Development of Integrated Science Module be based on Scientific Approach in the Connected Integration to Improve of The Students Critical Thinking Skill

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ABSTRACT

The objectives of the research are: 1) to understand the characteristics of integrated science module; 2) to understand the feasibility of integrated science module; scientific-based natural science module on the subject matter interaction of living beings with environment; 3) to understand the effectiveness of integrated science module. This research is research and development (R&D) that use Four-D model have four step that are: define, design, develop, and disseminate. The subject of limited trial done to nine students of VII class in junior high school and wide scale trials conducted to thirty students of VII class in junior high school another. The utility testing was performed using pre-experimental design, One-Shot Case Study kind. The analysis technique used descriptive qualitative and quantitative. The result of the research shows that: 1) The characteristics of integrated science module be based of scientific approach in the connected integration to improve the student critical thinking skill module has been successfully developed by Four-D development model. 2) Feasibility of the integrated science module is validated by expert validator, education practitioners, peer-review also the respond given by the teachers and students after learning module using the obtained results that module has excellent category and fit for use in learning. 3) The average critical thinking skills of students in the first learning activities is 72,97% with enough category, in the second learning activities have increased 85,72% with good category and the third learning activities have increased 89,32% with good category. The average of students achievement in the first learning activities aspects of knowledge 3,22 with good category and increased to the second also third learning activities 3,32 and 3,50 with good category. The average of students achievement aspect of attitude increase from the first until the third learning activities row to be 3,25; 3,36; 3,47 with good category. The average of students achievement aspect of skill increase from the first until the third learning activities row to be 3,07; 3,30; 3,45 with good category. Can be concluded that integrated science module be based of scientific approach in the connected integration to improve the student critical thinking skill is effective to improve critical thinking skills and achievement of students.

Keywords: scientific, connected, critical thinking skill, achievement, integrated learning module

1. INTRODUCTION

In the science learning the students are faced with natural situation and contextual. Learning of science is contextual and relevant by means of experience daily. The student be shoved to make relation between concepts in the science relevant by their experience. The science learning aimed at the meaning full learning. In the science learning enable the student to apply the science concept make use of the scientific approach (Rahmatiah, 2014).

Education component comprises education purpose, the student, environment, and media of education which mutual interaction and dependences to achieve of education purpose, among other via the education in school. Trianto (2013:1) to explain that the education can afford to support the future national building is the education can afford to develop the potential of the student, until be able to solve the problem of life.

Actually the science consist of product, process, and scientific attitude. The product of science consist of concepts, principles, laws, and theories. The proses consist of process skill, among other are observation, questioning, opinion, data collecting, analyzing, conclusion, and communication. Scientific attitude. After learned of science the students possessed of the scientific attitude, among other honest, careful, discipline, and so on.In the learning science, the student be demanded have to active. The student to carry out the process activity to find of the concept (Prasetyo, 2011: 3).

In the development of curriculum 2013 to explain that the learning science in lower secondary school be conducted by integrated science. In science integrative learning to compound some aspect among other attitude, knowledge, and skill domain. Substantially, science can be used as tools to develop attitude, knowledge, and skill domain (Kemdikbud, 2013: 167).

In the integrated science learning can be implemented by integrated, connected, and webbed. The connected integration have characteristic to connect inter concepts, inter topics, and inter skills, inter ideas in the one field study. Superiority of the connected model among other the student become easy to find the connection in the one field study. The weakness of connected model among other for lack to show of the connection inter discipline. (Depdiknas, 2006: 8).

In the implementation of the integrated science learning can be carried out by scientific approach. In the science learning which resort to scientific approach the student get the direct experience. The learning activity of the integrated model in the scientific approach to be carried out by some steps: observing, questioning, data collecting, analyzing, communicating (Rosana, 2014).

The critical thinking skill can be mean as thinking skill to evaluate the information before become thinking competence and be stored in memory. The student which have critical thinking skill will capable to exploit the information and to seek the relevant information resource to solve of the problem (Rosana, 2014). There are six indicators of the critical thinking among other interpretation, analyzed, inference, evaluation, description, and self-instruction.

The module is included media learning which can be used as learning resources. Module learning system is individual learning which carried of specially learning objective and be used mastery learning principle. The good module will grows of the student learning motivation so the student learning achievement keep increasing.

The Result of the need teacher analyze show that: (1) the teachers meet difficulty to learning of integrated science; (2) the teacher very need subject matter which can to improve of the student critical thinking; (3) the teachers need the scientific approach in the science learning; (4) the teacher need integrated science module with the connected approach.

2. RESEARCH METHOD

This Research is included in the research and development (R & D) which have purposed to develop of science module have as a base of scientific with the connected integration. The module to be developed with the four D model which be suggested by Thiagarajan (1974, 5). 4 D included define, design, develop, and disseminate. Product of the research is science module be based the scientific with connected integration.

