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Original Research Article

Development of Integrated Science Modules to Train Students' Critical Thinking Skills

Rabiatul Adawiyah[1*], Badruzsaufari[2], Rahmat Yunus[3]

[1]Masters Program of Natural Sciences Teaching, Lambung Mangkurat University, Banjarmasin, Indonesia
[2]Department of Biology, Faculty of Mathematics and Natural Science, Lambung Mangkurat University, Indonesia
[3]Department of Chemistry, Faculty of Mathematics and Natural Science, Lambung Mangkurat University, Indonesia

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***Corresponding author:** Rabiatul Adawiyah

Abstract

This development research is aimed to evaluate the validity, practicality, and effectiveness of the integrated science concept module that has been developed to practice the critical thinking skill of the eighth-grade students in the odd Semester. The subject of the research are the the eighth-grade students of MTs Al Azhar Barito Kuala. This research is conducted in the academic year 2019/2020. The data of module validity is gained through the assessment of 3 experts. The data of module practicality includes the assessment of module implementation and students' responses on small group test. The data about module's effectiveness is gained from; 1) the result of students' critical thinking, 2) the result of cognitif students' assesment and 3) students' response on the learning activities and the practice in the field test. Data of the research were collected through test and observation and then were analyzed descriptively. The results of the research showed that the integrated science module to practice the students' critical thinking skills could be stated to be valid in all aspects, including design, format, material, language, presentation, supporting innovation of the module and the improvement of teaching learning activities. The module was also considered practical because it was easy to be used by the students. These can be seen from 1) the implementation in the small group test that obtained scores of 91,67% for module 1 and 94,44% for module 2 and 2) positive response from students toward learning process. The effectiveness of the science module was also fulfilled. This was based on the findings in the research i.e: 1) the average of students' critical thinking skills on small group test reaches a good category (3≤4), 2) students' critical thinking skills on the field test which at least reaches a good category (3≤4), and 3) cognitif assesment results gained through the field test was in a good category (80≤100%).

Keywords: Integrated science module, critical thinking, effectiveness.

INTRODUCTION

The 2013 curriculum is an Education Unit Level Curriculum (KTSP) which focuses on mastering contextual knowledge according to each region and environment. The curriculum emphasizes student assessment of three things: attitude (honest, polite, disciplined), skills (through practical assignments/school projects), and scientific knowledge. The 2013 curriculum requires students to find out for themselves what teachers are assigned to science subjects so that learning will run effectively and efficiently and are interconnected with scientific approaches.

Minister of National Education Regulation No.22 of 2006 concerning Content Standards (SI) that the substance for science subjects at the SMP/MTs level is implemented in an integrated manner. Furthermore in the Ministry of Education Decree No. 65 of 2013 that the RPP is compiled for each basic competency that can be carried out in one or more meetings and must pay attention to the interrelation and integration between Core Competencies (KI), Basic Competencies (KD), learning materials, learning activities, indicators of competency achievement, assessment, and learning resources in a wholeness of learning experiences. This proves that the application of integrated science learning in SMP/MTS has a strong legal basis. One of the goals of science education is to provide students with the ability not to memorize concepts, but the ability to apply concepts obtained in everyday life [1, 2]. Besides that students can also develop positive attitudes when studying Natural Sciences [3]. This is because the activities in science are always related to experiments that require skill and perseverance. Science

is not just a collection of knowledge about objects or living things, but it involves how to work, how to think, and how to solve problems.

The fact that is happening at this time science learning in schools still experience some problems that can hinder students' critical thinking attitudes. The learning process in schools at this time the teacher has not provided optimal opportunities for students to be able to develop their creativity. As a result, most students are unable to link and use the science concepts they learn to address the problems they face [4]. Yet according to [5] science learning is closely related to daily life so students have a variety of experiences about a concept based on what is seen everyday. Learners try to rationalize learning experiences based on their initial knowledge. Therefore teachers should be able to design effective learning to help students connect their initial knowledge with new information so as to produce meaningful learning [6]. This is in line with Ucak & Guzeldere [7] which states that students can understand new information when the information is related to what was previously obtained. If the teacher is not optimal in producing effective learning, it will certainly trigger problems related to science learning.

