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Management of high school laboratory for experimental optimization of physics education

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ABSTRACT

Educational interaction is the main activity in the learning and learning process in order to achieve educational goals. This target changed again during face-to-face learning in early 2022 when conditions were conducive after COVID-19, especially in coastal areas. This is certainly a challenge for teachers and other components to think creatively and innovatively in learning where difficult times to meet in class have occurred systematically when the learning system prioritizes the internet. Therefore, through this service activity, teaching and learning through real lecture programs from universities in local villages and in high schools in coastal areas such as the Meranti Islands Regency, Riau Province has carried out trials of implementing experimental coaching and teaching aids for science teachers. and physics teachers to get an understanding of the concept of simple natural phenomena where the available equipment is limited to be able to explain and carry out activities for experimental purposes.

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1. INTRODUCTION

Based on UU No. 20 of 2003 concerning the role of education, that education creates potential in a person in the form of spiritual strength, self-control, intelligence, intelligence, noble character, and skills needed to be able to live in a conscious and planned society [1-3]. This can explain that the role given by education can determine a person's personality in society [4, 5].

Educational goals will be disrupted and difficult to achieve optimally from learning preparation, especially when the conducive atmosphere of COVID-19 is no longer a barrier, and student habits have been formed with online learning [6, 7]. The learning system in schools is no longer carried out online and the learning process is again applied face-to-face in schools, especially in the Meranti Islands Regency [8-10]. This is certainly a challenge for teachers and other components in preparing learning materials to be delivered to generate interest in learning in the classroom so that learning can be achieved and students can understand the learning materials optimally [11-13].

Learning science, especially science, demands broader teacher competencies, not carrying out activities in the form of transfer of knowledge in the form of theory or only in the form of visual images, because understanding science only requires an understanding of broad natural phenomena, rational evidence, sensory experience, and facts nature happens [14-17]. However, this learning process may be difficult to implement during face-to-face learning in schools in early 2022, so most students are less interested in learning if it is done only by giving structured assignments to students, both introduction to theory and learning practice [18, 19]. This results in students becoming less interested and enthusiastic in the learning process, resulting in an incomplete understanding of the material [20].

From the explanation above, it is certain that some of the causes are the lack of empowerment and creativity of teachers to prepare for the return of face-to-face learning in the classroom in 2022. Therefore, efforts and solutions to these problems, we offer learning methods, open-minded ways, and learning solutions. students' interest in learning by using simple tools and materials for science practicum becomes a teaching tool by the teacher to students.

2. ACTIVITY METHOD

The proposed form of activity is in the form of teaching and learning activities through the development of experiments and teaching aids for science or science teachers. Basic experimental learning about understanding concepts from simple natural phenomena to complex ones by displaying practical equipment and materials as well as teaching aids directly. Furthermore, it will be tested on students and introduced to parents. This experimental tool can be displayed both in mechanical and non-mechanical (electromagnetic) forms physically in the form of simulations and real practices that can be accepted by the senses, hearing, and sight.

This activity is also carried out using synchronous and asynchronous methods. Development of innovation and creativity in the practicum learning process with demonstrations that include understanding:

a. Systematic approach: understanding a natural event that has cause and effect, the flow of events that produces work or product which can then be said
b. Historical approach: in-process activities and schedules and changing events that demonstrate results and generate understanding.
c. Summary approach: the premise of events that are clearly and precisely related to a series of natural events, analyzed and compared to produce conclusions from an event
d. Comparative approach: providing analogies and comparisons of events, both processes and results of a natural event that can be developed and safe.

Evaluation methods and activities include:

a. Provision of online materials: Basic concepts of science/science, especially physics
b. Demonstration of equipment and practicum materials
c. Process and testing of experimental tools and materials
d. Iteration and simulation approach: Measurement and calculation
e. Oral and written evaluation: Simulation exercises and self-demonstration

Activities are detailed in the following modules:

a. Uniform straight motion, average speed and time: dynamic speed velocity and explain the characteristics of uniform linear motion based on its kinematic quantities.
b. Free fall motion: understand the characteristics of free fall motion and free-fall velocity.
c. Simple pendulum: calculation of the effect of mass, and length of rope with a simple pendulum swing.
d. The spring constant and Hooke's law: the acceleration of a gravitational load through a simple pendulum experiment, explaining Hooke's law and making use of the period and mass relationship in the oscillation of a spring.
e. Standing waves and sound: an explanation of the formation of standing waves and the difference between knots and bellies. Explanation of range shifts in the frequency range.
f. Magnetism and electromagnetic induction: an explanation of the right-hand rule and an explanation of Faraday's law of induction and knowing Lenz's law and magnetic permeability.
g. Ohm's law and electric circuits: can distinguish ohmic and non-ohmic resistance, determine the relationship between current and voltage using ohm's law, and use ohm's law to obtain the values of I and V.
h. Fluid viscosity and Archimedes' Law: an explanation of measuring viscosity and seeing the effect of temperature on viscosity as well as proving Archimedes' law and determining the density of liquids using Archimedes' law equations.

