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The Development of Electronic Module Based on Scientific Literacy on Colloidal Topic

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Abstract: This research is motivated by the problem of the lack of variety of teaching materials used during the teaching and learning process in schools. The reason for this research is to design electronic module teaching materials based on scientific literacy on colloidal topics. This research is a development research consisting of 4 stages, namely: define stage, design stage, develop stage, and disseminate stage. This research instrument uses validation sheets and questionnaires which are analyzed descriptively qualitatively and descriptively quantitatively. This electronic module was validated by 4 media validators, namely 2 chemistry lecturers and two chemistry teachers and material validators, namely 1 chemistry lecturer and two chemistry teachers. Based on the results of the study, the percentage of assessment on the validation of teaching materials by media experts was 89% with very feasible assessment criteria and the percentage of assessment on validation of teaching materials by material experts was 91.75% with very appropriate assessment criteria on aspects of content feasibility, language feasibility, presentation and presentation feasibility. graphic eligibility. The response of class XII IPA 7 students from SMA Negeri 7 Medan was obtained with a total percentage of 91.29%, which means students strongly agree and accept and respond to teaching materials very well.

Keywords: teaching materials; electronic module; scientific literacy; chemistry; colloid

1. INTRODUCTION

Improving the quality of human resources has a close relationship with improving the quality of education [1]. One of the ways to improve the quality of education is the use of learning media in the process. This is because the use of learning media can support and attract students' interest in participating in learning activities and the use of media in learning must be tailored to the needs of the students, such that the media utilized is appropriate for the topic delivered [2]. Technology's integration into the teaching and learning process has created a new learning environment that can help students become more interested in the subjects they are studying [3]. A means of simplifying teaching materials so that it is easier for students to understand. One of the objectives of teaching materials is to adjust the content based on the demands of the curriculum by considering the needs of students. Examples of teaching materials are books, student worksheets and learning modules.

Along with the development of technology, the shape of the module is also growing and has a positive impact. The development of the module starts from the form of a printed module to the form of an E-module. E-modules as teaching materials can contain interactive experiments and simulations combined with pictures, videos and animations. E-modules can be used in chemistry subjects because chemistry is one of the sciences that develops along with technological developments and their application in everyday life. Chemistry subjects have a goal where students have the ability to understand chemical concepts, principles, laws, and theories as well as their application and solving related problems in everyday life and technology [4].

One of the chemistry topics that requires modules as teaching materials is the topic of colloids. This is because the topic of colloids contains material that requires the help of special media to visualize the properties, formation of colloids and their application in everyday life which does not allow all to be practiced or shown directly on the grounds that it is dangerous and expensive [5].

Based on the results of an interview with one of the chemistry teachers at SMA Negeri 7 Medan, explained that the ongoing learning could not be carried out fully face to face, causing the colloid learning process to be limited and still only guided by textbooks. Limited textbooks mean that students do not have other sources of reading related to colloidal material. This is in line with the opinion that textbooks provided by the school in fact cannot be used by students on the grounds that the number of textbooks is not proportional to number of students, causing learning not take place properly [6]. The existing ones are expected to be able to improve students' scientific literacy skills in colloidal topics.

Scientific literacy is the ability to identify, understand and interpret science-related issues that a person needs to make decisions based on scientific evidence [7]. The application of the concept of literacy in the colloidal topic process is not only intended to understand a collection of facts and theories but is actually the realm of a learning process to understand and interpret phenomena and events that are relevant to daily life. That is why it is important to develop electronic science literacy-based modules on colloidal topics.

1.1 Teaching Materials

Teaching materials are all forms of materials that are systematically arranged that allow students to study independently and are designed in accordance with the applicable curriculum. Teaching materials have unique and specific properties [8]. Unique, means that the teaching materials can only be addressed to certain subjects in a particular learning process as well. Specific, means that the content of teaching materials has a purpose in the learning process [9]. Therefore, it can be concluded that teaching materials play an important role in helping teachers in teaching and learning activities that are arranged systematically in written and unwritten form in order to create an effective learning atmosphere and achieve the desired learning objectives.

1.2 Learning Modules

A module is one of the teaching materials that are packaged in a systematic and complete form which contains a set of planned learning experiences to assist students in achieving learning objectives [10]. Furthermore, the module is a collection of subject matter that is compiled in writing so that students are able to absorb the material themselves [11].