The application of integrated science learning requires professional teachers with learning tools that support integrated science learning in schools. According to Amy & Cherin [8] a science teacher will be able to provide science knowledge to students in a simple and precise procedure if the teacher masters the science material well. In addition, learning tools are indispensable for guidance for teachers and students. Learning tools that can be prepared include teaching materials in the form of integrated science modules that contain the scope of the field of natural sciences so that they can complement pre-existing teaching materials.

The learning done by Al Azhar MTs teachers is not optimal because it is done with lectures without using learning methods, moreover developing process skills (practicum) and critical thinking skills possessed by students are less used. One reason is the lack of support for module books that educate students to develop process skills (practicum) and critical thinking skills. BNSP [9] explains that Integrated Science learning in SMP / MTs emphasizes providing direct learning experiences through the use and development of scientific process skills and attitudes. This is in line with Hansen & Lovedahl [10] which states that learning by doing is an effective learning tool, meaning that a person will learn effectively if he does. Therefore, the module developed in this study applies a process skills approach to develop students 'critical thinking skills in the hope that integrated science learning can be carried out by prioritizing the development of students' skills.

Integrated science learning has very complex characteristics because it requires critical thinking in analyzing an issue. Giving students critical thinking is one of the outcomes expected from science education. But in reality students of science learning now still apply conventional methods as according to the Depdiknas [11], stating that the tendency of learning science at present is only oriented to science products. This is shown by the large number of students who study natural science by memorizing concepts, principles, laws, and theories. As a result, the dimensions of attitudes, processes and applications cannot be achieved optimally. Therefore, it is necessary to make changes in learning science.

The PISA 2015 literacy results indicate that students in Indonesia still have low level thinking skills, especially in the implementation of science. Overall the scientific literacy of Indonesian students based on 2015 PISA study data is relatively low, ranking 62 out of 69 countries evaluated [12]. The ability to think at this low level has not shown any significant improvement over time. According to Susilo *et al*., [13], states that learning by science teachers does not make students accustomed to practice to actively think critically. Therefore, learning is needed that can train students' critical thinking skills.

Thinking skills can be obtained through practical activities in the learning process (classroom activity), while the learning process at school tends to be oriented towards student activities that contain thinking abilities. If this is ignored, the abilities of Indonesian children will remain underdeveloped. Therefore it is necessary to innovate that is oriented towards the learning process. According to Glasser [14] defines critical thinking as (1) an attitude of wanting to think deeply about issues and things that are within the reach of one's experience; (2) knowledge of logical examination and reasoning methods; and (3) a kind of skill to apply the methods. Critical thinking requires a concerted effort to examine every assumptive belief or knowledge based on supporting evidence and the conclusions that result.

Based on preliminary observations at MTs Al Azhar Barito Kuala integrated science learning has not yet taken place. The reason is that science teachers at these schools have different disciplines and there are still limited media learning tools or integrated science learning resources both for teachers and students so that learning is carried out separately. Therefore, this study will develop instructional materials in the form of learning modules in odd semester with the theme: (1) Framework, Muscle, and Simple Aircraft, (2) Additive and Addictive Substances which are packaged in integrated science modules.

Various development studies have been reported by Asnida [15] reporting the results of research on critical thinking skills, character behavior, good social skills, improved learning outcomes and student performance accompanied by excellent student and teacher responses. This study chose the module because the variation of teaching materials currently in school are textbooks and worksheets that have not been integrated, so the need for the development of other teaching media in the form of modules to encourage students to learn more independently. Prastowo [16] states that a module must be able to be used as teaching material in lieu of the educator's function. So if the educator in this case the teacher has the function to explain something, then the module must be able to explain something in a language that is easily accepted by students as well as the teacher.

Based on that background, one of the ways that can be taken to provide integrated science teaching materials is to compile integrated science modules with a process approach to all odd semester material, it is hoped that the integrated science module can overcome the constraints of implementing integrated science in terms of the limitations of the guidebook. Majid [17] states that the module is an independent learning package which includes: a series of learning experiences that are planned and systematically designed to help students achieve learning goals. By using integrated science modules students will be trained and accustomed to learning integrated science students will be trained and accustomed to learning integrated science so that later they can produce quality graduates.

