JOURNAL LA EDUSCI

VOL. 02, ISSUE 01 (014-019), 2021
DOI: 10.37899/journallaedusci.v2i1.266

Designing Chemistry Learning Media to Train Ecopreneurship

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Article Info

Article history:
Received 26 December 2020
Received in revised form 16 January 2021
Accepted 22 January 2021

Keywords:
Chemistry Learning Media
Vocational School Learning
Ecopreneurship

Abstract

The purpose of this research is to get the draft chemistry learning media design developed to support ecopreneurship. Ecopreneurship at The Faculty of Mathematics and Natural Sciences (FMIPA), State University of Surabaya (UNESA) is broken down into eco-innovation (new ideas), eco opportunities, and eco commitment. Design of this research is giving the assignment to research objectives. The model development research with stages, SMK learning in class, students doing assignments, arrange learning media design, assessing game design, and data analysis. The assignment is compiling a plan for developing instructional media that can be applied in chemistry learning in SMK. That assignment was assessed by 3 experts and the score was averaged. The assessment has been fulfilled if all media plans have met the fulfilment criteria. The innovation of chemistry media was also assessed and has met the innovation when obtaining an average of at least 4 with a maximum scale of 5. This research was conducted at the Department of Chemistry FMIPA UNESA in the odd semester of the academic year 2019/2020. The results showed 4 vocational chemistry learning media designs, VCO-Making KIT, Voltaic Cell KIT, Acid-base Mini Lab, and Red and Ox Games. All of that has fulfilled the contents and construct besides that the student has a new idea.

Introduction

The ecopreneurship-based curriculum is a program implemented at The Faculty of Mathematics and Natural Sciences (FMIPA), State University of Surabaya (UNESA) which operationally, the courses in the chemistry education study program must show the nuances of ecopreneurship, which means that lectures in the chemistry education program of FMIPA Unesa can be measured to what extent ecopreneurship can be achieved according to the indicators that have been formulated. Ecopreneurship at FMIPA UNESA is broken down into (1) eco-innovation (new ideas), (2) eco opportunity (opportunities), and (3) eco commitment (commitment).

The Ecopreneurship characteristic is structured to become a characteristic of learning at FMIPA Unesa as a follow-up to the development of the Indonesian National Qualifications Framework (KKNI) curriculum and the National Higher Education Standards (SN Dikti) and the achievements of FMIPA and UNESA as an Eco campus in 2015 and 2016. Eco campus is one university participation to create an environmentally friendly campus. This program is aimed at universities in Indonesia, is voluntary, without coercion from the government. It is hoped that this program will raise awareness and concern for all campus residents to run and succeed in this program. Campus as a group of intellectuals should be a role model to society on the importance of preserving the environment (DeJong & Langford, 2002; Prasetyantoko, 2008; Yogev & Michaeli, 2011; Hirsch & Ng, 2011).

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It is hoped that the achievement in the SMK chemistry learning course includes students having the ability to plan and implement chemistry learning at SMK, where students are able to compile lesson plans and make learning media that can be used in chemistry learning at SMK. With these achievements, it is possible for an ecopreneurship nuance to be raised during lectures so that the expectations of the curriculum can be achieved.

Learning media is a learning tool that can be used as an intermediary in the learning process so that messages and learning objectives can be achieved. This definition implies that all learning media used are always aimed at achieving the learning process experienced by students, so it is not merely a means of conveying learning messages. The learning process referred to includes, the process of finding concepts, solving problems, and applications in everyday life (Rahayu et al., 2012).

The variety and types of media are quite large so that they can be used according to the conditions, time, finances, and material to be delivered, but in reality, it is different from the situation at school. The teacher finds it difficult to use the available media with various obstacles, among others, it is difficult to use, the media is not equipped with an explanation for its use, the media has not been able to make students happy, it is not in accordance with the learning objectives, is not suitable for culture. Learning media have a contribution to improving the quality of learning. The presence of media not only helps teachers in the learning process but also provides added value to learning activities.