The function of the module is to overcome the weaknesses of the traditional teaching system; to increase learning motivation; to enhance the creativity of trainers in preparing individual lessons; to realize the principle of continuous progress andto realize concentrated learning [12].

1.3 E-Module

The use of teaching materials with technology is an integrated technology. E-modules are included in integrated technology because the modules are teaching materials with the help of computer technology developments. The E-module is a type of print media that can be transformed in its presentation in digital or electronic form [13]. The learning process in the E-module is designed not only centered on educators but also provides opportunities for students to construct their knowledge and skills based on independent learning [14].

1.4 Scientific Literacy

Scientific literacy is the main goal of science education. Scientific literacy is more than understanding scientific knowledge. Scientific literacy can be an access where students can ask questions, find, and make decisions that are developed from their curiosity related to their daily life experiences. Scientific literacy means that students can ask questions, find, or determine answers to questions that come from everyday experiences [15]. Scientific literacy requires knowledge of scientific concepts and theories as well as knowledge of general procedures and practices related to scientific research and scientific progress. The learning process that involves science in it can create students who have the ability to communicate, the ability to think, the ability to solve problems to the ability to master technology. Therefore, it is important to involve scientific literacy in learning because scientific literacy also has a pedagogical mission to learning activities. The pedagogical mission of scientific literacy is to produce human resources who have critical, creative, innovative and productive thinking.

The characteristics of scientific literacy have been grouped by PISA. The general classification of scientific literacy is as follows [16] :

a. Natural content and changes that occur due to human activities.

b. The process of science, the ability of students to identify scientific issues, explain natural phenomena scientifically.

c. In the context of science, science participants are able to apply science to solve real problems in daily life, technology, health and the earth and the environment.

There are four components that must be considered when developing science teaching materials in the form of science modules. The four components are science as a body of knowledge (the knowledge of science), science as a way of investigating (the investigative nature of science), science as a way of thinking and the interaction of science, technology and society [17].

a. The knowledge of science

   This category intends the text to present, discuss, or ask students to remember information, facts, concepts, principles, laws, theories, and others. Textbook materials in this category include, (a) presenting facts, concepts, principles, and laws; (b) presenting hypotheses, theories, and models and (c) asking students to recall knowledge or information.

b. The investigative nature of science

   This category denotes a text that encourages students to think and act by encouraging them to "find out." Textbook materials in this category are (a) require students to answer questions through the use of materials; (b) requires students to answer questions through the use of graphs, tables, and others; (c) require students to make calculations; and (d) involve students in thought experiments or activities.

c. Science as a way of thinking

   This category denotes that the text's purpose is to show how science in general, or a certain scientist in particular, went about "finding out." Texts in this category are such as (a) describing how a scientist experimented' (b) depicts the historical development of an idea; (c) emphasizes the empirical nature and objectivity of science, and (d) discusses evidence and implements evidence.

d. Interaction of science, technology and society

   This category is meaningful to demonstrate the consequences or implications of science on society. Texts in this category are (a) explain the benefits of science and technology to society, (b) emphasizing the negative impacts of science and technology on society, (c) explore societal concerns linked to research or technology and (d) highlight scientific and technical vocations and jobs.

1.5 Colloidal Learning

In colloidal material, the recommended approach to be used in the process is a scientific approach. This is because the 2013 curriculum uses a scientific approach so that students get an understanding to know, understand and practice scientifically related to colloid lessons. The learning model implemented in the 2013 curriculum related to colloidal material is inquiry learning. Inquiry learning is a series of learning activities in which all abilities of students are maximally involved to seek and investigate systematically, critically, and logically so that they can find their own knowledge, attitudes and skills as a form of behavior change [18]. In the process of implementing inquiry learning on colloid topics, students are involved in

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finding the essence of colloid subject matter and the teacher only acts as a guide or facilitator in the colloid learning process.

2. METHODS

2.1 Location and Time of Research

This research was conducted at SMA Negeri 7 which is located on Jalan Timor No. 36, Gaharu, Medan City from October 2021 to January 2022.

