IOSR Journal of Research & Method in Education (IOSR-JRME)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 10, Issue 2 Ser. I. (Mar. - Apr.2020), PP 41-52
www.iosrjournals.org

Development Of Electronic Physics Module For Class XI High School Semester 2 Using Model Inquiry Based Learning Integrated Approach Contextual Teaching And Learning

Yulkifli[1], Elmi Yanto, A.S[1], Rahmi Agustia, W[1]., Ifzi Ihsan [1], And Yohandri [1]
[(1)]Department of Physics, Universitas Negeri Padang, Indonesia
Corresponding Author: yulkifli

Abstract: *Utilization of technology can be used to change print teaching materials into non-print with the aim that students can learn independently and be more motivated to learn. One of the non-printed teaching materials is an electronic module. In the electronic module used there is an inquiry based learning model and an integrated contextual teaching and learning approach. This research aims to produce an electronic module using an inquiry based learning model integrated with the contextual teaching and learning approach with valid, practical and effective criteria. While the type of this research is development research with the development model used is ADDIE. The ADDIE model has five stages consisting of analysis, design, development, implementation, evaluation. The research instrument consisted of a validity questionnaire sheet, a practicality questionnaire sheet and an objective test sheet. The data analysis technique uses percentage descriptions for preliminary study analysis, validation and practicality. The effectiveness test uses N-gain analysis on knowledge competence. The results of the study concluded that the electronic module uses an integrated inquiry based learning model of contextual teaching and learning approaches meeting valid, practical and effective criteria. Therefore this electronic module is suitable for use in learning in schools.*
Keywords: *Electronic Module, Inquiry Based Learning, Contextual Teaching and Learning.*

Date of Submission: 27-02-2020 Date of Acceptance: 13-03-2020

I. Introduction

Education implemented in various countries is one of the most important components in improving the quality of human life in the country. Education always changes with the times and advances in Science and Technology (Science and Technology). Quality education can provide a very good contribution to a nation that can produce high quality graduates who can be formed through the learning process. The learning process is a process of interaction between students and teachers and other learning resources in order to achieve the expected goals through various experiences. Learning by utilizing current technological developments is expected to be able to explain abstract material and make it easy in the field of education to compile and develop teaching materials that are interesting, innovative and can increase the independence and curiosity of students.

One way to overcome the problem of independence of students is to use teaching materials in the form of modules. The module is one of the instructional materials that is arranged systematically and interestingly. The module is a book written with the aim that students can study independently without or with the guidance of the teacher. A module can be said to be good and interesting if (1) students are able to teach themselves, (2) whole subject matter, (3) not dependent on other media, (4) has a high adaptive power to the development of science and technology, and (5) friendly with students [1]. Therefore learning to use modules is seen as more effective, because modules are one form of independent learning material that can guide students to learn for themselves about the learning material provided.

Modules will be developed in accordance with the structure of module development and learning design by following the development of technology and information as outlined in a learning resource called an electronic module. The purpose of using electronic modules is to be implemented as an independent teaching material that can help students improve their understanding. Electronic modules can also be used anywhere, making it more practical to carry them anywhere and can present information in a structured, attractive manner and has a high level of interactivity. In addition, the learning process no longer depends on the instructor as the only information [2].

The expectation of the policy is that educators can make students able to learn independently, actively and make learning more enjoyable, especially in learning Physics. Physics in learning is one branch of science

that studies about natural phenomena. Physics has contributed a powerful idea in technological progress. Advances in technology that have been built are related to the progress of physics. To get good knowledge, students must be directly involved in the learning process, so that their competencies develop fully [3]. Therefore one of the learning activities of physics that is effective and truly reflects the nature of physics is to involve students directly through practical activities, so that learning that takes place is more meaningful.

The purpose of using non-printed teaching materials is so that students can learn independently and at any time, so that students' understanding of learning materials is increasing. Video, audio, simulation, animation and can make learning more fun and make it easier for students to learn [4]. In this non-printed teaching material used, the material to be used on a computer or cellphone can be used by students wherever needed. By utilizing technology and automatic information, comfort in learning becomes more enjoyable.

In the development of electronic modules used a learning model. The selection of learning models that can be adapted to the characteristics of successful learning, material, students, learning environment and the ability of teachers in the management system and setting the learning material environment [5]. using inquiry-based learning models in learning can instill ideas for students so as to make them easier to understand learning material [6]. The model chosen was Investigation Based Learning (IBL) based on material analysis conducted based on grouping material consisting of facts, concepts, principles, and procedures. The IBL model was chosen because the learning material could be announced for the procedural category.

The use of the IBL model in ongoing learning activities requires students to carry out concept inquiry activities independently, so that students are directly involved in the discovery of concepts. The IBL model in a learning process is able to involve students directly into real life by conducting their own investigations of a learning material [7]. While the IBL model can invite students to think critically, logically, and systematically [8]. The use of the IBL model in learning is expected to help students in understanding the concepts contained in the electronic module well.

