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## THE EFFECT OF E-MODULES BASED ON ROLE-PLAYING LEARNING MODEL WITH A CULTURALLY RESPONSIVE SCIENTIFIC APPROACH TO MASTERY OF THE CONCEPT OF MAGNITUDE AND MEASUREMENT

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### Abstract

Physics is a fundamental science that is essential to master, particularly the skill of measuring quantities in daily life. This study aims to analyze the influence of an e-module based on a role-playing learning model with a scientific approach and culturally responsive teaching on 10th graders' conceptual mastery of quantity and measurement. The study was conducted using two cycles of Kurt Lewin's Class Action Research Cycle. The implementation of this learning innovation used a sample of 27 students from class X-11 at SMAN 9 Malang. The e-module learning media is based on a role-playing learning model with a scientific approach and culturally responsive teaching. This approach was found to increase students' conceptual mastery in magnitude and measurement in class X-11 at SMAN 9 Malang. The percentage of passing scores increased from 30% after Cycle I to 70% after Cycle II. This e-learning module is based on a role-playing model with a scientific approach and culturally responsive teaching. It has been found to improve students' conceptual mastery in quantity and measurement in class X-11 at SMAN 9 Malang.

### Keywords:

e-module, role-playing, scientific approach, culturally responsive teaching, quantity and measurement.

## INTRODUCTION

The problem of low conceptual mastery in Physics can be caused by various factors. One possible cause is a learning process that does not actively involve students (teacher-centered). (Sutrisno, 2018, Armani, 2021). There are ways for students to master concepts, such as through practice and repetition. (Stout, 2020). Exercise and repetition can be performed independently using certain media to make the student learning process enjoyable and flexible. One such medium that has been developed is an electronic module (e-module). (Armani, 2021) The e-module is a type of learning media that is systematically packaged to enable students to learn in an integrated, interactive, and independent manner. (Seprida, 2015).

(Setyawan, 2017) and (Sabrina, 2021) It has been stated that using a scientific approach can improve learning outcomes because it actively involves students. (Setyawan, 2017) (Nikita, 2018) (Suyatna, 2020) (Sabrina, 2021). (Suryanto, 2023) The MBA program uses a simulation-based role-playing learning model to help students understand management theory through experiential learning. However, this research lacks a scientific approach and does not cover quantitative and measurement material. Further development is necessary to improve the format and content to be more targeted and professional. E-modules use role-playing learning models to help students master concepts, attitudes, and actions by experiencing different roles and becoming inspiring characters. (Suryanto, 2023).

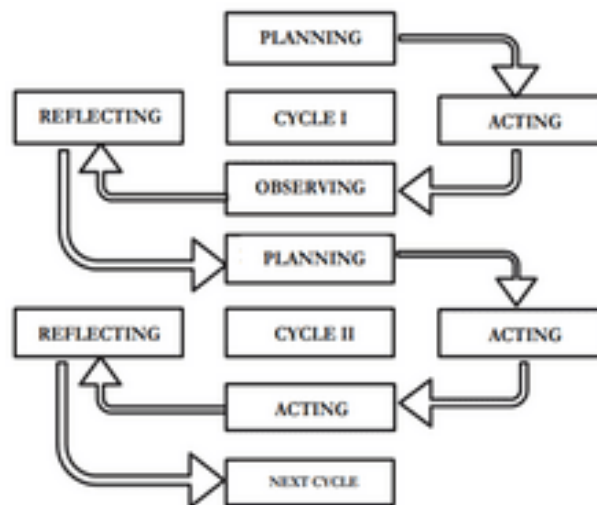
Similar research has been conducted on e-modules that utilize a role-playing learning model and a scientific approach to dynamic fluid material (Martha et al., 2023) Improving students' conceptual mastery and problem-solving skills can be achieved through various methods. However, this media does not yet integrate culturally responsive teaching in its learning. It is important to build the character of students living in this modern era so that they always remember their identity as Indonesians with a wealth of local wisdom to protect. Research related to this has been conducted by (Mahmudah, Siti, 2023) which can help develop critical thinking skills and foster an appreciation for Indonesian culture. Integrating culturally responsive teaching into role-playing scenarios enables students to explore values and issues relevant to their own needs and culture, in their language, with instant feedback from peers. This approach can help solve problems. (Cherif, n.d.) (Dracup, 2008) (Craciun, 2010) (Paudi, 2019) (Bawa, n.d.)

A learning innovation is required to accommodate all types of student learning styles (visual, audio, kinesthetic) by integrating a culturally responsive teaching approach according to local wisdom into the scenarios in the role-playing learning model. This is based on the results of the diagnostic assessment analysis and preliminary research studies. Students will enter the 5 doors of a scientific approach, following the e-module guide, to carry out a detective mission on quantity and measurement. This learning innovation is an e-module based on a role-playing learning model with a scientific approach and culturally responsive teaching, aimed at improving mastery of the tenth-grade concept on the subject of quantity and measurement.

## METHOD

Classroom Action Research is a research method that can be easily integrated into teaching and learning processes. It poses real problems that teachers must observe and act upon to improve and enrich classroom learning activities in a professional manner. This study utilized Collaborative Classroom Action Research. Collaborative action research has the potential to launch and strengthen teacher research skills as a natural extension of classroom practice. (Septiani, 2018). Classroom Action Research (CAR) is a simple and effective method for improving teachers' skills. Collaborative Classroom Action Research (CCAR) is a systematic process in which participants examine their teaching practices using research methods to enhance learning outcomes for students, teachers, and other stakeholders.