2.2 Subject and Object of Research

The subject of this research is the development of an E-module based on Scientific Literacy on colloidal topic consisting of: 1) 3 expert validators (lecturers) in the chemistry department; 2) 2 chemistry teachers at SMA Negeri 7 Medan; 3) class XII students at SMA Negeri 7 Medan, total students are 36 students. While the object of this development research is an E-module based on Scientific Literacy on colloidal topic.

2.3 Type and Design of Research

The type of research carried out in this research is the type of research and development or Research and Development (R&D) which refers to the research design of the 4-D model development. The 4-D development model consists of 4 main stages, namely: Define, Design, Develop, Disseminate [19]. In general, the stages of research and development includes (1) the define stage, which involves identifying problemstyp and potentials in the classroom, (2) the design stage, which involves creating scientific literacy E-module, (3) the develop stage, which includes validation of the design and then revisions to the design, and (4) the disseminate stage, which is the step in which the electronic chemistry module is distributed to schools [20]. This research was carried out up to the disseminate stage. Trials on E-modules that have been designed and developed are carried out on students in class XII MIA 7.

2.4 Data Collection Techniques

The data to be collected is qualitative , namely data in the form of a description in the form of sentences. Qualitative researchers are human instruments, function in determining the focus of research, selecting sources, collecting data, assessing data quality to analyzing data and making conclusions on their research [21]. This data will contain the results of interviews with resource persons. Furthermore, data collection using a questionnaire . This data consists of answers that come from validators for products that have been developed, descriptions of the implementation of product trials and the results of student responses to products that have been developed.

2.5 Research Instruments

To obtain data in this study, non-test instruments were used. The non-test instrument was used to analyze the E-module based on scientific literacy, the validity and to determine the students' responses to the E-module based on scientific literacy. The instrument used is a checklist sheet with a Likert scale. The Likert scale is applied as one of the most basic psychometric tools that is often used in educational and social science research [22]. This study uses questionnaire that aims to collect feasibility data for the developed scientific literacy-based E-module and also a student response questionnaire to obtain response data to the E-module. This research was conducted in accordance with the procedures that have been prepared. The following in Figure 1 can be seen the research procedures carried out.

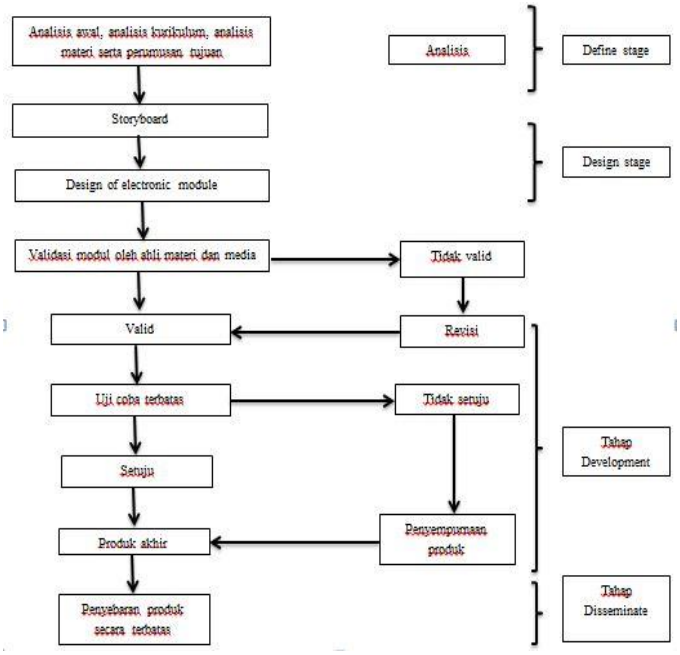

Figure. 1 Research procedure

Based on Figure 1, the procedure is described as follows.

a. Define Stage

The first stage in the research is needs analysis or is called the definition stage. The researcher analyzes the syllabus in accordance with the 2013 curriculum to obtain information about what teaching materials are suitable for the needs of students. Information about these teaching materials serves as input in the development of teaching materials, namely E-modules based on scientific literacy.

b. Design Stage

This stage is the stage of designing or compiling a draft which will be developed into an E-module based on scientific literacy. The development of these teaching materials is also based on the analysis that has been carried out which was obtained based on initial observations and interviews with teachers.

