DEVELOPMENT OF BIOLOGIC ELECTRONIC MODULE AS A STUDENT'S SELF-LEARNING SOURCE SENIOR HIGH SCHOOL

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Abstract: Electronic module helps students to learn independently, facilitate students to learn wherever and whenever according to their ability level. This research aims to produce biological electronic module there are valid, practical and effective. Electronic module developed using software KVISOFT Flipbook Maker. The research using type of research and development, which refers to ADDIE development model to produce an electronic module that focused on virus material, based on the national curriculum (K-2013). The subjects were high school students of class X IPA. The results showed that the electronic module is suitable to use. The average value of total validity of validators is 4.34, it means the electronic module is included in a valid criterion. The category of practical and effectiveness in this research was not implemented because limited time.

Keywords: Electronic module, KVISOFT *Flipbook Maker*

Introduction

According to Mulyasa, learning resources are one of the important components that determine the success of the learning process. Learning resources can be formulated as anything that can provide convenience to students in obtaining a number of information, knowledge, experience, and skills in the teaching and learning process (Wulandari, 2011).

The success of learning is very dependent on the use of learning resources and the selected learning media, appropriate learning resources and teaching materials can meet the learning objectives, namely motivating, attracting attention and stimulating students through learning materials. One form of learning resources that supports the student's independent learning process is a module (Trianto, 2010).

Based on initial observations at SMA Negeri 2 Tolitoli, it is known that so far the modules made by teachers are conventional modules, namely modules in the form of hardfiles and reproduced by photocopy. This causes some of the text and images in the module to be less legible and have an unattractive appearance because they are only black-and-white text and images.

In addition, the hardcopy module is also prone to being scattered and lost. As a result, students who lost the module re-purchase the module. Therefore, it is necessary to make an effort to make the module as a learning resource that is attractive in terms of appearance and is flexible. An attractive display will motivate students to read, while the flexible nature of a module will give students the opportunity to study anywhere and anytime. The development of e-book technology encourages the combination of print technology and computer technology in learning activities, one of which is the module. The presentation of the module can be transformed into electronic form so that it is given the term electronic module (Sugianto, 2013).

Electronic modules can be implemented as independent learning resources that can help students improve their competence or cognitive understanding. Electronic modules can also be used anywhere, making it more practical to carry anywhere because it is a combination of print media and computers. Electronic modules can present information in a structured, flexible and have a high level of interactivity.

The electronic module designed is a module in the form of a softfile. This electronic module allows it to be installed on students' computers or laptops so that the problem of loss and the price of the module is resolved. The existence of electronic modules that can be installed on computers or laptops can be a solution for students to be able to study anywhere and anytime seeing that students' interest in these electronic devices is very high. Thus, the learning process becomes more flexible for students.

The next advantage of the electronic module that is made is that it is possible to have videos and animations in the module that are able to provide an explanation of the subject matter. Another advantage is that practice questions and evaluations in the form of multiple choice are actively presented. These things are certainly an innovation and an advantage of electronic modules that cannot be found in conventional modules.

The electronic module was made using Kvisoft flip book software. According to the animation website Teknokids in Ramdiana (2013), Flip Book is one of the classic types of animation

made from a pile of paper resembling a thick book, on each page a process of something is described, which later the process looks moving or animated. The software provided by this vendor is now able to make Flip Book animations with more variations, not only text and images, but also video and audio can also be inserted in the Flip Book that is created.

Until now, there has been no innovation in making learning resources in the form of electronic modules that are used at SMAN 2 Tolitoli, especially in biology subjects. For this reason, it is necessary to make an electronic biology module that can be used by students as a source of independent learning in which there are components needed for more meaningful learning. As an independent learning resource, the electronic biology module can support students' understanding of the material presented by the teacher and provide an interesting new learning environment. Learning biology through electronic modules can be used both inside and outside the classroom. Thus, learning biology becomes flexible and not rigid. It is hoped that the electronic biology module can help students learn independently and the learning process becomes more meaningful so that students better understand the biological materials being studied.

Based on the above, the researchers are interested in developing electronic modules using the Kvisoft flip book software as an innovation in the world of education that utilizes the development of science and technology. This research is about "Development of Biology Electronic Module as a Source of Independent Learning for High School Students (SMA)".