Not all chemistry learning media have to use expensive materials and tools, materials around the environment can be used as simple chemistry learning media (Rahayu et al., 2012). As it is known, that "our world is a chemical world", meaning that everything in this world is inseparable from chemical aspects. This gives an inspiration that the environment is actually a means to study chemistry and to show chemical phenomena as written in chemistry subject matter taught in class.

In the 2017 SMK (Vocational School) curriculum structure, chemistry subjects are included in the C1 (Basic Expertise Field) vocational interest group, which means that chemistry is an important part or as a support for vocational/productive competencies (Kemendikbud, 2018). Chemistry learning in SMK requires simple chemistry learning media that can be developed with materials that exist in everyday life to support the success of students in learning chemistry at SMK.

Learning media requires ideas or ideas that demand innovation efforts by the developer and this needs to be trained in various lecture activities. Also to make a media plan must meet the requirements of learning media following the objectives of developing the media, one of the requirements is decision-making activities. If the development of media as a learning medium must certainly meet the demands of the requirements as a learning medium (Lutfi & Hidayah, 2018). One of the courses that can train ecopreneurship is the SMK chemistry learning course and based on the description of the problems above, it is necessary to do further research on whether by designing media as a medium for learning chemistry, students can develop ecopreneurship in the aspects of new ideas and designing activities make decisions.

Methods

The design of this research is in the form of assigning project assignments to the research objectives, namely in the form of developing a learning media development plan that can be applied in chemistry learning at SMK. After attending the SMK Chemistry Learning course, students in groups complete the task of compiling a learning media development plan based on certain criteria. The results of project assignments are assessed using predefined guidelines.

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The data from the expert's assessment of the game plan as a media for chemistry learning was carried out on an average of the three assessors (score 1 to 5) on each aspect. The average of each aspect obtained is converted into a percentage and the conversion results are interpreted in Table 1.

Table 1. Interpretation of Assessment Results

Percentage	Criteria
0% – 20%	Very unsatisfactory
21% - 40%	Less satisfactory
41% - 60%	Satisfactory enough
61% - 80%	Satisfactory
81% - 100%	Very Satisfactory

The assessment is said to have been fulfilled if all media plans have met the criteria. The results of the assessment of the novelty aspect of the media plan as a medium for learning chemistry. It is said to have met the novelty if it obtains an average of at least 4 with a maximum scale of 5.As well as data on the level of decision making in the media plan as a learning medium, the sum of each plan has reached an average of at least 4 from a maximum score of 5.

Results and Discussion

There have been 4 designs of SMK chemistry learning media, namely: (1) KIT (Integrated Instrument Component) VCO Making, (2) Volta Cell KIT, (3) Acid-Base Mini Lab, and (4) Red and Ox Game. Assessed on the design of SMK chemical media including aspects of content requirements and aspects of construct requirements: aspects of chemistry has elements of guiding, conformity to student characteristics, involves students, and provides feedback. The second category assessed was the novelty of the learning media and the third category assessed the learning media plan to train decision making. The results of the assessment on the aspects of the content requirements and construct requirements of the 4 designs of SMK chemistry learning media are presented in table 2.

Table 2. Results of the Assessment of Learning Media Requirements

Aspect	Rating result				Average
	Media 1	Media 2	Media 3	Media 4	
Content Requirements					
Content Validity	93,4%	86,6%	86,6%	93,4%	90%
Has a purpose (knowledge structure)	100%	93,4%	86,6%	93,4%	93,4%
Construct Requirements					
Characteristics of chemistry	86,6%	93,4%	93,4%	93,4%	92%
Has a guiding element	93,4%	93,4%	86,6%	86,6%	90%
Suitability with student haracteristics	100%	93,4%	86,6%	86,6%	91,6%
Involving Students	93,4%	86,6%	93,4%	93,4%	91,6%
Feedback	86,6%	86,6%	93,4%	93,4%	90%

