The Improvement of Teacher Competency Makes Expansion Learning Media through Model Workshops Modeling, Modification and Creativity

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Abstract. Teachers in Middle School Sub Rayon 23 Medan still has low competence in making learning media. The creative ideas from the science teacher have not yet emerged, the teacher's understanding of making the learning media expansion is still minimal, the teacher has not been motivated to make the media curiosity about the media is still low. This study aims to find out how to improve teacher competencies in making science learning media, especially expansion. The action hypothesis in this study is the teacher's competence in making science learning media possible improved through workshops. The subjects of the study were 9 people of Natural Sciences at Sub Rayon 23 Junior High School in Medan. The object of research is learning media especially expansion. Media Learning IPA is Swelling Solids of goods secondhand or materials that price it cheap so it can be affordable. The results of the data analysis makes learning media Expansion Solids in cycle 1 at 29.33 (Less), Cycle 2 at 64.00 (Good), and meeting 3 at 84.89 (Very good). Increase in the average value of teacher competence: 84.89% - 29.33% = 55.56%. The results of the questionnaire analysis showed that 95.00% of the science teachers of the Sub-Rayon 23 Junior High School in Medan strongly agreed to make the learning media for Solid Substance Expansion through workshops conducted by researchers because of their increased competence.

1. Introduction

Science (Natural Sciences) in junior high school aims to develop a variety of science skills. In accordance with the learning objectives of science in junior high school, science teachers must use learning media so that students' scientific skills can develop. This is appropriate when referring to the cone of [1] which says that good learning outcomes will be obtained if students are able to manifest the knowledge gained by direct observation and experience [1]. To be able to teach students with direct observation and experience, the teacher is required to be able to make learning media so that the subject matter can be easily mastered by students. [2] says the teacher can at least use inexpensive, simple and unpretentious tools but is a necessity in the effort to achieve the expected teaching goals [2].

Based on the results of supervision conducted by researchers as school supervisors of science teachers in Sub Junior High Schools, Rayon 23 Medan obtained preliminary data: 66.67 % of the Natural Sciences laboratory is not functioning properly this is caused by incomplete tools/materials. 88.89 % of science teachers conduct conventional teaching and learning, subject matter is delivered
verbally even though science subject matter is demanded to use learning media. 100% of the science teachers is still low competence to create learning media. From the initial data of the supervision results it turns out that the science teacher is still low in competence to analyze and describe the concepts of science in learning science. For the subject matter of expansion, the description is verbally or simply by writing the process of expansion on the board and even dictated. Students only imagine in their minds, that an object will expand if heated. The condition that occurs in the application of the science concept is that the science laboratory is not functioning in science learning because the teacher is not able to make the learning media for expansion and also the tools/materials are incomplete, while the provision of tools/materials is rarely done by the school principal.

Based on the preliminary results of the supervision results obtained by the researchers, the researchers worked with the principal of the Sub Junior High School. Rayon 23 Medan presents science teacher at SMP Sub Rayon 23 Medan to hold a workshop. The researcher explained the purpose and objective of the workshop was to create an expansion learning media. The learning media made are Expansion of Solid Substance, because this subject matter is Class VII odd semester material according to the time of the workshop and this subject material is abstract subject matter so that teachers in the teaching and learning process are required to use learning media. The researcher asked the science teacher of SMP Sub Rayon 23 Medan each freely created to create a medium for the expansion of Solid Substance with the hope that the science teacher's creative ideas would emerge. In fact creative ideas from the science teacher has not appeared, understanding teachers make instructional media expansion still minimal, teachers have not been motivated by making media, curiosity about the media is still low. Teachers generally reflect, ask each other the teacher beside him, leafing through the textbooks and other handbooks.

Based on the background of the problem, the problem of this research can be formulated as follows an effort to improve the competence of teachers in making media for expansion learning through the TMK Model Workshop in SMP Sub Rayon 23 Medan. The purpose of this study was to find strategies to improve teacher competency in developing expansion learning media through the TMK Model Workshop in SMP Sub Rayon 23 Medan.