This study implemented Kurt Lewin's Class Action Research Cycle, as shown in Figure 2, over two cycles. The sample consisted of 27 students from class X-11 at SMAN 9 Malang. The research method used to implement the media was Kurt Lewin's class action research with two cycles, as shown in Figure 1. (Khasinah, 2013) (Wahyuningtyas, 2023).



Picture 1. Kurt Lewin's Class Action Research Cycle

The formula used to calculate students' learning outcomes is as follows:

$$\text{Score} = \frac{\sum \text{number of correct answers}}{\sum \text{total number of questions}} \times 100$$

## FINDINGS AND DISCUSSION

### Findings

The e-module includes material, practice questions with corrective feedback, experimental worksheets, and tests that utilize the play learning model to simulate the role of a detective in the scientific approach. The Culturally Responsive Teaching (CRT) approach is integrated into role-

playing scenarios to facilitate learning. Previews of this media can be seen in Figures 2, 3, and 4.



Picture 2. E-Module Home Page



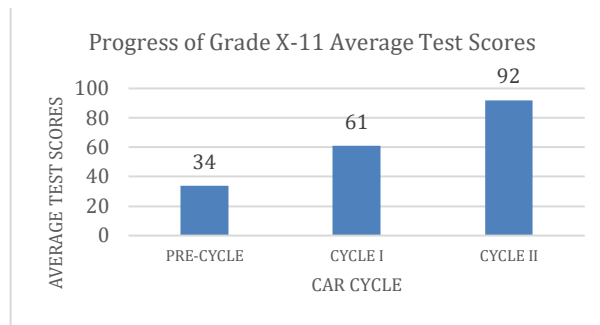
Picture 3: Integration of Role-Playing Scenarios with Culturally Responsive Teaching



Picture 4.5: The Scientific Doors of Quantity and Measurement Mission

This learning innovation accommodates all student learning styles, including visual, audio, and kinesthetic, through interactive media with engaging audio-visuals and instructions for students to conduct investigations of quantity and measurement based on local wisdom. The exploration process begins with the 'Start' button and follows the flow of 'Goal' > 'Your Mission' > 'Test', with guidance from the role-playing character. The initial step for students is to follow the orientation of prospective detectives by selecting the 'Goal' button to comprehend the DC Boy and DC Girl characters and scenarios. After following the 5-door scientific approach, students, acting as DC Boy and DC Girl, took the test and were subsequently appointed as Detective-C for successfully completing the detective mission of quantity and measurement.

This e-module on media innovation was implemented during PTKK in X-11 at SMAN 9 Malang. The program consists of two learning cycles, following a pre-cycle that includes a conceptual mastery test. The test results from the pre-cycle showed that none of the students had passed, likely due to a lack of familiarity with the quantity and measurement material covered in grade 7 of junior high school. After conducting interviews with several students, it was found that during the Covid-19 pandemic, students did not receive clear and complete instruction.



Picture 5. Progress of Grade X-11 Average Test Scores

**Tabel 1. Results of E-Module Implementation**

ACTION	PRE-CYCLE	CYCLE I	CYCLE II
Passed Score Percentage	0%	30%	70%
Average Score	34	61	92
Max Score	65	85	100
Min Score	10	15	55

## Discussion

During Cycle I, students received e-module media and were guided in their learning with it. Additionally, they were instructed to study the material independently at home. Following the test, the percentage of students who passed increased by 30% compared to the pre-cycle results. During Cycle I, students were taught through a mission-based approach, entering doors I to III via a sliding caliper experimental simulation. This was followed by an investigation of measuring instruments in everyday life, related to local wisdom. Some students were able to improve their scores as a result of this activity (Handhika, 2016) (Hakim, 2023). At the end of Cycle I, students have the opportunity to write a reflection journal.

The results of Cycle I evaluation showed that students were unable to study the e-module independently and there was no progress made as a result of working with the team to investigate quantity and measurement in the field. (Imaningtyas, 2016) (Martha et al., 2023). In Cycle II, the teacher provided repetition of steps to enter door III by offering students opportunities to conduct experiments using six fundamental measuring instruments. (Susilo, 2020). After finishing, proceed to Door IV to discuss the material, ask questions, and reflect. During the process, it became evident that the students were enthusiastic because they were able to practice using the six fundamental measuring instruments, divided into teams. In this cycle they also enter door V to make a video presentation of the results of experiments in class and investigations of measuring instruments that contain local wisdom in everyday life around them (Mulia, 2016) (Mahmudah, Siti, 2023).

According to Figure 5, there has been a clear increase in the class average score, indicating that this learning innovation has successfully improved students' conceptual mastery. Students are considered to have mastered the concept of quantity and measurement if their test score is equal to or greater than the KKM score of 78. Table 1 shows the results of media implementation data in learning, which demonstrate how concept mastery increased in each cycle. The improvement in conceptual mastery is attributed to this media's ability to accommodate all learning styles, engage students in fun learning, allow for independent and repeated study, and involve students directly in building knowledge in a concrete and contextual manner that aligns with local cultural wisdom. (Venina, 2020) (Surip, 2021) (Mahmudah, Siti, 2023). After Cycle II, student test results showed an increase in mastery with a passing score percentage of 70%, which was higher than after Cycle I. (Martha et al., 2023).

## CONCLUSION

This e-module learning media is based on a role-playing learning model with a scientific approach and culturally responsive teaching. It has been shown to increase students' conceptual

mastery in class X on magnitude and measurement at SMAN 9 Malang. The percentage of passing scores after Cycle II was 70%, which is an improvement from the 30% achieved after Cycle I. However, it is important to note that this class action research cannot be generalized as it was only applied to one class, namely X-11 at SMAN 9 Malang. Therefore, future researchers could conduct research on two classes: the experimental and control classes. This would allow for a comparison of the effectiveness of the e-module media with conventional media.

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