Research Article

Simple Teaching Tools: Efforts to Improve Mastery of Direct Current Electrical Materials by Utilization in Physics Learning

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Abstract.
A teaching tool is a collection of concrete objects that are purposefully developed or created to make the learning process more relevant and effective. Our findings at one of Ambon City's high schools revealed that there were no teaching tools for direct current (DC) power. Hence, learning has only been accomplished via the lecture technique. This impacted students' poor mastery of the material. This study aimed to improve mastery of the DC electricity topic using basic teaching methods in physics education. This type of study consists of a one-group pre and post-test. Data were examined with N-Gain to measure the increase in mastery of the subject after students completed the learning procedure. The research sample consisted of 22 students from Class XII-3. According to the study's findings, 45.5% of students with high qualifications and 54.5% of students with medium qualifications improved their mastery of the material under study. Thus, it is possible to conclude that the use of simple teaching tools in DC electricity material in physics education can improve students' comprehension of the topic at hand.

Keywords: simple teaching tools, material mastery, direct current electricity

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1. Introduction

Education is the process of enhancing or changing the knowledge and behavior of a person or group of individuals. According to Rismayanti [1], education will help a person develop good academics, attitudes, behavior, and morality, whether it is received in the family, at school, or in the community. Education also seeks to enrich human lives through learning activities. Learning is a process in which students gain information and understanding through interactions with teachers. Interesting learning is essential in the teaching and learning process in the classroom since uninteresting teaching and learning can lead to student boredom. According to Munthe [2], every learning topic provided to children has its own set of issues, including science material.

Science is the study of nature and is an integral component of human life, one example being physics. Physics is a science that investigates diverse physical events in an abstract manner, so it is critical to grasp the concepts being studied before transferring them during the learning process. According to Kause [3], physics learning must be delivered in real world so that students find physics more relevant, hence increasing their involvement and motivation in the learning process.

Learning physics remains tough for students to understand since it is usually associated with formulae, and students' limited ability to master the subject in understanding abstract notions, as well as their lack of participation in the learning process, necessitates a solution. One possible method is to use learning media. Learning media are instruments that can facilitate the teaching and learning process. The use of learning media to apply learning can boost students' interest, attentiveness, and learning achievement for the content being taught [4]. Teaching tools are an excellent type of learning media for clarifying abstract topics and capturing students' learning interest. Teaching tools are a collection of concrete objects that are purposefully developed or created to help students understand and develop concepts and principles. Teaching tools can explain, demonstrate, or prove the concepts or symptoms under study [5].

Gulo's [6] research shows that learning can be enhanced with teaching tools. It demonstrates that basic teaching tools can improve students' physics learning outcomes by approximately 8 points. Then, in addition to learning outcomes, aspects of student activeness in learning activities increased in number from cycle one to cycle two, such as enthusiastic attitudes toward learning and asking questions, implying that this demonstration method using simple teaching tools can be used in future lessons.

Based on the results of interviews and observations conducted by researchers at one of the high schools in Ambon City, information was obtained that one of the hindering factors in delivering material was the absence of trials/experiments carried out in the physics laboratory because there were no direct current electrical teaching tools, so the learning process Until date, teachers have exclusively taught in the classroom using the lecture approach. This has an impact on students' poor grasp of the material. One method is to employ basic teaching tools to help students understand direct current electricity information that may appear abstract, hence improving students' knowledge of the material.

2. Method

We employed a quantitative descriptive approach to present an overview of students' cognitive capacities. We used this strategy to explain current events and occurrences [7]. Data was collected through preliminary and final assessments, and the results were analyzed using the N-Gain equation to determine the increase in understanding of direct current electricity material after students completed the learning process. This study employed a one-group pretest-posttest design. In this study design, a pretest is performed on research subjects before to treatment in order to better understand the results of the treatment.

$$O_1 \quad X \quad O_2$$

Information:

O1: pretest (before using direct current electrical tools)

X: treatment (use of direct current electrical tools)

O2: posttest (after using a direct current electrical tools)

Figure 1: One-group pretest-posttest research design.

