



# The Influence of Volta Element-Based Learning Media on Students' Science Process Skills

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**Abstract:** Based on the results of interviews with science subject teachers for class IX as initial observations at SMP Negeri 5 North Polongbangkeng, it was found that there were obstacles during the learning process in class where educators still played an active role in learning (middle teacher). Besides that, the facts found in class show that learning is less effective and enjoyable so students are less enthusiastic about learning, and only memorize concepts but applying these concepts in everyday life is still difficult. The purpose of this study was to increase students' abilities in scientific processes with voltaic media. The type of research used in this research is Quasi Experiment. The design of this study was (the matching only pretest-posttest control group design). Learning media based on voltaic elements is media that can utilize natural resources in the surrounding environment and specifically for science-based subjects, besides being able to increase students' learning abilities and improve students' abilities and science process skills.

**Keywords:** Learning media; Post-test; Pre-test; Science process skill; Volta element

## Introduction

The development of science and technology from time to time is very fast and sophisticated and is supported by increasingly intense globalization. This phenomenon requires every nation to improve various areas of life including education. Education plays a role in developing the human self and dealing with any changes that occur. These changes are intended to improve and create high-quality and professional human resources (Cohen et al., 2007). The Independent Learning Curriculum can create students who are creative, intelligent, innovative, and effective (Setyono et al., 2019).

The importance of education is also very obligatory in Islam, one of the proofs is in a saying of the Prophet. Explained:

طَلَبُ الْعِلْمِ فَرِيضَةٌ عَلَى كُلِّ مُسْلِمٍ

It means: "Seeking knowledge is obligatory for every Muslim" (History of Ibn Majah, Al-Baihaqi, Ibn Abdil Barr, and Ibn Adi, from Anas bin Malik).

The hadith mentioned above can be interpreted that the law of seeking knowledge is obligatory for all

Muslims, both men, and women. The meaning of knowledge here is in general both syara' and science (Cameron et al., 1983).

Learning activities in formal education that take place in schools are active interactions between teachers and students. Teachers are responsible for organizing learning well, creatively, innovatively, up to date, and active involvement between the two learning subjects. Teachers as initial initiators and directors and mentors, while students as experienced and actively involved to obtain self-change in learning (Endedijk et al., 2014).

Science studies the universe in the form of natural facts, natural concepts, principles about nature, and the process of discovery (Maison et al., 2019). Science education can be a place to study nature and the environment (Brata et al., 2020). The learning process provides direct experience to develop students' abilities to study nature through experimentation (Ernawati et al., 2022).

Based on the results of interviews with science subject teachers for class IX as an initial observation at SMP Negeri 5 North Polongbangkeng, it was found that there were obstacles during the learning process in the classroom where educators still played an active role in

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the learning (teacher center). Besides that, the facts found in class show that learning is less effective and enjoyable so students are less enthusiastic about learning, and only memorize concepts but applying concepts in everyday life is still difficult. Likewise, the science process skills that exist within students have not been optimally developed, even though students have can them. One of the reasons is that the learning resources in the community and the surrounding environment have not been used optimally for the benefit of learning. This tendency causes students' science process skills to be less developed (Chabalengula et al., 2012).

Science process skills (SPK) is an approach that directs that finding knowledge requires the skills of observing, conducting experiments, interpreting data, communicating ideas, and so on (Darmaji et al., 2019). SPK can be interpreted as skills possessed by science scientists in acquiring knowledge and communicating their acquisition. These skills mean the ability to develop logic, act efficiently, and effectively, and creativity (Ilma et al., 2020).

The role of the teacher is very important to determine the most appropriate method with systematic steps to be able to awaken students' science process skills (Setiawan et al., 2020). This learning tendency causes students' science process skills to be less developed. This is because, in the learning process, students are not allowed to practice their science process skills (Ango, 2002). So, there needs to be an effort that can be taken to improve science process skills. One of them is using learning media based on voltaic elements (Alsubaie, 2016).

Learning media based on voltaic elements is one of the media that can be used by educators as a tool in teaching electricity. By using learning media based on voltaic elements, educators can provide learning visualization chemistry which can cause the occurrence of electrical energy spontaneously. The research aims to improve students' science process skills through voltaic element media.

**Method**

The research location was at IX class SMP Negeri 5 North Polongbangkeng, Takalar Regency, South Sulawesi Province. The type of research used in this research is Quasi Experiment. The design of this study is (the matching-only pretest-posttest control group design) described by Frankel et al. (2009) as follows:

Treatment Group	M	O <sub>1</sub>	X	O <sub>3</sub>
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Control Group	M	O <sub>2</sub>	C	O <sub>4</sub>

Information:

M: Matching sample (sample installation)

X: Treatment

C: Treatment

O1 & O2: Giving test before treatment

O3 & O4: Giving tests after treatment

**Result and Discussion**

Research on the effect of voltaic element-based learning media on students' science process skills have been successfully carried out. In the descriptive analysis of the processed data, namely pretest (before) and posttest (after) data, voltaic element media-based learning was applied in learning physics in class IX.1 student at SMPN 5 North Polongbangkeng (Table 1).

**Table 1.** Distribution of Pre-test and Post-test Frequency of Experiment Class Science Process Skills

Pre-test		Post-test	
<i>Xi</i>	<i>Fi</i>	<i>Xi</i>	<i>Fi</i>
75	1	100	6
70	2	90	4
65	5	80	5
60	3	70	4
55	3	60	1
50	2		
45	4		

Based on Table 1, it is shown that the experimental class pretest for the value range 50–65 has the highest frequency value of 13, and for the range 66 – 75 has a frequency of 3 and for the range, 0–45 has a frequency of 4. As for the posttest in the experimental class, the range 61–90 has the highest frequency, namely 13, for the range 91–100 there are 6 frequencies and for the smallest frequency in the range 0–60, it is 1. The distribution table of the results is shown in table 2.

