
Validity of E-Module Based on Problem Based Learning Integrated Demonstration Video and Science Literacy

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Abstract

The time of mechanical insurgency 4.0 is a period of digitalization in different areas particularly within the field of instruction so it takes educating fabric that can increment understudy movement in learning. This type of research is educational design research using the Plomp model. This model consists of three steps: (1) preliminary research, (2) prototyping, and (3) assessment phase. The research instrument used observation sheets, questionnaires, and learning outcomes tests. The e-module was validated by six construct experts and three content experts. This inquires about points to create an e-module of electrolyte and nonelectrolyte solutions based on problem-based learning integrated demonstration videos and scientific literacy and decide the level of validity of created e-module. This sort of investigation is instructive plan inquire about utilizing the plomp model. The appraisal rebellious utilized were perceptions sheets, surveys, and learning results tests. The e-module was approved by five validators, to be specific the build validator and the substance validator. The comes about of the validity of the e-module develop gotten Aiken's V normal esteem of 0.85 with a substantial category, and the validity of the e-module substance gotten a normal CVI esteem of 1 with a substantial category. Based on the results of the study, it was concluded that the problem-based learning e-module of electrolyte and nonelectrolyte solutions integrated with demonstration videos and scientific literacy developed was valid.

Keywords: E-modules; Electrolyte; and Nonelectrolyte Solutions; Problem Based Learning.

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INTRODUCTION

The advancement of the times within the 21st century appears that nearly all hardware utilized in life is digital-based. This is often in agreement with the advancement of science and innovation, where science and innovation incredibly impact the arrangement methodology, and execution of learning (Satya, 2018). The learning handle within the classroom must be integrated with innovation that's as of now creating (Sari et al., 2019, p.1). In this respect, advancements within the world of instruction require teachers to know how to form learning more appealing and the aptitudes required by understudies can be encouraged within the 21st century (Fauziah et al., 2017).

The advancement of ICT can too be utilized to extend understudy intrigued in learning, one of which is through e-modules. E-module is a free instructing fabric that contains data in advanced arrange, e-module can make it simpler for clients. E-module are the result of development from ICT-based modules which have focal points compared to print modules, specifically the nearness of sound, video, picture, activity, and tests that can give input for understudies (Cheva & Zainul, 2019).

A module may be a total unit comprising of a series of learning exercises that are organized to help understudies in accomplishing objectives that are defined particularly and clearly. The modules are organized programs bundle utilized for self-study. Instructing with the module is carried out with person educating and is custom-fitted to the capacities of each person (Nasution, 2013).

An electronic module is an electronic form of a module that can be perused on a computer and outlined with the specified computer program. E-module may be a learning apparatus or office that contains materials, methods, limitations, and ways of assessing that are planned efficiently and alluringly to realize that anticipated competencies concurring to the level of complexity electronically. (Priyatni et al., 2017).

One application that can be used to create an e-module is Flip PDF Professional. Flip PDF Professional is software that can be used to convert PDF files to digital publication pages and change the appearance of the PDF to be more attractive like a book. The Flip PDF Professional application has many advantages including being easy to use because it can be operated for beginners who are not familiar with HTML

programming. Creation of feature-rich flipbooks that have page editing functions, and can make modules interactive by including multimedia such as images, videos from youtube, MP4, audio, video demonstrations, hyperlinks, quizzes, and more (Seruni et al., 2019).

The problem-based learning model gives understudies chemistry questions related to the standard of living so that understudies can conduct independent/group examinations to discover solutions (Purnamasari et al., 2020, p.2). Problem-based learning is based on the guideline that the learner's learning preparation is helped by a combination of a student's mental investigation, and the capacity to collaborate with others. There are several benefits of utilizing PBL in chemistry learning for understudies, especially it can make strides inventive considering abilities, autonomous think about abilities, and self-evaluation (Jansson et al., 2015).

The development of e-module can be combined with learning models that are considered capable of supporting student activities (Alfiantara et al., 2016). The preferences of e-modules based on problem-based learning lie within the stages of problem-based learning, to be specific understudy introduction to issues, organizing understudies for learning, directing the students and gathering examinations, creating and showing work as well as analyzing and assessing issue tackling forms (Sugihartini & Jayanta, 2017).

