International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 6 No. 2 January 2018, pp. 439-447

Thinking Ability Analysis High-Level Using Problems in Class VIII TIMSS MTsN Flat In the District Land

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***Abstract* – This study originated from the lack of high-level thinking skills in science class VIII Indonesia. Trends in International Mathematics and Science Studies (TIMSS) 1999, 2003, 2007 and 2011 showed the average value of science students are respectively 435, 420, 427, and 406 from the average standard 500. Low scores reflect low acquisition Indonesian students IPA implementation and reasoning ability of Indonesian students. The purpose of this study was conducted to determine the ability of students' higher-order thinking and the factors that influence it.**

This study is a descriptive study conducted in MTsN Batusanggkar, MTsN Paninjauan and MTsN Sungai Jambu in Tanah Datar. The instrument used to collect data is the text of TIMSS 2011 test questions and the interview guides for teachers and students. The achievement of students seen by the content domain, cognitive domain. The results of the 65 students in the district of Tanah Datar MTsN obtained 26.2% of students with high-level thinking skills with sedangdan level of 73.8% of students have a low level thinking skills. The achievement of high thinking skills tests eighth grade students in Tanah Datar content of 36.6% based domain. Cognitive domain application domain 36.8%, while 40.2% of cognitive reasoning. Based on interviews with teachers and students, the cause of the low ability students' higher-order thinking is students have never worked on about TIMSS. Questions used in different schools with about TIMSS given, lack of interest in reading the students, as well as lack of implementation and reasoning abilities of students.

Keywords – Descriptive TIMSS, the ability to think critically, MTsN

I. INTRODUCTION

Qualified human resources is an important factor in the development in this globalization era. Experience in many countries shows, the quality of human resources is more important than natural resources are abundant. Qualified human resources can only be realized with a quality education. Therefore, improving the quality of education is not negotiable in order to improve the quality of human resources of Indonesia (Tjala, 2005).

The quality of education is a major problem that is always in the spotlight in the world of education. Education is the process of formation of qualified human resources, the bookish knowledge, skills and positive attitude. Improving the quality of education can be achieved through improving the quality of the learning process that is geared towards the quality of educational outcomes. One of the problems facing education in Indonesia is low quality of education. One indicator that shows the low quality of education in Indonesia is the result of an international assessment of student achievement Indonesia.

Results of a survey conducted by the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA). TIMSS (1999) reported that among the 38 participating countries, Indonesia was ranked 32nd for science and ranked 34th in mathematics (Anggrani and Wasis, 2014). Trends in International Mathematics and Science Study (TIMSS) in 2003, for science students put Indonesia on the

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36th and the 45 participating countries, with an average value of 420. Achievement Indonesia also was below the international average is 500. Even the achievements of Indonesia are far below Malaysia is ranked 20th. Indonesian students' science achievement in TIMSS from 1999 to 2011 continued to slump seen from the scores and rankings obtained. Below is a ranking of data based on the results of the TIMSS science Indonesia.

When considered TIMSS data, TIMSS achievement in Indonesia in 1999 to 2011 with results that did not show much change at any participation. Ranked Indonesia is still at the bottom of the group with the acquisition of the score is still very low. Indonesian student achievement in science in TIMSS in 2011 is more worrying because Indonesia ranks 40th out of 42 participating countries with an average value of 406 under Marocc / o and Ghana. (Kemendikbud Research and Education Research Center, 2011)

In the TIMSS science assessment framework divides the domain of content and cognitive domain. The content domain consists of Biology, Chemistry, Physics and Earth Sciences, while the cognitive domain consists of knowing (knowing), apllying (applying), and reasoning (reasoning). The ability of Indonesian students' science is at the level of cognitive knowing (knowing), which is the lowest level of cognitive levels according to the criteria of TIMSS (Mullis, et al, 2009). Indonesian students have not been able to apply basic knowledge held to resolve the issue at the level of applying (applying) and the level of reasoning (reasoning).

