Student Worksheets For E-Learning Models Based On Environmental Projects On Geometry Topics In Spreading Literacy Culture

Rani Sugiarni, Sarah Inayah, Ramdhan Fazrianto Suwarman

Abstract: The role of technology becomes an important challenge in this century which is spreading in the education world. Therefore we need teaching materials that can help students in support literacy culture by utilizing e-learning. This study objective is to examine the validity of student worksheets for e-learning models based on environmental projects on Geometry topics of Class XI Vocational High Schools which are developed by utilizing waste. This type of research refers to the Four-D (4-D) development model. The validity of student worksheets is reviewed by 4 experts consisting of material experts, education experts, linguists, and mathematics teachers of Vocational High Schools. The assessment results viewed from aspects of the topics, language, and media show that the student worksheets are good and deserve to use. This is indicated by the results of evaluating the use of student worksheets in class, which shows that student activities can spread a culture of good literacy accompanied by generally positive student attitudes.

Index Terms: student worksheet, e-learning, environmental project, literacy culture.

1. INTRODUCTION

The Indonesian nation has a variety of cultures. Unfortunately, the level of Indonesian literacy is still low even though it has been 70 years since Indonesia became an independent country. The level of people literacy of a nation has a vertical relationship to the quality of the nation. High interest in reading a book affects one's insight, mentality, and behavior. There are many factors why Indonesian people's literacy has a low percentage. Some of these factors are the lack of interesting material from reading and the lack of reading culture by families, schools, and communities. The role of schools is the main instrument for spreading cultural literacy, because interest in reading can open a window of knowledge and intelligence. But graduates of the 12-year program planned by the government in advancing the nation to vocational high schools are not optimally spreading cultural literacy.The impact of the low cultural literacy of the nation is that it will be more difficult to compete for the national and international work world. Based on data from the Central Bureau of Statistics (BPS) of Indonesia, the largest contributor to unemployment in Indonesia in 2017 came from vocational high school graduates of 11.41%. Whereas the graduates of Vocational High School should have been prepared to work, according to Ubaid the real reason is they do not have the expertise or skills needed by today's work world [1].These problems cannot be separated from the learning process that is applied in schools in fostering cultural literacy and student skills, especially in mathematics that are often considered difficult by students. One topic that is difficult for students is geometry. The teacher does not provide appropriate learning media in the classroom so students are less able to understand that topics. Teachers only provide explanations and simple exercises from books in school and are limited in class without practicing reading skills and understanding problems by giving specific student worksheets that result in low reading interest. This has an impact on students' daily test scores, where only about 10% or 3 students out of 30 students complete the topic. Literacy skills can be trained using appropriate media [2], student worksheets for e-learning models based on environmental projects. That student worksheets in the form of an environmental project. The project is defined as a plan of tasks that must be done. Assignments are given with an environmental approach. According to Siwa (2013) with definition project in learning as a process, where knowledge is constructed through the transformation of experience [3]. The design of assignments with the approach and use of environmental materials is expected to be an experience for students. The project-based student worksheet is packed with e-learning models. The student worksheet is expected to be an attraction for students to be able to culture reading with the help of e-learning technology. According to Hanum (2013) effective learning can be said to be learning that utilizes information and communication technology optimally in the learning process as a tool. One of the utilization of information and communication technology in learning is to apply e-learning [4].E-learning according to Chandrawai (2010) itself is a learning process carried out through internet technology [5]. Whereas Ariesta (2012) defines e-learning as an educational concept that utilizes information and communication technology in the teaching and learning process [6]. E-learning can connect between educators and students in online learning room [7].Characteristics of e-learning [3], among others. First, Utilizing electronic technology services; where teachers and students, students and fellow students or teachers and fellow teachers can communicate relatively easily without being limited by protocols. Second, Utilize the advantages of computers (digital media and computer networks). Third, Using self-learning materials stored in computers so that they can be accessed by teachers and students anytime and anywhere if they need them. Fourth,

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Utilizing learning schedules, curriculum, learning progress results, and matters relating to education administration.To build e-learning [4] components that can form learning are needed, one of which is the e-learning system and application. The software system is often called the Learning Management System (LMS).Until now there have been many types of Learning Management Systems, one of which is Schoology. Schoology is an LMS in the form of social web that offers the same learning as in the classroom for free and is easy to use like social media Facebook [8].Therefore an analysis is conducted for student worksheets with an e-learning model based on a project environment that is feasible and effectively used for students especially the topic of geometry.

