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The Mentoring of Senior High School Physics Teachers In Improving Students' Scientific Questions Ability

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ABSTRACT

The ability of students to ask questions is one of the obstacles faced by teachers when teaching. Most students do not want to ask questions when the teacher gives the chance to ask questions. The low ability of students to ask questions was also influenced by the ability of teachers to raise the enthusiasm of students to ask questions also experienced by physics teachers in Aceh Tengah. Therefore, it is necessary to increase teacher professionalism in these activities. The purpose of this activity is to provide support to physics teachers on how to improve students' scientific questioning skills in physics lessons at SMA Aceh Tengah District. The target of Community Service activities in 2020, is the core teachers in the field of Physics in Aceh Tengah Regency, totaling 10 people. Implementation of assistance uses the Question Web-Based Learning (QWBL) learning model or the questions based learning model. Assistance material is the development of student worksheets based on questions or called the student activity question web worksheets (SQWS). SQWS is a question sheet that can link one question with other questions about the material being studied. The teacher's ability to improve students' scientific questioning skills in learning physics is measured using the Scientific Asking Skills Assessment Sheet (SASAS) or scientific questioning skills test assessment sheet. The results of the mentoring show that the teacher's ability to ask questions before going mentoring is in the average scientific category and less scientific, whereas after mentoring the average ability of the teacher to ask is in the scientific category and very scientific. This shows that the mentoring activity very helped physics teachers to improve students' scientific questioning skills at SMA Aceh Tengah district.

Keywords: Assistance to physics teachers, the ability to ask teachers, and students' scientific questioning skills

INTRODUCTION

Asking questions is one of the strategies or ways to gain meaning or curiosity about something that is not yet clear (Newnham, 2011). Asking questions is a necessity of human life because every human being has a desire to know about something that is around him, but because of limitations in thinking so humans are not able to meet their needs.

The ability of teachers to manage the skills to ask questions is one important component in the learning process. The teacher can make the student questions as a tool: (1) help maintain attention, (2) involve shy and shy students, (3) emphasize repetition, and (4) assess student's learning (Eggen & Kauchak, 2012; Sockalingam & Schmidt, 2011).

The results of preliminary observations show that students, questioning skills in learning physics at SMA Aceh Tengah district are still very low. Students tend to be passive and lack the confidence to ask questions and discuss in class. The reason students do not want to ask is that they are afraid of being laughed at by the friends, do not know what to ask, and are afraid of wrong questions or not according to the concept.

The low ability of students to ask questions was also influenced by the ability of teachers to inspire students to ask questions. The facts in the field show that teacher questions are more dominant than students, questions during the teaching and learning process in the classroom. This is very contrary to the idea of applying the scientific method in the 2013 Curriculum because asking is one step in a scientific approach (Scientific approach). The low ability of teachers to improve students, ability to ask questions is also experienced by physics teachers in Aceh Tengah. Therefore, teacher assistance is needed in improving students, ability to ask both general questions and scientific questions in learning physics.

Problem of Research

The formulation of the problem in the community service is: (a) can teacher assistance improve students' scientific questioning abilities? (b) whether teachers can develop student activity question web worksheets (SQWS) in learning physics? and (c) how are ways to improve students' ability to ask scientific questions?

Research Focus

The main purpose of this study is to provide assistance to teachers in an effort to improve students' scientific questioning skills, to train teachers to develop student activity question web worksheets (SQWS) in learning physics at SMA Aceh Tengah district

A. Scientific Question

Scientific questions are questions that can be answered using experiments and factual reasoning (Duncan, 2015). Good scientific questions are expressed in a way that shapes or describes a problem and can be tested using accepted scientific methods. Scientific questions are also called testable questions, which are questions that can be tested or proven through experimentation (Reid et al, 2010).

Critical questions are part of scientific questions because critical questions are often used in scientific inquiry. In scientific investigations known as research questions. Research questions are also called scientific questions, which are questions that can be answered or tested (testable questions) through scientific research and data analysis (Chiron & Sandra, 2012). Questions that are oriented towards scientific inquiry can guide empirical investigation activities in gathering data and using that data to develop explanations about scientific phenomena (National Research Council, 2000).

Scientific questions are the second step of the scientific method, where each researcher always asks a question that can be answered through research, formulating hypotheses and conducting experiments. The application of scientific methods in learning begins with making

observations, asking scientific questions, formulating hypotheses, designing and conducting experiments, and conducting reviews of hypotheses. Scientific questions are an empirical investigation process that leads to the activity of collecting and using data to explain a scientific phenomenon (Chiron & Sandra, 2012).

The skill of asking scientific questions is the ability of students to ask scientific questions in learning. There are four basic guidelines must be considered in developing good scientific questions, namely: (1) have answers and can be tested (that can have an answer and be tested), (2) can be tested through several experiments or measurements that can be done (can be tested by some experiments or measurements), (3) developed based on what you already know (builds on what you already know), and (4) the answer leads to other good questions (when answered, leads to other good questions) (Reid et al, 2010).