Unfamiliarity of students work on the problems that demand a high level thinking abilities, allegedly due to the ability of Indonesian students' science is at the level of cognitive knowing (knowing), which is the lowest level of cognitive levels according to the criteria of TIMSS (Mullis, et al, 2009). Factors causing the other as students in Indonesia are poorly trained in solving problems of contextual, demanding reasoning, argumentation and creativity in meyelesaikannya, where such questions are characteristic problems of TIMSS and teachers are not accustomed to give a matter-skill high-level thinking.

Problem TIMSS test students' comprehension levels, especially high-level thinking. Problem being tested not only in the form of questions that require a basic knowledge of students. Problem TIMSS demands of various levels of thinking, such as aspects of student reasoning, problem solving aspect, concluded, hypothesize and its relation to daily life (IEA, 2013). High-level thinking skills is the ability to connect, manipulate, and transform knowledge and experience that already has to think critically and creatively in order to determine decisions and solve problems in new situations (Heong, 2011). Bloom has stated that there are two levels in the thinking of students, namely Low Order Thinking (C1 - C3), and High Order Thinking (C4 - C5). According to Anderson and Krathwohl (2001) dimension of the cognitive process from analyzing to mengkresikan including high-level specific to the skills of thinking (High Order Thinking).

Based on the above and an author interview to a science teacher at MTsN environment in Tanah Datar, the majority of science teachers state that has never examined the questions that measure students' higher-order thinking abilities. Teachers also did not know about TIMSS, TIMSS matter how the shape and the students also had never heard information about TIMSS. Given the importance of high-level thinking skills of students who have a positive impact in the future. Intelligence in analyzing the environment, intelligence in analyzing the readings, the intelligence in the association, the intelligence to understand the existence of others and intelligence in solving personal problems. 2013 curriculum requires students to think "HOTS", the writer interested undertake a study of the high-level thinking skills of students in the district MTsN flat land use problems TIMSS.

In connection with the problems that talah dipapparkan, the research was conducted with the objective of a high level thinking skills mnegetahui eighth grade students MTsN in Tanah Datar in solving problems TIMSS given. The results of this study are expected to provide information about high-level thinking skills of students in order to improve the quality of special education in the field of science and input in evaluating the implementation of the science curriculum in madrasas.

II. REVIEW OF LITERATURE

2. Theoretical Framework

2.1 Learning Theory

Learning theory is an attempt to describe how humans learn, so help us all understand the inherent complex process of learning. There are three main perspectives in learning theories, namely behaviorism, Cognitivism, and Constructivism. Basically the first theory is complemented by both theories and so on, so there is a variant, the main idea, or figures that cannot be entered clearly belong to which, or even become its own theory. But this does not need to argue about. The more important for us to understand is where good theory to be applied in certain areas, and where appropriate theory to other areas. This kind

of understanding is important to improve the quality of learning. Learning theories paying attention to how people influence others to place the process of learning (Sumiati, 2007).

2.2 Factors Affecting Learning

Factorsto learn is the learning event that happened to the learner, which can be observed from the difference in behavior before and after being in the learning process. Meaning learning is a change in the person's behavior toward better in implementing the learning (Slameto, 1995). Factors that affect a person in the study of many kinds. Factors studied and even then divided into two parts: internal factors coming from within and external factors or comes from outside.

Internal factors influenced many of the student's own and external factors affected by the environment, be it a family environment, school environment and the community. Both factors can affect each person to improve his performance obtained by way of learning.

Social factors in learning in this case is the human factor, neither man was present or indirectly present. The presence of the person or persons at the time a person is studying, will interfere with the individual in the study. These factors, in general, are disruptive to learning and ultimately will result in an influence on a person's learning outcomes (Slameto, 1995).

Usually these factors interfere with concentration, so that attention cannot be directed to the study or the learning activities solely. Therefore, in many ways, these factors should be regulated, so that learning can take place with the best (Suryabrata, 2004). Similarly, the factors of non-social learning, such as: the state of air, air temperature, weather, time of day (morning or afternoon, or evening), place (location), the equipment used for learning (such as stationery, books -book, props, and so what we call learning tools).