Tryout be done to collect the data which relevant with the product development that is learning module be based on scientific with connected integration. This tryout be carry out among other to test the prior product in the form of validation from the expert, teachers, and peer review. The small scale of tryout be carry out to 9 students at the VII F class in SMP of Waru. The large scale of tryout be carry out to 30 students at the VII D class in SMP of Weru.

Instrument of this research in the form of questionnaire, validation sheet, item test, and observation sheet. In this research use technique of data analyze is descriptive of quantitative and qualitative, that is to describe the meaning of data in the quantitative and qualitative manner. The beginning of analyze to be carried out by quantitative manner, and then the data be analyzed by qualitative descriptive. The data of documentation and interview be analyzed by qualitative descriptive.

The data which be analyzed comprises the data of need study and the data of validation result from the expert, the teacher, peer review, and students. The data which be analyzed are data collection from the activity of the small scale test and the large scale test. The data which be found from the large scale test among other: the feasibility analyze of learning component, the result analyze of affective learning, the result analyze of psychomotor learning, the result analyze of cognitive learning, and the result analyze of critical thinking skill test.

3.   RESULT OF RESEARCH AND DISCUSSION

3.1   Result of Defining

In this step of defining to be done distributing of questioner to teachers and students. In this case questioner be given to 5 teachers and 30 students. In the questioner of teacher needs consist of 32 questions, and the questioner of student needs consist of 32 questions.

The result of questioner distributing about needs from teachers and students show that: 1) The subject matter of science learning is suitable for the 2013 curriculum; 2). The amount of books learning which available is not enough to support the curriculum 2013 implementation, 3). The students have text books MGMP produced and local education department, 4). The students not enthusiastic to use the text books available, 5). The text books which can be used standalone learning are limited, 6). The students need training to improve the critical thinking skill, 7). The subject matter of learning not yet accommodate substance in a complete manner.

The Analyze result of the teachers need show that: a). Almost totality of the teachers touch difficulty in the learning of integrated science, b). Almost 100% of the teachers need subject matter which can be improved the critical thinking skill of student; c). All of the teachers need the subject matter of the integrated science manner.

The analyzed result of questioner of the teachers and students need questioner show that the module be needed in the science learning which be based scientific approach with the connected integration to improve the student critical thinking skill.

The result of the need analyze, the critical thinking analyze, and the national examination analyze be made the basis to develop the learning module be based on scientific with connected integration. The developing of module also refer standard which have been by BSNP about the development standard of learning text book and module.

Be said module be based on scientific because the module be arranged by steps of the learning be based on scientific.

3.2 Result of the Design

In the design step can be find result selected format and prior design of module. Selection of format be appropriated the criteria of module format and be based on scientific approach with be added the unsure of critical thinking skill. The component of learning be based on scientific consist: observing, asking, data collecting, analyzing, and conclusion.

In the prior design step of the module be carried out arranging of module and produce the module design draft. In the module draft among other consist of: title, preface, introduction, core competence, basic competence, and list of content. In the developing of module at each learning activity be arranged by scientific steps.

3.3 Result of Development

Design of module be developed became the first draft of the module be based on scientific consist of three leaning activity. Draft 1 of module. The first Draft of module then be validated by subject matter expert, media expert, language expert, and peer review on behalf of respond and recommendation The validation result data be showed in the Table 1.

Table 1. The Validation Result of Module

Validation	Validator	Means	Criterion
Design and	Language Expert	3,95	Very Good
Language	Science Teacher	3,76	Very Good
	Peer review	3,45	Good
Subject	Subject Matter Expert	2,91	Good
	Science Teacher	3,86	Very Good
	Peer review	3,47	Good
Presentation	Media Expert	3,91	Very Good
	Science Teacher	3,87	Very Good
	Peer review	3,47	Good
Means		3,63	Very Good

From the table 1 can be resumed that after the module have been revised be based on the recommendations from the experts and validators is suitable to be used in the learning science. And then step be carried out the small scale test.

In the small scale test be carried out for the students at VII class. Result of small scale test also be used for information collected which can be used as added material to complete the module. After the module have been completed, and then did the large scale test.

The large scale test be carried out in the VII class with participate students amount 30 persons. Evaluation of module be carried out at the last of learning when the total subject matter be finished. Data which be collected consist of evaluation result and

response of students to learning during application module. The result of the large scale test be showed in the Table 2.