Scientific questions are also called experimental questions, namely questions that require explanation, prior knowledge and can be tested, while questions that cannot be answered through experiments are not scientific questions or are often called Non-Testable Questions (Reid et al, 2010). Unscientific questions are questions that are based on values or opinions, right or wrong, beautiful or ugly and so on (Duncan, 2015 & Nur, 2011).

B. Scientific Questioning Skills

Based on the understanding of the questioning skills and scientific questions above, the scientific questioning skills can be interpreted as a skill or ability of students to compile scientific questions and can be proven through experiments. Students' skills in compiling scientific questions can be trained through the use of a network of questions, whereas to prove scientific questions can be done using scientific methods or science process skills.

The application of scientific questioning skills is closely related to the application of science process skills. Students can ask scientific questions through science process skill steps, namely formulating problems, formulating hypotheses, identifying variables, defining operational variables, determining experimental steps, conducting experiments, analyzing data, and making conclusions related to the material being studied. Ways to identify variables are very important to understand by students because good scientific questions must contain two or more variables and these variables must be measurable (Nur, 2011).

C. Question Web-Based Learning Model

Question web-based learning (QWBL) model is one of the learning models specifically designed to overcome the problem of students, difficulties in asking, and communicating during teaching and learning in class. Difficulties of students asking questions are overcome by using student activity question web worksheets. QWBL model is adapted from the Cooperative Learning (CL) type Student Team Achievement Division (STAD), Problem-Based Learning (PBL), class discussion or Classroom discussion (CD), inquiry-based learning, or Inquiry-Based Learning (IBL). The QWBL model is also supported by several learning theories and relevant research results. One characteristic of a learning model is the presence of syntax (phases) or steps of learning. The phases in the QWBL model are formulated or adapted

from the PBL, CL, DC, and IBL models. The phases of the QWBL Model are organized into five phases, namely: (1) Identifying the problem and conveying the objectives; (2) Conveying information and arranging networks; (3) Discuss scientific questions; (4) Reflecting and appreciating; and (5) Evaluation (Evendi, Suantini & Wasis, 2018). The QWBL model can be applied in various subjects because the difficulty of asking students not only occurs in learning physics but also occurs in other subjects.

METHODOLOGY OF RESEARCH

General Background of Research

In this section, several stages of the community service process will be described, namely: (1) coordination of the implementation team with partners and LPPM Unsyiah, preparation of materials, (2) identification of problems by the partners, training of teachers and reporting of activities.

The method used in this service activity is (a) lecture by displaying slides using infocus; (b) discussion, question and answer about the preparation of question-based learning model (QWBL) and student activity question web worksheets (SQWS), (c) Conducting simulations and discussions on how to apply the QWBL model and the use of SQWS in physics learning; and (d) Evaluating the ability of teachers to ask scientific questions in physics learning during mentoring activities.

This research was conducted at the Aceh Tengah MGMP, namely SMAN 1 Takengon, located at Jalan Lebe Kader No.13, Merah Mersa, Lut Tawar, Takengon, Aceh Tengah Regency. This service is held from January 18, 2020 to April 14, 2020.

Sample of Research

The subject in this research was Physics Teacher of SMA Negeri at Aceh Tengah has many as 10 people.

Instrument and Procedures

The instrument used to collect data in this service are (a) question network sheet (LJP). LJP is a network question sheets that can link one question with other questions about the material being studied; (b) *Scientific Asking Skills Assessment Sheet (SASAS). SASAS* is the scientific question skills test assessment sheet consists of a written test in the form of essays with a total of 15 items. The results of the mentoring show that the ability to ask teachers before mentoring is in the average scientific category and less scientific, whereas after mentoring the average ability of the teacher to ask is in the scientific category and is very scientific.

Data Analysis

The scientific question skills test data is measured using the Scientific Asking Skills Assessment Sheet (SASAS) instrument or the scientific question skills test assessment sheet.

The trainee's scientific questioning skills test is a written test in the form of essays with a total of 15 items. Each item is given a score of 1 to 4 so the maximum score is 60.

The quantity of questions is the number of trainees who ask questions and the number of participants who want to ask is indicated by the number of participants who show their hands to ask when the tutor gives the chance to ask participants. The quality of participant questions is participant's questions that arise during the learning process that is recorded by two observers or the training team. The results of observing the quantity and quality of questions of trainees are measured using category: Opportunity to ask participants given by the teacher, The number of participants who showed their hands to ask, and the number of participants who asked, Very Scientific (VS), Scientific (S), Less scientific (LS), and Not Scientific (NS).

RESULTS OF RESEARCH

1. Analysis of Participants' Scientific Questioning Skills Test

The scientific questioning skills test of the training participants is a written essay test with a total of 15 questions. Each item is given a score of 1 to 4 so that the maximum score is 60. The results of the data analysis of the scientific questioning skills test of the training participants can be seen in brief in Table 1.