2.3 Tests as Evaluation Tool

Evaluation of learning outcomes includes using tests to measure learning outcomes. Tests can be defined as a set of questions or tasks are planned to obtain information about the trait, attribute educational, psychological or learning outcomes that each of the questions or duty shall have the answers or that provision is deemed correct (Openness development Learning Center, 2007).

Measurement construed as granting numbers or certain characteristics possessed by people, things, or certain objects or formulations according to clear rules. Assessment is a process for making decisions using information obtained through the measurement of learning outcomes either using test instruments and non-test. Ratings are intended to give the value of the quality of learning outcomes (Arifin, 2010).

In classical learning outcome evaluation purpose is to distinguish the failure and success of a student. But in its development, the evaluation is intended to provide feedback to students and to learners as consideration for improvement as well as a guarantee against the graduates as the responsibility of an institution that has graduated. Test, measurement and assessment is useful for: selection, placement, diagnosis and remedial, feedback, motivating and guiding learning, improving the curriculum and educational programs as well as the development of science (Openness development Learning Center, 2007).

2.4 High Level Thinking Skills

Ability high-level thinking is focused on problem solving, analysis and evaluation. High-level thinking skills more effectively stimulate students to understand the material in depth. For high-level thinking skills students should master the low-level first (Jensen et al, 2014).

This high-level thinking skill requires a person to apply new information or previous knowledge and manipulate information to reach the possible answers in a new situation. High-level thinking is thinking at a higher level than just memorize facts or say something to someone exactly like something is conveyed to us (Ward, 2010).

2.5 TIMSS

TIMSS *(Trendsin International Mathematics and Science*Study) is an international study of mathematics and science achievement of junior high school students. The study was coordinated by the IEA *(The International Association for the Evaluation of Educational* Achievement) based in Amsterdam, Netherlands. *TIMSS* is a study that is held every four years, namely in 1995, 1999, 2003, and so on. Indonesia began to participate since 1999 (IEA, 2009).

TIMSS is designed to align the education system with math and science curriculum in the participating countries. Therefore, the results show the extent to which students have learned penegetahuan mathematical and knowledge and skills being taught in schools. *TIMSS* also collects background information about students, teachers, schools, curriculum and education policy for cross-country comparisons, and the educational context which may be related to student achievement.

The main objective is to improve the TIMSS mathematics and science learning by providing data on student achievement in relation to the form of curriculum, instructional practices, and school environments are different. *TIMSS* also collects a variety of contextual information about how the learning of mathematics and science was held in each State. *TIMSS* submit questions for students, teachers, and principals in the form of a questionnaire about the curriculum, school, classroom and learning.

III. METHODOLOGY

This research type is descriptive. This type of research is used to describe the high-level thinking skills MTsN eighth grade students in Tanah Datar and its antecedents. This study uses a qualitative method. Furthermore, to check the truth of these tests were conducted data collection by interview.

Informants were students and teachers from 3 MTsN located in Tanah Datar. The study population was eighth grade students in 3 MTsN in Tanah Datar enrolled in the academic year 2016/2017. At every school in class VIII as the samples selected using purposive sampling technique, so that researchers get information relevant to the research objectives of the samples have been determined.

In every school grade VIII sampled been first class to work on the problems of high-level thinking skills tests. Researchers chose one class at each school because the ability of students per class homogeneous. For the interview data, researchers chose two students of class VIII and a science teacher at each school.