The COVID-19 widespread, which is changing the social arrange of society, has ended up an outside figure that influences the current learning handle. Physical confinements and social exercise on the expansive scale don't permit learning to be carried out face-to-face so it contains a major effect on learning exercises that must be carried out essentially. Down-to-earth learning is more prevalent in extraordinary places such as research facilities (Strielkowski, 2020).

Chemistry could be a characteristic science that creates through the method of working video exhibits within the research facility to deliver science products. Clarifications of chemistry as an item and handle of logical work related to the presence of viable exercise in the laboratory (Pebriana et al., 2018).

The material used in the manufacture of this e-module is electrolyte and nonelectrolyte solution which is one of the materials in chemistry subjects studied in high school for grade ten. In general, the material for electrolyte and nonelectrolyte solution is that students are

led to master the material. Learning includes the nature of electrolyte and nonelectrolyte solution, differences in electrolyte solutions into the strong electrolyte and weak electrolyte solutions, causes of the ability of electrolyte solutions to conduct electricity, and grouping electrolyte and nonelectrolyte solutions based on the type of bond.

Literacy in the context of learning is defined as the ability to access understand, and use things intelligently through various activities, including reading, viewing, listening, writing, and speaking (Hartati et al., 2020). Scientific literacy is very important to develop because everyone needs information and knowledge to make choices and to solve problems every day. Students need to have scientific literacy skills to be able to address various scientific issues that are developing in society. One of the important factors that can improve students' scientific literacy is textbooks (Hartini et al., 2019).

In line with the perceptions that the creator has made concerning the method of learning chemistry amid the current COVID-19 widespread. The educating materials utilized by teachers today are for the most part within the frame of modules and control focuses, in this way making online learning less appealing for understudies and has not been able to make strides understudy learning results. The educating materials required are electronic-based instructing materials with integrated learning models, exhibit videos, and scientific literacy that can spur understudies to memorize since amid the COVID-19 widespread, understudies don't get learning within the laboratory.

Students who have never attended practicum within practicum within the research facility will pick up backhanded encounters with this exhibit video-based educating fabric. Based on the comes about of observations made at senior high schools 1, 8, and 13 Padang, it was concluded that at this time teachers needed instructing materials within the shape of e-modules by executing exhibit recordings in them, since at this time the practicum may not be carried out.

Based on the results of observations about perceptions within the three schools, it can be concluded that at this time the educating materials required by understudies are educating material in which there are pictures, recordings, and animations, and can duplicate cases in the standard of living.

The conclusion from the results of observations in three schools related to the teaching materials used and the implementation of the practicum can be seen in Figure. 1 and Figure 2.