RESEARCH METHODS

Development research using the Tessmer model aims to improve the product. The product studied was the 2013 Curriculum Integrated Science learning module in 8th grade. This type of research was Formative Evalution. The trial design is guided by the formative evaluation flow design. The groove design includes self-evaluation. Self-evaluation to adjust the draft module that has been made with the 2013 curriculum. Expert opinion is used to determine content validation (relevant). Individual trials are used to establish the practicality of expectations through module readability. Small group trials to establish the actual practicality gained from the implementation of the module. Small group trials are also used for the effectiveness of expectations derived from students' ability to do module assignments. Field trials are used to determine the actual effectiveness.

The research subjects were determined purposively based on micro cycles with a total of 41 students during the trial. This type of research data includes: validity data, practicality data, and effectiveness data. Data collection techniques in the development of this module were obtained from the module validation sheet and notes regarding improvements or suggestions from the opinion of the expert team. Practicality data is collected through student readability test sheets on individual tests and observation sheets of module implementation in small group tests. Data about the effectiveness were obtained from through the students' cognitive learning outcomes assessment sheet and student critical thinking skills.

RESEARCH RESULTS AND DISCUSSION

Module Validation

The results of the Integrated Science Module Development in the form of validity data are obtained from expert validation data. Validated Integrated Science Module Development includes 1) Module design, 2) format, 3) material, 4) language, 5) presentation, 6) supporting innovation and improving the quality of teaching and learning activities. The focus of validation is directed at content validation (content) conducted by three validators with a composition of two from the expert and one from the practitioner. Details of the validation results are described in Table-1.

Table-1: Module Validation Results

No	Validated Indicator / Aspect	Score			Modus	Category
		1	2	3		
1.	Module Design	4	4	4	4	Very Valid
2.	Module Format	4	4	4	4	Very Valid
3.	Module Material	4	4	4	4	Very Valid
4.	Material Linguism	3	4	3	3	Valid
5.	Presentation of Content	4	4	4	4	Very Valid
6.	Supporting innovation and improving the quality of teaching and learning activities	4	4	4	4	Very Valid

The development of Integrated Science modules is declared valid based on the results of the validity data of the experts on the aspects of module design, format, material, linguistic, presentation, supporting innovation and improving the quality of the KBM as indicated by the results of expert validation in the very valid category. The results of this study are in line with previous findings Angkowati [18] that the development of science learning modules that are carried out is valid; Imama [19] that greening school-based modules on plant classification are said to be valid; Pratiwi [20] that the development of learning modules has been said to be valid; Setyowati *et al*., [21] and Mingle [22] that the development of modules as teaching materials is feasible to use.

This finding is in line with the requirements of the Depdiknas [23] that the development of teaching materials in general that are assessed by experts including the content eligibility component, presentation component and linguistic components must be valid before being used in previous tests. The Integrated Science Module is developed according to the conditions of students who use it in learning. The validity of the Integrated Science module developed in this study has fulfilled the rules of product development both module design, format, material, linguistic, presentation, supporting innovation and improving the quality of the KBM as indicated by the results of expert validation in the very valid category.

The teaching material developed in this study is a learning module that contains 2 main materials, namely (1) Framework, muscle and simple plane principles, and (2) Additive and addictive-psychotropic substances to train students' critical thinking skills at the SMP/MTs level. The integrated Science module is very valid based on observational data where each category gets a valid and very valid category. The module design gets very valid categories. The format of the category module is very valid. The contents of the material in the category module are very valid. Language has a valid category. Presentation gets a very valid category. And support the innovation and quality of the KBM get a very valid category. All indicators have been validated by experts and have met the proper rules although there are several aspects that must be corrected. This is in line with the results of previous studies [24-27, 18]. Each expert assesses the product to determine the strengths and weaknesses of a product [28] because validity is one of the criteria for the feasibility of development results [29].

Revisions made based on the recommendations of the experts, including improvements to the cover design, table of contents, description, glossary, prerequisites more clearly, the description of the picture must be readable, the description of the material adjusted to the purpose, the English terms must all be written Italic, and the text can written to make the reader more active. Input on the improvement of modules is needed both from the aspects of module design, format, material, linguistic, presentation, and supporting innovation and improving the quality of teaching and learning activities so that they can be used as a source of student learning in accordance with the results of Purnomo [30]. advantages compared to textbooks in general. Modules as a learning tool make it easy for students to understand the study of the material and become the main means of promoting independent learning because the module has advantages in terms of flexible development [31].

Practicality of Modules

The practicality of the module is obtained from the implementation of the module in the small group test to see the weaknesses and deficiencies in the Integrated Science module the results of development that might not be seen in the previous stage. Data on module implementation in small groups is presented in Table-2.