Table 1. Distribution of the study population

No.	School	Total Sample Research
1	MTsN Batusangkar	24
2	MTsN Paninjauan	21
3	MTsN Sungai Jambu	20
Number		65

The next stage is the analysis of the data. The data obtained from the test are suspended researchers then analyzed using a percentage formula as follows.

$$P = \frac{F}{N} X\ 100\%$$

Description:
P = Percentage of respondents results
F = Frequency of students who answered
N = number of students who take the test
Having obtained the next score is converted into the following categories:

Table 2. Category Level High Level Thinking Skills

Score		Category
3.01 to 4.00	76-100	high
2.01 to 3.00	51-75	Average
1.00 -2.00	26-50	Low

Heong (2011)

IV. RESULTS AND DISCUSSION

4.1 Results

The results of high-level thinking skills of students MTsN VIII class 3 in Tanah Datar many as 65 people obtained through tests and interviews to the question TIMSS science teachers and students representing each of the madrasah. Based on the test results about high-level thinking skills known to the average ability of eighth grade students in Tanah Datar MTsN relatively low percentage of 39%. Batusangkar MTsN students' ability in solving problems of high-level thinking by 45.4%, 37.1% MTsN Paninjauan, and MTsN Sungai Jambu by 34.7%.

4.1.1 The results of the High-Level Thinking Skills Students in Problem Solving TIMSS

Score results obtained from test answers about TIMSS and interviews, are used to determine the level of high-level thinking skills (Higher Order, Thinking Skill / HOTS) students obtained the highest and lowest scores are respectively are 75 and 20. From these scores can be categorized as high-level capabilities of students in accordance with the table category level high-level thinking skills are presented in table 2. The results of the study were obtained from 65 subjects showed that there are no students with high-level thinking skills high level, 26.2% of students with high-level thinking skills and 73.8% of medium level students with the ability to think critically low levels.

4.1.2 The results of the High-Level Thinking Skills Students Based on Cognitive Domain

Calculations based on the average value of the cognitive domain aims to determine the achievement of high level thinking skills of students in the aspects of the application*(Applying)*and reasoning*(Reasoning)*.The results

of high-level thinking skills of students based on cognitive domains can be seen in Figure 1.

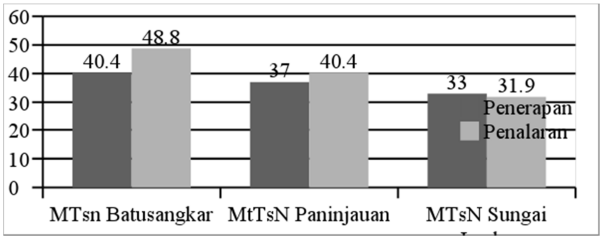

Figure 1. Graph of high-level thinking skills MTsN eighth grade students in Tanah Datar based cognitive domain

Of high level thinking skills of students based on cognitive domain describes about the most answered correctly by students. The results of this study explains that, high-level thinking skills MTsN eighth grade students in Tanah Datar better at reasoning domain compared to the application domain.

4.1.3 The results of the High-Level Thinking Skills Students Based Content Domain

Calculations based on the average value of the content domain aims to determine the achievement of high level thinking skills of students in all aspects studied in materials science SMP level. Covering the fields of Biology, Chemistry, Physics and Earth Sciences. The average value of the content domain achieved by the students can be seen in Table 3 and Fig.2.

Table 3. Average percentage of high-level thinking skillsgrade students MTsN eighthin Tanah Datar based domain content.

Madrasah	Content Domain			
	Biology	Chemistry	Physics	Earth Sciences
MTsN stone cage	52.9	41.5	29.9	45.6
MTsNPaninjauan	42.9	32.2	25.9	40.0
MTsN Sungai Jambu	45.5	32.6	17.3	32.1
Average	47.1	35.4	24.4	39.5

From the table it can be seen, for all domain content, MTsN stone cage has the ability to respond better. For physics domain MTsN Jambu River has the ability to answer MTsN lower than the others.