1. Selection of Teaching Materials

   The selection of teaching materials is based on the characteristics of the 2013 Curriculum High School syllabus material that is in accordance with the needs of students. This development uses E-modules as teaching materials.

2. Selection of Format

   The format selection has been adjusted to the teaching materials used. The selection of this format includes the design of the content of teaching materials or E-modules, layout design, writing fonts, images and so on.

3. Preliminary Design

This stage is designing a E-module based on scientific literacy and then consulting with the supervisor. Suggestions and inputs obtained from supervisors can be used as revision material.

c. Develop Stage

This stage produces an E-module based on scientific literacy that has been revised and then a limited trial will be conducted on the module. The development is carried out by involving relevant references and scientific literacy learning.

Product validation was carried out by media experts, material experts and chemistry teachers using the BSNP questionnaire as a validation instrument. The validator assesses based on the criteria set by BSNP which includes the feasibility of content, language, presentation and graphics. The validator also provides suggestions regarding the developed E-modules based on scientific literacy. After doing the validation, then revision of the E-module based on Science Literacy was carried out.

d. Dissemination Stage

The dissemination stage is carried out when the trial is limited and the instrument has been revised. The purpose of implementing this stage is to disseminate E-modules based on Science Literacy. This research only conducted limited dissemination. Limited dissemination is carried out by disseminating and promoting the final product of the E-module by distributing limited student response questionnaires to students at SMA Negeri 7 Medan. A limited student response questionnaires was conducted to determine the application of the E-module in learning by looking at the results of student responses then carry out product improvement.

2.6 Data Analysis

Data analysis in research intends to process data obtained from research results so that they can be accounted for and believed to be true. Data analysis is one of the requirements so that research data can be used for hypothesis testing [23]. The data analysis techniques used in this research are descriptive qualitative data analysis techniques and quantitative data analysis techniques that describe the results of the validity test and student responses. The two data analysis techniques are presented as follows.

a. Qualitative descriptive analysis

Qualitative data analysis was carried out by grouping all information in the form of input, criticism and suggestions for improvement contained in the questionnaire. The data processed in the qualitative analysis came from the results of validation and review by media experts and material experts on the E-Module based on scientific literacy on colloidal material.

b. Quantitative descriptive analysis

Quantitative descriptive analysis is done by analyzing quantitative data in the form of numbers. Quantitative descriptive analysis is used to analyze the data obtained from the questionnaire:

1. E-module Validity Analysis

The data obtained in the questionnaire will be processed by means of descriptive statistics. The rating scale used in the modified BSNP eligibility questionnaire is 1 to 4, where the lowest score is 1 and the highest score is 4. The formula used to calculate validation data based on the questionnaire is as follows:

$$\text{Percentage of validity} = \frac{Obtained\ score}{Maximal\ score} \text{ x } 100\%$$

The value the percentage of the scale of feasibility or product validity carried out by media experts, material experts and chemistry teachers is as follows.

Table 1. Criteria for the percentage of media validity [24]

Interval (%)	Qualification	Feasible Criteria
81-100	Very valid	Very worthy / not revised
61-80	Valid	Eligible/not revised
41-60	Sufficiently valid	Decent enough/needs revision
21-40	Less valid	Not worthy/revision
0-20	Invalid	Very unworthy/total revision

2. Student response questionnaire

The student questionnaire or response questionnaire was carried out after the students used the E-module. The student response questionnaires were analyzed descriptively. The category of student response assessment can be presented in the following table.

Table 2. Category of student response assessment [25]

Percentage (%)	Criteria
76-100	Strongly agree/very good
51-75	Agree/good
26-50	Disagree/bad
0-25	Strongly disagree/very bad

The formula used to calculate student response questionnaire data is as follows:

$$\text{Percentage} = \frac{Obtained\ score}{Maximal\ score} \text{ x } 100\%$$

The results of the data analysis that have been carried out will then be adjusted to agreement on numbers so that the criteria for validity and numbers can be determined. After doing this, conclusions and results from the data analysis can then be drawn.

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3. RESULT

3.1 Result of Define Stage

At the define stage or needs analysis that has been carried out includes determining and defining facts and a series of needs in the chemistry learning process at SMA Negeri 7 Medan as well as collecting initial information regarding the conditions and products to be developed. Needs analysis is done by carrying out field observations in schools.