Method

1. Research type and design

The type of research used is Research & Development with the ADDIE model which aims to produce an electronic biology module that is valid, practical and effective.

2. Location and Time of Implementation

The research was carried out in February 2020 – July 2020. The results of the development of this electronic module were tested on a small scale (small scale) in class X IPA SMAN 2 Tolitoli. The trial will be carried out in the even semester of 2020.

3. Research Subject

The subjects of this study were students of class X IPA SMAN 2 Tolitoli, and partner teachers in the field of biology. Class X IPA SMAN 2 Tolitoli consists of 40 students. The partner teacher in the field of Biology is 1 person.

4. Expected Research Results

The expected result of this research is to produce an electronic biology module for high school students, especially class X.

5. Research Implementation Procedure

The development of the electronic module in the Biology subject of class X SMA applies the type of research and development that refers to the ADDIE development model. The ADDIE model consists of 5 stages, namely 1) analyze (analysis), 2) design (design), 3) develop (development), 4) implement (implementation) and 5) evaluate (evaluation).

a. Analysis

At this stage the researchers carried out initial data collection activities to find out problems in learning that occurred in schools. The steps taken in the analysis phase include: a) conducting needs analysis, b) analyzing student abilities, c) analyzing content, d) conducting structural analysis, and e) setting development goals and learning objectives to align with the desired goals. achieved.

b. Design

The design stage is the stage of designing the media to be developed. The design stage contains an explanation of the electronic module design and the design of research instruments. The design stages of the ADDIE development model consist of an instructional strategy, choosing a design format, making a design plan, creating a design document, and an evaluation design.

c. Development

The steps taken in the electronic module development stage are: a) electronic module development, and b) quality assurance. The completion of the analysis and design stages becomes a solid basis for carrying out the development process. Researchers have access to undeveloped materials, learning objectives, and design documents to help guide product development.

d. Implementation

The implementation process is carried out after the development process is complete. Researchers will carry out three stages in the implementation process, namely: content training, evaluation and feedback. Content training will provide opportunities for researchers to present material designs to users (students and teachers). This allows researchers to demonstrate the flow of material contained within the electronic module. The evaluation will be carried out after the content training is carried out and the researcher will receive feedback from the evaluation.

e. Evaluation

This stage is the last step of the ADDIE development model. The evaluation stage aims to evaluate the results of the development and display the revision of the development product. The stages of evaluation consist of product evaluation. The measurement of the quality of this development product does not refer to the measurement of software quality, but rather to the quality of learning tools. Thus the quality of electronic modules can refer to the quality criteria according to Nieven. According to Nieven (2006: 26), a material is said to be good if it meets the quality aspects, including: 1) validity, 2) practicality, and 3) effectiveness.

Research on the development of this electronic module evaluates reactions, where what is seen is student responses, and teacher responses. Students and teachers are asked to rate the electronic module after completion of the implementation phase to see the effectiveness and practicality of the electronic module. Some of the statements used may relate to the purpose, the product's ability to stimulate student interest in learning, the quality and feasibility of the electronic module, and the ease of use of navigation.

6. Data Analysis Techniques

a. Validity data analysis

The data from the expert validation results for each learning device were analyzed. The assessment of the experts includes three aspects, namely aspects of format, aspects of content, and aspects of language.

1) To recapitulate the data from the media and instrument validity assessment results into a table which includes: (a) aspects (Ai), (b) criteria (Ki), (c) validator assessment results (Vji);
2) Determine the average assessment results of all validators for each criterion

1) with the formula: $\overline{K_i} = \frac{\sum_{j=1}^{n} V_{ij}}{n}$, with:

$\overline{K_i}$ = the mean of the criteria i

V_{ji} = the score of the assessment results against the i-th criterion by the j-th evaluator

n = number of validators

Determine the average of each aspect with the formula:

$$\overline{A_i} = \frac{\sum_{j=1}^{n} \overline{K}_{ij}}{n}, \text{ with:}$$

$\overline{A_i}$ = i-th aspect average

$\overline{K}_{ji}$ = the mean for the i-th aspect of the j criteria

n = the number of criteria in the i-th aspect

$\overline{A_i}$ $V_a = \frac{\sum_{i=1}^{n} \overline{A_i}}{n}$

Determine the value of Va or the total average with the formula:

with:

V_a = total mean

$\overline{A_i}$ = i-th aspect average

n = many aspects

The value of Va or the total average value is referred to the intervals for determining the validity of the media as follows.