2 RESEARCH METHOD

The research model used is development research. The development used is the ADDIE model. This ADDIE model was developed by Dick and Carry (1996) to design learning systems. The system developed in learning is an e-learning model student worksheet based on environmental projects. This model has five stages [9]. that is

This study uses method of collecting data, that is (1) document recording method, (2) questionnaire method. In this research, document recording is carried out by making reports about the stages that have been carried out in developing student worksheet products based on environmental projects. In this study, the document recording method uses data collection instruments in the form of a work agenda. The result of the work agenda is a product development report. The questionnaire method is a way to obtain or collect data by sending a list of questions to respondents / research subjects. This questionnaire method is used to measure the feasibility of products that have been made, both in the evaluation (Expert Judgment) of the content experts, linguists, instructional media experts, and students when testing individuals or groups and to determine student responses to the use of worksheets student project-based e-learning model. The instruments used to collect data in the development of this study were (1) product development reports; and (2) questionnaire sheets. Document recording report in product development format used to collect data about product development design from the analysis stage to the design. Questionnaire sheets are used to collect evaluation data (expert judgment) from subject experts, design experts, and instructional media experts as well as from students during individual, group and field test. Questionnaires are used to collect responses after using student worksheets for e-learning models based on student environment projects so that they can determine the effectiveness of the use of the product. In this research development used data analysis techniques, that is (1) qualitative descriptive analysis techniques; and (2) quantitative descriptive analysis techniques. Qualitative descriptive analysis is carried out by grouping information from qualitative data in the form of input, responses, criticisms, and suggestions for improvements contained in the questionnaire. The results of this analysis are then used to revise the products developed.

3. RESULT AND DISCUSSION

3.1 Analysis

In the analysis phase of topics on the student worksheet in teaching mathematics on the geometry of space developed based on graduate competency standards regulated in the Regulations Attachment of Minister of Education and Culture Nomor 20 Tahun 2016 About Competency Standards for Primary and Secondary Education Graduates, that are

1. Attitude: Have behaviors that reflect attitudes: believe and fear God Almighty, have character, honest and care, responsible, lifelong learners, and physically and mentally healthy in accordance with the development of children in the family, school, community and the surrounding natural environment, nation, state and regional.
2. Knowledge: Having factual, conceptual, procedural, and metacognitive knowledge at a simple technical and specific level regarding science, technology, art, and culture in the context of himself, family, school, community and the surrounding natural environment, nation, state, and regional.
3. Skill: Have thinking and acting skills, creative, productive, critical, independent, collaborative and communicative through a scientific approach in accordance with what was studied in education units and other sources independently.

After adjusting to graduate competency standards then adjusted to the level of secondary school education which includes basic competencies in topics of geometry based on aspects of attitude, knowledge, and skills. Furthermore, adapted to the characteristics of students. The topic of geometry developed from the syllabus consists of the position of points, lines and planes in three-dimensional geometry and the distance of points, lines, and fields in three-dimensional geometry.

3.2 Design

The stages of the material presented are adjusted to the lesson plan that is in accordance with the basic competencies in the syllabus, as follows:

Tabel 3. Basic competence of Geometry

Basic Competence	
Knowledge	Skills
3.23 Analyze points, lines and planes in three-dimensional geometry	4.23 Presenting problem solving related to the distance between point to point, point to line and line to plane in three dimensional geometry

Topics are arranged in two stages, the first stage is to deliver the position of points, lines, and planes in three-dimensional geometry while the second stage is to deliver the distance of points, lines, and fields in three-dimensional geometry, each consisting of five student Worksheets.Topics collected in developing Student Worksheets, some of which are revised editions of student and teacher textbooks, the internet, and other sources.