The initial analysis was carried out by conducting interviews with chemistry teachers at SMA Negeri 7 Medan to determine the need for teaching materials to be used in the chemistry learning process at school, especially on colloidal materials used in SMA Negeri 7 the. The results of the initial analysis based on class observations and interviews with chemistry subject teachers, namely learning limitations due to the covid-19 pandemic made it difficult for teachers to provide maximum understanding to students, limited teaching materials used in the learning process and E-modules as independent teaching materials had not been used in the learning process.

Curriculum analysis that has been carried out is to find out core competencies and basic competencies related to colloidal material and to find out what materials are in chemical colloid materials that can be used as materials for making chemical teaching materials in the form of E-modules. The 2013 curriculum is used as a reference in the design phase of products, structures and components of teaching materials. At this stage, the syllabus is used as a guide.

Material analysis carried out to select relevant material from several source books and then rearrange it. Analysis of colloidal material contained in the textbooks for teachers and students from 2 different publishers. The results obtained are that the aspects contained in scientific literacy are still not fulfilled in every sub topic of colloid material discussed. The two books still do not place all aspects of scientific literacy on the 5 topics discussed. The topics are as follows: 1) colloid system, 2) types of colloids, 3) colloid properties, 4) colloid manufacture and 5) colloid application in life.

The formulation of the objectives that have been implemented serves to limit the research so as not to deviate from the initial objectives of learning. Based on the analysis that has been carried out, the purpose of the E-module is to overcome existing problems and limitations of teaching materials and increase students' interest in learning in colloid topics and develop students' scientific literacy skills.

3.2 Result of Design Stage

The teaching materials selected and developed by researchers were E-module teaching materials. Researchers used Microsoft Word application to create and design the E-module teaching materials. Then the files or teaching materials that are still in word form are converted to PDF and then published to FlipHTML5. The application can make the flip book maker more appealing, this multimedia gadget can contain files in the form of pdf, photos, videos, and animations. Background, control buttons, navigation bar, hyperlinks, and back sound are all included in flip book maker's design templates. Students can read as if they were physically reading a book since there is an animation effect that simulates physically opening a book when switching pages [26].

The steps for preparing the product design for this E-module include adjusting the core competencies and basic competencies as well as the syllabus based on the 2013 curriculum. The format used in product design is in the form of learning media for E-modules based on scientific literacy which can be compiled into a draft module. The draft of the module teaching materials was prepared according to the results of the book analysis conducted by the researcher.

3.3 Result of Development Stage

The develop stage functions to produce product that have been revised based on suggestions and input from media experts and material experts. This development stage includes a product validation test (E-module colloid based on scientific literacy) by experts and product revision. The E-module validation aims to determine the feasibility of the media and material on the E-module to be used in learning activities.

The feasibility level of the E-module teaching materials is carried out by means of validation carried out by media experts and material experts.

a. Material Expert Validation

The questionnaire used consisted of 26 assessment items with a score range of 1-4 points accompanied by 5 supporting questions. Aspects of assessment by material experts include aspects of content feasibility, aspects of language feasibility and aspects of presentation feasibility and aspects of scientific literacy. The data on the results of the assessment by material experts on this E-module can be seen in Table 3 below.

Table 3. Result material expert validation

Aspect	Validator			Average	%	Criteria Feasibility
	1	2	3			
Content feasibility	3.62	3.67	3.68	3.65	91.25	Very feasible
Language feasibility	3.33	3.83	3.5	3.55	88.75	Very feasible
Presentation feasibility	3.67	3.71	3.71	3.69	92.25	Very feasible
Scientific literacy	4	4	4	4	100	Very feasible

Based on Table 3, it can be seen that the average score of the material assessment carried out by the validator is the content feasibility aspect of 91.25%, the language feasibility aspect of 88.75%, the presentation feasibility aspect of 92.25% and the scientific literacy aspect of 100%. Based on the feasibility criteria of the validation results by the three validators, the results of the validation of the material for developing this electronic module are in the "very feasible" criteria as an E-module learning media based on scientific literacy on colloidal material.

b. Media Expert Validation

The questionnaire used consisted of 12 statement items with a score range of 1-4 points with 2 supporting questions. The assessment is based on module size, module cover design and module content design. The data on the results of the assessment by media experts on this electronic module can be seen in table 4 below.