Validity categories are as follows:

4,5 ≤ Va 5	= very valid
3,5 ≤ Va ≤ 4,5	= valid
2,5 ≤ Va < 3,5	= not valid
1,5 ≤ Va ≤ 2,5	= invalid
Va < 1,5	= very invalid

Note: Va is the value for determining the validity level of the electronic module

Results And Discussion

1. Research Results

Research on the development of electronic modules is research on the development of learning resources to increase student learning independence. The development research that has been carried out refers to the ADDIE development model. The results of the stages of implementing the research are as follows.

a. Stage of analysis

1) Needs analysis

Needs analysis was conducted to collect information related to student needs and teacher needs in the learning process. Information collection activities carried out by researchers aimed to identify problems that support the process of developing this electronic module.

Based on the needs analysis conducted by researchers through library research, preliminary observations and interviews, information was obtained that the problems that are still being addressed by teachers are problems of effective learning resources. So far, teachers only use textbooks, worksheets, and learning modules. The learning module developed by the teacher is still a conventional module.

Students need learning resources that can help them understand the subject matter of biology. Students with different levels of understanding do need learning resources that can support their learning activities. Many students can understand the subject matter if they repeat it many times, and it is very rare for students to understand the subject matter by reading or listening to it only once. So far, students only use textbooks, worksheets and conventional modules.

The problem of limited time allocation in the learning process at school, also creates limitations for teachers in explaining subject matter to students which cannot be repeated many times, so students must repeat themselves at home in order to understand the material well, therefore students need learning resources that they can use at home.

Based on observations made by researchers, it is known that all students can use computers well because they receive lessons about using computers in ICT subjects, besides that most students also have laptops and sophisticated smart phones.

The electronic module is one of the learning resources that can be used by students at school or as a source of independent learning for students at home. Presentation of electronic modules is not a new thing for students, because previously students have interacted a lot with electronic books (e-books) in learning activities. Thus, the problem of learning resources and the solutions suggested by the researchers are feasible to be developed, taking into account that this electronic module development solution is the fastest solution to solve the problems faced by teachers and students at SMAN 2 Tolitoli.

2) Student analysis

Student analysis was conducted by interviewing students randomly. Based on the results of these interviews, it is known that the existence of modules among students is still limited. In biology, only students in class XI and class XII use the module, so the researchers chose to develop an electronic module for use by class X students.

3) Content analysis

Content analysis is carried out through an assessment of the subject matter used in the development of electronic modules to find out which content can be used in whole, in part, or with modifications. Content analysis is carried out by the researchers themselves from the results of collecting materials and materials that have been analyzed that can be used in developing products, both in the form of existing materials, survey results, images, and existing electronic learning (videos, animations). The results of the material review are then obtained which materials can be used and which materials do not need to be used.

4) Structural analysis

The structure analysis stage aims to analyze the structure of the material concept to be developed, to ensure that the product developed includes all material information that students need to know. Structural analysis was carried out on the concept of virus material for class X science in odd semesters based on the 2013 curriculum.

5) Objective analysis

Analysis of objectives includes assessment of core competencies, basic competencies, learning indicators, and learning objectives.

b. Design stage (Design)

The design stage is the stage of designing the media to be made. The design stage starts from the instructional strategy, then the selection of the design format, the making of the design plan, the creation of the design document, and the evaluation design. The results of the implementation of the design phase are as follows.

1) Instructional strategy

Instructional strategy is a grouping of learning objectives according to the unification of the topic of learning materials. The activities used in presenting the material can be in the form of classroom learning and independent learning.

2) Selection of design format design

Format design is a structure that results from a combination of student needs, content, and development goals. The design format chosen is in the form of a self-study guide. The self-study guide was chosen so that students can study independently at home, so that students' thinking skills can develop better with more practice.