3. Results and Discussion

This study was carried out during three meetings at one of Ambon City's high schools. The research sample consisted of 22 students from Class XII-3. The study was designed to assess mastery of the content using simple direct current electricity teaching tools. The simple teaching tools in question consist of a breadboard for arranging electrical components such as resistors and jumper wires, followed by a digital multimeter to measure voltage, current strength, and resistance in the circuit. Students begin learning by constructing problems involving the notion of direct current electricity. Following that, students develop hypotheses, then autonomously construct electrical circuits and collect data. After collecting the data, they analyze it in accordance with the information and instructions on the worksheets. Finally, students draw judgments about what they have learned. Table 1 shows students' initial and eventual mastery of the material.

Table 1 reveals that, prior to the implementation of simple teaching tools, 100% of students failed subject mastery criterion due to a lack of understanding of direct current electricity. After completing the learning process, students' understanding of direct current electricity material was 31.8% good, 50% sufficient, and 18.2 appeared to be

TABLE 1: Data on Students' Initial and Final Mastery of Material Achievement.

Mastery Level	Mastery of Initial Material		Mastery of Final Material		Material Mastery Criteria
	f	%	f	%	
90-100	-	-	-	-	Very good
80-89	-	-	7	31.8	Good
70-79	-	-	11	50	Sufficient
<70	22	100	4	18.2	Fail
Amount	22	100	22	100	
Average	16.9		75.1		

within the failure threshold. Figure 2 depicts the overall mastery of the material at the beginning and completion of learning.

In Figure 2, before beginning the learning process with simple teaching tools, an initial test is administered to verify students' understanding of the basic information on direct current electricity. The initial exam results reveal that 100% of students meet the material mastery criteria for failing. This incompleteness results from student's lack of knowledge and grasp of the material. This is backed by Charli's [8] opinion that the issue that leads students to struggle with formula questions is a lack of mastery of the material's concept, thus they do not know the formula that must be utilized to answer the problem.

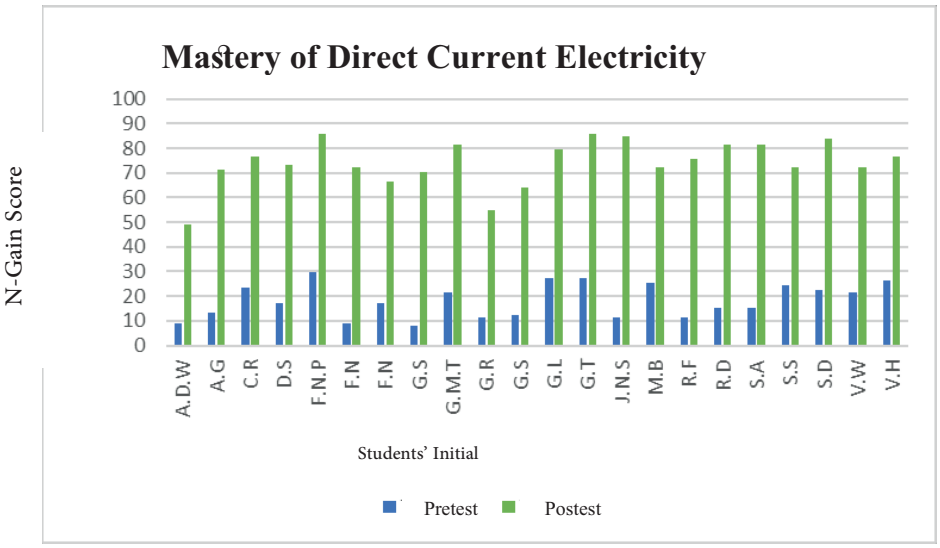

Figure 2: Achievement of mastery of direct current electricity material.

