

Development of science teaching materials based on Science Technology Society (STM) and its influence on learning outcomes of fourth grade students of MIN Medan Tembung

Diah hafizhotul husna

Postgraduate students Program basic education

University medan state

Medan.indonesia

diahhafizatulhusnah@gmail.com

Nuraini

Lecture Medan State University

University medan state

Medan.indonesia

Ramlan Silaban

Lecture Medan State University

University medan state

Medan.indonesia

Abstract- This study aims to determine the feasibility, effectiveness of teaching materials based on STM science and to know the improvement of learning outcomes by using STM-based science teaching materials. The background in this study is a) The teaching materials used by the teacher have not brought up current issues and helped solve the problems of the surrounding community. b) The textbooks used present little information that is not sufficient to help students c) Text books have not been able to lead students to construct their own knowledge d) learning system that is still classical and based on the handbook of natural science subjects that affect low student learning outcomes. this research will be categorized into the type of research development research in this study which will be developed namely STM-based teaching materials. the development of STM-based teaching materials used was modified and adapted to the Dick and Carey development model. The stages in this study will be grouped into three groups, namely: 1) preliminary study 2) planning, 3) Validation and testing. Subjects in this study were grade IV students of MIN Medan Tembung, Medan, totaling about 32 students. In the experimental class and grade IV b as the control class amounted to 34. The results of this study showed an increase in student learning outcomes before using STM-based teaching materials with after using STM-based teaching materials in the experimental class, namely: in the experimental class totaling 32 students on the pretest there are 13 students complete category with a percentage of 40.62% while students in the incomplete category there are 19 students with a percentage of 59.37%. while the posttest results of students in the complete category are 32 students with a percentage of 100%. As for the average value of the pretest results is 72.18 while the average value of the posttest results is 88. It can indicate that there is an increase in student learning outcomes by using STM-based teaching materials by not using STM-based teaching materials. expected to be a reference for teachers in carrying out the teaching and learning process in

science learning, especially for the level of MIN / SD in class IV natural resource material.

Keyword-Development of science teaching materials, Method Science Technology Society (STM), Learning outcomes.

I. INTRODUCTION

Today, existing technology offers a variety of conveniences that were not previously forgotten. communicate with people who are in different parts of the earth in just minutes or even seconds. Haidir and Salim (2012: 65) advances in information technology also make the world smaller, without limits and with the world wide internet just like a small global village [1]. technology consists of hardware (hardware) which is equipment that can be used to support a better educational process in order to achieve the stated goals. software technology (software) are ways, strategies, methods and approaches that are systematically designed to support the educational process. [2] Salminawati (2012: 135) The task of educators is to educate operationally educating is a series of teaching and learning processes, giving encouragement, praising punishing, giving examples, getting used and so on [3]. The task of education is not just teaching how most people think, but serving as a motivator and facilitator in the teaching and learning process. An educator will influence students by actualizing all potential learners can be actualized well and dynamically. As in accordance with the quote above that in the learning process there must be motivation and facilitators who support one of the technologies developed in the community [4]. Aware of this, technology is also very important with the use of existing technology so it can alleviate human work.

community technology is now being developed by many layers of society. one form of application is the application of community technology learning in schools but can help the community itself so that students can apply the technology of the community at home with simple but useful technology for the surrounding community. [5] According to Jhon Dewey (in Badar, 2014: 64) learning based on problems is the interaction between stimulus and response, is the relationship between two directions of learning and the environment. the environment provides input to students in the form of assistance and problems, while the nervous system of the brain functions to interpret the aid effectively so that the problems faced can be investigated, assessed and analyzed and the solution is sought properly [6]. student experience gained from the environment will make him material and material in order to gain understanding and can be used as guidelines and learning objectives. It is expected that with STM-based teaching materials students can improve their enthusiasm and motivation in learning and students no longer feel that science is a complicated lesson and only memorize death, but can make science as a fun learning in everyday life [7]. Low student learning outcomes, seen from the KKM, especially in natural science subjects are problems that arise in learning activities. problems in learning activities can be viewed from several aspects, aspects of students, which affect learning outcomes arising from individual factors and social factors. [8]

