Development of Learning Media for Formalin Test Teaching Aids To Increase Interest in Learning and Chemical Literacy of Smk Students

Istiqomah[1*], Anna Permanasari[2], Indarini Dwi Pursitasari[3]

[1] Vocational High School of SMK Amaliah Ciawi
[2,3] Study Program of Science Education, Graduate School of Pakuan University

[*]E-mail: istiaziz2305@gmail.com

Abstract: This study aims to produce formalin test props as a learning aid to increase student interest in learning and chemical literacy of SMK students. The Research and Development method used in this study was a Four D (4D) design. The results of the development were examined for effectiveness through research involving 30 students majoring in Multi-media at Amaliah Vocational School. Testing the effectiveness of teaching aids in supporting the achievement of interest in learning and chemical literacy was carried out using the pre- experimental method. The teaching aids were validated by three lecturers consisting of expert lecturers. The instruments used include teaching aids validation instruments, learning observation formats, student response questionnaires, and chemical literacy test questions. The results of the development show that the teaching aids have met the requirements in terms of relevance, pedagogic, technical, originality and aesthetics. Furthermore, it was found that the use of teaching aids in learning could increase students' interest in learning and chemical literacy on average in the high category.

Keywords: *formalin test equipment, student interest in learning, student chemical literacy.*

INTRODUCTION

The 2013 curriculum in SMK based on Permendikbud No. 70 of 2013 explains that chemistry lessons are included in the specialization group (C1). These specialization group subjects are expected to provide an understanding that forms the basis for supporting student competency skills. In Vocational High School, chemistry is not the main subject like high school, so it has not been optimally developed. This has an impact on the lack of involvement of vocational students in learning chemistry. One of the factors that cause low student involvement is the low interest in student learning. Chemistry subjects are considered not to contribute to the development of their expertise. Interest is a fundamental key to

achieving student success in learning. Students' interest in learning according to the results of preliminary research shows that students' interest in learning is influenced by learning resources and content being taught, student perceptions,and learning strategies applied.[1] (Boddey & Berg, 2015). It was further explained that vocational school students who have generally poor performance and tend to view chemistry as irrelevant to the vocational field, have an impact on decreasing interest in learning chemistry. (Haryanti, et al 2017). Therefore, science learning must get serious attention. Hutauruk, (2018). According to Sudjana (2002), teaching aids play an important role as a tool to create an effective teaching and learning process. Finding concepts in everyday life is an implementation of science learning which can be categorized into chemical literacy. Learning techniques are paths, tools, or media used by teachers to direct the activities of students (Uno, 2007). An assessment instrument that can assess students' chemical literacy is important to develop because chemistry learning achievement requires an assessment tool that not only assesses understanding and memorization but can also assess the application of students' concepts when facing problems (Shehabudin, 2018).

Science learning should be carried out coherently with the times, contextual for all the needs of the field responsible for achieving scientific literacy (Toharudin, 2011). Chemistry learning is one part of science learning, so chemistry learning is also responsible for achieving chemical literacy. Chemical literacy is part of scientific literacy, it is very necessary to teach students so that they can live in the midst of modern society in the 21st century. Therefore, various efforts have been made in various countries, including Indonesia. To improve students' scientific literacy and chemical literacy, for example, by launching a new 2013 curriculum for chemistry subjects. Basically the 2013 curriculum suggests the need for students to have chemical literacy. Assessing chemical literacy can use the scientific literacy framework and Shwartz chemical literacy. (Rahayu, 2017).Efforts that can be used to improve scientific literacy skills are to improve the quality of learning by using aspects of local culture in learning (Arini, 2017).

Chemistry learning that is packaged with the aim of chemical literacy is very relevant to SMK, because it will involve chemistry with the need for skill development. A person's pleasure will affect interest. Hardjana (1994) states that interest is a high tendency of the heart towards something that arises because of a felt need or not felt or desire for certain things. To increase interest and chemical literacy, various supports for learning are needed, including media. Media can bring concepts, skills and student learning attitudes closer to learning objectives. . Learning media is very varied, one of which is teaching aids. Teaching aids are tools for learning so that the concepts are easily understood by students (Widiyatmoko & Nurmasitah, 2013). The use of teaching aids in the learning process in many

vocational schools is not optimal because the facilities andinfrastructure in schools are still minimal. Props are only available for a few concepts (Depdikbud, 2011).