I. Mirrors and lenses: an explanation between diverging and converging lenses and mirrors, selecting the properties of lenses and mirrors using beam diagrams and analytically using mirror equations and equation factors.

3. ACTIVITY IMPLEMENTATION

The service is carried out directly at the Meranti Islands Regency Education Office and involves several equivalent schools such as SMP/SMA and also Madrasah Aliyah Hidayatul Mubtadiin Semukut which is followed by a Real Work Lecture program located in Pulau Merbau District, Meranti Islands Regency, Riau Province, Indonesia. . Historically and geographically, in this village there is the oldest Madrasah Aliyah Hidayatul Mubtadiin which is at the same level as the high school in its day. In this village, there is also a maqam of the famous tarekat cleric, the late KH. Syarifuddin son of the late KH. Affandi Insight, who is known as the person who used to clear the forests of the Meranti Islands for housing, is so crowded until now. In Semuku there are five hamlets, each hamlet is inhabited on average by 200-250 people. Geographically, Madrasah Aliyah Hidayatul Mubtadiin Semukut is located at coordinates between 1°00'23.7"N 102°33'45.7"E and is located on the east coast of the island of Sumatra. This has the potential to serve to improve the quality of education in the new school year. The Meranti Islands Regency Government has made efforts to improve and maintain the quality of education in several areas far from the city, such as in coastal areas during the pandemic by following regulations from the Ministry of Education of the Central Government, to minimize the spread of disease. COVID-19.

Figure 1. The release of the Kukerta group at the DPL residence.

The target of this activity is not only partners as science/physics subject teachers at secondary schools in the coastal area of the Meranti Islands, but also additional targets, namely lecturers, laboratory personnel, and students who are carrying out Real Work Lectures. activities such as those shown in Figure 1 involve training in the use of experimental and visual media tools. The expected goals are:

a. Teachers: The main target is science/IPA teachers at the secondary school level. This general and comprehensive target is used because not all teachers are available according to their field of study, not all schools have science/science teachers and there are even teachers in other fields of study who teach science/science in these schools.
b. Students: In line with the teacher's guidance, training and evaluation will also be carried out on students as examples and trials in the form of face-to-face learning practices using these visual and visual aids.
c. Parents: A motivation for students and great hope for teachers to care for parents has also given the simple introduction of fun, awkward and exciting practical demonstrations. Parents will be involved as a trigger for students' enthusiasm and an extension of the control of school education at home, so it is not a matter of knowing and understanding what parents get but the spirit of coaching

that can touch and be the responsibility of all parties to make it happen. concerned with distance education.

d. Lecturer: in addition to having competence, knowledge, and experience, the development of innovation and creativity is also shown in the types and forms of practicums and teaching aids that will be produced.
e. Laboratory staff: expected not only capable and reliable in managing the laboratory so far, they can also have new knowledge and experience in using laboratories/tools and materials.
f. Students: both as a provision of existing abilities, provision of experience that will be possessed, potential and work ethic of students also becomes a challenge for him to participate in preparing teaching materials in the laboratory/props and materials that will be displayed.

Figure 2. Activities and motivation to learn physics on teachers.

4. EXPERIMENTAL LEARNING OPTIMIZATION CHALLENGE

After looking at the main ideas described above, there are several suggestions and hopes for an integrated community service program at the Meranti Islands Regency secondary school:

a. Not only focused and driven on the community or village but can be implemented in educational institutions in the existing sub-districts, even if possible to be implemented in community business groups.
b. There is a need for a more careful survey of the level of student participation in secondary schools so that in its implementation students can work together with the community and the education component in the village.
c. The form of optimization of experimental coaching activities can be carried out between lecturers and students, and financing activities can be done through external sources.
d. The time of the activity is adjusted to the conditions of the school and the environment so that evaluation and monitoring of this development can be carried out.
e. Debriefing for students can be done, considering that there has been a COVID pandemic and the limited availability of coastal laboratory equipment has caused students to lack information about science/physics experiments both at school and in other learning activities. Students are aware of demonstrations and experiments in cyberspace such as through internet media.

Figure 3. Practical activity by one of the physics lecturers at Universitas Riau.

Figure 4. Photo with community service participants.

5. CONCLUSION

This community service activity with integrated student real work lectures has succeeded in optimizing the management of the science/physics laboratory in the development of experiments for school elements, teachers, students, and also students. Optimization and empowerment of off-line science/physics experiments have made participants, especially teachers, students, and workers able to understand with a high level of understanding including elaborating the existence of misconceptions in understanding natural phenomena.

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