



Developing of Module Challenge Based Learning in Environmental Material to Empower the Critical Thinking Ability

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Abstract

This research aimed to compile a product development, knowing the feasibility and knowing the effectiveness of challenge-based learning (CBL) modules in an environmental material to empower the critical thinking ability. The research was a research & development model of Borg & Gall. Validation the product was done by material expert, expert of development and design module, expert of device and evaluation of learning, a linguist and practitioner of learning of Biology. Subject of the research was a student of grade X MIA Islamic State Senior High School Karanganyar. This research results are: (1) module in the form of product module for teachers and students CBL based on environmental material was developed based on CBL syntax and indicators of Fascione's critical thinking that visualized in the objective, material, activities, and evaluation items; (2) appropriateness of module for teachers and student based on CBL environment material according to the validation results of qualified as good until very good; (3) Modules based CBL environmental material is effective to improve the ability of student critical thinking.

Keywords: challenge based learning, critical thinking ability, environmental material, module.

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INTRODUCTION

The challenges in an era of dynamic, evolving, and progressive knowledge require human resources with high intellectual ability. High intellectual abilities are characterized by abilities of logical, systematic, critical, thorough, creative, and having well on competition skills to communicate ideas and solve the problems.

Those abilities equipped the learner intellectual that may be developed through education. In the era of knowledge, intellectual capital, especially on higher order thinking skill is a necessity as a reliable workforce in the 21st century (Galbreath, 1999).

The critical thinking ability is one of the ability that required in the 21st century. Critical thinking ability has a role in equipping the learners to handle the problems of social, scientific and practical issues effectively in the future (Snyder, Snyder, Snyder, & Snyder, 2008).

The critical thinking ability is an intellectual process of conceptualising, synthesizing, analyzing, applying, and evaluating various information that derived from observations, experiences, reflections, where the outcome of this process is used as a reason in taking action (Walker, 2006). Critical thinking ability plays important role to the success of future learner life and is able to solve the problems.

The critical thinking ability of Indonesian students is still low. The indication is coming from research conducted by Sadia (2008) that indicated the students' critical thinking ability of SMP Negeri (State Junior High School) and SMA Negeri (State Senior High School) in Bali Province is still low. The research results Priatna (2003) and Suryadi (2005) showed that the critical thinking ability of student in Bandung is still low, and the research result from Hadi (2013) shows that the critical thinking ability of student in Malang is still low.

The low of critical thinking ability is also occur in the students of MAN (State Islamic Senior High School) Karanganyar. Based on preliminary test results using six aspects of critical thinking from Facione (1990) in MAN Karanganyar obtained data that shows the low of students' critical thinking ability, from 112 students the students critical thinking ability on high qualified are only 7%, medium qualified of critical thinking ability is 11% and 82% of students critical thinking ability are low qualified. From each aspect of critical thinking, there are 19.64% on interpretation aspect, 41.07% on analysis aspect, 48.21% on evaluation aspect, 45.83% on conclusion aspect, 29.91% on explanation aspect, and 58.92% on self management.

The low ability of student critical thinking has also seen in the results of the National Examination (UN), based on the analysis of the UN's score 2013/2014 showed that in environmental materials, especially on the "Environment" indicator, the average score obtained by students MAN Karanganyar is 66.03, the city's rate score is 79.00, and the provincial's rate score is 80.46, out of 156 students of MAN Karanganyar IPA who followed the National Examination year 2013 / 2014, 66.03% passed and 33.97% did not pass the exam (National Education Standards Agency, 2013).

Then, the analysis results of teaching materials at biology subject in MAN Karanganyar especially on the basic competence of "Environmental" to train the critical thinking ability indicators (Facione, 1990) as follows: (1) interpretation aspects are 26.46% , 46.59% and 24.26% in low category; (2) analysis aspects are 10.58%, 37.16% and 13.45% in low category; (3) evaluation aspects are 18.74%, 8.33%, and 12.5% in low category; (4) conclusion aspects are 14.42%, 9.61%, and 12.49% in low category; (5) explanation aspects are 14.28%, 85.70%, 16.06% in low category; and 6) self management aspects are 19.73, 19.73%, and 13.15% in low category.