Table-2: Results of Module Implementation in Small Group Tests

No.	Implementation of Assessed Modules	Score (%)	
		1	2
1	Mastering the given module material	83,33	83,33
2.	Organizing groups	100	100
3.	Plan activities in groups	100	100
4.	Analyze & make conclusions	83,33	100
5.	Prepare reports on the results of activities	83,33	83,33
6.	Review and implement feedback	100	100
	Average	91,67	94,44
	Category	Very practical	Very practical

Category description:

85 - <100% = very practical
70 - <85% = practical
50 - <70% = not practical
10 - <50% = impractical

The module was developed by researchers with the concept of Integrated Science, where each learning activity carried out is always associated with three fields (Biology, Physics and Chemistry). The results of researchers' interviews with students found the fact that students had never done learning using the

Integrated Science module. This shows that students are not accustomed to being directly involved in learning, so they are not yet too responsive to Integrated Science learning.

The practicality of the expectation in the module is obtained through a one to one evaluation stage. The components in the assessment are curriculum suitability, accurate and up-to-date, clear and concise language, arousing motivation and interest, arousing student participation, module writing quality, linguistic, drawing, content updating, systematically in accordance with scientific structure.

The use of the Development module does not get obstacles, in other words the situation in the learning process is normal in accordance with the plans that have been formulated, especially practicum activities (LKPD) on each module, although there are some students who need a long time in using the module, maybe students not used to it because they first used the module to study independently but were still eager to learn.

The module has carried out a practical test of hope and was revised again based on input and comments from students. This is in line with the results of research previously reported [32, 33, 19] where the development results module already meets the practical criteria based on the results of the actual and expected practicality test. Practicality is a requirement to carry out field trials so that module effectiveness can be realized.

The use of modules can make it easier for students to build understanding of the concept of presentation of material and discussion of examples of easy to understand questions especially physical matter questions that use a lot of calculations, practical instructions are easy to understand, materials used by practicums are easy to understand, materials used by practicums are easy obtained in the school environment. Therefore, in the learning process students do not need much teacher guidance. The perceived benefits of the learning process by using modules are increased student learning activities and independence in learning.

The actual practicality is obtained from the excellent results of the activities carried out in modules 1 and module 2. Evidenced by all indicators of the feasibility of the modules assessed include: 1) Mastering the given module material with a percentage of 83.33% respectively in module 1 and module 2; 2) Organize groups with a percentage of 100% each in module 1 and module 2; 3) Plan activities in groups with a percentage of 100% each in module 1 and module 2; 4) Analyze and make conclusions with a percentage of 83.33% in module 1 and 100% in module 2; 5) Prepare reports on the results of activities with a percentage of 83.33% in module 1 and 100% in module 2; 6) Reviewing and implementing feedback with a percentage of 100% each for module 1 and module 2. Overall, the percentage in the implementation of module 1 which reached 91.67% and module 2 of 94.44% has a very good category, so the module Class VIII Integrated Science learning to practice critical thinking skills can be declared practical. Well designed learning tools will facilitate teachers in implementing the learning process [27].

In the small group test, students' responses to the Integrated Science module include: 1) Is a new thing in schools with a percentage of 100%; 2) Support the implementation of learning activities by 100%; 3) Module is interesting and evokes learning motivation with a percentage of 100%; 4) The contents of the module can be understood with a percentage of 83.33%; 5) Practical instructions are easy to implement by 100%; and 6) Module contents are good enough with a percentage of 100%. In the small group test, all students provide support for the use of the module and most students give positive responses and generate motivation, and overall the module content is good enough. This is in line with the results of the study of Dewi *et al*., [34] which states that students' positive responses indicate students are interested in learning to use modules. So the module as a learning resource has advantages over textbooks in general [16].

Modules are said to be practical when users easily use them in the learning process [29]. Based on the practicality test of expectations in one to one evaluation, actual practicality test on the results of the implementation in modules 1 and 2, and students' responses to the use of the module in small group tests, it can be concluded that the module can be said to be practical and easily understood by students.

The module of the results of this development was declared practical based on the student's suggestion data on individual tests and the implementation of the small group test module. The implementation of the module depends on the teacher himself designing the module with a simple but interesting, so students who learn it quickly understand and easily understand. Depdiknas [23] module is a learning tool or tool that contains material, methods, boundaries and ways to evaluate systematically and attractively designed to achieve the expected competencies according to their level of complexity.

