JICR - Journal of Innovation and Creativity Resource
Vol. 2, No. 1, 2023, pp. 19-24

Efforts to enhance teacher competency at Kampar Regency High School in learning physics using mechanical KIT

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ABSTRACT

The learning process at school cannot be separated from students' cognitive abilities regarding teaching material. Especially in physics learning material, students' ability to understand the material depends on how the learning process (understanding concepts) is emphasized. Physics material, especially mechanics, is sometimes difficult to describe in real life due to limited examples, but Mechanics KIT is one solution that can be used to help students achieve their learning goals. Of course, this process begins with the ability and mastery of using KIT by the teacher, in this case, the physics teacher. The formulation of the problem in this service activity is how to increase teacher competence in using KIT Mechanics in learning. This service activity aims to conduct training for teachers at SMA N 1 Kampar to increase competence and mastery of the use of KIT mechanics in learning. The results of the evaluation of activities, it can be seen that the competency ability to use KIT mechanics in physics learning by teachers has increased significantly.

ARTICLE INFO

Article history:

Received Oct 14, 2023
Revised Nov 12, 2023
Accepted Dec 25, 2023

Keywords:

Cognitive Abilities
KIT
Mechanics
Physics

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1. INTRODUCTION

Physics is one of the mandatory science subjects at high school/equivalent level which studies physical natural phenomena in the form of matter, energy, and the interaction processes between the two. By conducting experiments, students will more easily observe these physical symptoms [1, 2]. For example, learning the concept of heat flow in a metal rod will be easy to understand if students carry out experiments. Without experimentation, this concept will be difficult for students to understand. Therefore, studying Physics without laboratory activities is in vain, because this is contrary to the essence of science [3-5]. It cannot be denied that there are still many schools that rarely involve laboratory activities in their learning process so the use and utilization of teaching aids, especially Mechanics KITs, in learning is not optimal [6, 7]. From the researcher's observations, there are several reasons why high school teachers avoid practicum activities (which are related to laboratories), namely, firstly, most evaluation systems in these schools only emphasize cognitive assessment, while other assessment aspects are not taken into account, the important thing is the student's final grade high and graduated. Second, the existing teaching aids are not complete, so the need for teaching aids for this lesson does not support practicum practicum activities [8-10].

Apart from some of the reasons stated above, teaching aids play a very important role, especially in teaching MECHANICS. Moll and Allen (1982) said that investigative laboratory activities have a significant effect on the development of several critical thinking skills and mastery of concepts [11]. The results of the study also show that the learning process using teaching aids can improve the quality of learning [12]. In this regard, various efforts to improve the achievement of physics learning goals in high school need to be considered. One of them is by holding "Training on the Utilization of KIT MECHANICS in Scientifically Based Learning at the High School Level in Kerumutan District, Kampar Regency".

Physics is one of the branches of Natural Sciences (IPA). Learning science means studying everything related to the objects of the universe, living and non-living things, and matter with all the changes that come with it. In physics learning, it requires supporting activities in the form of practicum and experiments in the laboratory. This is because physics is built with the scientific method. Through the stages of the scientific method, physical scientific products are obtained, such as concepts, principles, rules, laws, and theories [13, 14].

The practicum method is one form of process skills approach. For students, the holding of practicum in addition to being able to train how to use the right tools and materials, also helps their understanding of the physics material taught in class. In addition, for students who have high curiosity, through practicum they can get answers from their curiosity in real terms [15]. Until now, not all high school / MA and vocational schools already have adequate laboratories, so they have not been able to use them optimally. The causes include; pursuing material targets and a lack of teacher skills in using the Physics Kits available at school. Practicum is a mandatory activity that should accompany the learning of physics material in class. In this regard, physics teachers need to be equipped with skills on how to use the Physics Kit with a scientific approach. This is one of the factors for the need for this service activity to be carried out, as an effort to improve the ability of teachers.