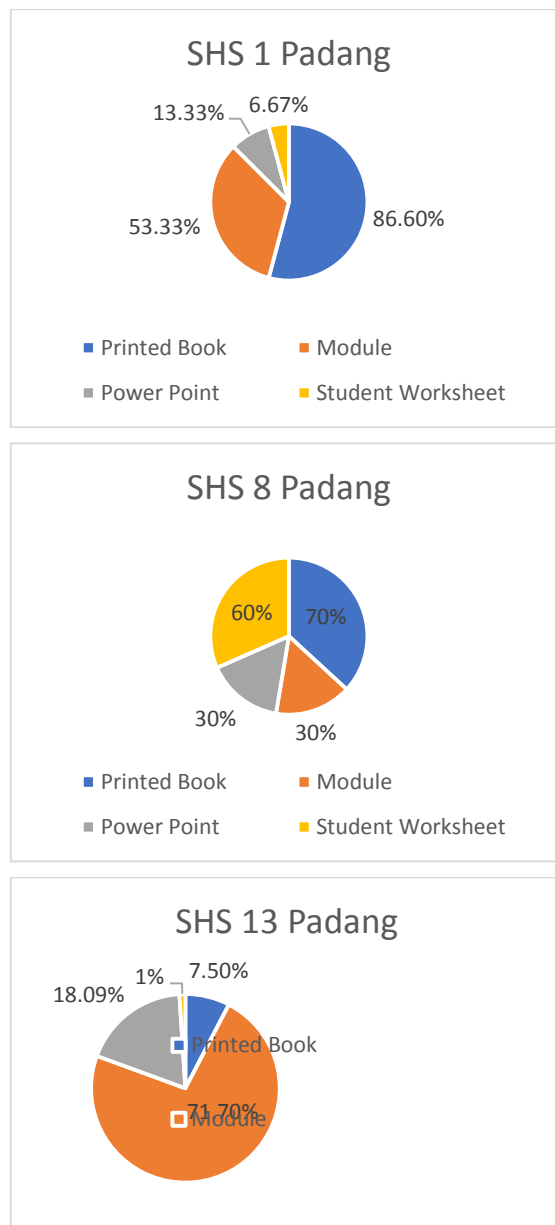


Figure 1. Teaching Materials Used

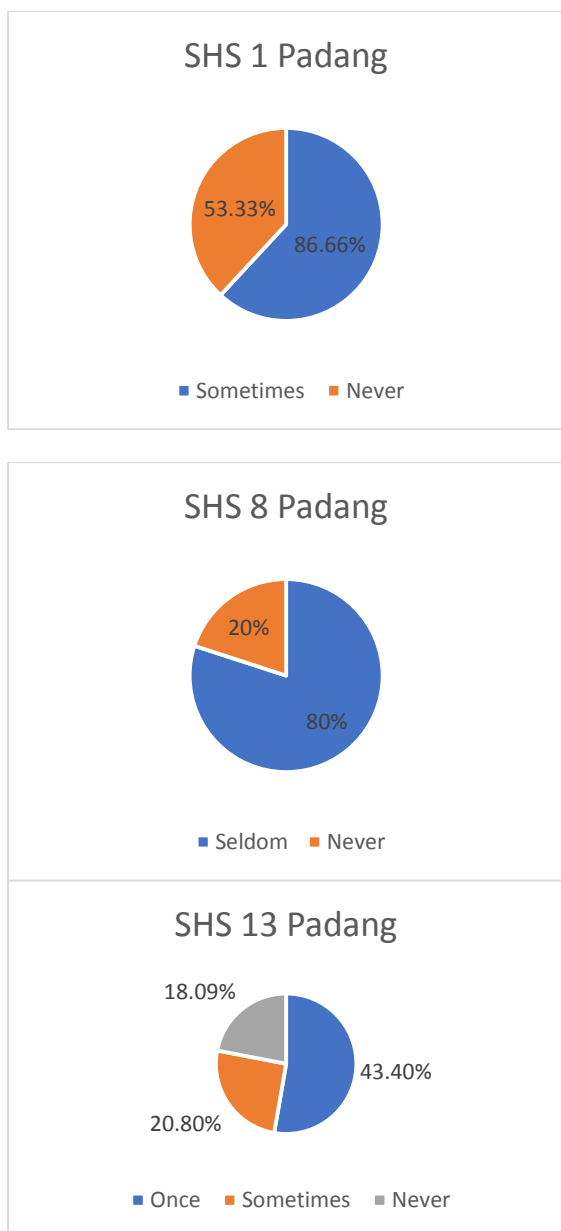


Figure 2. Practical Implementation in the Laboratory

METHOD

The type of research used is Educational Desing Research (EDR). Teaching material in the form of electrolyte and nonelectrolyte solutions e-modules for grade ten in senior high school based on problem-based learning models integrated demonstration videos and scientific literacy are the products resulting from this research. The development model used in this study is the Plomp model (Fauziah, et al.) 2021) which has three stages, namely: (1) preliminary research, (2) prototyping stage, (3) assessment stage.

Subject tests in this study were students who enrolled in grade ten for the 2021/2022 academic year at senior high school 1 Padang, chemistry teachers, and chemistry lectures at the University State of Padang.

The method used to analyze content validity is Lawshe’s CVR (Content Validity Ratio). Lawshe’s CVR is a method used to measure content validity. Lawshe proposes that each expert responds to each item three answer choices, namely: (1) invalid (not required), (2) less valid, and (3) valid. If more than half of the experts provide valid responses to an item, then the item has a sufficient level of validity.