Module Effectiveness

Student Learning Outcomes (Cognitive)

The group student learning outcomes in the field test used as one of the assessments of actual effectiveness are presented in Table-3.

Table-3: Cognitive Learning Outcomes in Field Test

Number of Students	Modul	KKM	Passing Grades	Not Passing Grades	Classical Completeness (%)
32	1	70	29	3	90,6
32	2		31	1	96,9

Based on Table-3 shows the learning outcomes data obtained on the subject matter of 2 modules stated classically complete, because it has exceeded the classical completeness value of 80%, but there are some students who have not yet completed because the value is below the KKM value of 70, so remedial is done to improve the grade not complete. The incompleteness of some students is caused by the student being a little slow in understanding the lesson and the limited time to repeat the lesson at home.

Based on cognitive learning outcomes on the effectiveness of expectations and actual effectiveness can be taken the results of the comparison. Comparison of cognitive learning outcomes in small group tests and field tests can be presented in Table-4.

Table-4: Comparison of Cognitive Learning Outcomes in Small Group Tests and Field Tests

Effectiveness	Number of Students	Modul	KKM	Passing Grades	Not Passing Grades	Classical Completeness (%)
Expectations and Actual Small Group Test	6	1	70	5	1	83,3
	6	2		6	0	100
Field Test	32	1	70	29	3	90,6
	32	2		31	1	96,9

Modules as teaching materials used in learning activities contain a set of planned learning experiences that are expected to be able to improve the learning process better, where students can learn more directed and systematically so as to improve critical thinking skills. Filsaime [35] describes critical thinking is a process that emphasizes logical and rational thinking. Critical thinking skills can be obtained through practical activities in the learning process (classroom activity). This Development Research produces a product in the form of modules. This module facilitates the process of independent learning for students. Learners can understand the concepts in the learning module easily even without teacher guidance.

Effectiveness is a state that contains an understanding of the occurrence of an effect or the desired effect in action. Module effectiveness is obtained from students' cognitive learning outcomes, critical thinking skills, character attitudes, social attitudes, and student responses. As for the school set the KKM for class VIII natural science subjects is 70 and the classical completeness limit of 80% but there is one student whose value is equal to the KKM value of 70. Module 1 classical completeness is 83.3%, module 2 is 100%.

The effectiveness of the module is divided into 2, namely the effectiveness of expectations and actual effectiveness. The effectiveness of expectations from a small group test based on cognitive learning results obtained data on the subject of 2 modules stated classically complete, because it exceeds the 80% classical completeness, but there are some students who have not yet completed because the value is below the KKM value of 70. Module 1 classical completeness 83.3%, module 2 is 100%.

The effectiveness of expectations from small group tests based on the results of students' critical thinking skills in module 1 and module 2, including: 1) Arranging the formulation of the problem (inference) with an average score of 3.00; 2) Making a hypothesis (inference) with an average score of 3.00; 3) Designing experiments/observations (inference) with an average score of 3.50; 4) Collecting data (interpretation) with an average score of 3.50; 5) Analyzing data (explanation) with an average score of 3.00; and 6) Making conclusions (evaluation) with an average score of 3.00. Overall, the average score of all aspects observed was 3.17 in the good category.

The actual effectiveness of the field test for learning outcomes data obtained data on the subject of 2 modules stated classically complete, because it has exceeded the classical completeness value of 80%, but there are some students who have not yet completed because the value is below the KKM value of 70. Module 1 classical completeness is equal to 90.6%, module 2 of 96.9%. Like the results of previous studies, namely Susana *et al*., [36] concluded that the integrated science modules based on critical thinking developed effectively were used to improve student learning achievement and critical thinking skills with good categories.

Group Critical Thinking Skills

Students' critical thinking skills towards Integrated Science modules are carried out by forming learning groups consisting of 6 groups, each group consisting of 5 or 6 students. Assessment of students' critical thinking skills is assessed from practicum/discussion activities contained in each module. The results of group critical thinking skills are presented in Table-5.