Based on the percentage of analysis of teaching materials at MAN Karanganyar may be concluded, thus are not comply the aspect of critical thinking maximally, predicted as less potential to help learners' success and success in the future, and then it needs a development. Teaching materials may be used in empowering critical thinking ability and students' independent which are modules.

Module is a solution for teaching material problem at MAN Karanganyar. The module contains a series of systematic activities that appropriate to the critical thinking character which can be learned through special designed instruction and practice. Modules are compiled according to the students' development in order they are easy to understand and support the students learning.

Module are a solution to empower the students critical thinking ability because module contains a material that completed by a series of activity, training, and self-assessment to monitor the mastery level of student learning, and more potential as a means to empower the critical thinking ability in achieving maximum learning output. A series of activities and training in modules are integrated with challenge based learning (CBL) model.

The challenge based learning model is a learning model that combines problem-based learning, project-based learning, and contextual learning which focus on problems solving of a daily life. This kind of learning creates a space where learners think critically and actively to seek solutions to solve existing challenges. Module with challenge-based learning model is a module that characterized by the syntax of CBL learning including: giving big ideas or main ideas, delivering important questions, challenges, guidance questions, guidance activities, guidance sources, solutions, and publications (Johnson & Adams, 2011).

The advantages of CBL learning model integration include active learners in learning where learners think how to solve the problems, the problems arise from everyday life or comes from global issues, and making a plan to solve the problems. The completion is in real action and solutions derived from simple things they usually find in their daily, in the process of problem solving occurs a high-level thinking process which is critical thinking.

Thus are in line to the research conducted by Swiden (2013), Baloian, Breuer, Hoeksema, Hoppe, & Milrad (2004), Jou, Min, Hung, Chen Kang, Lai (2010) and Sodikin (2013) show the CBL learning model can increase the motivation and learning achievement of students, and the research results O'Mahony et al. (2012), Luis & Marrero (2013), Tajuddin, Siti Mariam, Azrol (2013) show that CBL learning model is able to improve the learning student output.

METHOD

This research is part of Research and Development (R & D). The development's procedure of this research is the development of the development model of Borg & Gall (Borg, Walter R, Gall, 1996) which is modified into nine stages. The steps of module development activities of Challenge Based Learning (CBL) are as follows:

The first stage is introduction and data collection. The second stage is planning including: compiling the matrix, determining the learning objectives of the module based on the indicators, defining the sub subject of the Environmental material, determining the format and visualization of the CBL-based content module, determining the learning device format, and determining the procedures of the research.

The third stage is initial module development that focuses on the suitability of module characteristics such as self-directed, content unity, independent, adaptive. The fourth stage is initial module trial; validation is carried out by the module material expert, development validation expert, design and readability of module, device learning expert and module evaluation, as well as linguist validation.

The fifth stage is revision I. The data obtained from the initial module trials, and then it used as an correction material for revision I. The sixth stage is limited module trials before the module is used on a wider scale. Limited module trials are conducted by validator individual educational practitioners (Biology teacher) and small group test (learners).

The seventh stage is revision II. Data obtained from module trials, then used as correction materials for revision II. The ninth stage is operational trials that are conducted to determine the effectiveness of Challenge Based Learning module products for class X students on environmental materials.

The design in the operational test is Pretest-Posttest Control Group Design, because there are two randomly selected groups, a control class and a experimental class. Control class (using existing school modules) and a experi-mental class (using Challenge Based Learning module). The sample in the trial consists of a class for experimental class and a class for control class that selected by cluster random sampling.

The last stage is revision III. The third product revision is based on operational test

results. The qualitative data and the analysis results are used for correction materials through revision in order to have appropriate modules.

RESULTS AND DISCUSSIONS

The results of research and development that have been implemented are a form of biology learning module based on Challenge Based Learning on environmental materials to improve the critical thinking ability. The observation initial result of critical thinking ability Facione (1990) on the students in MAN Karanganyar obtained the results.