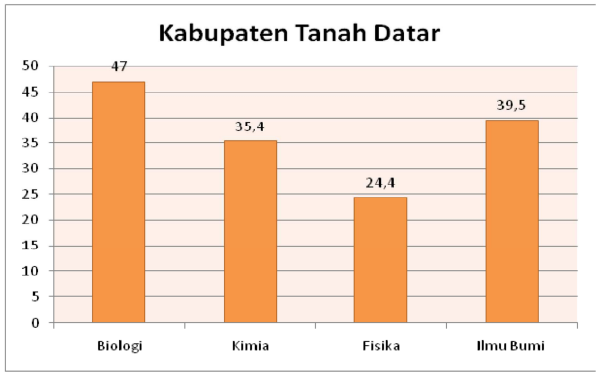

Figure 2. Graph of high-level thinking skills MTsN eighth grade students in Tanah Datar based domain content.

In Figure 2, note that the achievement of high level thinking skills tests eighth grade students in Tanah Datar MTsN low with a percentage of less than 60, but for the content domain of Biology students MTsN in Tanah Datar has the ability to respond better than other content domains.

4.2 Discussion of *Results 4.2.1 High Level Thinking Skills Problem Solving Students In TIMSS*

Of the 65 students of class VIII MTsN in Tanah Datar, no student with the ability to think critically high levels. 26.2% of students with high-level thinking skills and 73.8% of medium level students with the ability to think critically low levels. The inability of students in class VIII MTsN working on the problems presented by the TIMSS because students are not accustomed to in the test with higher-level thinking about such a matter TIMSS. Based on the interviews, the students find it difficult to understand about storytelling, so with graphs, tables. For the matter of graphs and tables of students should be able to understand it first and draw conclusions based on graphs and tables are presented.

In addition, teachers also never examined the matter which has graphs and tables on the students. Factors laonnya teachers also never perform tests using higher level thinking questions or similar tests in science subjects. If students are accustomed to read charts and tables, the students will be trained to answer questions.

4.2.2 The results of the High-Level Thinking Skills Student Based Cognitive Domain

Activity learn to solve problems is learning activities in an effort to develop the ability to think. Thinking is a high-level cognitive activity (Suprijono: 2010). High-level thinking skills of students based on cognitive domain according to TIMSS can be divided into two, namely: the application domain and the domain of reasoning. Domain

application (applying) aims to determine students' ability to use the knowledge to be able to explain and solve practical problems. Domain reasoning (reasoning) is intended to determine the ability of students in the use of evidence and knowledge to analyze, synthesize and generalize in new and complex situations (Mullis et al, 2000).

The achievement of eighth grade students MTsN in Tanah Datar in answering the question about- higher level thinking (about TIMSS 2011) can be categorized as low, with respective average percentage of the application domain and the reasoning was 36.8% and 40.3%. These results explain the achievements of high-level thinking skills of students of class VIII in Tanah Datar although low, but it's better for the domain of reasoning compared to the application domain, whereas the reasoning domain is the domain that is higher than the application domain. This means better students in the ability to analyze and draw conclusions in the form of knowledge rather than the ability of application of knowledge and understanding of science in the immediate situation.

Judging from the application domain, the ability of eighth grade students in Tanah Datar MTsN poorly on indicators linking that can be answered by students with a percentage of 27.9%. MTsN eighth grade students in Tanah Datar has not been able to link the knowledge of the biological or physical concepts underlying what is observed or which can be inferred from the behavior, the use of objects, organisms or substances.

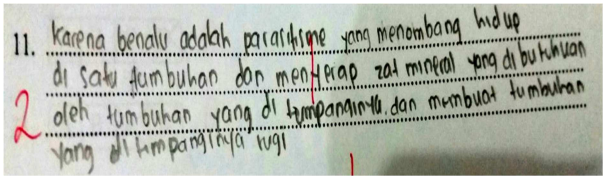

Figure 3. One Answer Student HOTS moderate level of Problem Domain Application (Connecting Indicator)

Students with a high level thinking skills level of being able to link the knowledge of the biological concepts in everyday life. Students can explain the result of the relationship or interaction between the rice plants with the parasite.

