomes. This will certainly make the quality and quality of education, especially on subjects far mathematics under other subjects. Based on diagnostic tests that have been done can be known directly the constraints felt by students when they do the math problems given. The inputs and findings of these observations and diagnostic tests are certainly meaningful for the improvement of the learning process in the future, especially in the mathematics lessons where the enactment of the mathematics curriculum in 2013 is a lesson that is separate from other lessons especially for grade IV, V and VI students.

From the explanation of the above problems, the researcher is interested to conduct a research to create a diagnostic test book based on diagnostic test results that have been done in several city districts located in North Sumatra. It is hoped that with the diagnostic test books that will be developed, teachers and other education stakeholders get the picture and solution that must be done from the problems faced by students in the process of learning to teach mathematics in the classroom. With a diagnostic test book that will be developed all the problems of learning mathematics in the classroom can be resolved and lead to better and improved mathematics learning outcomes.

**Books:** The book is broadly defined as all forms of writing, drawings of words written and depicted on papyrus, papyrus, parchment and paper in all its forms: in the form of rolls, hollowed and tied with or bolted on the back with leather, fabric, cardboard and wood. (Encyclopedia of Indonesia (1980, pp. 538)). H.G. Andriese et al mentions the book as "information printed on a bound paper into a single unit". Unesco in 1964, in H.G. Andriese et al. Providing the definition of the book as "Publication printed, not periodically.". In accordance with the three definitions of the above book, the book is defined as a collection of printed and stapled papers containing information that can be used as one source in the teaching learning process.



**Diagnostic Test:** In the process of mathematics learning, diagnostic tests serve as facilitators of information providers "what students already know, what students do not know yet, and what solutions to take to address student problems". Diagnostic tests are assessments that aim to look at the student's weaknesses and causal factors. This assessment is conducted for the purposes of tutoring, remedial teaching, and finding cases. Diagnostic test questions are prepared to be able to find the type of student learning difficulties (Sudjana, 2009). Characteristics of diagnostic tests include: a) designed to detect students' learning difficulties, b) developed based on analysis of possible causes of difficulty causing problems / weaknesses of students, c) using questions or brief answers to capture weakness information students are complete, d) accompanied by a follow-up plan in accordance with identified difficulties. The steps of developing this diagnostic test include: a) identifying basic competencies that have not been achieved, b) determining possible sources of masala, c) determining the appropriate form and number of questions, d) composing the problem grid, e) writing questions, f) review questions, and g) develop assessment criteria. The function of diagnostic tests can be expressed to: a) identify problems or difficulties experienced by students b) plan follow-up in the form of solving efforts according to problems or difficulties that have been identified.

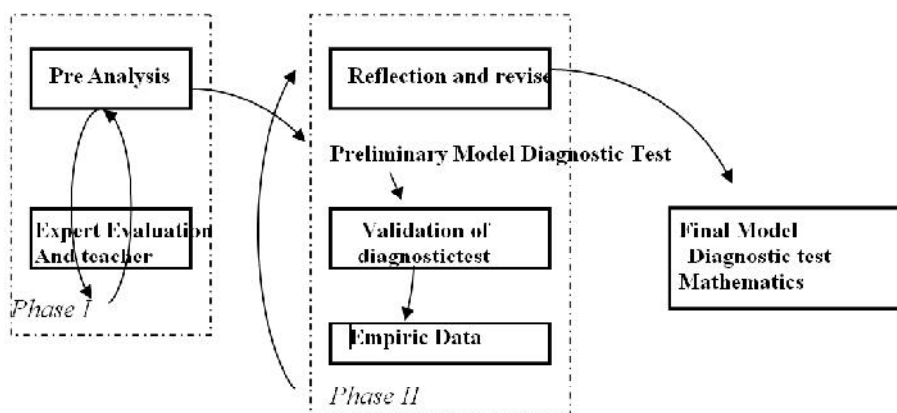
**Mathematics:** Our basic mathematics education is aimed at the development of practical, logical, critical, and honest mindset oriented to the application of mathematics in solving problems (Puskur, 2002). Students are expected to master the basic concepts of mathematics correctly so as to apply them in everyday life as well as in learning mathematics at the next school level. Students are prepared attitude and mental to be able to face situation and condition of globalization world development and transfer of science, technology and information in the future. Furthermore, mathematics learning in elementary schools is expected to develop numeracy skills, improve math skills, and shape critical, honest, disciplined, efficient and effective attitude. In order to achieve the above objectives of mathematics learning, teachers teach basic mathematics by explaining the concepts and operations of mathematics, giving examples of doing the questions, and asking students to work on similar problems with problems that have been explained by teachers. This model emphasizes on memorizing concepts and mathematical procedures to solve problems. This learning model is called a mechanistic model (Freudhental, 1973).