3) Design development planning

Development planning design is a development document that is used to guide the implementation of development and as a control in the development process.

4) Design document creation

The electronic module designed by the researcher is displayed in storyboard format as the main design of the product design. The electronic module is designed as many as 70 pages consisting of the front cover, initial completeness of the module, introduction, activity unit, evaluation and back cover.

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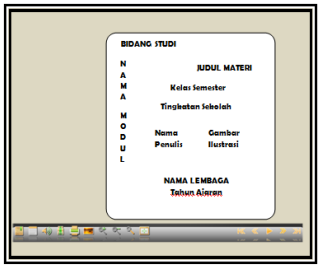
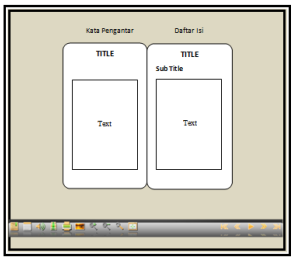
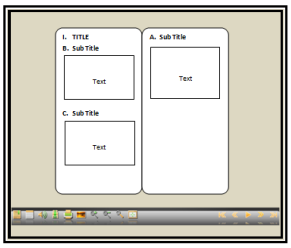
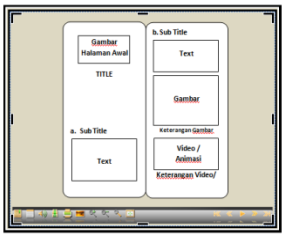
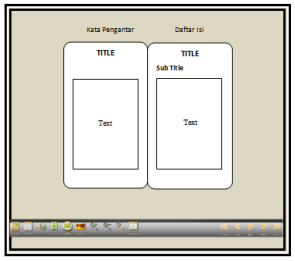
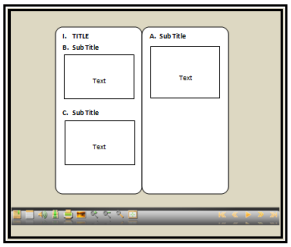
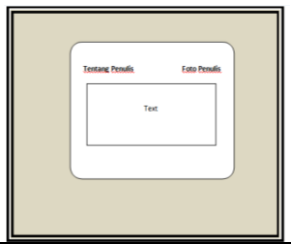
Font Cover 
initial equipment model 
Intoduction 
Activity unit 

Evaluation 
Module final equipment 
Back Cover 

5) Evaluation design

The evaluation design is in the form of research instrument designs used by researchers, namely: 1) instrument validation test questionnaires and electronic modules, 2) student response questionnaires, 3) teacher response questionnaires.

c. Development stage (Development)

1) Product early development before validation

a) Electronic module development

The initial product of the electronic module was made based on the design stage and before being validated by the validator.

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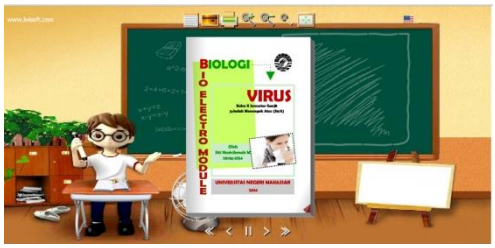
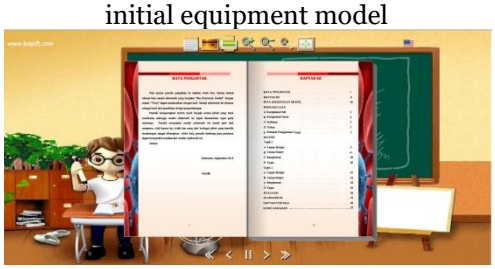
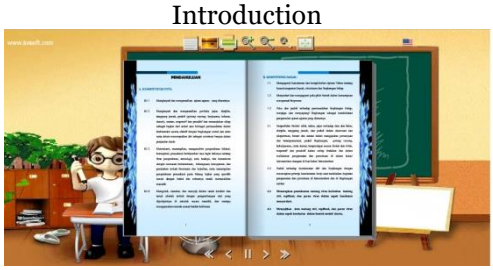
Font Cover 