At the stage of validity, the content of the questionnaire used was arranged according to the answer categories : (1) invalid (not required), (2) less valid, (3) valid. The answer given by the expert is analyzed first by converting the answer if the expert who answered “valid” will be worth 1; if the expert answers “less valid”: will be worth 0 and if the expert answers “invalid” will be worth -1 (Sugiharni & Setiasih, 2018).

$$CVR = \frac{n - \frac{N}{2}}{\frac{N}{2}}$$

Information:

CVR = content validity ratio

n = the number of experts who answeres valid

N= total number of experts

Learning media is said to be accepted if the CVR value in the learning media is equal to or greater than the critical value, while the learning media will be rejected if the CVR value is less than the critical value in the number of experts. The critical value of CVR is as follows:

Table 1. CVR Critical Value (one-tailed, α=0,5)

Total number of experts	CVR critical value
5	0,736
6	0,672
7	0,622
8	0,582

The average CVR value obtained in each aspect is calculated based on the Content Validity Index (CVI) value as follows:

$$CVI = \frac{\text{the amount of CVR received}}{\text{number of accepted aspects}}$$

CVI is the average CVR value. The CVI value illustrates that every aspect has good validity. CVI is calculated based on the number of experts who provide valid assessments. In the final decision, the CVI score must be 1.00 consisting of five experts. The minimum CVI

value is 0,78 which states aspects of the learning media are acceptable (Wilson et al., 2012).

The method used to analyze construct validity is using Aiken's V. The validator's assessment of each statement is analyzed using the Aiken's V formula. The Aiken's V formula can be written as follows:

$$v = \frac{S}{n(c-1)}$$

Information:

S = r-I₀

I₀ = Low validity score (the lowest scale used is 1)

c = The highest validity rating score (the highest scale used is 4)

r = The number given by an expert

n = Number of validators.

RESULTS AND DISCUSSION

Validation is carried out by five validators, namely content validators and construct validators. The content validity assessment shows that the electrolyte and nonelectrolyte solution e-module has an average CVI value of 1 for all aspects of the suitability of the e-module content with a problem-based syntax which shows that all validators answered acceptably, as well as for aspects of the suitability of the e-module to the content of chemistry has an average CVI of 1 out of a total of 15 items



Figure 3. E-Module Front Page/Cover

The results of the validity of the e-module construct the average value of Aiken's V from the validity of the e-module is 0.85 with the valid categories. The results of the e-module construct validation data analysis are summarized in Table 2.

Table 2. E-Module Construct Validation Analysis

Rated Aspect	Aiken's V	Category Validity
Content component	0.86	Valid
Linguistic component	0.84	Valid
Serving component	0.87	Valid
Graphic component	0.85	Valid
Average value	0.85	Valid

In construct validity, the assessment aspect consists of four aspects, namely the content component, the linguistic component, the presentation component, and the graphic component. Assessment of the component aspects of the content of the electrolyte and nonelectrolyte solution based on problem learning integrated demonstration video and scientific literacy related to the composition of the e-module. Based on the results of Table 2, it

is obtained that the average value of Aiken's V is 0.86 with a valid category.

Based on Aiken's V value obtained, it shows that e-module of electrolyte and nonelectrolyte solution based on problem-based learning integrated demonstration video and scientific literacy that was developed is following the demands.