According to [3] learning media are all things that can be used to channel messages and stimulate the learning process of the learner. [4] proposed an effective media use planning model known as ASSURE. (ASSURE stands for Analyze learner characteristic, State objective, Select or modify media, Utilize, Require learner response, and Evaluate). Various benefits of learning media have been discussed by many experts. According to Kemp and Dayton in [5], although it has long been realized that many of the benefits of learning media users, their acceptance and integration into teaching programs runs very slowly.

In this study, what is meant by expansion learning media is media that uses second-hand goods or goods that are cheap. Used goods are all things that can be used from the items left after being used by the owner to deliver the lesson material in the teaching and learning process. Low-priced goods are goods that can be affordable to buy even easily obtained around the school. In learning science it is very necessary teaching aids as tools to help students understand the natural phenomena that surround them. According to [6] the workshop is a meeting of people who work together in small groups, usually limited to problems that originate from themselves. Participation is expected to produce certain products.

Making learning media expansion through TMK Model Workshop. At the initial activity stage, the science teacher Sub Rayon 23 Medan together with researchers started the activity by conducting a trial workshop for taking the initial data of the teacher's competency in learning media. Identify problems faced by teachers and find solutions to those problems. Then together determine the biggest problem experienced by the teacher. In the planning stage, the science teacher Sub Rayon 23 Medan will be fostered by researchers making learning media for Solid Substance Expansion by holding a TMK Model workshop so that teachers can practice directly making the learning media. This workshop is done making media learning Swelling Solids 3 (three) cycles, they are; cycle 1 (mimic), cycle 2 (Modification), and cycle 3 (creativity). At the observation stage the observers were observed
by the researcher and the school supervisor who served in SMP Sub Rayon 23 Medan. In the reflection phase, the researchers reflect on media create learning media. Then the researchers consider the responses and suggestions for improving the process of making these learning models in the next cycle of school supervisors as observers.

2. Materials and Methods
The location of this research was carried out at SMP Negeri 23 Medan, located at Jl. Raya Menteng Ujung Medan. The research subjects were Junior High School science teachers. Rayon 23 Medan as many as 9 (nine) people, consisting of 1 (one) person from Medan 23rd Public Middle School, 1 (one) person from Medan 23rd Open Public Middle School, 1 (one) person from Medan Adventist Private 3, 1 (one) people from Parulian 2 Private SMP Medan, 1 (one) person from Al Washliyah 1 Medan Private SMP, 1 (one) person from Al Washliyah 29 Private SMP Medan, 1 (one) person from Muhammadiyah 05 Private SMP Medan, 1 (one) people from Medan National Private Middle School, 1 (one) person from Tri Jaya Medan Private Middle School, and 1 (one) person from Medan An Nizam Private Middle School.

The object of research is expansion learning media. Learning media that are made are from used goods or from materials that are cheap so they can be affordable to make the expansion learning media done through the TMK Model Workshop. The model used in this workshop is a model Kemmis designed cycle process (cylical) comprising dat 4 (four) phases of activities, namely: planning (planning), action (action), observing (observation), and reflection (reflective). These stages keep repeating until the problem is considered solved.

![Figure 1. Kemmis Model Cycle [7]](image)

In the planning phase of the first cycle of this workshop, the researcher will instruct the IPA teachers in the workshop participants to create a learning media for Solid Substance Expansion by imitating the example prepared by the researcher. At the planning stage of the second cycle of this workshop how to modify the learning media in accordance with the learning media available in the textbooks or other handbooks as well as modify the existing media. The researcher collaborated with the school supervisor who served in SMP Sub Rayon 23 Medan.

Researchers guiding teachers make instructional media Expansion Solids cycle 3 already exists then be expected to have the creative idea each teacher makes media learning Swelling Solids, according to teachers’ creativity and the use of tools/material provided by each teacher. In the observation phase of the first cycle of this workshop, the researcher together with the school supervisor observed the science teachers making the media for the expansion of Solid Substance in accordance with the work instructions contained in the Student Worksheet (Student Worksheet). Record all the instructional media manufacturing operation and present the results of a man using instructional media expansion. In the observation phase of cycle 2, the researcher together with the school supervisor observed the science teachers making learning media for Solid Substance
Expansion. In the observation phase of the 3rd cycle of the workshop, the researcher together with the school supervisor observed the science teachers making the media for Expansion of Solid Substance.