Based on Table 1, the results of the initial observation of critical thinking ability (Facione, 1990) show the critical thinking ability of students in MAN Karanganyar are not optimally empowered.

Table 1. Initial Observation Result of Critical Thinking Ability

| No. | Aspects of Critical Thinking Ability Facione (2013) | Results (%) | Category |
|-----|---|--------------|---------------|
| 1. | Interpretation | 19.64 | Low |
| 2. | Analysis | 41.07 | Medium |
| 3. | Evaluation | 48.21 | Medium |
| 4. | Conclution | 45.83 | Medium |
| 5. | Explanation | 29.91 | Low |
| 6. | Self Management | 58.92 | Medium |
| | Average | 40.59 | Medium |

The results of initial module trials have done by expert validations, the detail is in the Table 2.

Table 2. Test Initial Module Results

| Expert validations | Average (%) | Qualifi-cation |
|--|-------------|----------------|
| Material validation of teacher modul | 9.18 | Very Good |
| Material Validation of teacher modul | 88.88 | Very Good |
| Development validation, Design and readability of teacher and student module | 83.69 | Very Good |
| Device validation Learning and evaluation Teacher module | 90.24 | Very Good |
| Device validation Learning and evaluation Student module | 97.71 | Very Good |
| Module linguist validation Teacher and student | 79.16 | Good |

The first product revision result is the revision of experts of material module, development, design and readability of modules, learning tools and module evaluation, and

linguist, that obtained proper first-model module products. Based on the revision results of the expert, it is concluded that the first product module has ready to be tested in field trial stage.

The field test results were a validation from education practitioners and limited trial to 15 students.

Table 3. Limited Field Trial Results

| Expert Validation | Average (%) | Qualification |
|---------------------------|-------------|---------------|
| Education practitioners 1 | 98,00 | Very Good |
| Education practitioners 1 | 93,00 | Very Good |
| 15 students | 81,55 | Very Good |

Based on the results of the limited field test and second product revision, it can be concluded that CBL-based module does not need to be revised, but need to improve the print of word/sentence, picture clarity and picture description.

Table 4. Descriptive Results of Score Statistical Pretest & Posttest Class X MIA 1 (Experiment) and X MIA5 (control)

| Class | Interval | Min Score | Max Score | Average (%) |
|----------------|----------|-----------|-----------|-------------|
| Pretes X MIA 1 | 43 | 30 | 73 | 54,42 |
| Postes X MIA 1 | 26 | 60 | 86 | 71,70 |
| Pretes X MIA 5 | 44 | 26 | 70 | 53,14 |
| Postes X MIA 5 | 33 | 43 | 76 | 61,04 |

Table 5. Anacova Test

| Variable | F | Significance Level | Partial eta Squared | Results |
|------------------------------|-------|--------------------|---------------------|------------------------|
| Class of Experiment, control | 83,47 | 0.000 (sig < 0.05) | 0.517 | H ₀ ditolak |

Table 6. Class Estimation Parameter Experiment in Control Class

| Score | Class | Result | Sig |
|---------------------------|------------------|--------|-------------|
| Average of <i>postest</i> | Experiment Class | 71,70 | - |
| | Control Class | 61,04 | - |
| Estimation | Experiment Class | 9,96 | 0,00(<0,05) |
| | Control Class | 0,00 | - |

Based on the descriptive statistical test using Challenge Based Learning module obtain-

ed higher average pretest and posttest than class using school module.

Anacova test in the research is Univariate Analysis of Variance aims to know the difference of posttest score to experiment class and control. Based on the results of Anacova test shows that there is difference of posttest score between experiment and control class because the significance level is lower 0.05, which may be concluded that there is different score of posttest between classes of Challenge Based Learning module to school module.

The parameter estimation result shows the control class that does not use the Challenge Based Learning module on environmental material has lower posttest score of 9.96 than the experimental class.