The results of research by Yager (1985) show that teaching aids can help minimize the number of students who feel that science is not fun and is just rote memorization. Based on the description above, it can be concluded that teaching aids can be a bridge for the development of students' scientific literacy through the implementation of constructive learning. This is in line with Yager (1992) that learning with visual aids is one of the constructivism learning strategies. Using practical teaching aids through science learning is the implementation of constructivism learning models. The learning approach with teaching aids parallels the implementation of the constructivist view in teaching and learning (Yager, 1992). That to generate interest in student learning in learning, it is necessary to have teaching aids. Due to the limitations of teaching aids in learning, especially on the material nature of chemistry, it is necessary to develop teaching aids to increase student interest in learning. One of the essences of chemistry is the introduction of chemistry in food. In learning this topic, one of the interesting materials to be practiced is the formalin test.

Formalin test equipment is a tool that can be used to test samples containing formaldehyde. Based on previous research, the formalin test by Regista et al (2015) has been carried out with a “Digital Formaldehyde Meter. However, the Digital Formalehyde Meter tool requires an expensive cost, the sample testing process is more complicated, because there are too many programs used to operate the tool, it requires training first. For some of the reasons above, the development of learning tools or media that will be used by students in learning is an interesting thing to study.

METHODS

This research uses research and development (R&D) methods. According to Sugiono (2013) , the research and development method known as Research and Development (R & D) is a research method that functions to test, develop and create certain products. Testing existing products because of doubts about these products, development or innovation means improving and perfecting existing products so that they are more practical to use, more productive and efficient. The research and development model used in this study is the Four-D model . Thiagarajan (1974)(in Sugiono, 2016). This model consists of 4 stages of development, namely Define, Design, Develop , and Disseminate or be adapted into a 4-D model, namely defining, designing, developing, and distributing.

The subjects in this study were students' interest in learning and chemical literacy of Multimedia majors at SMK Amaliah as measured by student response questionnaires and students' chemical literacy after learning using formalin test

props. The results of student responses and students' chemical literacy tests were then described and grouped according to the four levels of chemical literacy formulated by Shwartz et al. (2006a) chemical literacy covers four domain.

RESULT AND DISCUSSION

This study uses a 4-D model design consisting of 4 stages, namely defining, designing, developing and disseminating. In this study, a limited disseminate stage was carried out because the purpose of this study was the development of learning media in good CHEMISTRY lessons in SMK only. The main result of this research and development is learning media. The data from the results of eachstage of development research carried out are as follows:

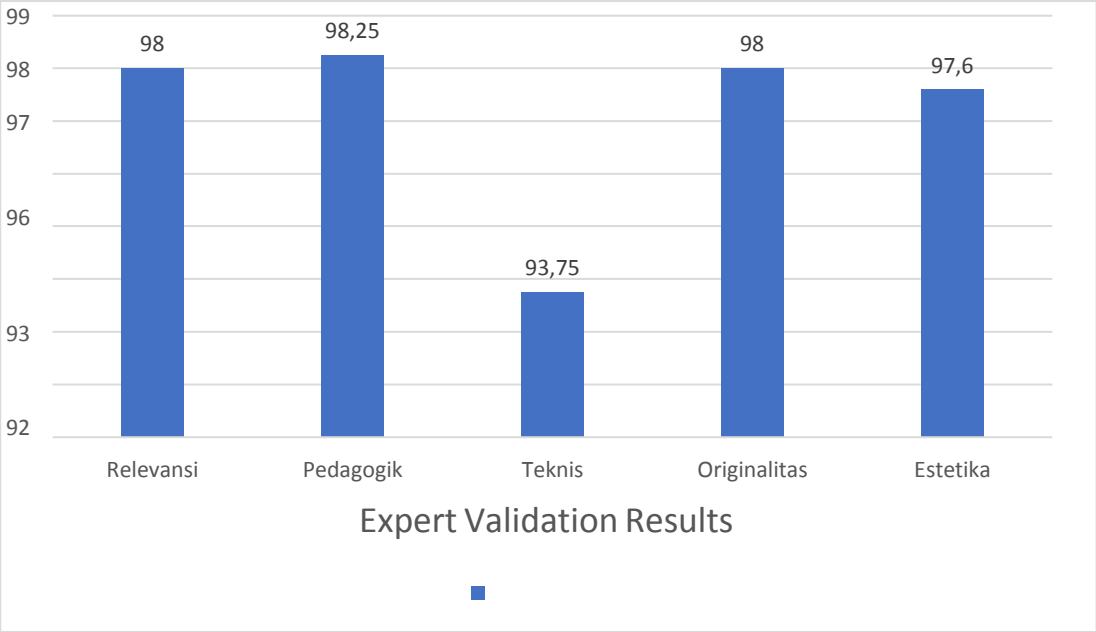
1. Define (Defining)
   At this stage is done to define and define. The requirements for development or often this stage is in the form of analysis ofKI (Core Competence), KD (Basic Competence), and GPA (Indicator ofAchievement of Competence) material on the nature of chemistry, as well as preliminary research related to the use of media in learning.
2. Design
   At this stage the researchers took several steps, namely selecting and determining the sub-chapters of the nature of chemistry, then preparing suitable learning media to support the learning process of the material of the nature of chemistry. One of the learning methods that can increase students' interest in learning and chemical literacy is the method experiment. Therefore, the researchers design the formalin test media as shown in Fig.