Making observations in cycles 1, 2 and 3 about: (a) the teacher's readiness to prepare tools/materials =\ldots\% (\ldots), (b) the teacher's ability to come up with creative ideas =\ldots\% (\ldots), (c) the ability of the teacher to make media =\ldots\% (\ldots), (d) the suitability of the media =\ldots\% (\ldots), and (e) the timeliness of producing media for the expansion of Solid Substance =\ldots\% (\ldots). The observations were analyzed by the researchers together with the school supervisors so that the scores of each teacher in these cycles 1, 2 and 3 were obtained.

In the reflection phase of cycle 1, researchers together with school supervisors reflect on the observations of the implementation of science teachers making learning media. This workshop is successful if at a minimum: (a) 75% of teachers can prepare tools/materials, (b) 75% of teachers have come up with creative ideas, (c) 75% of teachers have the competence to make media, (d) 75% of media created by teachers is appropriate, and (e) 75% of teachers are on time ready to make the expansion learning media. Assessment makes learning media in this workshop there are two types, namely: (1) Competency assessment makes learning expansion media. Competency assessment makes the expansion learning media there are 5 (five) aspects, each aspect scores 5 (five). Then the maximum score is 25 (twenty-five). While the acquisition score depends on the number of answers from the five components.

| Table 1. Assessment indicators |
|--------------------------------|
| **Score:** | **Value** |
| 5= Very good | 81 – 100 |
| 4 = Good | 61 – 80 |
| 3 = Enough | 41 – 60 |
| 2 = Less | 21-40 |
| 1 = Very Poor | 1-20 |

The competency value of each teacher makes learning media for the expansion of Solid Substance, is the value in cycles 1, 2 and 3 namely the value of cycle 1 (imitating), cycle 2 (modifying), and cycle 3 (the result of creativity). Assessment of teacher attitudes makes learning media expansion. Teacher attitude assessment makes there are 4 (four) aspects of expansion learning media, each aspect scores 5 (five). Then the maximum score is 20 (twenty). The number of teachers who participated in the workshop at SMP Sub Rayon 23 Medan Junior High School 23 Medan area are 9 (nine) people, the attitude value is the average value of the nine teachers.

3. Result and Discussion
From the results of observations of the competence of science teachers making media for the expansion of Solid Substance at meetings 1 to 3 of 9 (nine) science teachers at SMP Sub Rayon 23 Medan workshop participants are like Table 2. The data of observations of the competence of natural science teachers made the media for the expansion of Solid Substances at meeting 1 (imitating), out of 9 (nine) science teachers of SMP Sub Rayon 23 Medan workshop participants are like Table 2.

| Table 2. Teacher Competency Data IPAM Makes Learning Media for Solid Substance Learning in Cycle 1 (Mimic) |
|---------------------------------------------------------------|
| **No.** | **Aspect** | **Total** | **Score** | **Information** |
| | 1 | 2 | 3 | 4 | 5 | |
| 1 | 2 | 1 | 2 | 3 | 2 | 10 | 40 | Less |
| 2 | 1 | 1 | 1 | 1 | 2 | 1 | 6 | 24 | Less |
| 3 | 1 | 1 | 1 | 2 | 2 | 1 | 6 | 24 | Less |
| 4 | 1 | 1 | 2 | 2 | 1 | 1 | 7 | 28 | Less |
| 5 | 1 | 1 | 1 | 2 | 2 | 1 | 6 | 24 | Less |
Figure 2. Science Teacher Competencies Make Learning Media Expansion of Solid Substances in Cycle 1 (Mimic)

3.1. Reflection Cycle 1

In the implementation phase of the reflection cycle 1 of this workshop, the researchers together with the school supervisors reflected on the results of observations of the competence of natural science teachers making learning media for Expansion of Solid Substance in cycle 1 (imitating), out of 9 (nine) natural science teachers of SMP Sub Rayon 23 Medan workshop participants are: (a) teacher readiness to prepare tools / materials = 24.44% (less), (b) observing the ability of teachers to come up with creative ideas = 20.00% (very less), (c) the ability of teachers to make media = 31.11% (less), (d) appropriateness of media = 46.67% (enough), and (e) timeliness makes learning media for Expansion of Solid Substance = 24.44% (less). The average value of the ability of teachers to make media learning for Solid Substance Expansion is 29.33 (less).

