CHEMISTRY EDUCATION PRACTICE

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DEVELOPMENT OF A CONTEXTUAL-BASED CHEMISTRY E-MODULE ON ELECTROLYTE AND NON-ELECTROLYTE SOLUTIONS FOR HIGH SCHOOL STUDENTS

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Abstract

This study aims to produce a chemistry e-module on electrolyte and non-electrolyte solutions for high school students. This study uses a research and development model grouped into three parts: preliminary studies, initial product development, and evaluation. The total population of the study was 144 students of SMA NW Suralaga, with 40 grade 11 students as the sample. Data collection techniques using a questionnaire then analyzed descriptive statistics. The results showed that (1) the results of the chemical e-module validation analysis were included in the very valid category (0.825). (2) the results of the analysis of student responses to the chemistry e-module fall into the very practical category (84%).

Keywords: Development, E-Module, Contextual, Electrolyte, and Non-Electrolyte Solutions.

PENDAHULUAN

According to the Indonesian Minister of Education and Culture, Number 22 concerns learning activities carried out by educators and students to achieve the expected competencies. In line with this, based on Law Number 20 of 2003 concerning the Indonesian National Education System, learning is an interaction process between students and educators and learning resources in a learning environment. (Wahyuni, 2016; Prayitno, et al 2018).

The learning process is always within the emergence of learning problems. The emergence of changes and shifts in learning paradigms has impacted various aspects of learning, including instructional design and media development, which need to be integrated with technological developments. Learning must emphasize understanding, skills, and character education (Alam, 2022).

Learning is currently developed to be student-centered, which involves student activity and directs students to explore the potential that exists within them (Muganga & Ssenkusu, 2019). However, the implementation of science learning, including chemistry in high school is still ineffective due to limited materials and learning resources in schools that can increase students' enthusiasm for learning because most of the material requires the help of suitable media to increase student understanding (Nechypurenko, 2020).

E-modules can help make the learning process more interesting by inserting pictures or videos (Handayani, 2021). It can help students understand teaching material because there are study instructions and a coherent understanding of concepts. The e-module can also be used anywhere, making it more practical to carry anywhere because it combines print media and computers. In addition, the learning process no longer depends on the teacher as the only source of information. E-modules can also improve understanding of concepts and materials delivered by educators (Susanti, 2020).

Based on observations and observations in high school, various problems occur when the teaching and learning process occurs—starting from less active students who rely heavily on the teacher's explanation. The next problem is that the teacher acts like students have the same ability. After the teacher conveys learning material to students, the teacher immediately gives written and practical assignments to students. Reviewing the extent to which students understand the material that has been delivered is necessary. So there are still many students who still need to understand the material fully. Most students need help completing written and

practical assignments given by the teacher. Furthermore, the researcher also found that the number of teaching materials used still needs to be increased. Even though the availability of teaching materials is important to bridge learning, considering that communication between students and teachers takes place separately in terms of time and place.

Therefore, it is necessary to innovate teaching materials that can make students active and more independent and build students' interest and motivation in learning, which can improve learning outcomes. This research focuses on developing contextually-based Chemistry E-Modules on the material of electrolyte solutions and non-electrolyte solutions for high school students. Teaching materials developed in electronic modules will be an attraction for students and teachers to use as a source of relevant material to help students understand chemistry.

RESEARCH METHODOLOGY

The research was conducted at SMA NW SURALAGA. This type of research uses survey research with a Research and Development approach. The aim is to produce a particular product and test its effectiveness. This model is grouped into three parts: preliminary studies, initial product development, and product evaluation or assessment (Lubis & Ikhsan, 2015).

The population in this study was NW Suralaga SMA students. The sample is part of the number and characteristics possessed by the population (Sugiyono, 2018). the sample in this study was 40 students of class XI SMA NW Suralaga.

The research instruments used to obtain data were validation sheets and student response questionnaires. The validity of the research instrument was carried out by three validators and analyzed using Aiken's V formula.

The data collection technique used is a questionnaire. The data analysis technique in this study is descriptive statistical analysis. This research data can be divided into 2:

Validation data analysis

In knowing the results of this agreement, validity indexes can be used, including the index proposed by Aiken, namely the Aiken V index. The Aiken V index is the validator's agreement index on the suitability of items (whether or not items are appropriate) with the indicators you want to measure with these items. Aiken index categori can be seen on table 1.