Electronic module development using the IBL model is supported by integrating the Contextual Teaching and Learning (CTL) approach. The purpose of using the CTL approach in learning aims to link learning materials experienced by students in daily life. CTL can motivate students to direct their own learning and to link knowledge and its application with every context found in their lives [9]. Combining the IBL model with the CTL approach in the electronic module is expected to make students able to find concepts in physics learning, make students more active, more motivated, so that learning becomes more meaningful and can improve students' learning competencies especially knowledge competencies.

II. Method

In the research conducted using the ADDIE development model. ADDIE stands for Analysis, Design, Development, Implementation and Evaluations [10]. In the analysis phase, the main activity is to analyze the development of electronic modules and the eligibility and requirements needed in the development of electronic modules. In developing electronic modules, first see if there are problems in the teaching materials used. Problems can occur due to the teaching materials used now that it turns out to be incompatible with the needs of the current technological era. At this stage of the analysis needs analysis, learner analysis, independence analysis, material analysis, and task analysis. The analysis phase carried out aims to determine the process of identifying problems that exist in the field that are always faced by students. the results will be obtained in the form of detailed student characteristics.

The planning stage is a structured process starting from determining important components consisting of determining learning objectives, designing learning activities, designing learning tools, designing learning materials to be applied and designing evaluation tools used to view learning outcomes. The fundamental purpose of the design stage is to show the design of the product being made. Products designed in the form of electronic modules use an inquiry based learning model integrated with contextual teaching and learning approaches. The main structure of the electronic module uses an integrated inquiry based learning model of contextual teaching and learning approaches including: general instructions, competencies, subject matter of learning material, content material, exercises, worksheets, evaluation, feedback and references.

The development carried out is a process in realizing designs that are made into reality. That is, the planning framework created has developed the electronic module. The steps undertaken in the development stage include validating by experts and conducting trials before being implemented. The electronic modules developed are first validated by experts or practitioners who act as validators. The purpose of the electronic module validation is to see the correct use of grammar, material concepts, views and indicators developed. Validation serves to determine whether a product is based on existing criteria such as material, construction, and language. The most important part of the validated electronic module is the suitability of basic competencies, indicators, language, and correctness of the concepts used. All stages of validation are said to be complete, if the validator if the validator declares valid against the electronic module so that the electronic module is ready to be tested. The input from the validator of the validation used is used as a reference to improve the developed

electronic modules. Validation is done using an electronic module validation sheet that is filled out by the validator.

Implementation is a concrete step to implementing the electronic modules that we are making. The implementation phase will run a program that has been prepared to see the system and functional instructors. That is, at this stage everything that has been developed is installed or set in such a way according to its role or function so that it can be implemented. At the implementation stage, researchers conduct practicality tests. Practicality is the level of use by teachers and students which is carried out by carrying out trials using revised electronic modules based on the assessment by the validator. This activity aims to find out the benefits, ease of use and time efficiency of electronic modules by students. In addition, at this stage an evaluation is also carried out to see the effectiveness of the electronic module. The target of this research is to obtain students' knowledge competency data after using an electronic module.

Evaluation is a process to see whether the electronic module being developed is successful, according to initial expectations or not. At this stage, quality measurements of products and processes are carried out before and after the implementation of activities. At this evaluation stage what is done is formative and summative evaluation. Formative evaluation is an evaluation conducted at each stage of the use of electronic modules whose purpose is for the needs of revision, while summative evaluation is an evaluation conducted at the end of the use of electronic modules with the aim to see the implementation in the use of electronic modules to the learning outcomes is carried out to determine the effectiveness of electronic modules developed .

III. Result And Discussion

Present the results in this study regarding the development of electronic modules using an inquiry based learning model integrated the contextual teaching and learning approach by using the ADDIE development model. The ADDIE development model process starts from the analysis, design, development, implementation, and evaluation stages. The analysis phase is the initial stage in the development of electronic modules. At this stage the researchers conducted field observations, and conducted analyzes to identify problems and possible solutions to solve those problems. This analysis phase consists of needs analysis, student characteristics analysis, independence analysis, material analysis, and task analysis. Needs analysis is the process of getting information about the needs carried out in learning activities so that an electronic module development is needed. This stage consists of an analysis of performance, graduation standards, and learning difficulties.

The results of the performance analysis include the identification of the teacher and the completeness of the facilities and infrastructure. Performance analysis seen is the learning tools prepared, the use of approaches, models, methods and learning media, supporting the learning process, evaluation, and timeliness of activities that have been scheduled. It was also seen, how the state of educational facilities and infrastructure used by teachers for graduation standard analysis included knowledge, skills, spiritual and social attitudes. While learning difficulties include media analysis, teaching materials, learning models, and learning approaches used during the learning process. The results obtained for teacher identification are included in the sufficient category, where the teacher has prepared the learning tools well and has the skills to use various methods. However, for the use of teaching materials and time efficiency is still lacking. When compared with the sub-indicators of the completeness of facilities and infrastructure, teacher identification has a lower percentage value. This is due to the existence of several indicators that need to be improved, namely supporting indicators of the learning process relating to using teaching materials in the learning process, using teaching materials and other learning resources in the learning process, compiling the teaching materials themselves and starting and ending the learning process according to the scheduled time.