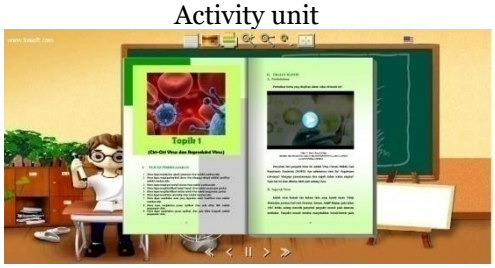
initial equipment model



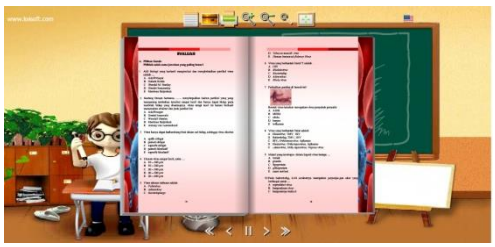
Introduction



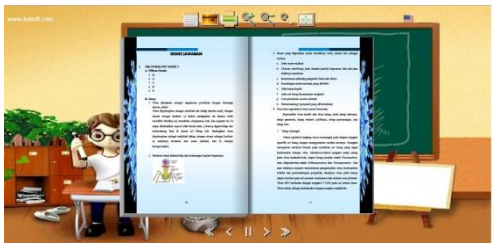
Activity unit



Evaluation



Module final equipment



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b) Development of product assessment instruments

The assessment instruments made were: (1) instrument validation test sheets, (2) electronic module validation instruments, (3) student response questionnaires, (4) teacher response questionnaires, and (5) question validation instruments. The initial results of instrument development are as follows.

(1) Instrument validation sheet

The instrument validation sheet consists of an electronic module validation instrument validation sheet, a teacher response questionnaire validation sheet, a student response questionnaire validation sheet, and a question validation instrument validation sheet.

(2) Electronic module validation test questionnaire

The electronic module validation instrument consists of ten assessment aspects, namely: 1) learning objectives, 2) concepts content, 3) didactical concepts, 4) organizational concepts, 5) technical concepts, 6) media concepts, 7) communication concepts, 8) concepts for test and evaluation, 9) design, 10) review of competency level. Each criterion for each aspect uses an assessment option, namely a score of 1 for a very poor assessment, a score of 2 for a poor assessment, a score of 3 for a fairly good assessment, a score of 4 for a good assessment, and a score of 5 for a very good assessment.

(3) How to validate the media and instruments that have been made

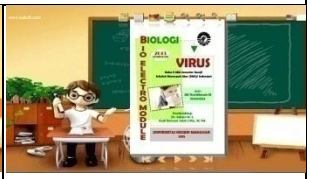
The electronic module that has been created is then validated by 2 validators. Instrument validation is the first validation stage carried out by researchers. The instruments that will be used in conducting research and development are first validated by the two validators, after the instrument is validated and declared valid by the validator, then the validation of multiple choice questions and questions in the form of descriptions will be entered into the electronic module. Validation of multiple-choice questions and description questions was also carried out by the two validators by providing an assessment using the validation instrument that had been made. Electronic module validation is the last validation stage carried out by researchers. The validation of the electronic module was also carried out by the two validators by providing an assessment on the electronic module instrument assessment sheet.

2) Product development after validation

a) Electronic module development

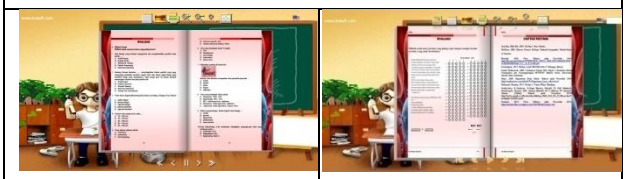
The electronic module development product underwent several changes after the first validation was carried out by the validator. The validation of the electronic module is not only done by providing an assessment on the validation sheet, validation is also done by providing suggestions for the improvement of the electronic module.