According to (Purwanto, 1987: 106) "individual student factors include maturity / growth factors, intelligence, training, learning motivation and personal factors, while social factors can be in the form of teachers, tools and methods used in teaching and learning, the environment and available opportunities and motivation social. [9] To overcome this problem researchers used the development of teaching materials with a learning approach and teaching aids that matched the material to be taught so that what was expected could be in accordance with the learning objectives and general goals of education set by the government. Community science and technology learning approaches are learning that can accompany students to be able to think critically from a problem issue that exists in the community. especially on natural resource material. The STM learning model will actively be involved in the learning process so that learning experiences occur, also requires students to hone their thinking about a problem. [10] STM learning models can create a learning product that can be useful for students and the surrounding community. Science material for grade IV students who will do the development of teaching materials that is the theme of the environment where I live. This material study is very important to foster student understanding, because it can shape students' thinking. the sub-environment environment where I live is covered by natural resource material that can increase students' understanding of how much natural resources the Indonesian state has so that they understand how to manage natural resources in Indonesia so that they do not run out quickly by utilizing technology combined with science. [11] therefore, the author uses the STM model. The author tries to develop teaching materials based on STM because the STM can bring learning closer to students' daily lives so that students are accustomed to solving

their own problems and can be useful for people's lives. Science learning is learning based on natural learning with the environment around students so learning with STM that is applied in teaching materials is expected to be able to bring students closer in their daily lives and can provide meaningful learning for students. The learning syntax of STM is 4 steps: (1) Invitations, (2) Exploration, (3) Providing solutions, (4) Follow-up [12]. the objectives to be achieved in this study are as follows. knowing the feasibility of teaching materials based on STM science, learning the effectiveness of teaching materials based on STM science, knowing the increase in learning outcomes by using STM-based science teaching materials

II. METHOD

This research will be categorized into the type of research development research in this study which will be developed namely STM-based teaching materials. the final product will be evaluated based on the product quality aspects that are determined thus the product of this research is a learning instructional material that is applied through teaching materials and learning plans that are feasible, valid and effective. the development of STM-based teaching materials used was modified and adapted to the Dick and Carey development model. Dick, Carey, and Carey (2001: 55) that the system approach always refers to the general stages of the Instructional Systems Development (ISD) system. The Dick and Carey development model has 10 stages:

1. Identification of Learning Objectives. The first step in the development process is to determine what information will be displayed and the skills that will be taught to students. Learning objectives can come from national education goals, performance analysis, analysis of student needs, and student learning difficulties.
2. Learning Analysis. After identifying the learning objectives, the next step is to determine the steps taken so that the learning objectives are achieved. The process of learning analysis will ultimately determine the knowledge, skills, and attitudes needed by students.
3. Learner and Context Analysis. The next stage is a parallel analysis of students, those who will learn skills until finally apply in their lives. Students' initial skills, tendencies / priorities, and attitudes are determined along with the characteristics of learning in order to produce products that are appropriate to their needs.
4. Determine Learning Objectives. The next step is to write down specific statements of what students can do when they finish learning. This statement derives from the skills identified in the learning analysis, identifies the skills that must be learned, the conditions under which skills will be demonstrated, and the criteria for successful learning goals.
5. Develop Assessment Instruments. Based on the stated goals, the next step is to develop a parallel assessment and measure the ability of students to do what is the learning objective. The main emphasis is placed on matters relating to

the types of skills outlined in the objectives with assessment requirements.

6. Develop Learning Strategies. Based on information from the previous five steps, the next step is to identify strategies for use in learning. Strategies are used to assist students' development in learning which includes pre-learning activities (stimulating motivation and focusing attention), presenting new content with examples and demonstrations, active learning and assessment activities, and follow-up activities related to newly learned abilities to do in the world real.

7. Develop and Select Learning Materials. The next step is to produce learning materials that are in accordance with the learning strategy. Learning materials usually consist of guidelines for students, learning material, and assessment.

8. Design and Conduct Formative Evaluation. After the learning draft is complete, the next step is to do an evaluation. Evaluation is done to collect data that is used to identify problems in learning and find opportunities to make learning better.

9. Revision of the final step in the design and development of the process is to revise the product. data from formative evaluation is useful for knowing product deficiencies and then used to improve product quality.