The data of observations of the competence of science teachers make the media for the expansion of Solid Substance in cycle 2 (Modified), out of 9 (nine) science teachers of SMP Sub Rayon 23 Medan workshop participants are as shown in the following Table 3.
3.2. Reflection Cycle 2

In the implementation phase of the reflection cycle 2 of this workshop, researchers together with school supervisors reflect on the results of observations of the competence of natural science teachers making learning media Solid Expansion in cycle 2 (creativity), out of 9 (nine) natural science teachers of SMP Sub Rayon 23 Medan workshop participants are: (a) teacher readiness to prepare tools / materials = 55.56% (enough), (b) observe the ability of teachers to come up with creative ideas = 64.44% (good), (c) the ability of teachers to make media = 62.22% (good), (d) suitability of the media = 71.11% (good) and (e) timeliness to make learning media Liquid Expansion = 66.67% (sufficient). The average value of the ability of teachers to make learning media Expansion of Solid Substance is 64.00 (good).

3.3. Cycle 3

The data from observations of the competence of natural science teachers made Gas Expansion learning media at the 3rd meeting (creativity), out of 9 (nine) science teachers of SMP Sub Rayon 23 Medan workshop participants are as the following Table 4.

Table 4. Competency Data of IPAM Teachers Making Gas Expansion Learning Media in Cycle 3 (Creativity)
Table 3. Science Teacher Competencies Make Learning Media for Expansion of Substance in Solid Cycle 3 (Creativity)

| No. | Aspect | Total | Score | Information |
|-----|--------|-------|-------|-------------|
| 1   | 2      | 3     | 4     | 5           |         |
| 2   | 4      | 4     | 4     | 4           | 19      | 76   | Very good |
| 3   | 4      | 4     | 4     | 4           | 4       | 19   | 76   | Well       |
| 4   | 4      | 4     | 4     | 4           | 4       | 20   | 80   | Well       |
| 5   | 4      | 3     | 4     | 4           | 4       | 19   | 76   | Well       |
| 6   | 5      | 5     | 5     | 4           | 5       | 23   | 92   | Very good |
| 7   | 5      | 4     | 5     | 5           | 5       | 24   | 96   | Very good |
| 8   | 4      | 4     | 4     | 4           | 4       | 20   | 80   | Well       |
| 9   | 5      | 4     | 5     | 5           | 5       | 24   | 96   | Very good |
| Sum | 40     | 35    | 39    | 40          | 36      | -    | -    | -          |
| N   | 88.89  | 77.78 | 86.67 | 88.89       | 80.00   | -    | -    | -          |

| Amount of Values | 764                  |
| Average value    | 84.89 | Very good |

Figure 4. Science Teacher Competencies Make Learning Media for Expansion of Substance in Solid Cycle 3 (Creativity)

3.4. Reflection Cycle 3

In the implementation phase of this cycle 3 reflection, researchers together with school supervisors reflect on the results of observations of the competence of science teachers making learning media for expansion of Solid Substance in cycle 3 (creativity), out of 9 (nine) junior high school science teachers. Rayon 23 Medan workshop participants are: (a) teacher readiness to prepare tools / materials = 88.89% (very good), (b) observe the ability of teachers to come up with creative ideas = 77.78% (good), (c) the ability of teachers to make the media = 86.67% (very good), (d) the suitability of the media = 88.89% (very good), and (e) the timeliness of learning media for the expansion of Gas = 80.00% (good). The average value of the ability of teachers make instructional media Expansion Substance Solid is 84.89 (very good), it is not necessary to continue to cycle to 4.