Based on the results of operational field trials showed the class using Challenge Based Learning module effectively trained the critical thinking ability of students of 51.7% score compare to control class.

The third product revision result is a final product that is feasible to use because it has been through expert validation stage, test of educational practitioner, small group test and operational field test result and revised based on suggestions by experts.

The developed module is a Challenge Based Learning module that contains critical thinking indicators on environmental teaching materials. Challenge Based Learning Module is developed based on the results of biology material analysis in MAN Karanganyar especially KD "Environment" shows that the content of teaching materials only contains a collection of materials and exercise questions that less empowering to the critical thinking ability of students, moreover the picture is not interesting, image is not clear, there is no conclusion, self assessment and having not yet comply the six aspects of critical thinking maximally.

Teaching modules using CBL learning model is able to teach students' critical thinking ability. The teaching module contains learning activities which is designed using CBL learning syntax and it capable of optimizing the critical thinking ability in learning, because student think how to solve the problems, in the process of problem solving occurs a high-level thinking process which is called as critical thinking and able to help student in learning independently (New & Consortium, 2009; Sukiman, 2012).

Developed Modules in the form of printed media that uses a Basic Competency is the environmental material. The developed modules are based on the characteristics (Sukiman, 2012) including self-instruction, self-contained, stand-alone, adaptive, and user friendly. Developed modules are in the form of teacher modules and CBL-based student modules.

The analysis results of teaching materials on the range of fulfillment of critical thinking aspects between the CBL-based modules and modules in the school are quite high. The range shows the increasing of the fulfillment of critical thinking aspects on module products.

CBL-based modules on environmental teaching materials are developed based on the syntactic stages of the CBL learning model using critical thinking indicators. The stage of syntax CBL learning model using critical thinking indicators is visualized into teaching modules on the aspects of objectives, materials, activities and evaluation exercise of sub-environmental on environmental change, environmental pollution, and systematically conservation of the environment.

Table 7. Indicators Average Comparison of Critical Thinking Module Challenge Based Learning and School Module

| Critical Thinking Aspect | Challenge Based Learning Module (%) | School Module (%) | Range (%) |
|---------------------------------|--|--------------------------|------------------|
| Interpretation | 92,64 | 32,43 | 60,21 |
| Analysis | 85,57 | 20,39 | 65,38 |
| Evaluation | 89,58 | 13,19 | 76,39 |
| Conclusion | 93,26 | 12,17 | 81,09 |
| Explanation | 89,28 | 38,68 | 50,60 |
| Self-instruction | 88,5 | 17,53 | 70,97 |

Table 7 shows the high of the critical thinking aspect in the range fulfillment between Challenge Based Learning module and school module. The range shows an increasing in the fulfillment of critical thinking aspects of module products. Overall, the increasing of critical thinking aspect of Challenge Based Learning module has increased above 50% with highest score in the conclusion aspect. The increasing does not reach 100% because in the material aspect there are some considerations which not all indicators are derived from critical thinking aspects and factual dimensions knowledge, conceptual, procedural may be visualized into module materials such as indicators of identifying, experimenting, analyzing, evaluating,

checking and determining, and then, the entire indicators may probably not be derive to material toward the effectiveness maintaining module that is called as critical thinking which is not limited to only accept the facts and knowledge (Puspitasari, 2014; Khatib, Muhammad, Iman, 2012).

Challenge Based Learning module may makes the students active in teaching learning process because students think how to solve the problems, in the process of problem solving, it may occurs a high-level thinking process that is critical thinking (New & Consortium, 2009). This is in line with research Hanson & Wolfskill (2000) that problem solving through teamwork is able to improve the student's ability of thinking. A research Gagne (1979), the problem solving activities in the learning process may trains the thinking ability because the learning process allows student to generate new ways of solutions, unconventional thinking, and problems is raised from ill-defined issues.

