Teacher empowerment and creativity models in the management of simple science teaching aids and experiments in high school

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ABSTRACT

The primary activity in the learning and learning process to accomplish educational objectives is educational contact. When conditions were favourable during COVID-19, particularly in coastal locations, this aim modified once again during face-to-face training in early 2022. When the learning system prioritises the internet, it is undoubtedly challenging for instructors and other components to think imaginatively and innovatively about how to teach in situations where it has been impossible to meet in class on a regular basis. Therefore, through this volunteer work, high schools in coastal regions like the Meranti Islands Regency in Riau Province have tested the implementation of experimental coaching and teaching aids for science teachers and physics teachers through real lecture programmes from universities in local villages. To be able to explain and conduct experiments, it is necessary to have a basic grasp of simple natural phenomena. However, this is not always possible due to the lack of appropriate equipment.

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1. INTRODUCTION

According to UU No. 20 of 2003, which discusses the function of education, a person's potential is created through education in the form of spiritual power, self-control, intelligence, noble character, and the abilities required to live in a conscious and planned society [1-3]. This explains how a person's personality in society can be determined by the function that education plays in that process [4-6].

When the accommodating environment of COVID-19 is no longer a barrier and student habits have been created with online learning, educational goals will be disrupted and impossible to attain ideally from learning preparation [7-8]. The learning process is once again implemented face-to-face in schools, particularly in the Meranti Islands Regency, and is no longer conducted online [8–10]. This is undoubtedly a problem for teachers and other stakeholders in creating and delivering learning materials to foster interest in learning in the classroom in order to achieve learning goals and ensure that students fully comprehend the materials [11–13].

Because understanding science only requires an understanding of broad natural phenomena, rational evidence, sensory experience, and facts nature happens [14–16], learning science, especially science, demands broader teacher competencies rather than carrying out activities in the form of knowledge transfer in the form of theory or only in the form of visual images [17]. The majority of students are less engaged in learning if instruction is only provided through the distribution of structured assignments, both as an introduction to theory and as learning practice, as this learning process may be challenging to implement during face-to-face learning in schools in early 2022 [18-19].

This causes pupils to lose interest and enthusiasm in the learning process, which leads to a lack of grasp of the subject [20].

The explanation provided above makes it clear that one of the factors is the lack of innovation and empowerment among instructors in preparing for the resumption of face-to-face instruction in the classroom in 2022. In an effort to address these issues, we provide learning strategies, open-minded approaches, and learning solutions. Utilizing inexpensive tools and supplies for a science practicum to pique students' interest in learning, the instructor uses this as a teaching technique.

2. ACTIVITY METHOD

The suggested form of activity includes experiments and teaching aids for science teachers or students in the form of teaching and learning activities. Basic experiential learning about comprehending ideas ranging from straightforward natural occurrences to sophisticated ones by directly exhibiting real-world tools and resources. It will also be presented to parents and tested on pupils. This experimental tool can be physically demonstrated in both mechanical and non-mechanical (electromagnetic) forms through simulations and hands-on activities that the senses of hearing and sight can accept.

Both synchronous and asynchronous approaches are used for this activity. Innovation and creativity are developed during the practical learning process with examples that show comprehension:

a. Systematic approach: comprehending a natural occurrence with cause and effect, the sequence of actions that results in work or a product that can then be claimed to have been produced
b. Historical approach: ongoing tasks, timetables, and developing circumstances that show outcomes and foster comprehension
c. Summary strategy: the idea is to study and compare a set of events that are obviously connected to one another in order to draw conclusions from the occurrences.
d. Comparative approach: offering safe and developable analogies and comparisons of events, including their processes and outcomes.

Techniques and exercises for evaluation consist of:

a. the availability of materials online fundamental ideas in science, notably physics
b. Equipment and resources for the practicum are displayed.
c. Process and evaluation of experimental equipment and supplies
d. Approach using simulation and iteration: Calculation and measurement
e. Oral and written assessment: Self-demonstration and simulation exercises

The following modules go into detail about activities:

a. Explain the features of uniform linear motion using its kinematic parameters including the terms uniform straight motion, average speed, and time.
b. Free fall motion: be familiar with its properties and free-fall velocities.
c. Simple pendulum: Using a swinging pendulum, you can determine the impact of mass and rope length.
d. The acceleration of a gravitational load using a straightforward pendulum experiment, illustrating Hooke's law, and utilizing the period and mass relationship in a spring's oscillation.
e. Standing waves and sound: a description of standing wave generation and the distinction between knots and bellies. explanation of frequency range range changes.
f. Understanding the right-hand rule, Faraday's law of induction, Lenz's law, and magnetic permeability are all necessary for understanding magnetism and electromagnetic induction.
g. Electric circuits and Ohm's law: able to distinguish between ohmic and non-ohmic resistance; be able to apply Ohm's law to calculate the values of I and V; and be able to determine the relationship between current and voltage.
h. Archimedes' Law and fluid viscosity: an explanation of how to measure viscosity, observe how temperature affects viscosity, demonstrate Archimedes' Law, and calculate the density of liquids using Archimedes' Law equations.
i. Mirror equations and equation factors are used analytically to choose the parameters of lenses and mirrors, as well as an explanation of diverging and converging lenses and mirrors.