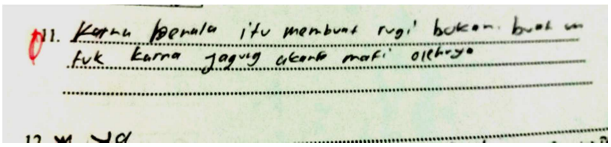

Figure 4. One Answer Student HOTS low level of Problem Domain Application (Connecting Indicator)

Student's ability to think critically low levels have not been able to link the knowledge of the biological concepts that can be observed or inferred behavior of organisms. Students only write things that are known and asked without any logical reason.

MTsN ability eighth grade students in Tanah Datar better application domain based on the indicators to find a solution. This contextual matter can be answered correctly by students with a percentage of 64.3%. Students are able to identify or using a relationship involving the application or a live demonstration of a concept.

Ability to solve problems is a very important aspect in learning. Tjalla (2005) said that the importance of problem-solving ability is seen from their usefulness in solving and finding solutions to daily life problems. This way of thinking, analytical, critical, accurate, and creative sharpened through problem solving in learning to encourage the students become the next generation high-powered analytical so as to put themselves in a variety of situations.

Judging from the domain of reason, the ability of eighth grade students in Tanah Datar MTsN poorly on indicators of planning (design). MTsN eighth grade students in Tanah Datar has not been able to design or plan a proper investigation to answer scientific questions, describe or identify the characteristics of the investigation, and the procedures used in the investigation, students were only able to be answered correctly by students with a percentage of 7.1%.

From interviews with students can be concluded that the student is difficult to understand about the stories and information from the image. Students' difficulty in composing a sentence in the answer. Teachers also less train students in trial conduct simple research or simple laboratory practicum.

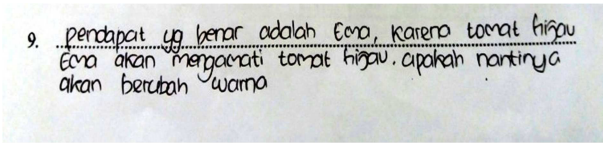

Figure 5. One Answer Student Problem Domain Reasoning (Indicator planning / design)

Ability eighth grade students in Tanah Datar MTsN good indicator for the synthesis integrate or domain reasoning can be answered correctly by students with a percentage of 64.3%. Students able to provide solutions to problems that the relationship between concepts in various fields of science to the problems of science.

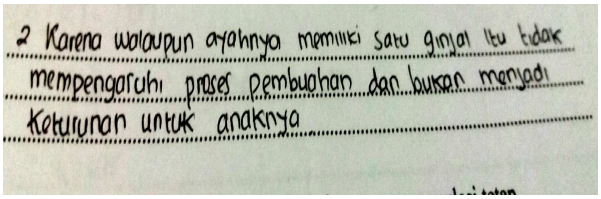

Figure 6. One Answer Student HOTS moderate level of Problem Domain Reasoning (Integrating indicators / Synthesis)

Based on the students' answers above can be seen the tendency of high-level thinking skills of students. Capability relates to the ability to analyze the main ideas about the identification, analyze arguments and compares what is known. Students with a high level kemampaun level of being able to identify the main idea by stating things that are known and questioned on the matter with a clear, concise and precise for most questions. Students can give reasons in accordance with the theory and its application in everyday life

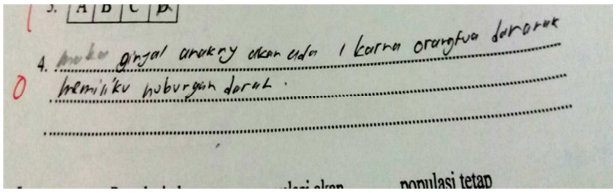

Figure 7. One student response HOTS low level of Problem Domain Reasoning (Integrating indicators / Synthesis)

Students with high levels of low-level capability able to identify the main idea of the matter by stating things that are known and questioned on the matter. The student has not been able to understand and apply the concepts into problems

Based on the interviews, the students were able to answer questions on the reasoning domain often associate the events experienced or natural phenomena with science. So that students are able to draw conclusions from the problems that are around it. As for the application domain students tend to discuss the subject matter of the science rather than natural phenomena. So that students are less able to apply his knowledge to the immediate situation.