The student critical thinking ability may be presented through organized and systematic questions in assessing a topic, and it making the students becomes independent and credible conclusions. Organized and systematic questions allow learners to engage in activities that help them to gain a deep understanding. The questions should be in sequences to help students in examining and understanding of each problems, issues, projects or decisions (Johnson, 2002). This is in line with opinion Rustaman (2005) which states that using effective questions means encouraging the students to think and make reasons. Similarly, an opinion Nasution (2011) state asking is a stimulus to encourage the children to think and learn, by asking, learners or students will gain knowledge.

The increasing of critical thinking aspect shows the success of research in developing the product of Challenge Based Learning module to enhance the critical thinking ability in 21st century demands which enable students to handle problems of social, scientific and practical issues effectively in the future (Snyder, Snyder, Snyder & Snyder, 2008).

The eligibility of Challenge Based Learning modules to train the critical thinking ability on environmental teaching materials is tested through the following stages: (a) Preliminary trials: module material validation, development validation, module design and readability, learning device validation and module evaluation,

and linguist validation; (b) Limited field trials: education practitioners and small group testing.

Based on the result of the assessment of the expert team of educational practitioners and students about the module, it had a result from good category until very good. The results of the assessment team of educational practitioners and students also may needs some improvement.

The result of the material expert validation on the student's module obtained the average score of each aspect of 88.88% shows very good qualified and concluding as not to have revision. The validation result of material expert on the teacher's module obtained average score of each aspect of 92.18% shows very good qualified and concluding as not to have revision.

The preparation of the module material should pay attention in the aspect of depth and breadth of material coverage. The material breadth describes the material size of the module, meanwhile the material depth concerns the details of the concepts of module which the students must learn (Depdiknas, 2008). Learning materials need to be properly identified in order the student competencies achievement is able to be measured. In addition, by identifying the types of material, the teacher will understand the accuracy in the learning model selection. The content or learning materials is related to the strategy of organizing learning materials. According to Mehrens (1984) strategy is defined the way to sequence and synthesize facts, concepts, procedures, and related principles.

Expert validation results to the development design and readability of module of teacher and student obtained an average score of 83.69% which shows very good qualified. In the expert's validation of development, module design and module readability, there is a revision of the product. Suggestions, criticisms and inputs from expert's validation of development, module design and module readability have been revised. The improvements are related to the images, cover and display modules are made more interesting. It is in line with opinion Prastowo (2012) state the images may supports and clarify the contents of the material which is needed because the images have functions to clarify the description of the material, increasing the students' attractiveness, and reduce the boredom of students in learning.

Validation result of instructional device expert and student module evaluation obtained an average score of all aspects of 97.71% which shows very good qualified and concluding as no

need to have revision. Expert validation result of learning device and evaluation of student teacher module obtained an average of all aspects of 90.24%, with very good qualified and concluding as no need to have revision. Based on the results of expert validation of learning device and evaluation of teacher module and student module may be concluded that there are no revision required. But there are some suggestions from experts such as spreading of the material levels; the exercise of the material is associated with daily life.

Exercise is a variety of learning activities that must be done by learners after reading the previous description. Exercise is useful for establishing the student's knowledge, skills, values, and attitudes. The purpose of the exercises, the learners learn actively and eventually master the concept that is being discussed in the learning activities (Sungkono, 2003).

The result of linguist validation obtained an average score of 79.16% that shows good qualified. The conclusion of linguist validation result is no revision required. CBL-based modules use a communicative language, easy to understand by learners, clear language structure and accordance with EYD. Language becomes an important symbolic language as a means to communicate the aim of developed modules.

The result of educational practitioner validation (teacher 1) obtained an average of 98.00% with very good qualified and no need to have revision, meanwhile the result of educational practitioner validation (teacher 2) obtained an average 93.00% with excellent qualification and no need to have revision. The result of educational practitioner validation may still have some suggestions and inputs from education practitioners such as using large letters in the module and material extension. Based on the result of educational practitioner validation concluded the CBL-based modules is no need to have revision and ready to use.

The results of small group trials obtained an average score of 81.55% with good qualified and no need to have revision. The results of small group trials still have some suggestions and inputs such as picture sentences, clearance pictures and wrong in punctuation. And then, the tested product is revised based on the student's suggestion.