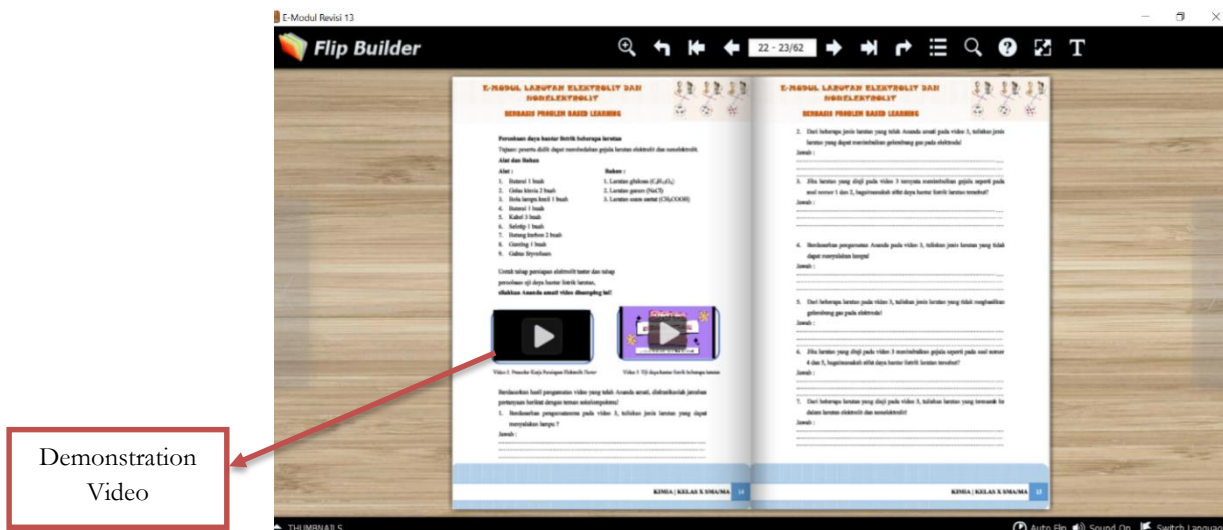


Figure 4. Video Demonstration in E- Module

The assessment of aspects of the linguistic component is related to the use of the author's language in explaining the electrolyte and nonelectrolyte solution material in the e-module. Based on table 2, it is obtained that the average value of Aiken's V is 0.84 with a valid category. This shows that e-modules was developed has used good, simple, and clear Indonesian rules so that it is easily understood by e-module users.

Assessment of the component aspects of the presentation of the electrolyte and nonelectrolyte solution e-module based on problem-based learning integrated demonstration videos and scientific literacy on table 2, it was found that the average Aiken's V value was 0,87 with a valid category. This shows that the presentation of e-module that has been developed systematically arranged based on the components of the e-modules according to the guidelines for compiling e-modules from the ministry of education and culture in 2017. The e-module in this study uses the FLIP PDF Profesional application. Several studies showed that e-module using FLIP PDF Profesional can

improve students' learning outcomes (Misbah et al., 2021). In addition, an e-module-the developed module is also following the problem-based learning syntax, namely, problem orientation, organizing students to learn, guiding individual and group investigations, developing and presenting work as well as analyzing, and evaluating problem-solving processes.

The use of PBL can make the students understand the learning materials better and attain longer retention in comparison to any other method. By using PBL, the teachers can make students discover the learning problems independently and continuously. At the same time, through the use of the PBL, the students are expected to be more impressed with the learning process and to find solutions to the given problems (Triwahyuningtyas et al., 2020).

Assessment of the graphic component aspects of the e-module related to the appearance or design of the e-module as a whole such as layouts, symbols, and illustrations presented in proportions that must be appropriate and attractive. Based on the table, it is obtained that

the average value of Aiken's V is 0.85 with a valid category. This means that the appearance or design of the presented e-module is attractive.

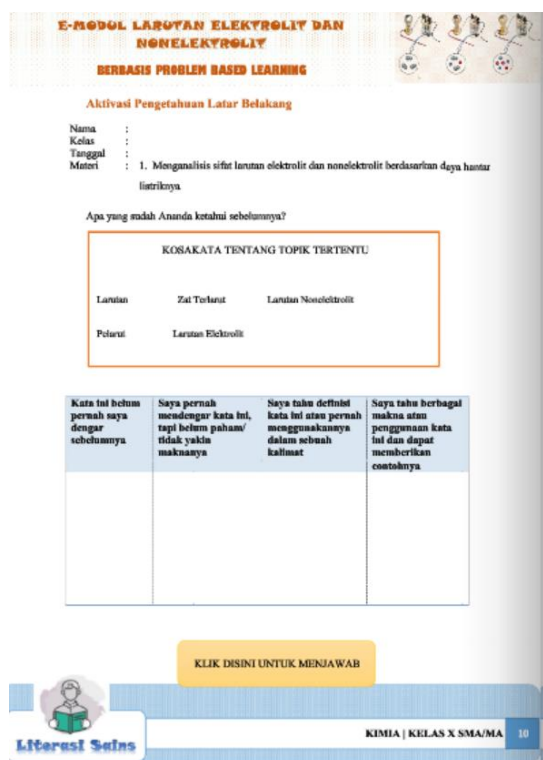


Figure 5. Science Literacy Graphing Tool

CONCLUSION

Aspects that were assessed as a whole for the construct validity test of the electrolyte and nonelectrolyte solution e-module based on problem-based learning integrated demonstration videos and scientific literacy were developed, the average value of Aiken's V was 0.85 with a valid category. Thus, the e-module has been declared valid in terms of content and constructs and can be tested for practicality and effectiveness test.

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