The results of the graduation standard analysis show that the aspects of the spiritual and social attitudes of students which are rated by teachers are very good which have a far higher value than aspects of knowledge and skills that have enough categories. Indicators of concern are that some students are still unable to solve problems that occur in learning activities. In the aspect of knowledge, it can be seen that students have not been able to find facts, concepts, principles, and procedures related to learning material. As for the analysis of learning difficulties, the function is to show the factors that can influence the learning process. While the results show that all sub-indicators of learning difficulties analysis are in the sufficient category. This is seen in the statement that students become less active while using existing teaching materials. Therefore the indicators of learning difficulties analysis need to be improved to make students active in analyzing problems.

The results of the study of the analysis of student characteristics consisting of analysis of general abilities, analysis of learning styles, attitude analysis, analysis of knowledge and analysis of skills. Acquisition of analysis on aspects of the actual ability in terms of three indicators namely: general ability, creativity and motivation towards learning. Judging from the assessment on each statement, there are most students stating the problem in the use of teaching materials, feeling bored in studying Physics, lack of curiosity and feel difficulty in learning Physics. For the analysis of learning styles including visual, audiotorial, and kinesthetic, the average

learning style shown by students during learning is in the sufficient category. This indicator analysis data gives a picture that students have different learning styles, therefore the incorporation of all learning styles will be better so that students become accustomed to applying all types of learning styles that are actually owned by each student, only it hasn't been applied well. Student attitude analysis which consists of spiritual and social attitudes has an average percentage in both categories. This data analysis illustrates that students already have an appropriate attitude towards religious teachings and social attitudes in each learning process.

For the analysis of knowledge which includes indicators of facts, concepts, principles and procedures have an average percentage in the sufficient category. Based on the analysis for each sub-indicator it appears that students still have problems in knowledge of facts, concepts, principles and procedures. This analysis data gives an illustration that students still enjoy learning Physics by listening to the teacher lecture and memorize formulas, and are not accustomed to understanding images, videos, or Physics objects in daily life. The results of the skills analysis show students are still not skilled in doing paractic activities, based on the average skill having a percentage in the sufficient category.

Independence analysis conducted for a preliminary study of the independence of students in learning physics is done by giving a questionnaire. The questionnaire given was filled in by the students according to the level of independence of the students. Based on the questionnaire obtained an average value of independence of students by 62.29%. The data illustrates the independence of students already in the sufficient category. But if the independence of the students continues to be trained, it will create a generation that is independent and able to solve their own problems, especially in learning Physics.

Material analysis needs to be done before developing the electronic module because it is used as a basis in knowing materials relevant to curriculum demands. Material analysis will also be related to the selection of learning models and effective approaches, so that the learning objectives are as expected. Material analysis is the identification of the material to be taught and arranging it systematically and linking one material with relevant material, such as concepts, principles and procedures can be associated with natural phenomena in everyday life. To facilitate analysis, it can first be made in the form of concept maps based on IC and BC. The concept map made consists of thermodynamic material, mechanical waves, sound waves, light waves, optical devices and symptoms of global warming. Based on the analysis of the task that has been done shows the task given by the teacher is in accordance with the competencies to be achieved, according to the material being studied, in accordance with the learning objectives and can improve the desired competencies.

Based on the analysis that has been done from the needs analysis, the characteristics of students, the independence of the material and the task, the design of the electronic physics module for class XI high school semester 2 using the integrated IBL model CTL approach. The results obtained in the design phase include the results of electronic module design as needed, to produce a draft electronic module that will be used in research. This electronic module is designed according to the module structure.