Based on table 2, it can be shown that the maximum score for the experimental class before being given treatment (pretest) is 75 and the minimum score is 45 with an average value of 58.25 and a standard deviation of 9.35. While the maximum score for the experimental class after being given treatment (posttest) is 100 and the minimum score is 60 with an average value of 85 so a standard deviation of 12.77 is obtained.

**Table 2.** Descriptive Statistics of Pre-test and Post-test Science Profession Skills for Class IX.1 Before and After Treatment

Descriptive statistics	Pre-test	Post-test
Number of samples	20	20
Maximum score	75	100
Min score	45	60
Average	58.25	85
Standard deviation	9.35	12.77
Variance	87.42	163.07

Data in table 2 also obtained a variance value of for the pretest 87.42 while for the posttest a variance value of 163.07 was obtained with a total sample of 20. This became the basis for determining science process skills. Where is the categorization value interval in the range (0-5)? Increase in student learning outcomes when the Post-test was carried out. Pre- and post-tests are used to measure knowledge gained from participating in a training course (Shivaraju et al., 2017). Pre-test/post-test

and post-test-only can be used as tools in evaluation to improve student learning. The pre-test/post-test evaluation model is to measure the initial knowledge of learning and compare it with the knowledge obtained after learning (Rabail Alam, 2019). The categorization score categories before and after applying voltaic element media-based learning to physics learning in class IX.1 student at SMPN 5 North Polongbangkeng can be shown in Table 3.

**Table 3.** Distribution of Pre-test and Post-test Categorization Applied to Volta Element Media-Based Learning in Physics Learning

Formula	Range	Experiment Class				Categorization
		Pre-test		Post-test		
		Frequency	Percentage (%)	Frequency	Percentage (%)	
$X > + 1.8x\bar{x}_i sb_i$	>88.38	0	0	11	55	Very good
$\bar{x}_i + 0.6 x < X \leq + 1.8 x sb_i \bar{x}_i sb_i$	80.46 - 88.38	0	0	4	20	Well
$\bar{x}_i - 0.6 x < X \leq + 0.6 x sb_i \bar{x}_i sb_i$	72.54 - 80.46	1	5	0	0	Enough
$\bar{x}_i - 1.8 x < X \leq + 0.6 x sb_i \bar{x}_i sb_i$	64.62 - 72.54	7	35	4	20	Not enough
$X \leq + 1.8 x \bar{x}_i sb_i$	< 64.62	12	60	1	5	Very less
		20	100	20	100	

In classes that use voltaic element-based learning media, the value of science process skills increases because students are required to independently carry out all observation activities. This increase can be seen in the categorization table of science process skills, namely in the very good categorization (Table 3). This is because in the experimental class at the time of research, the students were given the flexibility to make observations so that during the test the students understood what had been practiced.

The rapid growth witnessed today globally in information and communication technology has brought about remarkable and unprecedented changes in the 21<sup>st</sup> century, thereby affecting the demand of modern societies. The educational system however has not been left out as there is a growing demand for the utilization of information and communication technology (ICT) in learning new skills and knowledge needed for the 21<sup>st</sup> century (Syahdan et al., 2021). This is necessary as the effect of technology in our everyday life cannot be overemphasized as today’s educational institute tries to reconstruct their curricula, and educational media to meet up with the increasing demand ICT has brought on our societies (Andriyani et al., 2021). The gap existing in the use of ICT and ICT-related tools in teaching and learning situations can therefore be a workout by training and retraining instructors on the use of these ICT-related technologies.

Learning media based on voltaic elements is media that is made in such a way as to be able to utilize the natural resources of the surrounding environment and specifically for science-based subjects, besides being able to improve learning outcomes it is also able to improve students' science process skills (Aisyah et al., 2020). In

this study, it can be seen that the science process skills that use these media have differences because, during the practicum, students make observations independently with the help of worksheets and researchers as teachers as facilitators and at the same time direct students.

The research results show that there is a significant influence on the science process skills of students who are taught using Voltaic Element-based learning media in class IX. This states that voltaic element media-based learning has an active role apart from improving learning outcomes it also plays a role in improving students' science process skills (Hasanah et al., 2021). Learning based on voltaic element media guides students to be independent in carrying out science-based activities themselves so that students are accustomed to doing this resulting in shrewdness and skills in making an observation increasing because of this attitude of independence (Sefriani et al., 2021).

Learning media that is utilized appropriately in the learning process will become a more effective and efficient support tool in achieving the learning objectives. In addition, learning media will also increase students' learning motivation (Brata et al., 2020). So the learning media can be interpreted as a tool of hardware or software used in the delivery of materials by teachers to students in the learning process (Özgelen, 2012). In learning, media is expected to make a more effective and efficient learning process for learning (Ediyani et al., 2020).

Necessary process skills are recording data, classifying, measuring, communicating, observing, using the space-time relationship between numbers and space, estimating (predicting), and drawing conclusions

(Marjanah et al., 2021). Integrated process skills are: hypothesizing, determining/controlling variables, interpreting data, designing/conducting experiments, modeling, and defining operationally (Kalemkuş et al., 2021). Many reports on learning science emphasized that students should not only gain conceptual and quantitative information but also need to develop science process skills such as hypothesizing, designing experiments and making conclusions based on data and observations, and working with other people as a team to solve complex and open-ended problems.

## Conclusion

Learning media based on voltaic elements is media that can utilize natural resources in the surrounding environment and specifically for science-based subjects, besides being able to improve learning outcomes it is also able to improve students' abilities and 'science process skills. This can be seen from the increase in learning outcomes through the Post-test that has been carried out by the teacher.

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