Table 2 Development of electronic modules on validation

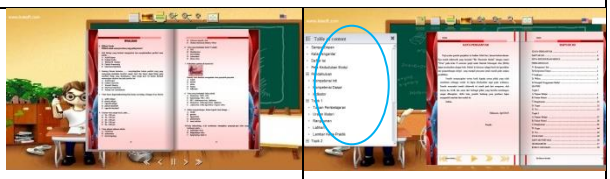
Before Validation	After Validation
1. On the cover page, add the name of the supervisor and add a description of the module developed based on the 2013 curriculum	
	

2. The pictures on various diseases caused by viruses are completed.

3. It is recommended that multiple choice questions be made in an interactive form.



4. The table of content facility available in the kvisoft software should be utilized.



The electronic module in the first validation no longer changes after being validated by the validator. The advice from the validator is only to tidy up the electronic module before burning it into a Compact Disk (CD). This validation is also carried out by providing an assessment on the electronic module validation sheet.

b) Development of product assessment instruments

The entire instrument in the initial product development that has been validated by 2 validators then undergoes several changes after validation is carried out. The validator provides input or suggestions for the instrument that has been developed by looking at the instrument and providing some suggestions in the suggestion column of the instrument validation sheet.

3) Quality assurance

Quality assurance is a step taken by researchers to find out the results of its development. The validator provides an assessment of the instruments and electronic modules that have been developed.

a) Validity Test

(1) Test the validity of the electronic module

The results of the validator's assessment during the validation process are presented in table 3.

Table 3 Results of the Validation of the Electronic Module

No	Rated aspect	Average score	Information
1	*Learning objective*	4,5	Valid
2	*Concepts content*	4	Valid
3	*Didactical concepts*	4	Valid
4	*Organizational concepts*	4,13	Valid
5	*Technical concepts,*	4,5	Valid
6	*Media concepts*	4,5	Valid
7	*Communication concepts*	4	Valid
8	*Concepts for tes and evaluation*		Valid
9	*Design*	4,5	Valid
10	*Review of competency level*	4	Valid
Average		4,30	Valid

The results of the analysis shown in table 3 above can be explained that the average value of the total validity of the electronic module is Va = 4.30, this value falls into the "valid" category (3.5 Va < 4.5).

In addition, before entering the questions into the electronic module, the questions were validated first. The results of the validation questions can be seen in tables 4 and 5.

Table 4 Validation Results of multiple-choice questions

No	Rated aspect	Average score	Information
1.	Instructional aspect	4,75	Very Valid
2.	Aspects of questionnaire component coverage	4,25	Valid
3.	Language aspect	4,17	Valid
Average		4,39	Valid

The results of the analysis shown in table 4 above can be explained that the average value of the total validity of the multiple-choice validation instrument is Va = 4.39, this value falls into the "valid" category (3.5 Va < 4.5)

Table 5 Validation Results about the description

No	Rated aspect	Average score	Information
1.	Instructional aspect	5	Very Valid
2.	Aspects of questionnaire component coverage	4,38	Valid
3.	Language aspect	4,17	Valid
Average		4,51	Very Valid

The results of the analysis shown in table 5 above can be explained that the average value of the total validity of the validation instrument on the form of the description is Va = 4.51, this value falls into the "very valid" category (4.5 Va 5)

(2) Validity of research instrument

Table 6 The results of the validation of the electronic module validation instrument

No	Rated aspect	Average score	Information
1.	Instructional aspect	5	Very Valid
2.	Aspects of questionnaire component coverage	4,25	Valid
3.	Language aspect	4	Valid
Average		4,42	Valid

The results of the analysis shown in table 6 above can be explained that the average value of the total validity of the electronic module validation instrument is Va = 4.42, this value falls into the "valid" category (3.5 Va < 4.5);

Table 7 Results of the validation of student response questionnaires

No	Rated aspect	Average score	Information
1.	Instructional aspect	5	Very Valid
2.	Aspects of questionnaire component coverage	4,25	Valid
3.	Language aspect	4	Valid
Average		4,42	Valid

The results of the analysis shown in table 7 above can be explained that the average value of the total validity of the student response questionnaire validation instrument is Va = 4.42, the value falls into the "valid" category (3.5 Va < 4.5) ;

Table 8 The results of the validation of the teacher's response questionnaire

No	Rated aspect	Average score	Information
1.	Instructional aspect	5	Very Valid
2.	Aspects of questionnaire component coverage	4,25	Valid
3.	Language aspect	4	Valid
Average		4,42	Valid