At this design stage, the formalin test props are shown in Picture 1.

Picture 1. Formalin test props.

To obtain a judgment whether the formalin test media is appropriate to be used and developed as a learning media, the researchers made question instruments which were grouped into 5 aspects including relevance, pedagogy, technical, original and aesthetic aspects. The instrument used is a rating scale containing questions on a scale of 1-4.

Based on the results of expert validation, the results are obtained according to Picture 2

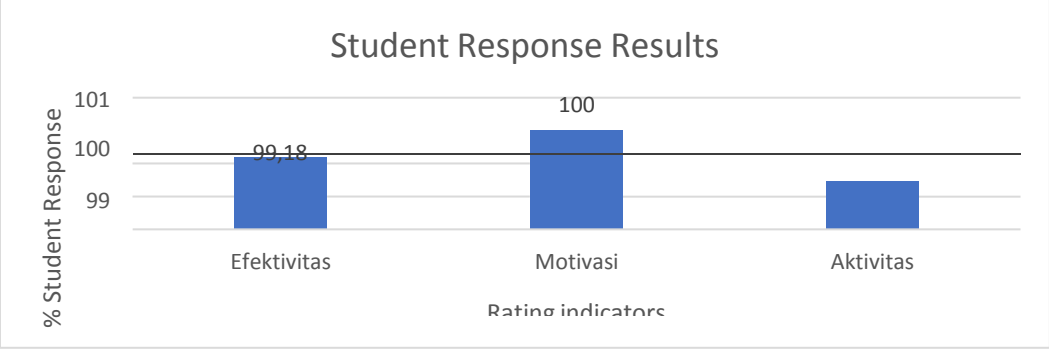


Picture 2. Results of validation of formalin test props

Based on the results of the validation of the formalin test props obtained all aspects above 90% so that the tool includes very good criteria, the formalin test tool is feasible to be used as a student learning media.

To find out student responses, the researcher gave a questionnaire containing questions from aspects of Effectiveness, Motivation, Activity, with an answer range of Dislike (TS), Dislike (SK), Like (S) and Very Like (SS) after learning using test props formalin.

Based on student responses, the percentage of each aspect of student response indicators is obtained, it can be seen in Picture 3



Picture 3. Student responses to formalin test props.

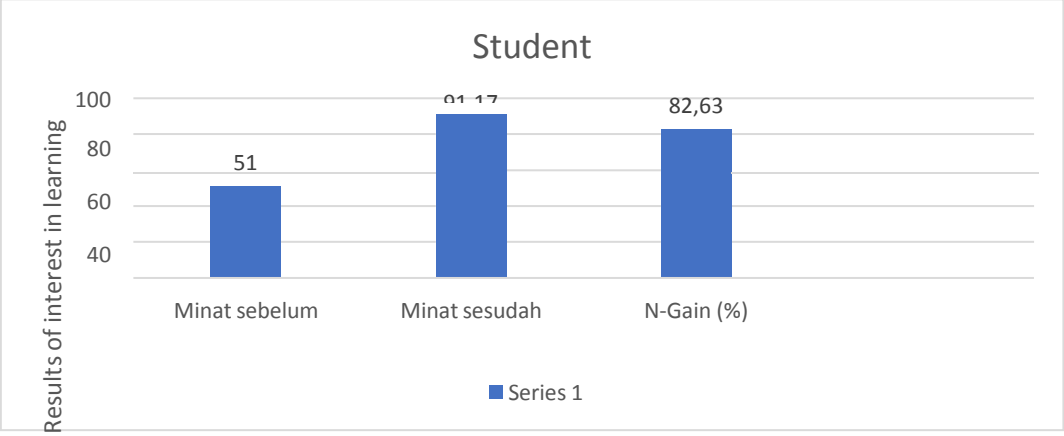
Based on Picture 3 shows the results on several aspects such as aspects of effectiveness, motivation and activity. From these several aspects, the effectiveness aspect is 99.18%, the motivation aspect is 100% and the activity aspect is 98.44%. Based on the results of the student response questionnaire, the average response obtained is above 90%, so it shows a very good response to the use of formalin test props in learning.

