

## Using Chemistry Teaching Aids Based Local Wisdom as an Alternative Media for Chemistry Teaching and Learning

Erfan Priyambodo<sup>1</sup>, Safira Wulaningrum<sup>2</sup>

<sup>1,2</sup> Department of Chemistry Education, Universitas Negeri Yogyakarta, Indonesia

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### ABSTRACT

Students have difficulties in relating the chemistry phenomena they learned and the life around them. It is necessary to have teaching aids which can help them to relate between chemistry with the phenomena occurred in everyday life, which is chemistry's teaching aids based on local wisdom. There are 3 teaching aids which used in chemistry teaching and learning, i.e. clay molymod, electrolyte tester, electroplating tool. The chemistry teaching aids was reviewed by media experts, material experts, and also reviewers. The reviewers' assessment showed that all of the teaching aids have a very good quality. Based on the response from Senior High School' students, they all agree that the teaching learning process using the teaching aids could improve their learning motivations.

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### Corresponding Author:

Erfan Priyambodo,  
Department of Chemistry Education,  
Universitas Negeri Yogyakarta,  
Indonesia.  
Email: erfana@uny.ac.id

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## 1. INTRODUCTION

In chemistry teaching and learning, teacher must follow the curriculum to design a kind of learning process, which an activity to implement the curriculum of an educational institution. The teachers' role in achieving the success of learning process is very important. The chemistry teachers should be able to develop a complete learning design and use a relevant teaching aid to the characteristics of students. It is important, because learning conceptions play an important role in students' study behaviour, especially in higher education [1].

Chemistry teaching and learning should aim in developing in the students those manipulative and experimental skills necessary to make them competent and confident in the investigations of the material resources around them [2]. In term of making chemistry concepts comprehensible to students, chemistry teachers must employ creative teaching methods and be prepared to respond to queries and explain concepts in a typical manner [3]. One of the methods that can be used is using chemistry teaching aids. Chemistry teaching aid can be defined as a media or tool which is helping student in understanding chemistry concepts. The chemistry teaching aids will help to visualize the abstract concepts in chemistry into something tangible and understandable to the students. Therefore, teachers can make innovation to develop their own chemistry' teaching aids. The teaching aids can be adjusted to the concept taught and made in affordable cost.

Chemistry teaching aids can help to relate between chemistry with the phenomena occurred in everyday life, which is chemistry teaching aids based local wisdom. Local wisdom is a particular characteristic which comes from district or region that has cultural value developed within local people from generation to generation. Local wisdom around the students can help students understand the relationship of their life-world and what they are learning in science [4]. Through local wisdom, students can learn the values of the culture and sense of nationalism that may affect learning outcomes (attitudes, behavior, and

thinking ability) [5]. Knowledge of local wisdom needs to be integrated in science learning process to improve the students' understanding toward the learning materials related to the surrounding environment [6].

## 2. RESEARCH METHOD

This research was focusing on students' perception in chemistry teaching and learning using chemistry teaching aids based local wisdom. The development of chemistry teaching aids based local wisdom was adapted the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model which is the most of the current instructional design model [7]. The phase of development chemistry teaching aids based local wisdom was described in five phase:

- a. Analysis phase  
Consists of (1) analysis and determine the product development objectives, (2) analyze the learning materials and collect the references, (3) conduct an analysis towards the product usage's target which will be developed.
- b. Design phase  
Consists of (1) create a design of teaching aid which will be developed, and (2) create an instrument for teaching aids assessment.s
- c. Development phase  
Consist of (1) create a chemistry teaching aids, which are clay molymod, electrolyte tester and electroplating tools, (2) create a guide book, (3) conduct product reviews by media experts, material experts, and reviewers.
- d. Implementation phase  
The chemistry teaching aids was used in chemistry teaching and learning for students grade X Senior High School.
- e. Evaluation phase  
Evaluate the learners' response towards the chemistry teaching aids as a learning media. The response gained by questionnaires which consists of 8 aspects. The aspects were learning conformity, material conformity, practicality and flexibility, time efficiency, tool durability, safety for the students, aesthetics and kit box.

## 3. RESULTS AND ANALYSIS

### 3.1. Clay Molymod

Molymod (molecular model) is a three-dimensional model which defines a molecular structure [8]. Visual representations and physical models are commonplace in chemistry teaching and learning [9]. One of their applications is to enhance the spatial awareness of concepts in chemistry teaching and learning [10]. One component of molymod which is the atom made of clay. Clay is used as the basic material for make the pottery. This pottery industry is a kind of local wisdom in Kasongan, Yogyakarta [11]. Molymod props can be seen in Figure 1.

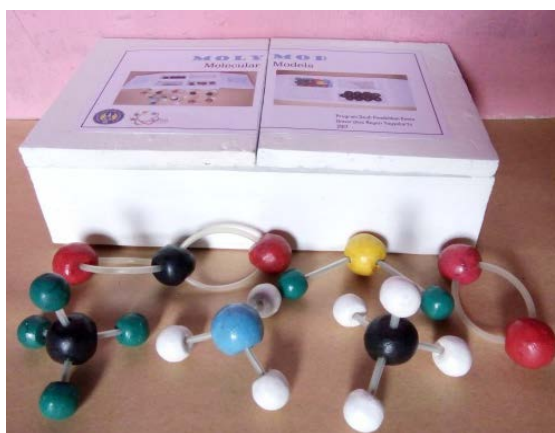


Figure 1. Clay Molymod

Overall, based on the reviewer assesment, the clay molymod has very good quality which is 85.83% of ideality percentage. This result shows that the usage of molymod will make the students easily understands the concept of abstract molecular structure. Learning in chemistry about molecular geometry using models becomes easier to understand by the students and it can enriches the students' learning experiences [12].

In addition, the molymod spheres are made of clay, while the connecting rods use a coated wire with a plastic hose so that it is safe when it uses by the students. The spheres are painted in different colors according to the type of the atom so they look more attractive. The use of attractive teaching aids can increase attention, and students focus more on the learning process; it makes the will easily understand the material concepts.

### 3.2. Electrolyte Tester

Electrolyte tester is a tool which helps to test whether a solution can conduct electricity or not. The solutions can be tested using an electrolyte tester; one of which is a solution used in the process of electroplating. The silver handicraft industry in Kotagede, Yogyakarta, uses electrolyte solutions which contains gilding metals so that the electroplating process can be done [13]. Electrolyte tester can be seen in Figure 2.



Figure 2. Electrolyte Tester

Overall, based on reviewer assesment, the electrolyte tester has very good quality with 85.17% of ideal percentage. The efficiency usage of the tool is necessary for smooth and successful learning activities because it will save the practice time. Electrolyte tester is very efficient when it used, because the tool is easy to use and does not require a long time to make this tools.

### 3.3. Electroplating Tool

Electroplating tool shows a simple electroplating process in Kotagede, in silver handicraft industry. The principle of electroplating is that the coated metal treated as a cathode which connected with a negative pole and the coating metal treated as anode which connected with the positive pole.



Figure 3. Electroplating Tool

Overall, the electroplating tool has very good quality with 88.17% of ideal percentage. The developed electroplating tool can support the achievement of learning objectives because it is developed with a simple circuit so that it matches with the thinking level of the students. The development of teaching aid should be adjusted to the intellectual level of the students, so that the students can understand the displayed objects and phenomena.

#### 4. CONCLUSION

There are three of teaching aids based on the local wisdom as a chemistry learning media, which were clay molymod, electrolyte tester and electroplating tool. Students are interested and motivated using chemistry teaching aids based local wisdom as a media for learning chemistry.

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