The Physics Education Study Program of the Department of PMIPA FKIP Universitas Riau Pekanbaru, which has been established since 1994, has a sense of responsibility that is in line with the vision and mission it carries to advance the quality of education in this Riau area and line with the implementation of the third Dharma of Higher Education, namely community service. To realize this activity, the Physics Education Study Program of the Department of PMIPA FKIP Universitas Riau collaborated with the UPTD Education Office of Kampar District to carry out community service in Kampar District, Kampar Regency.

2. IMPLEMENTATION METHOD

Training is carried out with an information discussion approach and practice using the Physics Kit tool. Teachers are trained to conduct Physics experiments using Physics Kits in groups. The stages of activity are as follows:

1. Before and after the training, participants will be given preliminary knowledge about the importance of experiments in Physics subjects.
2. The service team conducted socialization about physics experimental equipment (KIT).
3. Participants were divided into groups with between 4 and 6 members.
4. Participants in groups conducted physics experiments that were different from other groups. Then each group took turns conducting physics experiments, according to the title of the experiment available on the Physics Kit tool.
5. The discussion of each experiment title, conducted together, is guided by the instructor.
6. Brief deepening of Physics concepts, which are related to the experimental material available on the Physics Kit tool.
7. Participants fill out questionnaires to evaluate the implementation of this service.

This activity is an effort to improve the skills of teachers in guiding students to do physics practicum/experiments at school. If this activity is approved for funding, then for the implementation team this activity is part of the Tridarma of higher education where one of the activities is to carry out community service.

2.1. Contextual Based Learning Media

In contextual learning, teachers do not pass information on casually but provoke students to search for themselves. Questioning activities in learning are very useful in exploring information about students' material mastery abilities, generating learning motivation, stimulating curiosity, focusing on student desires, and guiding students to find and conclude something [16].

Learning will be more meaningful when it is related to students' real lives. Linking instructional content with the context of life and student needs will increase learning motivation and will make the teaching and learning process more efficient and effective. This type of learning approach is called contextual teaching and learning [17]. This learning model is more concerned with student experiences and activities than material mastery targets.

CTL is a learning model that links the subject matter with real life. Knowledge and skills will be acquired by students by building their new knowledge and skills as they learn. The contextual learning process takes place naturally in the form of activities that students do to work and experience for themselves, not the instant transfer of knowledge by teachers to students. So, the role of the teacher is only limited to mentors and facilitators, so that learning that activates students and is meaningful to students can be carried out. Therefore, efforts to increase student learning creativity can be obtained through contextual models [16].

Contextual comes from the word Context which means "relationship, context, atmosphere, and circumstances". So Contextual Teaching and Learning (CTL) can be interpreted as learning related to a certain atmosphere. In general, Contextual means meaning: that is relevant, relevant, and carries meaning, meaning, and importance. Contextual is a learning concept that helps teachers relate the material taught to real-world situations and encourages students to make connections between the knowledge they have and planning in their daily lives [18].

The concept of learning departs from contextual learning by prioritizing that what students need to learn first is what is in their environment [19]. By learning what is in their environment, students will be more motivated, because what they learn can be felt benefits in everyday life.

Students will like and be motivated to learn if the things learned contain certain meanings for them. Meaningfulness is personal because it is perceived as something important to oneself. It is possible that the lessons presented by the teacher are not perceived as meaningful, trying to make his lessons meaningful for all students. The trick is to relate their learning to students' past experiences, future goals, interests, and values that are meaningful to them [20].

By knowing the environment around him, then later students after finishing learning, will try to use this environment as a resource that he will manage as a resource that can provide added value for him [19].

2.2. Scientific Approach

The scientific approach is a learning process designed in such a way that learners actively construct concepts, laws, or principles through the stages of observing (to identify or find problems), formulating problems, proposing or formulating hypotheses, collecting data with various techniques, analyzing data, drawing conclusions and communicating concepts, laws or principles that are "discovered". The scientific approach is intended to provide understanding to students in knowing, and understanding various materials using a scientific approach, that information can come from anywhere, anytime, not depending on unidirectional information from the teacher. Therefore, the expected learning conditions are directed to encourage learners to find out from various sources through observation, and not just being told.