It is in line with opinion Prastowo (2012) state the images may supports and clarify the contents of the material which is needed because the images have functions to clarify the des-

cription of the material, increasing the students' attractiveness, and reduce the boredom of students in learning.

Based on the preliminary field results: module material validation, development validation, module design and readability, validation of learning device and module evaluation, linguist validation and limited test: educational practitioners and students may conclude that CBL modules are good to excellent qualified and has proper/ready to use. The module feasibility is determined by validators, practitioners, students and teachers.

The effectiveness of Challenge Based Learning module on Environmental Pollution is based on the increasing of score the critical thinking ability. The module effectiveness is also seen from the difference of significance data (score) before and after using CBL module.

Anacova test results indicate a posttest's score difference between experimental class using CBL modules and control class using school module due to significance level 0.000 less than 0.05. Based on the anacova test results may conclude that CBL module is effective to train the critical thinking ability on environmental material.

The Estimated Parameter table shows the classes that do not use Challenge Based Learning module obtained on a lower posttest score of 9.96 than class using CBL modules. Based on Estimation Parameter table conclude that CBL module is effective to train the critical thinking ability of class X students MAN Karanganyar on environmental material of 51,7%.

CBL module is effectively to train the critical thinking ability compared to school modules because CBL modules are systematically arranged based on objectives, materials, activities, evaluation aspects using CBL syntax and critical thinking indicators on dimensions of factual, conceptual and procedural.

The Challenge Based Learning model is a new learning that combines problem-based learning, project-based learning, and contextual learning and thus is focused on problem solving of everyday life. Thus learning creates a space where students think critically and actively to seek the solutions and solve the existing challenges.

In CBL syntax, the Big Idea stage and Essential Question are combination of problem-based learning. Problem-based learning will contribute greatly to the development of critical thinking ability due to the problem-based

learning provides a tools for students to analyze the problems, evaluate their ideas as part of reflective thinking, manage data as a process of metacognition practice, and present their proposed (Gallagher, Sher, Stepien, & Workman, 1995). In line with previous research, Yuan, Kunaviktikul, Klunklin, & Williams (2008) problem-based learning leads students to self-study in order to enhance the critical thinking ability and is able to analyze the problems in the real world. And the research from Sinprakob & Songkram (2015) problem-based learning is able to improve the critical thinking ability of students.

The CBL syntax of the challenge stage (The Challenge), Guiding Question (Guiding Resources), (Guiding Resources), (Solution) is contextual teaching and learning, this learning is focused on problem solving of daily life. Contextual learning will contribute to the development of critical thinking ability due to CTL assists the students to develop their intellectual potential (Johnson, 2002). In line with the research conducted by Sadia (2008) shows the use of contextual learning model is proven able to improve the ability of critical thinking ability. And a research is from Suryawati, Osman, & Meerah (2010). Contextual learning frameworks are able to improve the students critical thinking ability and train them to be more different and evaluative.

The CBL syntax of the stage of Assessment and Publishing is combination of project-based learning. Project-based learning leads students to practice and understand the complex thinking and know how to integrate in the skills which are often linked to real life, able to search and use the sources, think critically and good on problems solving (Yesildere, Sible, Turnuklu, 2006). Similarly research, Musa, Mufti, Latiff, & Amin (2012) states the project-based learning has enabled the students to share and exchange their ideas in finding the solutions related to the problems, and project-based learning contribute to the development of soft skills accordance to the workplace which seems needing in the 21st century.

The CBL syntax in Challenge Based Learning based is effectively to trains the students critical thinking ability because in each CBL syntax it is able to empower the critical thinking ability. This is in line with research results of Johnson and Adams (2011) show that CBL learning model applied to 65 teachers and 1.239 students, are able to improve the critical

thinking ability. Another research conducted by Baloian, Breuer, Hoeksema, Hoppe, & Milrad (2004) suggests that the implementation of CBL learning model encourages students to have a strong focus on learning, cooperation and thinking differently about self-learning. And the results of the study Martin, Rivale, & Diller (2007), O'Mahony et al. (2012) show the use of CBL model is more effectively to develop the innovation and thinking ability than the use of traditional learning models and powerpoint slides. And, other research results Swiden (2013), Jou, Min, Hung, Chen Kang, Lai (2010) and Tajuddin, Siti Mariam, Azrol (2013) CBL model is able to increase the activity, motivation and learning outcomes of students.