From the results of observations of the competence of science teachers making learning media for expansion of Solid Substances in cycle 1 (imitating), cycle 2 (modifying), and cycle 3 (Creativity) of 9 (nine) science teachers at SMP Sub Rayon 23 Medan workshop participants according to Table 3. It turns out that from the five aspects observed it can be concluded that the Science Teachers who participated in the TMK Model Workshop were still lacking in capacity (29.33%) to make media for expansion learning.
Table 5. Data Science teachers’ Competence Learning Media Expansion Substance Solid In cycle 1(Mimic), cycle 2 (Modification), and cycle 3 (Creativity)

| No. | Cycle 1 (Imitating) | Cycle 2 (Modify) | Cycle 3 (Creativity) | Information |
|-----|---------------------|------------------|-----------------------|-------------|
| 1   | 40                  | 76               | 92                    | Complete    |
| 2   | 24                  | 48               | 76                    | Complete    |
| 3   | 24                  | 60               | 76                    | Complete    |
| 4   | 28                  | 64               | 80                    | Complete    |
| 5   | 24                  | 48               | 76                    | Complete    |
| 6   | 32                  | 72               | 92                    | Complete    |
| 7   | 40                  | 76               | 96                    | Complete    |
| 8   | 24                  | 52               | 80                    | Complete    |
| 9   | 28                  | 80               | 96                    | Complete    |
| Sum | 264                 | 576              | 764                   | Complete    |
| N   | 29.33               | 64.00            | 84.89                 | Complete    |

From the results of the science teacher attitude questionnaire made learning media for the Expansion of Solid Substance out of 9 (nine) IPA junior high school teachers. Rayon 23 Medan workshop participants are as Table 5. The average value of the teacher's competence in making media for the expansion of Solid Substance, cycle 1 (Mimic) is 29.33, cycle 2 (Modification) is 64.00, cycle 3 (Creativity) is 84.89. Increasing the average value of teacher competence: 84.89% - 29.33% = 55.56%. Data from observations of the competence of natural science teachers make learning media for expansion of solid substances, in this workshop of 9 (nine) science teachers of junior high school Sub Rayon 23 Medan participant workshop is as the following Table 5.

Table 6. IPA Teachers’ Attitude Data Making Expansion Learning Media

| No. | Attitude Aspects | Score | Information |
|-----|------------------|-------|-------------|
|     | 1                | 2     | 3           | 4           |
| 264 |                  |       |             |             | Complete    |

From the results of the science teacher attitude questionnaire made learning media for the Expansion of Solid Substance out of 9 (nine) IPA junior high school teachers. Rayon 23 Medan workshop participants are as Table 6. The average value of the teacher's competence in making media for the expansion of Solid Substance, cycle 1 (Mimic) is 29.33, cycle 2 (Modification) is 64.00, cycle 3 (Creativity) is 84.89. Increasing the average value of teacher competence: 84.89% - 29.33% = 55.56%. Data from observations of the competence of natural science teachers make learning media for expansion of solid substances, in this workshop of 9 (nine) science teachers of junior high school Sub Rayon 23 Medan participant workshop is as the following Table 6.
Junior High School science teacher in all Rayon 23 Medan 95.00% strongly agreed to make the media for the expansion of Solid Substance through workshops conducted by researchers, because of their increased competence. Based on the research results, there are several findings in this school action research. Teacher competence makes the media for expansion learning increase after attending the TMK Model Workshop. To be able to find out efforts to improve teacher competency in developing expansion learning media, a TMK Model Workshop can be conducted with the following strategies: (a) T = Imitate, (b) M = Modification, and (c) K = Creativity. Imitate, the point is that the researcher tells the teacher to make media.

The average value of teacher competence in making media for the expansion of Solid Substance, cycle 1 (Mimic) is 29.33, cycle 2 (Modification) is 64.00, cycle 3 (Creativity) is 84.89. Increasing the average value of teacher competence: 84.89% - 29.33% = 55.56%. Junior high school science teachers. Rayon 23 Medan 95.00% strongly agreed to make the media for the expansion of Solid Substance through workshops conducted by researchers, because of their increased competence.

Based on the conclusions of this study that all science teachers can create learning media that will be used in teaching, both from used goods and goods that are cheap so they can be affordable. all junior high school principals can facilitate science teachers to make learning media through workshops in collaboration with School Supervisors. All school supervisors of Faculty of Math and Science Group can guide science teachers to create learning media through workshops facilitated by the school principal.

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