A learning approach can be said to be a scientific approach or a scientific approach when meeting the requirements (7) criteria as follows:

1. Learning materials based on facts or phenomena that can be explained by certain logic or reasoning; Not just a fantasy, legend, or fairy tale.
2. Teacher explanations, student responses, and teacher-student educative interactions are free from immediate prejudice, subjective thinking, or reasoning that deviates from logical thinking.
3. Encourage and inspire students to think critically, analytically, and appropriately in identifying, understanding, solving problems, and applying learning materials.
4. Encourage and inspire students to be able to think hypothetically in seeing differences, similarities, and links to each other from learning materials.
5. Encourage and inspire students to be able to understand, apply, and develop rational and objective thinking patterns in responding to learning material.
6. Based on empirical concepts, theories, and facts that can be accounted for.
7. Learning objectives are formulated simply and clearly but draw on the presentation system.

The learning process that implements a scientific approach will touch three domains, namely: attitude (affective), knowledge (cognitive), and skills (psychomotor). With such a learning process, it is hoped that learning outcomes will produce productive, creative, innovative, and effective students through strengthening integrated attitudes, skills, and knowledge. The scientific learning approach (scientific approach) by touching these three domains can be explained as follows:

1. The realm of attitude involves the transformation of the substance or teaching material so that students "know why."
2. The realm of skills involves transforming the substance or teaching material so that students "know how".
3. The realm of knowledge involves the transformation of the substance or teaching material so that students "know what."
4. The result is an improvement and balance between the ability to be a good human being (soft skills) and humans who have the ability and knowledge to live properly (hard skills) from students which include aspects of attitude competence, knowledge, and skills.
5. The 2013 curriculum emphasizes the modern pedagogic dimension of learning, which uses a scientific approach.
6. The scientific approach to learning as intended includes observing, questioning, reasoning, trying, and forming networks for all subjects.

3. RESULT AND DISCUSSION

Community service activities have been carried out at SMA Negeri 1 Kampar, Kec. Kampar with the theme of the workshop on the use of KIT Mechanics in learning High School Physics at Kampar speed. A total of 4 lecturers of Physics Education became resource persons in this activity, including Prof. Dr. Nur Islami, MT, Dr. Azhar, S.Pd., MT, Dr. Dedi Irawan, M.Sc., and Muhammad Sahal, M.Si. The participants of this service activity were physics teachers at the equivalent high school level in Kampar Regency. Here is some documentation of the activity.

Figure 1. Opening of the workshop on the use of KIT mechanics in physics learning.

The implementation of this service activity is integrated with the annual Gebyar Physics program conducted by the Physics Student Association which is also carried out at SMA N 1 Kampar KamparKab. Kampar, so that workshop activities can be assisted directly by 4 related students. The workshop was divided into two sessions, session 1 was material deepening, and session 2 was a demonstration of the use of KIT. The activity begins with doing an initial evaluation test which is immediately followed by deepening the material. After that demonstration of the use of KIT Mechanics, the next activity was that teachers were allowed to carry out practicum activities using KIT mechanics in collaboration with 3 groups. In this case, the activity was accompanied by all resource persons and students involved as shown in Figure 2. At the final stage of the activity, participants will fill out an observation sheet in the form of a questionnaire of service activities.

Figure 2. Documentation of material deepening activities, demonstrations, and practices of using KIT mechanics in learning high school physics.

4. CONCLUSION

The implementation of workshops on the use of KIT Mechanics in learning high school physics for equivalent high school physics teachers in Kampar Regency has been carried out well. From the results of the evaluation of activities, it can be seen that the competency ability to use KIT mechanics in physics learning by teachers has increased significantly.

ACKNOWLEDGEMENTS

We would like to thanks FKIP Universitas Riau that has supported this activity funded by PNBP FKIPUniversitas Riau 2023 with contract No. 008/UN9.5.1.1.5/SPK/PT/2023.

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