Challenge Based learning module is effective to empower the critical thinking. The pretest and posttest results show an increasing of each critical thinking indicator.

Table 8. Average Comparison Results of Increased Critical Thinking Indicators

| Critical Thinking Aspects | Pretest (%) | Posttest (%) | Range (%) |
|---------------------------|-------------|--------------|-----------|
| Interpretation | 61.02 | 73.84 | 12,58 |
| Analysis | 60.51 | 66.66 | 6.15 |
| Evaluation | 44.10 | 74.48 | 30,38 |
| Conclusion | 29.74 | 71.79 | 42,05 |
| Explanation | 57.94 | 70.76 | 12,82 |
| Self-instruction | 73.84 | 79.48 | 5,64 |

Table 8 shows the high fulfillment the range of critical thinking aspects between pretest-posttest using Challenge Based Learning module. The range shows increasing the fulfillment of critical thinking aspects of students. The highest increasing of fulfillment of critical thinking aspect is in conclusion aspect of 42.05%. Students who have the ability to conclude are more competent in making conclusions or hypotheses based on facts, judgments, beliefs, principles, concepts or representations (Ricketts & Rudd, 2005).

The increased of critical thinking aspects in the second range is evaluation aspects of 30.38%, evaluation aspect is the ability to assess the credibility of the statement or other presentation by assessing or describing person's perception, experience, situation, decision, trust and assess the logical power from the relationship inferential inferences or actual inferential relationships among statements, descriptions, statements or other forms of representation (Facione, 1990).

The increased of critical thinking aspect in the third range is explanation aspects of

50.60%, the explanation aspect is the ability to declare a person's position or justify a position based on evidences, criterias, or contextual abilities to convince and use insight criteria to support the decision (Facione, 1990).

The increased critical thinking aspect in the fourth range is self-instruction of 70.97%, the self-instruction aspect represents the outcome of person's consideration process, the ability to justify the reasons is based on evidences, concepts, methodologies, a certain criterion and consideration reasonable, and the ability to present a person's reason for a convincing argument (Facione, 1990). Self-instruction is an individual's ability to monitor personal cognitive activities and to ensure himself or herself that invlove in critical thinking or not (Ricketts & Rudd, 2005). Self-instruction plays a role in self-directed to assist the students in managing their thinking, behaviors and emotions in order to achieve the successful of the learning experience and achieve goals (Zumbrunn, Tadlock, & Roberts, 2011). The previous research Elliot & Dweck (2005) states the students who have high achievement have a strategy in self instruction, especially in learning. Self instruction is important for the learning process because of self-instruction, may have a significant impact on academic outcomes (Zimmerman, 2008). This may help students to make better learning habits and strengthen their learning abilities (Wolters, 2003).

The increased critical thinking aspects in the fifth range is the aspect of analysis of 65.38%, the aspect of analysis is to identify the intentions and conclusions in the relationship among statements, concepts, descriptions, or forms of statements that are expected to declare trust, despair, experience, reason, information or opinion (Facione, 1990). Students who have analytical ability are better to identify the relationships among statements, questions, concepts or descriptions to declare confidence, assessment or reason (Ricketts & Rudd, 2005).

The increased critical thinking aspect in the lowest range is the interpretation aspect of 60.21%, the interpretation aspect is the ability to understand the meaning and significance of various situations, data or events, this ability to categorize, determine the significance, and clarify the meaning (Facione, 1990). Students who have interpretatation ability are more capable to understand and express the meaning about experiences, beliefs, data, rules and others

during the learning process (Ricketts & Rudd, 2005).