Table 1. Aiken index categories

No	Index range	category
1	$V \leq 0.4$	Less valid
2	$0.4 < V \leq 0.8$	Valid
3	$0.8 < V \leq 1$	Very valid

Analysis of student response questionnaires

This data is then analyzed quantitatively. Data from student response questionnaires, as measured using a Likert scale with four intervals, were analyzed quantitatively—analysis of student response questionnaire sheets to determine practicality.

RESULTS AND DISCUSSION

This study aims to meet valid and practical criteria through validation and practicality tests with the research method according to Bord and Gall, which is simplified into three stages: a preliminary study, initial product development, and product evaluation.

In the first stage of the preliminary study, the researcher conducted a needs analysis divided into two stages: literature study and field study. At the literature study stage, researchers look for several sources, such as several relevant journals that discuss the use of instructional media that can attract student learning interest. The second stage after the preliminary study was a field study. The researcher conducted a field study with direct observation and observation at SMA NW SURALAGA in class XI MIPA.

After doing a preliminary study, the next stage is product design. Several things are done at this stage, namely: Material assessment. The first stage is to adjust basic competencies and indicators of competency achievement. The second is product design. The steps in product design go through several stages: making an attractive cover, creating a material concept, making images that match the material, preparing quiz questions, opening the professional flip pdf application, entering material, inserting images and videos related to the material, and finally publishing. The evaluation phase aims to produce draft 2, revised by the validator or experts and tested on students so that it is valid and practical to use as a learning medium on electrolyte and non-electrolyte solutions.

The validation of contextual-based chemistry e-module learning media on electrolyte and non-electrolyte solution material was carried out by three validators. The results of this validity

will determine the validity of the learning media developed. Based on the index set by Aiken, the results of the validity of the learning media that have been carried out can be described in Table 2.

Table 2. Average Results of the Validation Analysis of Learning Media Experts Based on the Aiken Index of Graphical Components

No	Items	∑s	V
21	Module Size	6.50	0.75
2	Module Display Screen Design	7.75	0.86
43	Module Cover Design	7.50	0.84
4	Module Content Design	8.00	0.89
Average overall score		7.40	0.83

Table 2 shows that the average value of V for the graphical component is V = 0.83. The chemical E-module learning media based on contextual materials on electrolyte and non-electrolyte solutions for graphic components is very valid.

Table 3 shows the results of the Learning Media Expert Validation analysis Based on the Aiken Index for Presentation Components.

No	items	∑s	V
1	Presentation of text, tables of instructions, and pictures used accordingly	7.00	0.78
2	The videos presented are appropriate	8.00	0.89
3	Include a bibliography	8.00	0.89
Average overall score		7.60	0.85

Based on the analysis results in Table 3 above, the results of the expert validation analysis for the presentation component with an average value of V = 0.85 are found in the very valid category.

Table 4. Validation Analysis of Learning Media Experts Based on the Aiken Index for Content Eligibility Components

No	Items	∑s	V
1	Material relevance to basic Competency	6.00	0.67
2	The material is explained systematically	7.00	0.78
3	Material according to the level of the student's ability	7.00	0.78
4	The examples given in the learning media are by the material	6.00	0.67
5	Compatibility with the development of science	6.00	0.67
6	Facilitate students in learning anywhere and anytime	7.00	0.78
Average overall score		6.50	0.73

Table 4 can be obtained from expert validation analysis data for the feasibility component of learning media content with an average value of V = 0.73 which is in the valid category.

Table 5 Analysis of Learning Media Expert Validation Based on the Aiken Index for the Language Component

No	Items	∑s	V
1	Using standard Indonesian	8	0.89
2	Sentence formulas used are communicative	8	0.89
3	Do not use words or expressions that lead to multiple interpretations or misunderstandings	8	0.89
Average overall score		8	0.89

Table 5 shows that expert validation analysis data can be obtained for the language component of learning media with an average value of V = 0.89, which is in the very valid category.