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Based on table 2, the content aspect of learning media reaches a percentage of 90% - 93.4%, where this percentage has met the minimum criteria. The design of SMK chemistry learning media has the correct concept of chemistry and is following the expected learning objectives. The media developed must have the correctness of the content and have a suitable purpose (Fenrich, 1998). On the construct requirements, the highest percentage is chemical characteristics of 92%, meaning that students have been able to design Vocational School chemistry learning media that have chemistry characteristics.

The aspect of suitability of student characteristics and student involvement both got a percentage of 91.6%, this result shows that the design of the SMK chemistry learning media has paid special attention to the characteristics of student learning and this is following the opinion. In choosing media, it must pay attention to the characteristics of students and chemistry has certain characteristics (Smaldino et al., 2014).

The results of the assessment on the novelty aspect of 4 designs of SMK chemistry learning media are presented in table 3.

Table 3. Results of the Assessment of Learning Media Newness Aspects

Aspect	**Rating Result**				**Average**
	Media 1	Media 2	Media 3	Media 4	
Media Design	93,4%	86,6%	93,4%	93,4%	91,6%
Display	93,4%	86,6%	93,4%	100%	93,4%

Table 3 shows that the novelty aspect has reached a percentage between 91.6% - 93.4% fulfilling the specified criteria, meaning that the media design and appearance have brought newness so that the media design has been able to train new ideas which are part of ecopreneurship. These results reflect that giving structured assignments in the form of designing instructional media can generate new ideas, students use thinking, imagination, stimulants from the environment in producing new products that are renewal and this is the hope for the curriculum of the FMIPA Unesa chemistry education study program (Curriculum Team FMIPA UNESA, 2016). The results of the assessment on the aspect of making decisions on 4 designs of SMK chemistry learning media are presented in table 4.

Table 4. Results of Assessment of Aspects of Decision Making

Aspect	**Rating Result**				**Average**
	Media 1	Media 2	Media 3	Media 4	
The resulting media can solve the problems of learning Chemistry	100%	86,6%	86,6%	86,6%	91,2%
Associating material / product benefits with faith in God	93,4%	93,4%	93,4%	93,4%	93,4%
The resulting media uses waste	86,6%	100%	86,6%	93,4%	93,4%
The resulting media resistance is very good	93,4%	93,4%	93,4%	93,4%	93,4%

Based on table 4, the learning media design that has been developed has met the standard of decision making where students have succeeded in designing learning media by making decisions by considering the aspects of the resulting media can solve the problem of learning chemistry getting a percentage of 91.2%, linking the benefits of the material/product with faith

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in God got a percentage of 93.4%, the media produced using waste got a percentage of 93.4%, and the resistance of the resulting media was very good, getting a percentage of 93.4%.

Ecopreneurship education is to help students realize entrepreneurial education that is environmentally friendly, can be applied in everyday life, and can foster a sense of community (Kainrath, 2009). Eco-commitment-based learning can be carried out so that students in the learning process, in addition to obtaining teaching materials, also create interesting and meaningful learning experiences that have an impact on the mental maturity, attitudes, and skills of students entering the world of work. It is also hoped that students will be able to recognize the impact of technology on their social life and be able to find out the interactions between social, technology, society, and the environment. Students are expected to be able to understand and apply the spirit of ecopreneurship so that later they can live and work, and be able to make the right decisions, and be able to take responsible personal and social actions in society.

Conclusion

The design of instructional media developed by students has met the requirements in terms of content and construct. Vocational chemistry learning lectures by giving project assignments have been able to train students to develop new ideas in designing instructional media. Students have been able to design learning media to make decisions. Lectures in the chemistry education study program are designed to train ecopreneurship so that it will be faster to reach the formulated ecopreneurship indicators.

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