Table 4. Result material expert validation

Aspect	Validator				Average	%	Criteria Feasibility
	1	2	3	4			
Graphic feasibility	3.89	3.86	3.39	3.08	3.56	89	Very feasible

From the table above, it can be seen that the average score of media assessment by validator 1 is 3.89 (97.25%), validator 2 is 3.86 (96.5%), validator 3 is 3.39 (84.75%) and validator 4 is 3.08 (77%).) with the average graphic aspect obtained at 3.56 with a percentage of 89%. Based on the feasibility criteria of the validation results by the four validators, the results of this development are in the "very feasible" criteria as a learning media for E-modules based on scientific literacy on colloidal material.

c. Product Revision

The product revision stage is carried out after the material validator and media validator provide suggestions. The revised e-module is then sent to the material and media validator for re-assessment. The product revision is complete if the material and media validator has stated that the following module electronics are valid. Some of the improvements implemented include the following, 1) Simplification of definitions in several parts, 2) adding an explanation of the material in the colloid sub-topic (the application of colloids in daily life), 3) improving the e-module cover, 4) changing the color or font size on the concept map and 5) changing the layout of the competency achievement indicators

3.4 Result of Dissiminate Stage

Media dissemination is a stage that is carried out when the electronic module learning media based on scientific literacy on colloidal material has been revised for the better. This stage is carried out by distributing the media in related classes along with distributing several student response questionnaires in class XII IPA 7 at SMA Negeri 7 Medan. The process of collecting data is by providing learning media, namely an electronic module based on scientific literacy on Colloidal material made using FlipHTML5, then distributing an assessment questionnaire (student response questionnaire) in the form of a link from the google form.

The questionnaire used was 22 assessment items with a score range of points 1-4. Aspects of student response include aspects of appearance, material aspects and aspects of benefits. The data on the results of the assessment by material experts on this electronic module can be seen in Table 5.

Table 5. Student Responses Results

Aspect	Percentage
Appearance	93.06 %
Material	90.12 %
Benefit	90.69 %
Total	91.29 %

Based on the results of data analysis on student response questionnaires that have been filled out by 36 students, where the number of students who chose the "strongly agree" category were 31 students, the results obtained from the criteria for the results of student responses with an average percentage of 91.29% with criteria "Strongly agree". Overall, the electronic module learning media based on scientific literacy on colloid topics does not need to be revised again. The electronic module can be used as an independent teaching material on Colloidal material that will be faced by class XI students in the second semester.

4. DISCUSSION

The research entitled the development of electronic module based on scientific literacy on colloidal topic, aims to produce electronic module teaching materials that are based on four aspects of scientific literacy. Independent teaching and get student responses to scientific literacy-based electronic modules on colloidal material. The research and development procedure used is the Research and Development (R&D) method with a 4-D model consisting of the analysis stage (define), the design stage (design), the development stage and the disseminate stage.

The first step that researchers have taken in this research is the define stage. This stage intends to find and collect problems for which solutions are sought. In this study, the needs analysis was carried out to identify and define the problems encountered in colloidal learning. In this stage, the researcher conducted initial observations by conducting interviews with one of the chemistry teachers at SMA Negeri 7 Medan, to find out the teaching materials and media used by chemistry teachers in the chemistry learning process at school, especially colloidal material. The results of the interviews that learning chemistry in the classroom is still only guided by the teacher and textbooks. Teachers still use learning media only in the form of powerpoint. The chemistry learning has also never used electronic modules as teaching materials and scientific literacy-based learning in chemistry is rarely applied so that students are less active and independent. Based on this information, the researchers got the motivation to develop an electronic module based on scientific literacy on colloidal material. This electronic module is made using FlipHTML5 which can support the module to be more interactive in its use. This electronic module was created to overcome existing problems and aims to minimize students' lack of interest in chemistry

subjects by producing scientific literacy-based teaching materials that can make it easier for students to learn both in groups and independently.