3. ACTIVITY IMPLEMENTATION

The program is run by the Meranti Islands Regency Education Office and involves a number of comparable schools, including SMP/SMA and Madrasah Aliyah HidayatulMubtadiinSemukut, which is followed by a Real Work Lecture program in the PulauMerbau District, Meranti Islands Regency, Riau Province, Indonesia. Geographically and historically, this area is home to the oldest Madrasah Aliyah HidayatulMubtadiin, which was once on par with a high school. The maqam of the late KH. Syarifuddin, son of the late KH. Affandi Insight, a well-known Tarekat priest who is credited with clearing the Meranti Islands' jungles for habitation, is also located in this area and is currently overflowing with people. There are five hamlets in Semuku, and each one has an average population of 200–250 people. Madrasah Aliyah HidayatulMubtadiinSemukut can be found on the east coast of the island of Sumatra at a geographic coordinate of 1°00'23.7"N 102°33'45.7"E. This might help to raise the standard of instruction in the upcoming academic year. By adhering to guidelines from the Ministry of Education of the Central Government, the Meranti Islands Regency Government has made efforts to enhance and maintain the standard of education in several rural areas, such as in coastal areas during the pandemic. This has helped to reduce the spread of disease. COVID-19.

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

This activity's target audience includes lecturers, lab staff, and students participating in Real Work Lectures in addition to its partners, who include secondary school teachers of science and physics in the Meranti Islands' coastal region. Training in the use of experimental and visual media technologies is included in activities like those depicted in Figure 1. The anticipated targets are:

a. Teachers: The secondary school level science/IPA teachers are the main target group. Because not all teachers are available according to their field of study, not all schools have science/science teachers, and even some teachers from other fields of study teach science/science in these schools, a generic and all-inclusive aim is employed.
b. Students: In accordance with the teacher's instructions, face-to-face learning techniques utilizing these visual and visual aids will be trained and evaluated on students as examples and trials
c. Parents: The straightforward introduction of entertaining, embarrassing, and thrilling practical demonstrations has also served as a motivation for students and a wonderful hope for teachers to care for parents. It is not a question of knowing and understanding what parents get but more of the spirit of coaching that can touch and be the duty of all parties to make it happen. Parents will be involved as a catalyst for students' excitement and an extension of the control of school education at home. concerned about remote learning.
d. Lecturer: Along with competence, knowledge, and experience, originality and creativity are also demonstrated in the kinds of practicums and instructional materials that will be generated.
e. Laboratory staff: Staff members should be capable and dependable in operating the laboratory currently, but they should also be able to gain new skills and experience using laboratories, tools, and materials.

f. Students: He faces a difficulty when it comes to helping to prepare teaching materials for the laboratory/props and materials that will be shown because of the students' potential and work ethic as well as the provision of their potential and existing abilities, experience, and work ethic.

Figure 2. Activities and motivation to learn natural phenomena.

4. EXPERIMENTAL LEARNING OPTIMIZATION CHALLENGE

The following are some thoughts and aspirations for an integrated community service program at the Meranti Islands Regency secondary school after considering the key concepts mentioned above:

a. It can be implemented in educational institutions in the current sub-districts and, if possible, in community business organizations. It is not just community-centered and village-driven.
b. In order for students to collaborate with the community and the education component in the village throughout its implementation, a more thorough survey of the level of student participation in secondary schools is required.
c. Between professors and students, there is a possibility for the optimization of experimental coaching activities, and funding can come from outside sources.
d. In order to evaluate and track this development, the activity's timing is modified to account for the school's and the surrounding environment.
e. Debriefing for students is possible given that the COVID pandemic and the scarcity of coastal laboratory equipment have left students without knowledge of science and physics experiments both in the classroom and during other learning activities. Students are aware of experiments and demonstrations in online thanks to digital media.

Figure 3. Practical activity by physics lecturers at Universitas Riau.

Figure 4. Community service participants.

5. CONCLUSION

This community service project, which also included integrated student actual work lectures, was successful in streamlining the operation of the science/physics laboratory in the creation of experiments for school personnel, teachers, and students. The improvement and empowerment of off-line science/physics experiments have enabled participants, particularly teachers, students, and workers, to understand with a high degree of comprehension, including extending the existence of misconceptions in understanding natural phenomena.

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