Table 1. The results of the training participants' scientific questioning skills

Participants	*Pretest*	%	Criteria	*Postest*	%	Criteria	*N-gain* (%)	Criteria
P1	2,33	58,33	S	3,73	93,33	VS	0,84	H
P2	2,13	53,33	S	3,73	93,33	VS	0,86	H
P3	1,87	46,67	LS	3,33	83,33	VS	0,69	H
P4	2,47	61,67	S	3,73	93,33	VS	0,83	H
P5	2,27	56,67	S	3,60	90,00	VS	0,77	H
P6	2,87	71,67	S	3,67	91,67	VS	0,71	H
P7	1,87	46,67	LS	3,53	88,33	VS	0,78	H
P8	1,93	48,33	LS	3,67	91,67	VS	0,84	H
P9	2,13	53,33	S	3,73	93,33	VS	0,86	H
P10	3,13	78,33	VS	3,80	95,00	VS	0,77	H
Rerata	**2,30**	**57,50**	**I**	**3,65**	**91,33**	**SI**	**0,79**	**H**

Very Scientific (VS), Scientific (S), Less scientific (LS), and Not Scientific (NS).

2. Data Analysis for Quantity and Quality of Participant Question

The question quantity is the number of participants who ask questions (NPWQ) and the number of participants who want to ask (NPWA), marked by the number of participants who rise their hands (NPRH) to ask questions when the tutor gives the opportunity to ask the participants. The results of the observation of the quantity and quality of the training participant's questions were measured using the instrument of the observation sheet for the quality and quantity of the training participant's questions. The results of observing the quantity

and quality of training participant questions can be seen briefly in Table 2, while in diagrammatic form it can be seen in Figure 1.

Table 2. Results of Quantity and Quality Observation Questions from training participants

No	NPWQ	Question quality		Question quantity			
		NPRH	NPWA	VS	S	LS	NS
1	I	3	2	-	1	1	-
2	II	6	3	1	1	-	1
3	III	5	3	1	1	1	-
4	IV	7	5	3	2	-	-
5	V	8	7	5	2	-	-

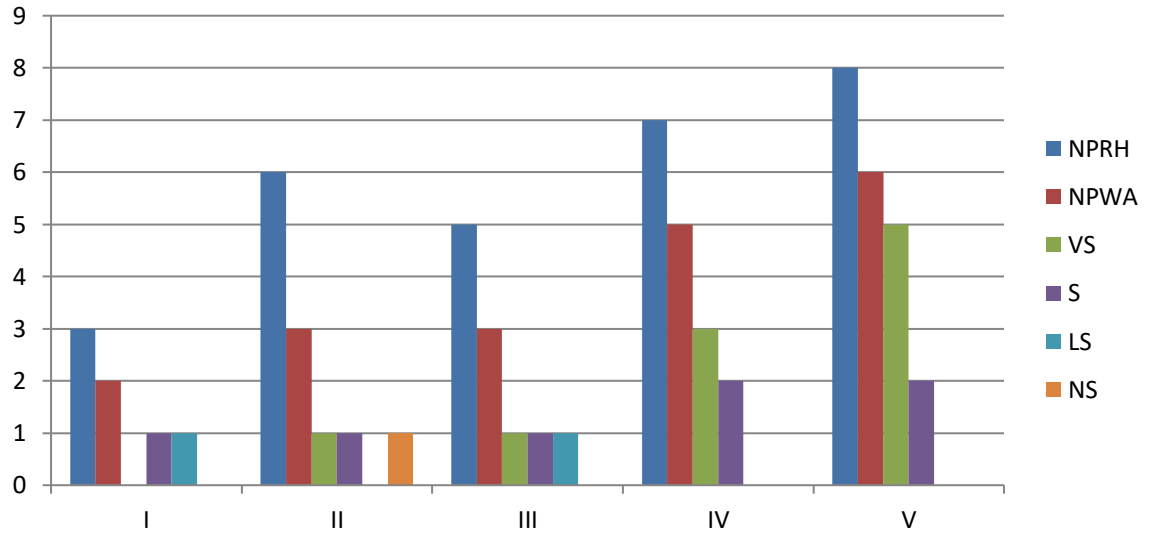

Figure 1. The question quality and quantity of participants

Based on the data in Table 1 and Table 2, it shows that in general the training participants are able to formulate scientific questions and can apply the QWBL model in learning physics, this is also supported by the results of the participant response questionnaire which states that almost 90% of participants stated that the QWBL model can improve students' ability to ask questions and this QWBL model can be applied in other lessons.

The Community Service Activities in 2020 which are devoted to the activities of mentoring high school physics teachers in improving students' scientific questioning skills. Based on the results of data analysis, it can be concluded that this mentoring activity increases the teacher's scientific questioning skills both in quantity and quality in physics learning in SMA Aceh Tengah District.

Figure 2. The community service team and implementation of training

Figure 3. Mentoring trainer (Dr. Evendi, M.Pd.) and training participants

CONCLUSIONS

The conclusion that can be conveyed by the servant is the Community Service Activities in 2020 which are devoted to the activities of mentoring high school physics teachers in improving students' scientific questioning skills. Based on the results of data analysis, it can be concluded that this mentoring activity increases the teacher's scientific questioning skills both in quantity and quality in physics learning in SMA Aceh Tengah District.

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