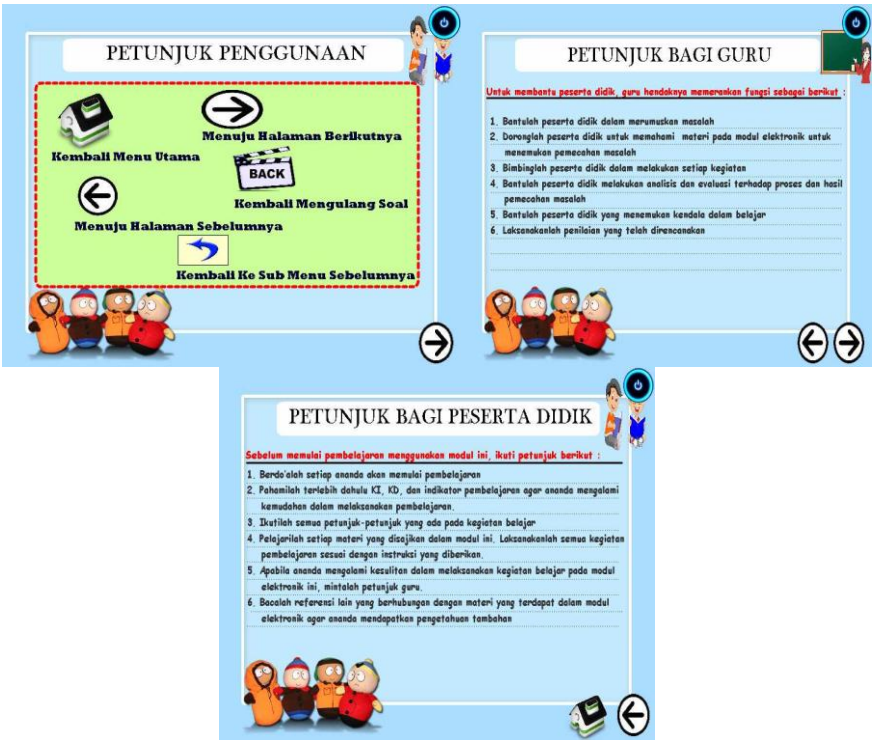


Figure 1. Instructions for Use, Instructions for Teachers and Instructions for Students

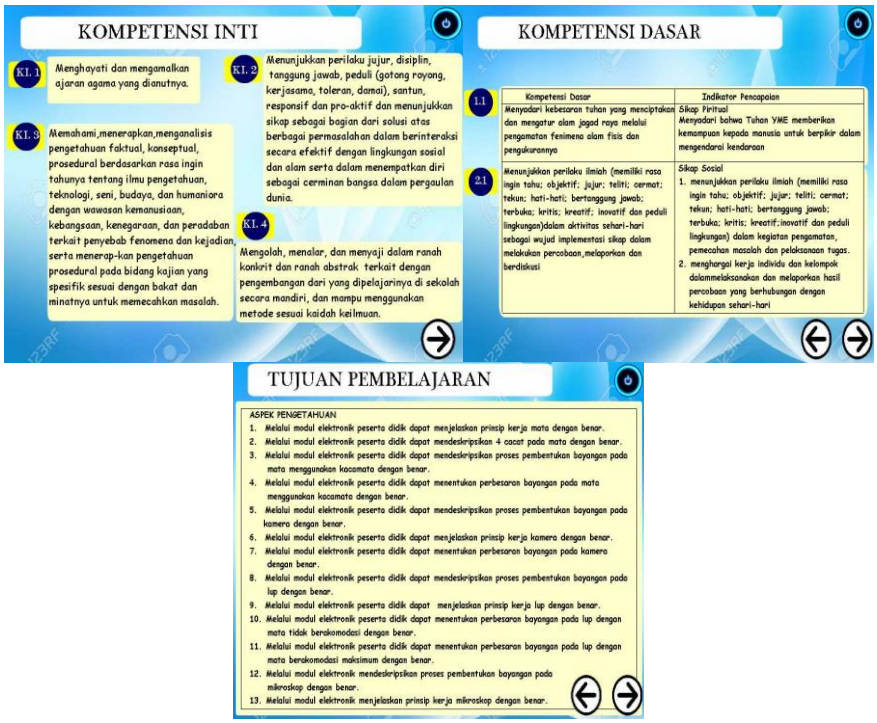


Figure 2. Core Competencies, Basic Competencies, Learning Indicators and Learning Objectives