The results of the analysis shown in table 8 above can be explained that the average value of the total validity of the teacher response questionnaire validation instrument is Va = 4.42, this value falls into the "valid" category (3.5 Va < 4.5) ;

Table 9 The results of the validation of the multiple-choice question validation instrument

No	Rated aspect	Average score	Information
1.	Instructional aspect	4,75	Very Valid
2.	Aspects of questionnaire component coverage	4,25	Valid
3.	Language aspect	4,17	Valid
Average		4,39	Valid

The results of the analysis shown in table 9 above can be explained that the average value of the total validity of the multiple-choice validation instrument is Va = 4.39, this value falls into the "valid" category (3.5 Va < 4.5) ;

Table 10. Results of validation instrument validation questions

No	Rated aspect	Average score	Information
1.	Instructional aspect	5	Very Valid
2.	Aspects of questionnaire component coverage	4,38	Valid
3.	Language aspect	4,17	Valid
Average		4,51	Sangat Valid

10 above, it can be explained that the average value of the total validity of the validation instrument in the form of description is Va = 4.51, this value is included in the "very valid" category (4.5 Va 5)

Discussion

a. Electronic Module Validity

According to Arikunto (2010), validity is the level of validity of an instrument. A valid instrument is an instrument that is able to measure what it is supposed to measure. A valid or valid instrument has high validity. On the other hand, an instrument that is less valid means it has low validity.

The validity of the electronic module is tested at the stage of developing the electronic module. The electronic module development stage is carried out in accordance with the design stage that has been made by the researcher. The validation of the electronic module is carried out by 2 validators by viewing and assessing the electronic module that has been made, then assigning a value to the validation sheet instrument which has previously been validated by 2 validators. The validation of the electronic module was carried out 2 times to obtain good validity.

This electronic module validity test aims to see the shortcomings of the electronic module, both in terms of content and appearance of the electronic module. The validity of the electronic module is a requirement that must be met before the electronic module is implemented for research subjects. The assessment criteria used to determine the validity of the electronic module consist of 10 assessment aspects, namely learning objective, concepts content, didactical concept, organizational concept, technical concept, media concept, communication concept, concept for test and evaluation, design, review of competency level.

Based on the results of the data analysis of the validity of the electronic module, the validity value of the validator for each aspect of the assessment, namely learning objective is 4.5; concept

content is 4; didactical concept is 4; organizational concept is 4.13; technical concept is 4.5; media concept is 4.5; communication concept is 4; concept for test and evaluation is 4.25; design is 5; review of competency level is 4.5. So the average value of the validity of the electronic module is 4.34; it can be concluded that the electronic module is included in the "valid" category (3.5 Va < 4.5).

The validity of electronic modules is important to be tested, because validity is one of the criteria that determines a product development is said to be good and feasible. The validity of the electronic module is concluded to be in the valid category because the electronic module that has been made meets all aspects of the validity assessment.

The electronic module excels in the design aspect based on the validation results from the validators, where the validator gives an assessment in the very valid category, namely with 4.67. The advantage of the KVISOFT software-based electronic module apart from the design is the presence of navigation buttons that make it easy for users. Not only that, the material and questions contained in the electronic module have been tested for validity. Based on the validator's assessment, the material contained in the electronic module is included in the valid category and the questions contained in the electronic module are also included in the valid category.

Electronic modules can be used by students as a learning resource that they can use for independent learning, students can easily use them because electronic modules are also made based on their age range. Students can use the electronic modules wherever and whenever they need them. The validity of the electronic module based on the validator's assessment is sufficient to assess the quality of the product that has been made.

Conclusions

1. Conclusion

Based on the results of research and discussion, it can be concluded that the developed electronic module is valid. The validity category is 4.30 which means that the electronic module is classified as valid.

2. Suggestions

a. It is hoped that the electronic module can be used as a source of student self-study that can be used at home or at school.
b. It is hoped that further development, such as testing the practicality and effectiveness of the modules that have been developed, can be connected to the internet, made a website, and so on. Development can also be done on other biological materials, thus enriching learning resources that can be used by students.
c. The product developed still has many shortcomings, the authors expect suggestions and constructive criticism, so that in further research the resulting product can be more optimal.

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