After the learning process using simple teaching tools was completed, a final test was carried out and data was obtained that the majority of students were able to

master the direct current electricity material as shown in Table 1 with 31.8% of students mastering the material well, 50% enough, and 18 .2% have not been able to master the material or have failed qualifications. Students continue to struggle with direct current electricity curriculum because they are not serious about participating in learning, which prevents them from mastering and absorbing the material offered by the teacher. This is consistent with the opinion of Setyani et al. [9], who believe that if students do not concentrate while studying, they would struggle to work on the problems offered, affecting their knowledge of the content. To measure the growth in mastery of direct current electricity material after students learn utilizing basic teaching tools, the N-Gain score equation developed by Richard Hake [10] was employed, as shown in Table 2.

TABLE 2: N-Gain Score Qualification.

Mastery Level	Frequency	Percentage (%)	Qualification
$g \geq 0.7$	10	45.5	High
$0.3 < g < 0.7$	12	54.5	Medium
$g \leq 0.3$	-	-	Low
Average N-Gain Score = 0.69			Medium

Table 2 shows that 45.5% of students experienced increased mastery of direct current electricity using simple teaching tools in high qualifications, while 54.5% experienced increased mastery of material in medium qualifications. Figure 3 depicts each student's progress toward material mastery.

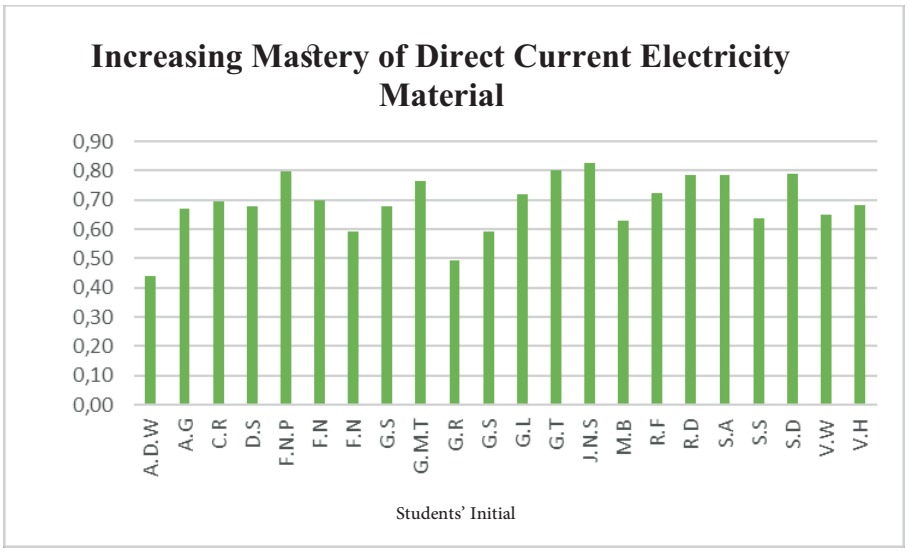

Figure 3: Increased mastery of direct current electricity materia.

Analysis of data on increasing mastery of material shows that 100% of students experienced an increase in mastery of direct current electricity material. As many as

45.5% of students experienced an increase in high qualifications, and 54.5% of students experienced an increase in mastery of material in medium qualifications. The main cause of increasing students' mastery of the material is because students are very enthusiastic in using simple teaching tools.

Aside from that, with this easy teaching device, students can not only hear the teacher's information but also practice directly using direct current electricity, making learning more engaging. This is consistent with research from Setiawan and Mahmud [11], which found that the use of teaching tools in learning can increase student attention by allowing them to instantly practice the subject being taught directly utilizing props, preventing students from becoming bored while learning. This increase in material mastery is also consistent with the belief of Novitasari et al. [12] that using learning media in the form of concrete objects in the learning process will influence students' mastery of the material while also making it easier for students to capture the information conveyed by the teacher.

4. Conclusion

Based on the findings of the analysis and discussion, it is possible to conclude that using teaching tools can help students grasp direct current electricity material at one of Ambon City's high schools. This is shown by 45.5% of students reporting enhanced mastery of subject in high qualifications, and 54.5% of students experiencing increased mastery of material in medium qualifications.

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