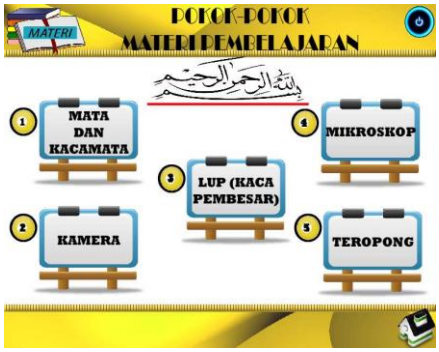


Figure 3. Main Learning Materials

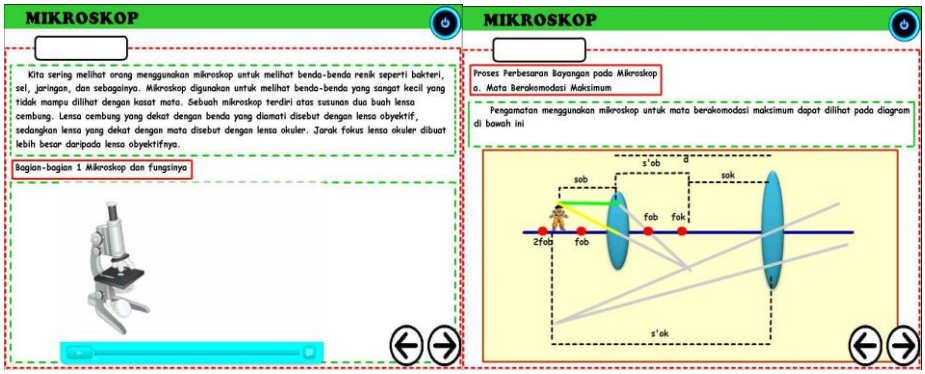


Figure 4. Content of Material

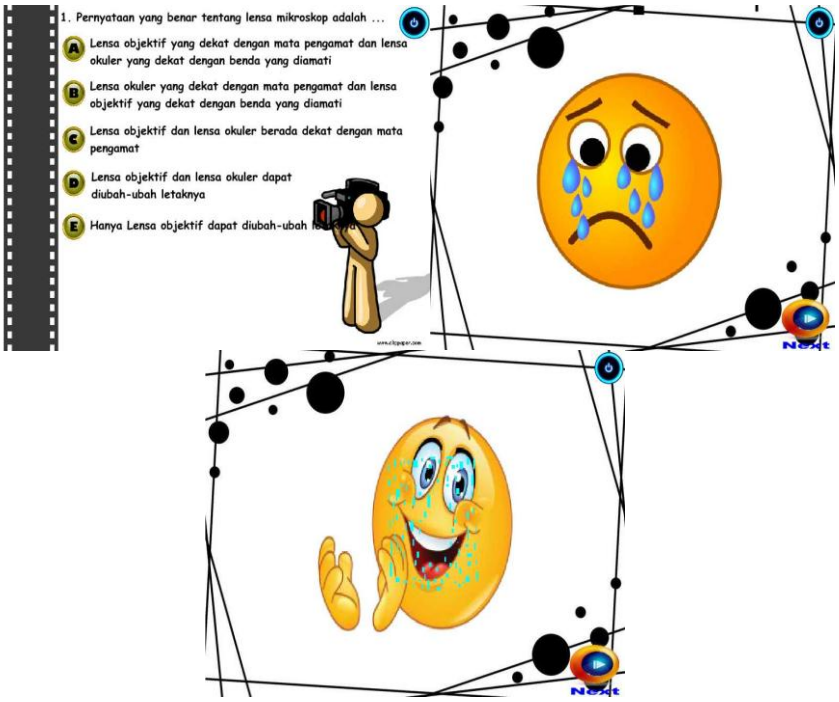
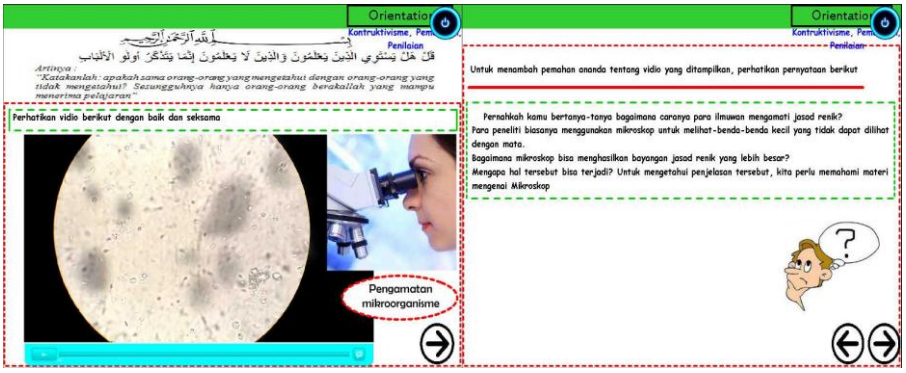
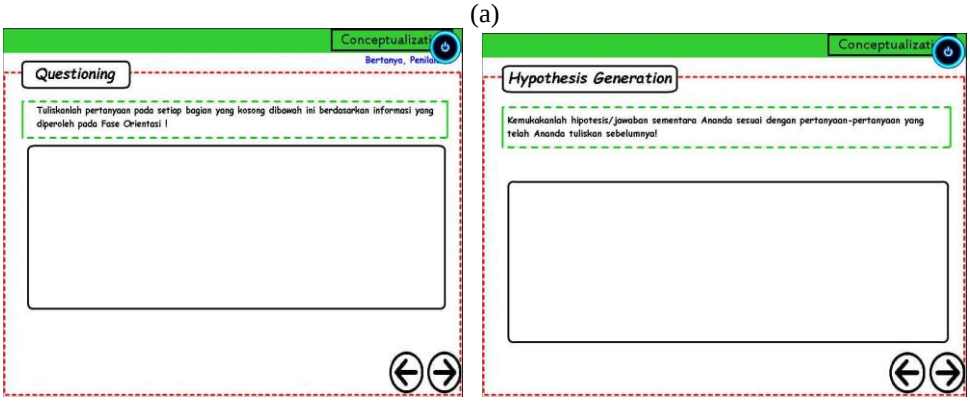