Table-5: Critical Thinking Skills in Field Test

No	Critical thinking skills	Means	Category
1.	Formulate a hypothesis (inference)	3,08	Good
2.	Designing Experiments/Observations (Inferences)	3,33	Good
3.	Collecting data (Interpretation)	3,50	Good
4.	Analyzing data (Esplanasi)	3,08	Good
5.	Formulating conclusions (Evaluation)	3,50	Good
6.	Critical thinking skills	3,50	Good

Category:

4 = Very good
3 - <4 = Good
2 - <3 = Good enough
1 - <2 = Not good

We can compare students' critical thinking skills with the Integrated Science module from the small group test and the field test. A comparison of critical thinking skills can be presented in Table-6.

Table-6: Comparison of Critical Thinking Skills in Small Group Test and Field Test

No	Critical thinking skills	Effectiveness of Expectations on Small Group Tests		Actual Effectiveness in Field Test	
		Mean	Category	Mean	Category
1.	Formulate the problem (inference)	3,00	Good	3,08	Good
2.	Formulate a hypothesis (inference)	3,00	Good	3,33	Good
3.	Designing Experiments / Observations (Inferences)	3,50	Good	3,50	Good
4.	Collecting data (Interpretation)	3,50	Good	3,08	Good
5.	Analyze data (Explanation)	3,00	Good	3,50	Good
6.	Formulating conclusions (Evaluation)	3,00	Good	3,50	Good

Based on the data of critical thinking skills the results obtained are that the critical thinking skills of students in module 1 and module 2, including: 1) Arranging the formulation of the problem (inference) with an average score of 3.08; 2) Making a hypothesis (inference) with an average score of 3.33; 3) Designing experiments/observations (inference) with an average score of 3.50; 4) Collecting data (interpretation) with an average score of 3.08; 5) Analyzing data (explanation) with an average score of 3.50; and 6) Make conclusions (evaluations) with an average score of 3.50. Overall, the average score of all aspects observed was 3.33 with the category already good, just need more practice making conclusions in accordance with the learning objectives. This is in line with previous research Wahyuni [37] reports that the science practical instruction developed has been appropriate to be used in learning in junior high schools and can improve students' critical thinking skills. According to Dimyati and Mudjiono [38] in supporting the development of process skills, the role of students in developing and discovering facts, concepts, and principles of science is very supportive. In this case the students' critical thinking skills are effective.

In the aspect of critical thinking skills to formulate problems, formulate hypotheses, design experiments/observations including indicators of facione namely inference. In this indicator, students will be able to write the information obtained from the problem given on the topic (1) Framework, Muscle, and Simple Plane, (2) Additive and Addictive Substances. Where students are given a set of modules to study independently and in groups. In the aspect of formulating the problem most students ask questions that are less in line with the learning objectives, due to the lack of reading and digging up information about the topics discussed. In the aspect of formulating the problem, the teacher guides students to formulate questions according to the learning objectives. In the aspect of formulating the problem all groups tend to remain.

In the aspect of formulating hypotheses (temporary answers) most students correctly predict facts but are less able to make hypotheses. This aspect is seen from the students' answers to the problem statements that have been made by students. In the hypothetical aspect, 4 of the 6 groups that became the study sample tended to remain even decreased. Based on the data obtained, students tend to be wrong in choosing answers to the problem formulation.

The aspects of designing experiments/observations are seen from the students' skills in designing experiments to be carried out by looking at the procedures that have been presented in the LKPD. In the aspect of designing an experiment/observation, 5 out of 6 groups tend to be fixed and 1 group has increased.

In the aspect of critical thinking skills to collect data including indicators from Facione namely interpretation, seen from students' skills in getting data from experiments that have been conducted and writing the results of observations true and complete. In the aspect of collecting data, 3 of the 6 groups that became

the study sample tended to be constant and experienced an increase in module 1 and module 2. Based on the data obtained, students lacked interaction with their fellow groups.

In the aspect of critical thinking skills to analyze data including indicators from Facione namely explanation. In the aspect of analyzing data, seen from students' skills in processing data obtained from the results of experiments and answering all questions correctly. In this aspect, all groups experienced a decrease from module 1 to module 2, because there were still a few errors from answering questions.

In the aspect of critical thinking skills to formulate conclusions including indicators from Facione namely evaluation. In the aspect of formulating conclusions, seen from the students' skills in making conclusions on the experiments conducted and in accordance with the learning objectives with sentences that are easy to understand. In this aspect, the teacher gives more direction so that conclusions must be adjusted to the learning objectives and those observed in the experiment so that formulating conclusions requires more practice.