## MATERIAL AND METHODS

This research uses development research method. Richey and Nelson (1996) identify that developmental research is oriented towards product development where the development process is described as thoroughly as possible and the product is finally evaluated. Van den Akker (1999) referred to it as a formative research in which research activities are carried out in a recurring process (cyclic) and aimed at optimizing the quality of product implementation in certain situations. In mathematics learning, this development research is applied in the

repetitive activities of designing and testing mathematical learning material products (Gravemeijer, 1999). The results of this research are theoretical, procedural, methodological, and empirical methods.

This research activity is carried out in 2 (two) stages. Both stages are described as follows:



**Figure 1.** Phase and activities of development research

Phase I of this research is called the front-end analysis phase which is aimed at analyzing and determining the mathematical competence that students must possess by considering the curriculum developed by the team of PUSKUR DEPDIKNAS (2000). This activity is followed by the compilation of items in accordance with each basic competence of mathematics material. Through the justification, analysis and evaluation of mathematics education experts and competent primary school teachers, the Early Model of diagnostic tests of mathematics lessons in grade V SD was developed. This research involves mathematic education development experts from the Education Office of North Sumatra Province and other mathematics learning experts. Activity Phase I was conducted within the first 6 months of this study.

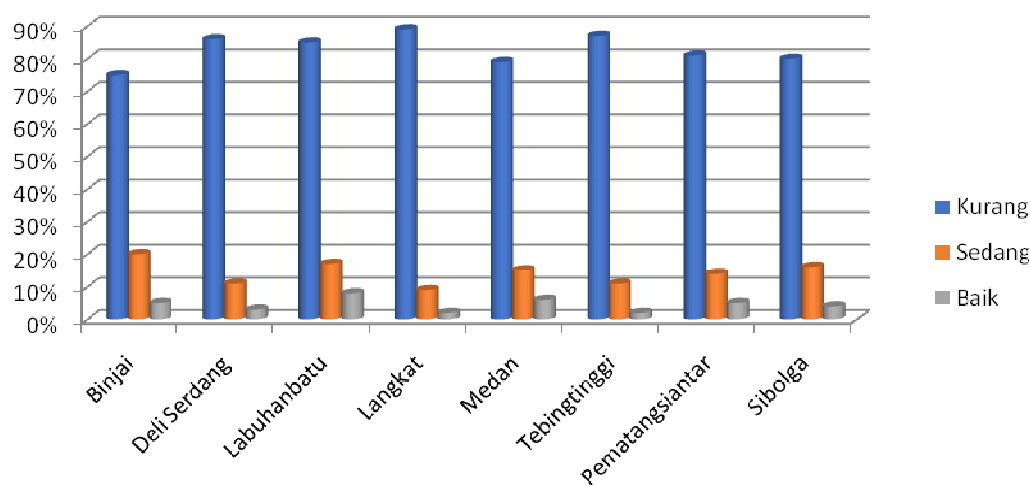
Data for phase I of this study were obtained from various measurement techniques. First, the observation sheet for experts and teachers used to justify the quality of the mathematics lesson diagnostic tests the researchers have drawn up. Second, in-depth interview. Analysis of the contents of mathematical competence in the curriculum and adapted to the stages of learning Realistic mathematics. Experts and curriculum developers of mathematics education and other school math learning experts will be involved in the preparation of a mathematics learning diagnostic model in this study. Experienced primary school teachers are also involved to evaluate the use of this developed mathematics learning diagnostic model.

## DISCUSSION

**Test Result:** Diagnostic tests were conducted in 8 districts of the city located in North Sumatra. The eight districts of the city are Binjai city, Deli serdang, Labuhan batu, Langkat, Medan, Tebingtinggi, Pematang Siantar and Sibolga. The material in the test is the material in class V by using the 2013 curriculum. The results of diagnostic tests conducted at schools in eight districts of the city in North Sumatra show similar abilities and outcomes, where students are still experiencing constraints and are still not able to do the questions given on the test. Results of diagnostic tests of elementary school students of the districts / city of North Sumatra Province as listed in the table below:

**Table 1.** Results of the Elementary Diagnostic Test in North Sumatra Province

No	District/City	Result of Diagnostic Test			Total
		Less	Moderate	Good	
1	Binjai	75%	20%	5%	100%
2	Deli Serdang	86%	11%	3%	100%
3	Labuhanbatu	85%	17%	8%	100%
4	Langkat	89%	9%	2%	100%
5	Medan	79%	15%	6%	100%
6	Tebingtinggi	87%	11%	2%	100%
7	Pematangsiantar	81%	14%	5%	100%
8	Sibolga	80%	16%	4%	100%



**Figure 2.** Results of the Elementary Diagnostic Test in North Sumatra Province



**Table 2.** Overview of Diagnostic test results in Eight Districts of North Sumatra Province

Question no 1	From the analysis results found that students do not understand the concept of completion of the sum of fractions. Where many students are found do not understand the concept of equalizing the denominator.
Question no 2	From the analysis results found that many students do not understand the concept of reduction of fractions. Where many students are unable to equate the denominator. Allegedly students do not understand the concept of looking for KPK.
Question no 3	From the analysis results found that students difficulty in multiplying between numbers so that the results obtained wrong. And there are also students who do not make the way allegedly students do not listen to the direction of workmanship problems.
Question no 4	From the analysis it was found that many students did not understand the concept of fraction division and the concept of converting fractions into mixed numbers
Question no 5	From the analysis results found that many students do not understand the story. And found also students who do not understand the concept of changing a dozen or two dozen or more. So the score obtained is low
Question no 6	From the analysis results found that many students do not understand the story. So in pengerjannya many students who only write the results but wrong and did not fill the answer sheet allegedly because not listening to the direction of the workmanship problem.
Question no 7	From the analysis results found that many students do not understand the concept of learning scale so that many students who do not fill out the answer sheet and wrong in writing answers. Hapal students also found the formula but did not understand the concept.
Question no 8	From the analysis results found that many students do not understand the story and the concept of seeking speed. There are also students do not understand change measuring units such as cm to km.
Question no 9	From the analysis it was found that many students did not understand the story and did not understand the concept of looking for debit.
Question no 10	From the analysis it was found that some students did not understand the concept of looking for beam volume. But many students already understand, but there are some students who are wrong in writing the value of the unit.
Question no 11	From the analysis results found that many students do not understand the story and many students do not understand the concept of solving the problem of looking for roots.
Question no 12	From the analysis that many students already understand the concept of making the cube nets but still not neat in the process. But there are some students who do not understand the concept so just describe the cube only.
Question no 13	From the analysis it was found that many students did not understand the concept of beam nets so that only the blocks were described. But there are students who already understand just in describing it less neat.



**TRENDS IN SCIENCE  
AND SCIENCE EDUCATION**  
**2017** State University of Medan  
November 14<sup>th</sup> - 15<sup>th</sup>  
Grand Mercure Hotel, Jl. Sutomo, No. 1, Medan, Indonesia



## CONCLUSIONS

The diagnostic test model can identify the causes of difficulties and the emergence of class V elementary students' errors in solving math problems that focus on concept comprehension problems, computational errors, no use of symbols, minimal prerequisite concepts, and less able to relate realistic facts with the mathematical concept itself. The results of tests conducted on schools located in several districts / cities in North Sumatra include Binjai city, Deli serdang, Labuhan batu, Langkat, Medan, Tebingtinggi, Pematang Siantar and Sibolga. have the same tendency in learning outcomes and show the ability of students in solving problems given is still very low.

## REFERENCES

- [1] H.G Andriese dkk. *Media Cetak*. Tersedia di: <http://networkedblogs.com> [20 September 2011]
- [2] Sudjana, Nana. 2009. *Penilaian hasil dan Proses Belajar Mengajar*. Bandung : Remaja Rosada.
- [3] Freudenthal, H. 1973. *Mathematics as an educational task*. Dordrecht, The Netherlands: Reidel.
- [4] Puskur. 2002. *Kurikulum dan Hasil Belajar. Kompetensi Dasar Mata Pelajaran Matematika Sekolah Dasar dan Madrasah Ibtidaiyah*. Balitbang, Depdiknas.
- [5] Van den Akker, Jan. 1999. Principles and methods of development research. In Jan van den Akker et al. (Ed.) *Design Approaches and Tools in Education and Training* pp. 1-14. Dordrecht: kluwer Academic Publishers
- [6] Gravemeijer, Koeno. 1999. *Developing realistic mathematics education*. Utrecht, The Netherlands: Freudenthal Institute