Table 2. Feasibility learning be based on Scientific

Observation Object	Observe	Category
Teacher Activity		
Learning Activity 1	78,8%	Good
Learning Activity 2	84,6%	Good
Learning Activity 3	90,4%	Very Good
Means	84,60%	Good
Student Activity		
Learning Activity 1	76,9%	Good
Learning Activity 2	82,7%	Good
Learning Activity 3	86,5%	Very Good
Means	82,03%	Good

From the table 2 can be showed that in the learning feasibility by module, activity of teacher and student activity have good category. In this means that the learning feasibility by module is suitable with the steps of learning be based on scientific. Affective evaluation of student consist of carefulness and integrity. Psychomotoric aspect of student be evaluated when doing the experiment activity. Evaluation Instrument of affective and psychomotor aspect be used observation sheet and be evaluated by observer. The analyzed result to the data be showed in Table 3.

Table 3 Learning Result of Affective and Psychomotor

Activity	Means	Category
Affective Aspect		
Learning Activity1	76,3	Good
Learning Activity2	78,8	Good
Learning Activity3	85,8	Good
Means	80,3	Good
Psychomotor		
Learning Activity1	77,5	Good
Learning Activity2	79,0	Good
Learning Activity3	84,0	Good
Means	80,2	Good

Learning result of cognitive aspect be found by value of competence test, be showed in Table 4.

Table 4. Cognitive Learning Result

Description	Result
Means Value	82,73
Highest Value	100
Lowest Value	62
Range Value	38
Thoroughness	90%
Not yet Thorough	10%

Value of critical thinking skill be found by pretest and posttest. Analyzed result of pretest and posttest value showed in Table 5.

Table 5. Title of Example Table

Test	Test Kinds	Result	Decicion
Normality	Kolmogorov Smirnov	Sig pretest = 0,200 Sig posttest = 0,200	H_0 Received
Homogeneity	Levene Test	Sig 0,055	H_0 Received
Pretest-Posttest Result	t-test	Sig. (2-tailed)= 0,000	H_0 Rejected

From the table above can be conclusion that there are means differently of critical thinking skill of students. Result of observation sheets about the critical thinking skill at every activity learning can be showed in Figure 1.
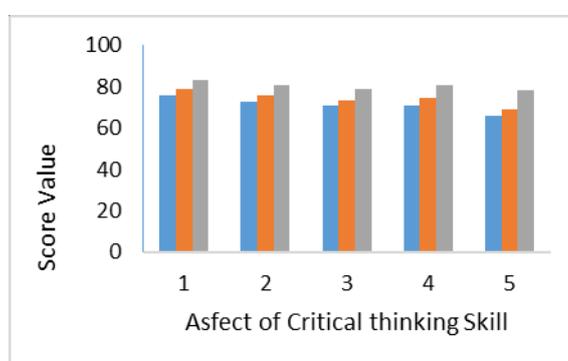

Figure 1: Histogram of Student Critical Thinking Skill

From Figure 1 can be concluded that critical thinking skill at the every learning activity occur improvement. The aspect of critical thinking skill which have highest increase is improvement, and the lowest competence is evaluation. In the last learning the student to answer the questioner. From the data which be collected indicate that the module which be used in the scale large test not necessary repair.

3.4. Result of Dissemination

The last step after have been done large scale test and then be did the dissemination step. Result of dissemination step be showed in the Table 6.

Table 6. Result of questioner for Product in the Dissemination Step

Aspect	Means (%)	Category
Content	90,83	Very Good
Presentation	91,43	Very Good
Language	86,67	Very Good
Means	90,31	Very Good

Result of dissemination show that the module which be developed have very good criterion. Thus the learning module be based on scientific approach which be developed can be used in science learning in the class

4. CONCLUSION

The first conclusion the integrated science module be based of scientific approach in the connected integration to improve the student critical thinking skill have some characteristics. Component of module be arranged by scientific steps, namely observing, questioning, exploring, analyzing, and concluding. Subject matter be arranged by some basic competence of one group in the field study. Arrangement of module contain the six indicators of the critical thinking among other interpretation, analyzed, inference, evaluation, description, and self-instruction. Module be developed by 4-D models which be suggested by Thiagarajan with 4 step, namely define, design, develop, and disseminate

The second conclusion feasibility of the integrated science module be based of scientific approach in the connected integration to improve the student critical thinking skill is validated by expert validator, education practitioners, peer-review also the respond given by the teachers and students after learning module using the obtained results that module has excellent category and fit for use in learning.

The third conclusion the average critical thinking skills of students in the first learning activities is 72,97% with enough category, in the second learning activities have increased 85,72% with good category and the third learning activities have increased 89,32% with good category. The average of students achievement in the first learning activities aspects of knowledge 3,22 with good category and increased to the second also third learning activities 3,32 and 3,50 with good category. The average of students achievement aspect of attitude increase from the first until the third learning activities row to be 3,25; 3,36; 3,47 with good category. The average of students achievement aspect of skill increase from the first until the third learning activities row to be 3,07; 3,30; 3,45 with good category. Can be concluded that   integrated science module be based of scientific approach in the connected integration to improve the student critical thinking skill is effective to improve critical thinking skills and achievement of students.

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