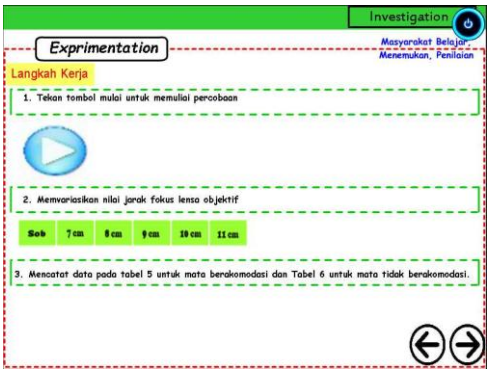
Figure 5. Exercise



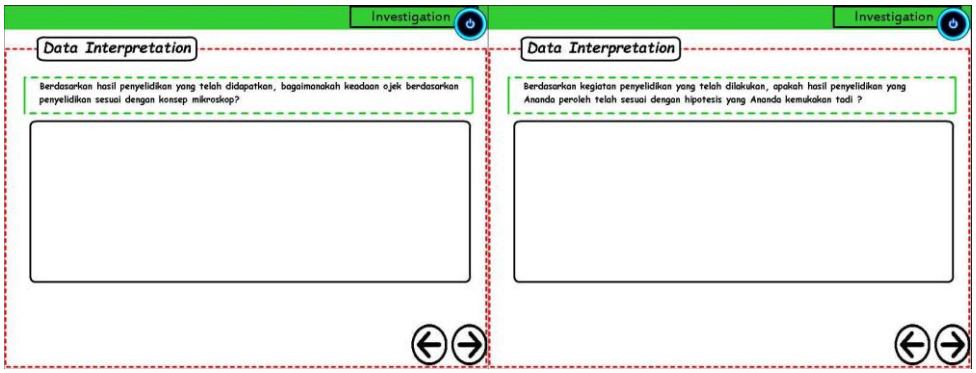
(a)



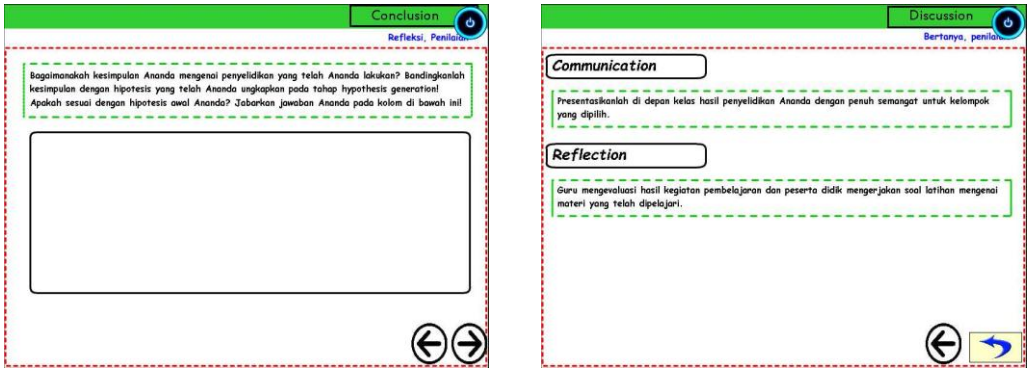
(b)



(c)



(d)



(e) (f)

Figure 6. Inquiry Based Learning phases integrated contextual teaching and learning approach.

Figure 7. Evaluation

Figure 8. Feedback

Figure 9. References

After the electronic module planning stage the next stage is development. At this stage the electronic module that has been designed will be seen for its validity. At this stage assisting researchers in developing and improving electronic modules that are developed so as to produce a valid and practical electronic module. Electronic module validation using the integrated IBL model CTL approach consists of four aspects namely content, language, presentation and graphic aspects. The results obtained from the electronic module validation stage are shown in Table 1.

Table 1. Electronic Module Validation Results

Aspect	Value V	Category
Content	0,86	Valid
Language	0,86	Valid
Serving	0,90	Valid
Graphical	0,93	Valid

Based on Table 1, it is shown that the electronic modules developed with an average value of 0.89 are in the valid category, with a V value greater than 0.6 based on the aspects of content, language, content and graphics obtained. Thus it can be concluded that this electronic module can be used for the learning process. The implementation phase aims to produce electronic modules in practical categories. At the implementation stage, the practicality and effectiveness of the electronic modules has been validated. The practicality test is obtained from the results of the questionnaire completed by the teacher and students. Results Questionnaire responses of teachers in using electronic modules can be seen in Table 2.