3.3 Development

Student Activity Sheets are sheets containing assignments that must be done by students. The student activity sheet developed contains title, subject matter, class/semester, learning objectives, group identity, guidelines for using worksheets, assignments carried out in the form of

environmental projects and conclusions.
Following is the display of Student Worksheets developed with mobile learning with the help of Google forms:

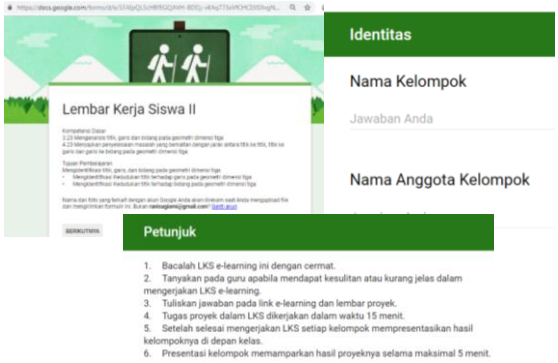

Fig 1. *Title, basic competencies, learning objectives, group identity, and instructions*

Then the project assignment display where students are given the project environment assignments as follows:

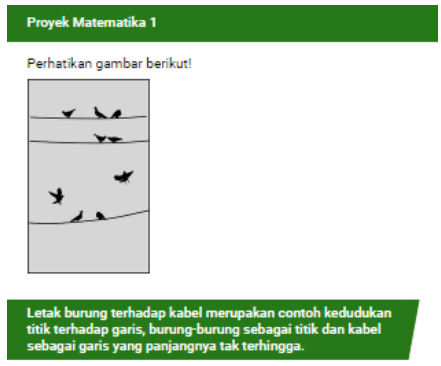

Fig 2. *Environmental Project 1*

Students are given an overview of environmental projects by paying attention to images that are usually seen by students around the environment. Then students are invited to prepare the tools and materials that students get in the school environment as follows:

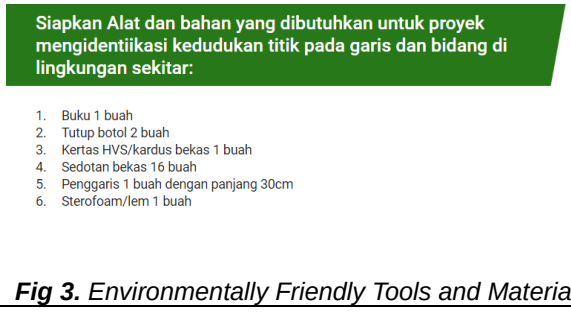

Fig 3. *Environmentally Friendly Tools and Materials*

Material obtained by students in the school environment comes from waste that is not used, which is then used by students to work on environmental projects to understand the topic. After students prepare the tools and materials then students are asked to follow the workings of environmentally friendly projects using the tools and materials that students get as follows:

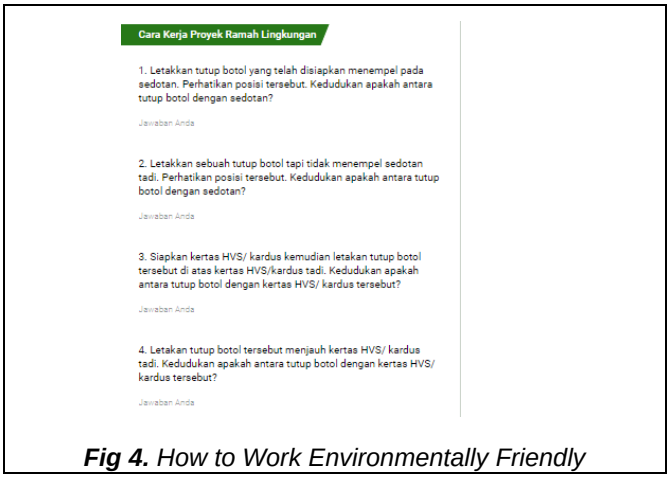

Fig 4. *How to Work Environmentally Friendly*

A simple environmental project 1 that students are asked to put the material they get in the environment. Then environmental project 2 students were asked to design a certain number of buildings. Environmental project 2 is explained as follows:

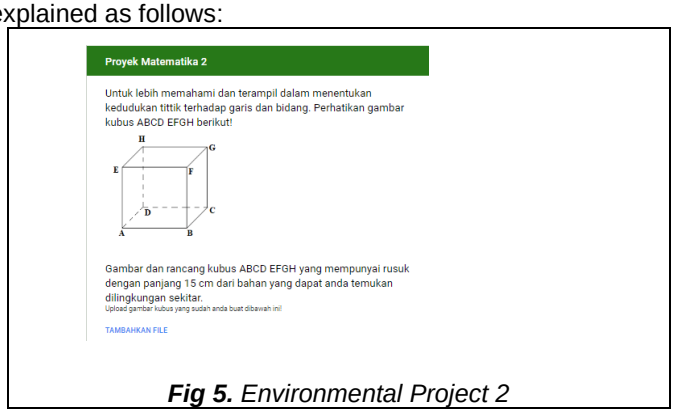

Fig 5. *Environmental Project 2*

Project 2 trains students' skills in creating and designing designs with teams by sharing creative tasks and ideas in designing geometry using environmentally friendly materials. Then students are given the questions according to the case that students designed as follows:

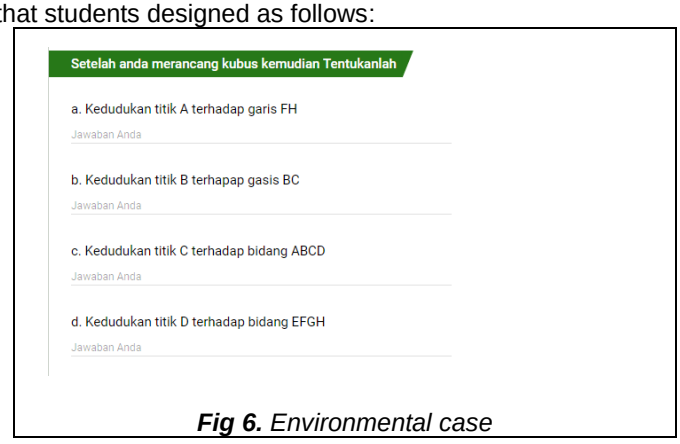

Fig 6. *Environmental case*

After students work on the case, students are asked to summarize the results of the environmental project work that has been done as follows:

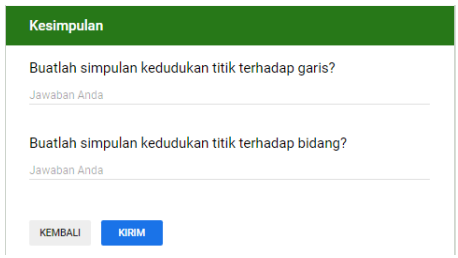

Fig 7. *Conclusion*

All geometry topics are developed by following the environmental project line. Then the link from the google form is entered into the schoology account. The Schoology account access code is distributed to students and students can easily access the account using a cellphone, laptop, or tablet while studying.

3.4 Implementation

The student worksheets that were developed were then assessed by material, language and media experts to see the effectiveness of the student worksheets. The assessment of material experts consisted of mathematics education lecturers and senior mathematics teachers. The assessment in terms of material aspects is as follows:

Table 1
The assessment is reviewed from the material aspect

Indikator	Score	
	Expert 1	Expert 2
A. Presentation	5	5
B. Content design	4	4
C. E-learning design	4	4
D. User friendly	4	4
General evaluation	Good	Good
Conclusion	Good	Good

Based on an assessment by experts to review aspects of geometry topic in general student worksheets are considered good and deserve to use. The next evaluation was evaluated from the aspect of language, the experts who assessed it were Indonesian language lecturers and Indonesian language teachers, as follows:

Table 2
Assessment is reviewed from the language aspect

Indicators	Score	
	Expert 1	Expert 2
A. Clarity	5	4
B. Communicative	4	4
C. Suitability	4	4
D. Content	4	4
E. Language	4	4
General evaluation	Excellent	Good
Conclusion	Good	Good

Based on an assessment by experts to review aspects of the language used, in general, student worksheets are considered good and appropriate. The next assessment is reviewed from the aspect of the media, the experts who judge are the two lecturers who teach instructional media, as follows:

Table 3
Assessment is reviewed from the media aspect

Indicators	Score	
	Expert 1	Expert 2
A. Presentation	4	4
B. Content design	5	4
C. E-learning design	4	4
D. User friendly	4	4
General evaluation	Good	Good
Conclusion	Good	Good

Based on an assessment by experts to review aspects of the media used in student worksheets it is generally considered good and appropriate to use. Overall, expert assessments are reviewed in terms of material, language and media in general, student worksheets are good and appropriate to be given to students.