10. Designing and conducting summative evaluation The final step in product development is to conduct summative evaluation. Summative evaluation is a product evaluation that produces absolute or relative values and occurs after the product is evaluated formatively and revised. [13]

So from the above STM syntax can be concluded Systematics writing of Teaching Materials. The systematic teaching material draft can be seen from the following table:

Table 1. Writing Composition of Teaching Materials

No	Sheet	Information
1	Sheet 1	Cover
2	Sheet 2	Foreword
3	Sheet 3	Tracing games in the neighborhood where I live are equipped with images
4	Sheet 4	Images related to the child's environment that are equipped with original images of the environment in the area around the child, namely tembung
5	Sheet 5	Discourse and response from discourse
6	Sheet 6	Worksheet 1
7	Sheet 7	Understanding of natural resource material that is accompanied by a term corner (understanding and definition of words that are considered taboo for students)
8	Sheet 8	Tasks related to LK

9	Sheet 9	My work (ie the results of the work produced on the worksheet)
10	Sheet 10	Repetition of understanding of the material impact of natural resource extraction and waste recycling along with discourses and worksheets 2 and 3 as well as my works 2 and 3) and so on
12	Sheet 11	Next sheet: summary and reflection
13	Sheet 12	Bibliography

The following data collection techniques that will be used in this study are: 1) Test techniques; This test technique is used to measure the cognitive aspects / domains of students. As for the tests that will be used in this study are divided into two, namely pretest and post test. pretest is a test given to the subject of the research before it is done. learning activities by implementing learning device products that are developed. This test aims to see how far the subject has mastered the material. Posttest is a test that is given to the research subject after learning activities are carried out by applying a learning device product that has been developed. [14] 2) Non-test technique; This non-test technique generally plays an important role in measuring student affective and psychomotor. Questionnaire Method; This questionnaire is used to see the effectiveness of the product being developed. This questionnaire is given to the teacher. This questionnaire is used to obtain the subject's response to the product being developed. Observation Method; is an activity carried out through observation. as for the purpose of observation is to get information related to data needed in product development. this observation relies on small notes as a result of the collection of data needed and things found through sight. Interview Method; the method or method used is a free interview. in the sense that the questions thrown are free questions that have not been prepared beforehand and have no guidelines. Documentation Method; Documentation is used to collect facts, book data that is carried out as a previous learning source as a study material to develop products.

III. RESULTS AND DISCUSSION

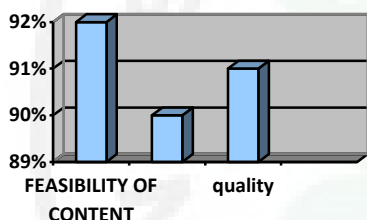
Based on the results of the validation data, the material experts stated that the STM-based teaching material products had content eligibility, presentation quality, and selection of images in the category "feasible without revision". And the revised validation results on the components of the quality of teaching material can be seen in the table

Assessment aspect	Assessment indicator	Assessment points	Score	Average	Criteria
Feasibility of material content	Quality of learning material	1. Depth of learning material in teaching materials	3	75%	Good
		2. The accuracy of the coverage of natural resources in the sub-environment I live	4	100%	Very Good
		3. Digestion of natural resource material in the subtheme 1 of the environment in which I live and logical exposure	4	100%	Very Good
		4. Accuracy of the order of learning material	4	100%	Very Good
		5. Clarity of learning objectives	4	100%	Very Good
		6. Compliance with indicators	3	75%	Good

Development of teaching materials with STM	7. Ease of understanding language delivered in teaching materials	4	100%	Very Good	
	Learning delivery system	8. The truth of the concept conveyed in the teaching material	4	100%	Very Good
	The quality of teaching materials using learning models	9. Suitability of STM teaching materials	3	75%	Good
		10. Involvement of the role of students in learning activities	4	100%	Very Good
		11. Encourage students to think critically from the problems of learning issues faced	3	75%	Good
		12. Preliminary quality in teaching materials	4	100%	Very Good
		13. Quality feedback in teaching materials	4	100%	Very Good
		14. Presentation time	3	75%	Good

	15. quality of practice questions	4	100%	Very Good
F = 55				
P = 91				
Criteria = valid	Qualification			

The level of validity and feasibility of STM-based textbooks according to material experts after the revision, is presented in the following diagram:

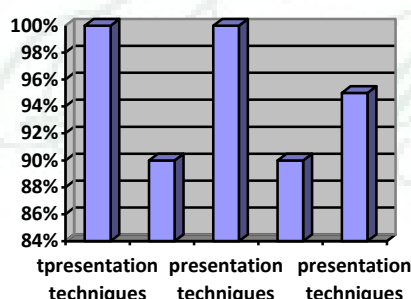


Based on the picture above, it can be seen that the qualification results of the feasibility indicators and validity of STM-based textbooks by material experts averaged 91%. If this result is referred to the criteria set out in the previous chapter, then the conclusions at the qualification level are "very valid." Based on the data from the validation of the learning design experts stated that the STM-based teaching material products have the feasibility of presentation, presentation of learning, language in which there is a display quality teaching materials in the category "feasible without revision". And the revised validation results on the components in the quality of teaching material design can be seen in the table.