After the define stage is implemented, the next stage is the design stage. At this stage, the product, namely an electronic module based on scientific literacy on colloidal material, begins to design its components. This starts from the selection of teaching materials, namely electronic modules that aim to facilitate the learning process, as well as independent teaching materials for students because teaching materials in the form of electronic modules have never been developed at SMA Negeri 7 Medan. In fact, the module teaching material is a relevant teaching material and is a good solution when learning is still carried out on a limited basis, as it is today. At the stage of selecting teaching materials, an electronic module was developed from the 2 books that were analyzed. The next step is the preparation of the electronic module product design. What is being carried out is adjusting core competencies and basic competencies based on the 2013 syllabus and curriculum. The format used in product design is in the form of electronic module learning media that refers to the 2013 curriculum by paying attention to the four components of scientific literacy in it, namely the knowledge of science, the investigative nature of science, science as a way of thinking, and interaction of science, technology and society. At this stage, the researcher writes a draft module that is developed according to the curriculum and syllabus which is then inserted into the electronic module so that the electronic module is made in accordance with the subject matter and scientific literacy.

The next stage is the development stage. This stage includes product validation and getting student responses regarding this electronic module. This stage is carried out to determine the level of media feasibility and the feasibility of the material developed in accordance with the 2013 curriculum and the syllabus used. This was assessed using a BSNP questionnaire given to expert validators where the material validator was one lecturer in chemistry at the State University of Medan and two chemistry teachers at SMA Negeri 7 Medan. one chemistry teacher at SMA Negeri 7 Medan. Based on suggestions regarding product deficiencies provided by expert validation, it is expected to make the module better and feasible to use in the learning process.

The validation results obtained from the validator are then analyzed. The validation carried out by material experts obtained results where aspects of content feasibility, language feasibility, presentation feasibility had an average of 91.75% which met the "very feasible" criteria, also accompanied by notes and suggestions that were used as guidelines for revising the material. Furthermore, the validation carried out by media experts got the results of the feasibility of graphics having an average of 89% which met the "very feasible" criteria, also accompanied by notes and suggestions that were used as guidelines for media revision. Based on the results of validation carried out, it can be concluded that e-module based on scientific literacy on colloidal material is very feasible to use.

The results of this study are in line with research conducted by Novia F. J which showed that the Android E-Module based on scientific literacy integrated with Islamic values in the reaction rate material produced was tested valid with percentage of 91.2% (very valid) [27]. In addition, research conducted by Linda Rosita that stated that the development of problem-based learning-based electronic module teaching materials on reaction rate materials that had been tested for media feasibility was 92% and material feasibility was 91% [28]. This shows that the feasibility test of the electronic module based on problem based learning on the reaction rate material is considered very feasible.

The last thing that was carried out was distributing electronic modules along with the results of student responses to class XII IPA 7. This stage was carried out to promote the product developed so that it was accepted by users. There are three main stages in the disseminate stage, namely validation testing, packaging and diffusion and adoption. Validation testing is a product that has been revised at the development stage and then implemented on the real target, packaging, diffusion and adoption, namely product packaging is done by printing the product which is then disseminated so that it can be absorbed (diffusion) or understood by others and can be used (adopted) in the classroom related. At this stage, a limited disseminate stage is implemented, the researcher carried out a limited trial to get student responses. This is done by giving questionnaires to students. The average obtained is 91.29% with the "strongly agree" category, so that the overall scientific literacy-based electronic module on colloidal material does not need to be revised and is worthy of being used as learning media.

The results of this study of student response to electronic module in line with research that done by Rizka Annisa Rahman which that the development of an electronic module based on Problem Based Learning (PBL) on thermochemical material obtained a total student response of 92.2%, which means that students accept and respond to teaching materials very well [29].

5. CONCLUSION

Based on the results of the analysis that has been carried out in this study, it can be concluded that:

The level of validity of an electronic module based on scientific literacy on colloidal topic as teaching material for SMA/MA class XI students was declared "very feasible" by material experts getting a score of 3.67 with a percentage of validity of 91.75% and declared "very feasible" by media experts with a value of 3.56 with a percentage of validity of 89%.

The level of student response related to an electronic module based on scientific literacy on colloidal topic as teaching materials for SMA/MA students in class XII SMA Negeri 7 Medan obtained the percentage of assessments stated "strongly agree" and "very good ” with a response percentage of 91.29%.

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