3.5 Evaluation

After the worksheet is deemed appropriate by experts who are declared good and suitable for use, the next stage is used directly in classroom learning. Environmental project-based student worksheets can spread literacy culture among students with e-learning models. This can be seen from the activities of students in working on student worksheets online at LMS schools as follows:

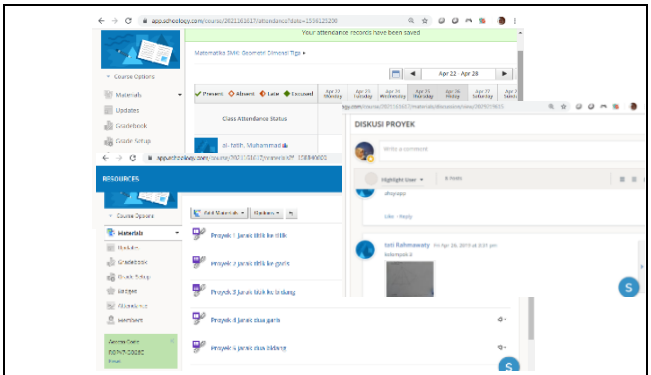

Fig 8. *Schoology Activities*

When opening the LMS students look enthusiastic about opening and accessing. Especially when working on student worksheets with friends, students can be seen paying attention to project instructions and how to work.Besides students' attitudes after learning to use student worksheets based on the e-learning environment model are as follows:

Table 4
Student attitudes towards student worksheets

Indicators	Positive	Negative	Interpretation
Ease of understanding content	56 %	39 %	Generally positive attitude 56 %
Language	75 %	25 %	Generally positive attitude 75 %
Clarity of study instructions and information in the student worksheet	76 %	24 %	Generally positive attitude 76 %
Appropriate student worksheet display	87 %	13 %	Generally positive attitude 87 %
Motivation	79 %	21 %	Generally positive attitude 79 %

Attractiveness	75 %	25 %	Generally positive attitude 75 %
Curiosity	80 %	20 %	Generally positive attitude 80 %
Tendency to complete student worksheets	78 %	22 %	Generally positive attitude 78 %

Based on the above table, it can be seen that students' attitudes are generally positive in terms of ease in understanding the contents of geometry material, the language used, the clarity of learning instructions and information in student worksheets, the appropriateness of student worksheets, motivation, attractiveness, curiosity, and tendency to complete student worksheets. In line with the results of the study [10] valid and effective practice worksheet models ". Yusri, R., Nurmi, N., & Delyana, H. (2019) state that project-based student worksheets integrated in topics of Geometry are valid and practical [11] Additionally, scientific project-based student worksheets are considered effective in improving student quality [12].The e-learning student worksheet model based on effective, good and feasible environmental projects so that it can be one of the teaching materials by class teachers in an environmentally friendly way because it does not require paper and students can study anywhere and anytime using e-learning technology tools assisted by mobile phones, laptops, tablets, computers, and others that can be connected to the internet network. The workings of project-based student worksheets produce an environmentally friendly mathematics learning media because it is done using environmentally friendly tools and materials and can spread cultural literacy among 21st century students..In line with building a culture of library literacy in schools, it becomes an alternative for schools [13]. But in this digital age, the efforts made in fostering literacy culture are complemented by media literacy at every level of education ranging from students, teachers, and curriculum [14]. Of course, the practicality of school-based student worksheets can spread a culture of literacy among students by looking at the results of student activities..

4 CONCLUSION

Based on the development of student worksheets that have been analyzed, designed and developed and implemented and evaluated that student worksheet generally good and deserve to use with the results of student activities can spreading literacy culture and ultimately generally positive student attitudes. Then seen from the aspect of ease in understanding the contents of geometry material, the language used, the clarity of learning instructions and information in student worksheets, the appropriateness of the appearance of student worksheets, motivation, attractiveness, curiosity, tendency to practice project stages is good.

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