Presentation	Presentation of learning	4. Practice questions at the end of learning	3	75%	Baik
		5. Determination of media selection	4	100%	Very Good
		6. Introduction	3	75%	Good
		7. Involvement of students in learning activities	4	100%	Very Good
Linguistic	Coherence and wrinkling of thought lines	8. The involvement of students in the activities of students who are closer to issues of learning problems	4	100%	Very Good
		9. Relationship with learning activities	3	75%	Good
		10. Presentation time	4	100%	Very Good
		11. Ease of understanding language	4	100%	Very Good
		12. Display	3	75%	Good
		13. Illustration	4	100%	Very Good
		F = 48			
		P = 92			
		Qualification = valid			

The level of validity and feasibility of STM-based teaching materials according to the learning design experts after the supervision, can be seen in Figure 4.5 as follows:

Assessment aspect	Assessment indicator	Assessment points	Validator score	Average	Criteria
Presentation eligibility	Presentation technique	1. Systematic consistency of deep dishes	4	100%	Very Good
		2. Concept collision	4	100%	Very Good
	Presentation support	3. Examples of questions in learning activities	4	100%	Very Good



At equal variances assumed is seen in the difference in the level of 5 percent $t = 856$, $P = <0.05$). The experimental group had significant changes compared to the control group. This means that the treatment we give to the experimental class is successful. The acquisition of posttest scores of students who were taught using STM-based Teaching Materials media through t test was $P = 0,000$. Based on the statistical figures showed $P <0.05$, and the results of the qualification of the students' responses were "very positive" then it was concluded that the Teaching Materials developed had significant effectiveness and could be used as a science learning media. The number of N-Gain acquisition is in the "high" (0.7) qualification in the experimental class and in the control class (0.5).

A summary of the results of the validation of the entire Teaching Materials product developed by the 2 Experts is presented

Table 2. The results of the experts' validation of the Teaching Materials developed

No	Assessment by	Value Gain	Category
01.	Expert Science material	91	Very valid and feasible
02.	Learning design experts	92	Very valid and feasible

The results of the validation of Teaching Materials products that have been developed are in a very valid and feasible category due to: (1) the suitability of the product material content with the theories used as a reference through validity instruments. Through STM-based Teaching Materials, students will engage and play an active role in learning activities and encourage students to answer in their own way. This finding is in line with the results of Rizal's (2014: 57) study, that with Guided Inquiry-based learning has a significant influence on the mastery of the science concept so that students can better understand the science concept in various situations they face in their daily lives. . amounting to $0.000 <0.05$, [15] meaning that there is a significant change compared to the control class. This finding is in line with the results of Abdi's research (2014: 87), which shows that students who learn through learning through STM-based instructional materials obtain higher scores from students who learn through conventional / traditional instructional media instruction. [16]

IV. CONCLUSION

STM-based science teaching materials for environmental themes where I live in natural resource material "feasible" category are used with the percentage of material experts on average 91%. With the qualifications "very valid", while the design experts display the quality of teaching materials in the category of "decent without revision", the average score is 92%.

STM-based science teaching materials on the theme of the environment in which I live in the subject matter of the "effective" category of natural resources are used. obtained results from 32 students there were 32 students who completed (100%) and 0 students who did not complete (0%) with an average score of 88. while, the control class had an average score of 83 there were 25 students who completed (73, 52%) and 9 students have not yet completed (26.47%). So that the learning outcomes of students who use STM-based Science Teaching Materials that are developed are relatively better compared to students who were taught without Teaching Materials which were developed with a percentage increase in the average score of 5%. STM-based with after using STM-based science teaching materials. on the results of the pretest there were 13 students in the complete category with a percentage of 40.62% of students in the incomplete category there were 19 percentages of 59.37%. in the posttest results the students in the complete category were 32 students with a percentage of 100%. the average value of the pretest results is 72.18 while the posttest result is 88. with the percentage of pretest and posttest increase of 59.38%.

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