The overall improvement in critical thinking aspects of the Challenge Based Learning module has increased over 50% increase with the highest score on the conclusions and the lowest score on explanation aspect. The increased score does not reach 100% because in the material aspect there are some considerations; not all indicators derived from the critical thinking aspects and the knowledge dimensions of factual, conceptual, and procedural may be visualized into module materials such as indicators to identify, experiment, analyze, evaluate, check and determine, and then, all the indicators does not probably to be the material due to the reason of maintain the effectiveness of the module that critical thinking is not limited to only accept the facts and knowledge (Puspitasari, 2014; Khatib, Muhammad, Iman, 2012).

The Challenge Based Learning module is more effective than the school module in empowering the critical thinking ability because have clear objectives and materials, valid of the evaluation questions and targeted activities. The activities are derived from the CBL model syntax and critical thinking aspect indicators in accordance with the factual, conceptual and prosedural dimensions. CBL modules are also equipped with practicum activities. Practicum make the students active in solve the problems, critical thinking in analyzing the existing problems and facts, and finding the concepts and principles based on real experience, and then learning becomes more meaningful (Hayat, 2011).

The Research of Brooke (2006) explains the critical thinking may also be improved by providing problems in learning in order the learners are encouraged to use their critical thinking ability to analyze and solve the problem. Is it supported by the results of the research Hanson & Wolfskill (2000) suggest the problem-solving through teamwork is able to improve the students' critical thinking ability, reduce the misconceptions, seek the information and construct an active understanding and provide high-level reasons.

Challenge Based Learning modules on environmental materials encourage the student to have the critical thinking ability: the interpretation ability has role to observe the characteristic, interpret the data and express the meaning of various experiences, analytical skills

has a role in identifying the relationships among the concepts of belief, judgment or reason, the evaluation ability has a role to assess the credibility of statements, representations of others and assessing the logical strength of statements, descriptions or questions, concluding abilities has a role in drawing conclusions or hypotheses based on facts, judgments, beliefs, principles, concepts or representations, explaining ability has a role to describe the phenomena, causal relationships and reinforcement arguments using empirical data as the basis of explanation, and self-instruction abilities has a role in self-directed to assist student in managing thoughts, behaviors and emotions in order to successfully guide the learning experience to achieve the goals. A person with critical thinking is usually curiosity, open minded, flexible, honest in dealing with something, wise in judgment, reconsidering with other insights, diligent in finding relevant information, reasonable in choosing criteria, focus on investigation, and persistent to seek an information as accurately as possible about the subject (Facione, 1990).

The increased of critical thinking aspect show the success of research in developing Challenge Based Learning module products to improve the critical thinking ability according to 21st century demands that enable learners to handle the problems of social, scientific and practical issues effectively in the future (Snyder, Snyder, & Snyder, 2008).

Challenge Based learning module will train the students to solve the problems, not only limited to the context of the module but also other problems related to the daily life. Sometimes, students are faced with problem situations, incomplete information and unanswered questions. The design is designed in order to ask the students how to solve it, such as defining, describing the problems, making hypotheses, tracing data and developing the solutions. And then, students are required to conduct the process of scientific thinking through critical thinking especially the ability to analyze, including: the ability to test ideas; recognize the arguments, reasons and statements (Facione, 1990). Thinking process is passed by students to assist them in their future life in society.

CONCLUSION

Challenge Based Learning module product to empower the critical thinking ability at class X on environment materials MAN Karanganyar is developed based on Borg and

Gall development procedure that is modified into 9 stages, using Challenge Based Learning syntax and Fascione critical thinking indicator that is visualized on purposes, materials, activities, and evaluation questions.

The feasibility of Challenge Based Learning module on environmental material at class X MAN Karanganyar has been tested through test of expert validation, education practitioner validation, small group test and operational field test with qualified of good to very good.

Challenge Based Learning module is effective to empower the critical thinking ability on environmental teaching material compared to class using school module of class X MAN Karanganyar because it shows posttest score with $F_{Table (0.05)} < F_{Count (0.05)}$.

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