Comparison of student learning outcomes for small group tests and field tests an increase. The small group test of the average small group test in modules 1 and 2 was 91.65% of the 6 students while for the field test the average in modules 1 and 2 was 93.75% of the 32 students divided into 6 groups. In the comparison of critical thinking skills on aspects of formulating the problem, there was an increase of 0.8 from the small group test with the field test. For aspects of formulating hypotheses there was an increase of 0.33 from the small group test with the field test. In the aspect of designing experiments/observations of fixed trends. In the aspect of collecting data, there was a decrease in the small group test and the field test. In the aspect of analyzing data, there was an increase of 0.5 from a small group test with a field test. In the aspect of formulating conclusions is also the same as analyzing the data an increase of 0.5 from a small group test with a field test.

Critical thinking skills are one that is expected to be mastered by students in the learning process. To be effective, critical thinking requires skills that will help determine the accuracy of information and will help in recognizing illogical and/or erroneous arguments [39]. Students must be guided by expertise in interpreting, analyzing, inferencing, evaluating, explaining and self-assessing as a means of exploring critical thinking skills [40].

Based on the data on the learning outcomes of the group students in the field test, some were incomplete because the students did not read the modules that had been given, did not interact with students in the group, and did not pay attention to the teacher when giving explanations. From students who do not complete will be given an explanation and repetition to the student so that students can understand the contents of the Integrated Science module.

Cholowski and Chan [41] in their research findings found that students' initial knowledge which is weak and their understanding of concepts is low which makes them weak in stating a conclusion. Muchtar and Harizzal [42] and Fahmi and Irhasyuarna [43] also found the fact that weak knowledge of concepts will continue to the difficulties of students in solving complex problems and arrive at mistakes in taking or evaluating conclusions.

Characteristic behavioral data shows that students have been diligent and careful in various practicum activities carried out most students get a score with a good category. This shows that students have been able to be diligent and careful in practicing. One of the reasons is because they were previously told that being diligent and careful is an assessment that will be observed by the teacher when the students do the practicum.

The social skills of the students measured in this study are collaboration and expressing opinions. The results of the assessment of collaborating students have shown good results. Likewise, the attitude of expressing an opinion is already good. Students can get a good assessment of social skills because they are encouraged by the teacher to work together in groups and dare to express opinions during discussions in order to obtain a good assessment. Based on the results of observations of students' activities during the learning process shows that the development of science modules can generate positive activities and reduce the negative activities of students. This is in accordance with research Erdemir & Bakirci [3] which states that studying science can develop a positive attitude.

Students' responses to the learning modules developed are very positive and can be applied in other classes. Based on the discussion, it can be concluded that the learning module developed is declared effective and can be used or applied to learning in the classroom or other schools.

Based on this discussion it can be concluded that the learning module developed was declared effective and can be used or applied to learning in all Al Azhar Barito Kuala MTs classes. To find out the effectiveness of this development module in other schools it needs to be tested again in other schools. According to Pharakhruvisitpapaporn [44] the effectiveness of a teaching method is able to develop students' critical thinking. Learning using modules is very useful for teachers in delivering material to students, students are more creative, independent, and students easily master competencies [45].

The advantage of using the development module created by this researcher is that the contents of the module can be adjusted to the state of the school environment so that students are easier to use and students read more. While its weaknesses make the development of teaching materials in the form of this module requires time, the deepening of the material owned by the teacher and the cost.

CONCLUSION

The results of the research that have been done have answered the problems that have been raised in the development module on the concept of Integrated Science class VIII are categorized according to:

1. The 8th Integrated Science Module that has been developed is valid based on expert opinion which can be seen from; 1) module design with a score of 3.72 2) format with a score of 3.63 3) material with a score of 3.80 4) language with a score of 3.17 5) Presentation with a score of 3.50 6) support innovation and increase the quality of the KBM by a score of 3.83 from the category validity of the category is very valid.
2. The 8th Integrated Science Module that has been developed is declared practical based on the students' opinion from the results of the implementation of the module in the small group test which reached 91.67% in module 1 and 94.44% in module 2 with a very practical category.
3. The 8th Integrated Science Module that has been developed is declared effective based on; 1) classical mastery of cognitive learning outcomes, 2) average critical thinking skills are good with, 3) good character characteristics of students 'behavior, 4) social skills of students in good category, and 5) students' responses with the good category.

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