3. Develop (Development)

   At this stage, before the formalian test media was developed, the researcher conducted a limited trial. The results of the limited trial state that the formal test media is feasible to use because the experimental objectives are achieved. And theresults of this limited trial, the researchers developed a formalin test tool so that it could be implemented in learning the nature of chemistry. There are six media developed and ready to be used by students in learning with the experimental/practical method.

The formulation of the problem in this research is to increase students' interest inlearning and chemical literacy. Based on Picture 1, it shows that from these several aspects, the effectiveness aspect is 99.18%, the motivation aspect is 100% and the activity aspect is 98.44%. Based on the results of the acquisition of student response questionnaires, the average response acquisition is above 90%.

Based on the results of student interest in learning, there was an increase in student interest in learning before and after using formalin test props in learning. The results of the student learning questions are shown in Picture 2.



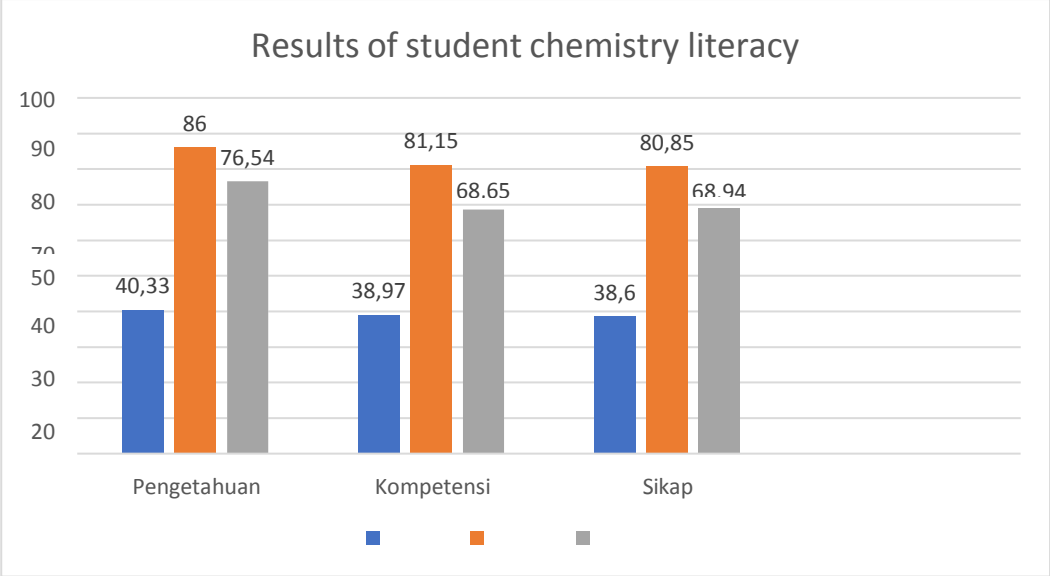
Picture 3 Students' learning interest before and after using teaching aids.

Based on Picture 2, there are differences in the results of student interest in learning before getting treatment (mean = 51.00) with student interest in learning after getting treatment (mean = 91.17) and an increase in N-Gain of 82.63% is on the High criteria. Based on the data obtained that the high value of N-Gain on

interest and the increase in the acquisition of interest before and after using formalin test props shows that learning by using formalin test props can increase students' interest in learning, this is evident from the results of the acquisition of interest before and after using formalian test props in learning has increased. This is also in line with research from Arsyad (2013) which examined that the use of learning media in the teaching and learning process can generate new desires and interests, generate motivation and design teaching and learning activities, and even bring psychological effects on students. This is also in line with research from Kahar (2017) which examines that learning by using teaching aids can increase students' interest in learning. Supriyatin (2014) who researched that learning with media can improve student learning outcomes and be able to explainmaterial that is abstract and difficult for students to understand.