After the product, namely, the learning e-module, was declared valid or feasible to use. It was then tested, and questionnaire data were obtained from student responses to the learning e-module to determine the practicality of the e-module. This practicality test is used to convince the data and broadly determine the product's attractiveness. Respondents to this practicality test were two lecturers at the Faculty of Chemistry at the University of Mataram and one chemistry teacher at SMA NW Suralaga. This practicality assessment was carried out by providing a product in the form of a contextual-based Chemical E-Module on electrolyte and non-electrolyte solutions along with a questionnaire containing 12 statement items covering three aspects, namely aspects of ease of use, aspects of attractiveness, and aspects of efficiency. The assessment obtained based on these three aspects can be seen in Table 6.

Table 6. Practical Test Results for Contextual-Based Chemical E-Modules in Electrolyte and Non-Electrolyte Solution Materials

No	Assessment Component	Percentage	Criteria

1	Ease of Use	87 %	Highly Practical
2	Attractiveness	87%	Highly Practical
3	Efficiency	84%	Highly Practical
Average		86 %	Highly Practical

Table 6 shows the assessment carried out by 40 respondents. For the ease of use component test, 87% obtained very practical criteria, 87% obtained attractiveness component with very practical criteria, and 84% efficiency component with very practical criteria. The average percentage obtained from the three components is 86%, with very practical criteria.

Based on the results of the analysis that has been presented in CHAPTER IV, it is found that the contextual-based chemistry learning e-module on electrolyte and non-electrolyte solution material that researchers have developed is based on four components, namely graphic components, presentation components, content feasibility components, and linguistic components are in the very Valid category. The graph of the validity of the chemistry learning e-module based on electrolyte and non-electrolyte solution material can be seen in Figure 1.

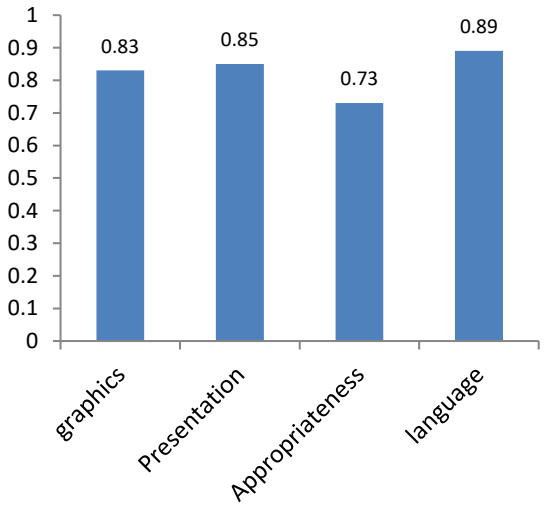

Figure 1. The results of the learning e-module validation

Figure 1 shows that the average V value was obtained and analyzed using the Aiken V index of 0.825. It means that the contextual-based chemistry learning e-module learning media on electrolyte and non-electrolyte solution materials developed by researchers is in the very valid category.

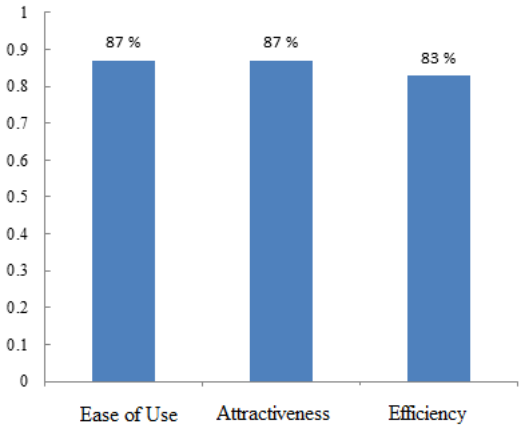

Figure 2. The Practicality of E-Learning Modules

Figure 2 shows the analysis of student response questionnaire observation sheets that researchers carried out using the practicality index. It is known that the average value of the three activities that researchers have observed is 85.6%. It means that the level of practicality of the learning e-module developed by researchers is very practical to use.

CONCLUSION

The results of the chemical e-module validation sheet analysis on the material for electrolyte and non-electrolyte solutions obtained an average value of V of 0.825, which is in the very valid category. Analyzing student responses using student response questionnaire sheets obtained an average of 86% in the very practical category.

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