It can be said in cognitive, improve critical thinking skills is to improve the ability of analysis, synthesis and evaluation of students. To give you an argument that fits the needs or the appropriate comment on a statement or condition requires the ability of analysis, synthesis, and evaluation can understand well, depth, detail or detail even in total to these conditions, so the argument or comments given support and aid to decision-making in critical thinking. And finally the students were able to take the right decision on a condition (Sudrajat, 2011)

Based on the interviews, most of MTsN VIII grade science teacher in Land District One reason teachers do not familiarize students with about- about C3 to C6 level is low ability students and supposition teachers about the issues of high level thinking skills for students only Olympics. As described by one of the teachers in the interview:

Factors affecting students in completing high-level thinking about- about the cognitive domain was the lack of ability of the students to discuss about natural phenomena related science lessons and students rarely associate natural phenomena with science teaching, lack of books support in learning science, and low reading students.

4.2.3 The results of the High-Level Thinking Skills Students Based ContentDomain

Analysis eighth grade students' ability MTsN in Tanah Datar contents ditinjaua domain shows the ability of the average low for all domains categorized content. The ability of the average content of physics domain of the lowest compared to the average ability in the content domain of biology, chemistry and earth science.

Results of interviews with students concluded that the students are difficult to understand the material because of a lack of understanding of physics students in the formula and to compute. On learning of physics teacher sometimes less explore the ability to think or reason, so the ability to answer the questions of physics is still low. Physics problem requires the student's ability to use logical thinking in answering, or solve the problems of physics. Necessary understanding or mastery of concepts, principles, theories, and laws of physics allow students to solve problems of physics.

According Anggraini (2014) said that the problems faced by students in solving test questions of physics, many of the students who do not have the ability to solve problems systematically, it is difficult to digest the principal question is not easy to determine the magnitudes of physics and symbols contained in question. Students also sometimes still difficult to define the concepts, principles, theories, laws and formulas used to solve, answer or solve problems

Overall achievement of the ability to think critically eighth grade students MTsN in Tanah Datar based domain contents categorized as low to the percentage of less than

60% , One factor is that students are not familiar with high-level thinking problems such as TIMSS.

Based on the interview, students find it difficult to understand the story, the problem with graphs, tables. For a matter of graphs and tables students should be able to understand it first and draw conclusions based on graphs and tables presented. In addition, the teacher also never tested the questions that have graphs and tables on the students. If students are accustomed to reading graphs and tables, then students will be trained to answer the question.

The next factor is developing in learning. Based on observations of the researchers, cultural teachers make orders to do something. That is communication between teachers and students. This kind of learning method makes students unmotivated to think and try to be creative. There is a positive and significant relationship between teacher communication practice with student learning motivation, the higher the teacher communication skill hence the student's learning motivation will also higher, conversely the lower the teacher communication practice hence the student's learning motivation will also be low (Yuliani: 2010).

V. CONCLUSIONS AND RECOMMENDATIONS

Based on the result of the research and the analysis of the thinking ability test for high grade students of VIII and interview, do not use high thinking ability, 26,2% students with medium high thinking ability and 73,8% students with low thinking ability.

The average percentage of high thinking ability of grade VIII MTsN students in Tanah Datar regency based on content domain shows students ability of class VIII for content domain is 33.8%. The average percentage of thinking ability of high grade students of grade VIII MTsN in Tanah Datar regency based on cognitive domain shows students ability of cognitive domain applying 36,8% while criminal cognitive domain 40,3%.

Factors that develop the ability to think high-level students are: interests, abilities, study habits, and tests given teachers. The test given by the teacher is a major factor that has the ability to think high level. Students with high-level thinking skills. With low thinking ability is not able to perform logic and reasoning skills, analysis and evaluation.

Based on the research that has been done writers, the authors provide advice teachers in science learning can improve students' high-order thinking. Teachers in science learning can improve students' higher-order thinking skills.

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