Table 2. Results of Practicality of Electronic Modules by Teachers

Aspect	Value (%)	Category
Can be used	97,92	Very Practical
Easy to use	96,43	Very Practical
Interesting	96,87	Very Practical
Efficient	96,87	Very Practical
Average	97,00	Very Practical

Table 2 shows the practicality of electronic modules by teachers having an average of 97.00% with a very practical category. That is, the electronic module developed is easy to understand, interesting, and can be used efficiently by the teacher so that it can be said to be very practical for the teacher. While the electronic module practicality data analysis by students can be seen in Table 3.

Table 3. Results of Practicality of Electronic Modules by Students

Aspect	Value (%)	Category
Can be used	89,02	Very Practical
Easy to use	88,47	Very Practical
Interesting	89,37	Very Practical
Efficient	94,29	Very Practical
Average	89,40	Very Practical

Based on Table 3 the average results of the practicality of electronic modules by students is 89.40% with a very practical category. That is, the electronic module is easy to understand, interesting, and efficient in the use felt by students. The effectiveness test is done by giving test questions before and after the use of electronic modules to students, the effectiveness test is carried out on knowledge competence. Increased competence of students' knowledge is obtained through differences in the average pretest results and the average posttest results. Based on the results obtained, the average value of students' pretest is 32.46. After using the electronic module obtained an average post-test score of 77.94. Following are the data of the students' pretest and posttest results in Figure 10.

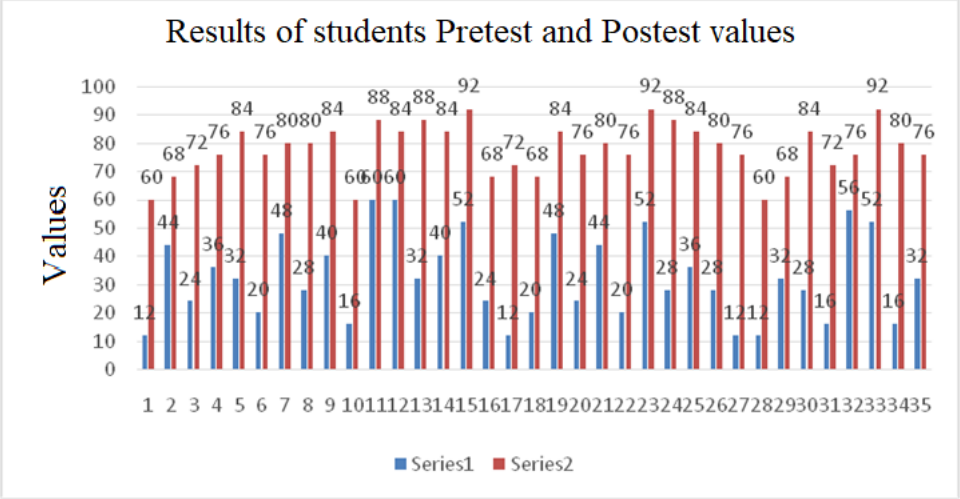


Figure 10. Student Pretest and Postest Value Data

Based on the students 'pretest and posttest scores, it can be seen that the increase in students' knowledge competence towards learning material using electronic modules. Following is the data presentation on students' competency improvement based on the N-gain formula in Table 4.

Table 4. Data Increased Competence of Student Knowledge

Student Number	Pretest	Postest	Ngain	Category
1	12	60	0,55	Medium
2	44	68	0,43	Medium
3	24	72	0,64	Medium
4	36	76	0,63	Medium
5	32	84	0,77	High
6	20	76	0,7	Medium
7	48	80	0,62	Medium
8	28	80	0,73	High
9	40	84	0,74	High
10	16	60	0,53	Medium
11	60	88	0,7	Medium
12	60	84	0,6	Medium
13	32	88	0,83	High
14	40	84	0,74	High
15	52	92	0,84	High
16	24	68	0,58	Medium
17	12	72	0,69	Medium
18	20	68	0,6	Medium
19	48	84	0,7	Medium
20	24	76	0,69	Medium
21	44	80	0,65	Medium
22	20	76	0,7	Medium
23	52	92	0,84	High
24	28	88	0,84	High
25	36	84	0,75	High
26	28	80	0,73	High
27	12	76	0,73	High
28	12	60	0,55	Medium
29	32	68	0,53	Medium
30	28	84	0,78	High
31	16	72	0,67	Medium
32	56	76	0,46	Medium
33	52	92	0,84	High
34	16	80	0,77	High
35	32	76	0,65	Medium

Referring to Table 4, it can be seen the comparison of results for pretest and posttest, then it can be seen an increase in student learning outcomes using N-gain scores. Based on an analysis of student learning outcomes on knowledge competency using gain scores, it can be stated that there is an increase in the average of

learning outcomes. This is clearly seen in the results of an increase in gain score of 0.67 which is categorized as moderate. Therefore, it can be concluded that the electronic modules used can improve students' knowledge competency and are declared effective for use in learning activities in the medium category.