To find out the increase in chemical literacy, it is necessary to carry out tests, namely pretest and posttest before and after using teaching aids in learning so thatpretest, posttest and N-Gain scores are obtained which are then categorized in the dimensions of chemical literacy.

The results of the pretest, posttest and N-Gain can be seen in Picture 4.



Picture 4. Results of Students' Chemical Literacy Pretest and Posttest

Based on Picture 4, the highest knowledge value was obtained because by learning to use formalin test props. Likewise, if the use of teaching aids will cause students to ask for learning so that it increases students' attention and will affect students' memory data so that lessons are more permanent or not easily forgotten. This is also in line with research from Chuang and Cheng that the use of media or tools in learning can improve students' cognitive abilities.

CONCLUSION

Based on data analysis and discussions that have been carried out on the results of research regarding the development of formalin test experimental teaching aids to improve chemical literacy and student interest in learning, it has been developed and has fulfilled the nature of teaching aids including the very good category. The teaching aids developed have accommodated the aspects of relevance, pedagogic, technical, originality and aesthetics. Based on student responses, the props developed can be used easily in practicum based on aspects of effectiveness, motivation, and activity.

1. The use of formalin test equipment in learning can increase student interestin learning, which is indicated by student response questionnaires before andafter learning by using teaching aids.
2. The use of teaching aids in learning the nature of chemistry can improve chemical literacy. The increase in the knowledge aspect is in the high category, while the competence and attitude aspects are in the medium category.

REFERENCES

Boddey, K. & Berg, Kd (2015). *The impact of nursing students' prior chemistry experience on academic performance and perception of relevance in a health science course*, Chemistry Education Research and Practice, 16, 212-227.

Buhari, B. (2011). Four-D Model (Learning Device Development Model from Thiagarajan, et al.

Chuang, TY & Chen, WF, (2007) Effect of Digital Games on Children's cognitive achievement, Journal of Media, 2 (1), 27 - 30

Education and Culture, (2001) Guidelines for Making Simple Chemistry Teaching Aids for Jakarta High Schools

Permendikbud No. 70, (2013) Basic Framework and Curriculum Structure of Vocational High Schools/Vocational Madrasah Aliyah

Rahayu, S, (2017). *Optimizing the Literacy aspect in 21st Century Chemistry Learning. Proceedings of the National Seminar on Chemistry*, UNY Journal of chemistry education, State University of Malang

Regeista, F et al, (2014). Performance Test Tool "Digital Formaldehyde Meter" Detecting Formalin Content in Food. Journal of Tropical Agriculture and Biosystems Engineering .2(2), 97-103

Robert E. Yager, (1985) Patricia E. Simmons and John E. Penick, Student Perceptions of the Usefulness of Schopl Science Experience, SchoolScience and mathenatics

Shwartz Y., Ben-Zvi R. and Hofstein A. (2006) *Chemical literacy: what it means to scientists and school teachers*? Journal of Chemical Education, 83 (10), 1557-1558

Toharudin, et al (2014), Building Science Literacy for Humonariora Students, Bandung

Widiatmoko, A & Nurmasita, S. (2013). Design Simple Technology as a science teaching aids from used materials journal of Environmentally Friendly processes. 1(1),45-47

Yael Shwartz, et al. (2006). The Use of Scientific Literacy Taxonomy for Assessing the Development of Chemical Literacy Among High School Students. The Department of Science Teaching, The Weizmann Institute of Science, Rehovot

Yager, RE (1992). Science Education International, The STS Aproach Parallels Constructivist Practice. Science

Arini, (2017) Development of local wisdom-based chemical teaching aids as a medium for learning chemistry for class XI, Proceedings of the 2017 UNY Chemistry National Seminar

Arsyad, A. (2013). Learning Media. Jakarta: PT. RajaGrafindo PersadaHardjana., (1994), Tips for Success in College. Yogyakarta: Kanisius

Kahar.MS (2017). Analysis of Student Interest in Using the Cavendish Balance Sheet. Science Education Journal 1 (2),73-83

Shehabudin, A (2018). The effectiveness of the use of teaching aids to increase student achievement in the material for building flat sides (cubes and blocks). Variant Journal. 1(2),2581-2587