The evaluation stage consists of two, namely formative and summative evaluation. Formative evaluation stage is the stage of data collection conducted for each stage used in the improvement process, meaning that formative evaluation aims to revise the electronic module using an inquiry based learning model integrated contextual teaching and learning approach in accordance with the inputs at each stage of the development model. The first stage of the ADDIE development model is analysis, during this stage suggestions are given to add preliminary studies. The second stage in product design is in accordance with the analysis conducted, at this stage there are few obstacles namely in designing electronic modules. Everything can be overcome, so that the resulting electronic module design is in accordance with the advice of the supervisor and validator. At the development stage the validity of the electronic module research instrument was carried out, for this stage not too significant difficulties were found in hindering this research. The results of the development stage are obtaining valid categories for research instruments and electronic modules using an inquiry based learning model integrated in the contextual teaching and learning approach.

Furthermore, at the implementation stage a limited trial is carried out to produce electronic modules with practical categories. However, at this stage there were no difficulties which could hamper this research. The implementation results obtained are electronic modules with effective tendencies. As for effectiveness seen from the knowledge competence of students, at this stage there are no significant errors to be corrected. After conducting a formative evaluation for each stage of the development model and having been revised in accordance with the advice given, a summative evaluation is carried out. Summative evaluation is done at the end of the program, so that it can be concluded that the electronic module using the IBL integrated CTL approach is in the valid, practical, and effective criteria.

IV. Conclusion

Based on the results of research and development carried out starting from the analysis, design, development, implementation, and evaluation obtained an electronic module using an inquiry based learning model integrated contextual teaching and learning approach with valid, practical and effective criteria the following conclusions are obtained:

1. The electronic modules developed are valid criteria with an average value of 0.89. The validation includes aspects of content, linguistic, serving, and graphic. Products developed after validation are valid criteria.
2. Practicality for the use of electronic modules by teachers and students namely 97.00 and 89.30 which are very practical criteria. Thus, the development of electronic modules received positive responses from both teachers and students.
3. The results of the effectiveness stage using a gain score, can be declared an average increase in learning outcomes. This can be seen through the increase in gain score of 0.67 which is categorized as moderate. Thus, it can be concluded that the electronic module uses an integrated inquiry-based learning model integrated contextual teaching learning approach otherwise effectively used in learning.

Acknowledgments

The authors would like to thank the Rector to Universitas Negeri Padang, PNBP, No. Contract: 814/UN. 35.13/LT / 2019. Thank you to all those who have helped implement this research.

References

[1]. Panduan pengembangan bahan ajar, (Jakarta, Depdiknas : 2008)
[2]. Gunadharma, Ananda. Pengembangan Modul Elektronik sebagai Sumber Belajar untuk Mata Kuliah Multimedia Desain. Artikel Ilmiah Tugas Akhir. (Fakultas Ilmu Pendidikan Universitas Negeri Jakarta : 2011).
[3]. Yulkifli, Melia, Vivi, Ningrum dan Widyaningrum, Indrasari. The Validity of Student Worksheet Using Inquiry-Based Learning Model with Science Process Skill Approach for Physics Learning of High School. JPPPF. 2019.5 (2) :155-162**.**
[4]. R Anggraini, Y Darvina, H Amir, M Murtiani, dan Y Yulkifli. Electronic Module Design with Scientifically Character-Charged Approach on Kinematics Material Learning to Improve Holistic Competence of High School Students in 10th Grade. IOP Conf. Series: Materials Science and Engineering 335 (2018) 012075
[5]. Kurikulum 2013 Sekolah Menengah Atas, (Jakarta, Permendikbud Nomor 59 : 2014)
[6]. Harry, Satria, Yulkifli, dan Ramli. Development of Natural Science Books Inquiry Based Learning Model with Character Contents. IOSR Journal of Research & Method in Education (IOSR-JRME). e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 9, Issue 3 Ser. I. (May. - June .2019), PP 49-56.
[7]. Nurjanah, nunung. Penerapan Model Pembelajaran Inquiry Based Learning dalam Meningkatkan kemampuan Berhitung dan Operasi Bilangan Anak Usia Dini. 2017; 3(2): 105 – 119
[8]. Kusmaryono, Heru dan Setiawan, Rokhis. Penerapan Inkuiry Based Learning untuk mengetahui Respon Belajar Siswa pada Materi Konsep dan Pengelolaan Koperasi. JPE DP. 2013; 7(2) : 133 – 145
[9]. Fadhilah,Z, Mawardi, Effendi dan Ridwan. Analisis of contextual teaching and learning (CTL) in the course of applied physics at the mining engineering department. Sci. 2017; 1(1) : 25-32
[10]. A.Pribadi, Benny. Model Desain Sistem Pembelajaran. (Jakarta: Dian Aksara. 2010)

Yulkifli"Development Of Electronic Physics Module For Class XI High School Semester 2 Using Model Inquiry Based Learning Integrated Approach Contextual Teaching And Learning." *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 10(2), 2020, pp. 41-52.