The Development of Learning Tools to Improve Students' Critical Thinking Skills in Vocational High School

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Abstract: The essential critical thinking skills are developed in order to address the challenges of modern education, global competition, and democratic life. Therefore it is necessary to create an atmosphere of learning that allows students to be able to think critically especially for Students of Vocational School through the preparation of learning tools with appropriate strategies and critical thinking instruments that are tested to be used by teachers. In this case, the purposes of this research are 1) to produce a preparation of learning tools in the form of a teaching plan based on Problem-Based Learning, and 2) valid and reliable critical thinking instruments. Based on the expert test and user test results, the instructional tools were eligible to be used in terms of both design and substance. The critical thinking instruments were based on Watson-Glaser Critical Thinking Appraisal (WGCTA) with five dimensions: Inference, Recognition Assumption, Deduction, Interpretation and Evaluation of Arguments with thesubject of Pancasila and Civic Education. Instrument validity test using product moment Pearson's correlation analysis, and factor analysis. While the instrument reliability test using Alpha Cronbach formula. This instrument was declared valid and reliable after it was tested on the then grade Students of Vocational School through three trials which resulted in 16 question items from 50 items prepared.

Keywords: Development, learning tools, critical thinking, students of vocational high school

1. Introduction

The Critical and creative thinking skills are increasingly required by Students of Vocational High School Students in the 21st century as they live in modern education, global competition and an increasingly complex democratic life that can adapt to the rapidly changing world for the development of his career.The ability to think critically and creatively are tools for students to learn independently for life (The basic activities of critical thinking are conducting investigation, interpretation, and evaluation. Evaluation activity in critical thinking is the process of testing the argument and determining what is inappropriate and what is inappropriate.

There are at least four reasons why it is necessary to develop critical thinking skills in education.*First*, it teaches students to respect others as a form of moral education. *Second*, preparing students to grow up in order to they can understand themselves through self-sufficiency and self-direction. *Third*, as the main goal of education through subjects of mathematics, science, art, history and so forth. *Fourth*, to accommodate the accuracy of analysis, good thinking, and deliberation in the life of democracy.

So the critical thinking skills in education are important because it can determine the quality of theschool, business, career, and students' behavior that all depends on students' ability to solve problems and make decisions.But in fact, the school system in Indonesia has not been able to create a condition of learning that allows students to think critically, creatively, responsibly, and provide opportunities for students to explore their imaginative ideas. So the level of thinking ability of students is only at a low level. Because teachers only ask students to learn, but rarely teach students how to learn as a result they are difficult to solve problems, make decisions, think critically, and think creatively. According to the results of the surveyin counseling guidance in East Java showed that 50.12% of students needed for critical thinking skills because it is required in competing in the world

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of work. The critical thinking skills of the students of Senior High School can be developed through problem-based learning activities, social interactions, enriched learning environments, and extra-curricular activities. Problem-based learning is an approach often used for the students of the senior high school or undergraduate.

Many research results show that PBL can improve the academic engagement of students, self-directed learning, self-regulated learning. Because the purpose of PBL is to help students 1) construct an extensive and flexible knowledge base; 2) develop effective problem-solving skills; 3) develop self-directed, lifelong learning skills; 4) become effective collaborators; And 5) become intrinsically motivated to learn. Based on the analysis conducted by the researcher to 45 Teaching Plans which had been compiled by Subject of Pancasila and Civic Education teachers, 87% the implicitly can not be used to develop critical thinking skills which reflected in learning objectives, learning activity steps and test used.Whereas the purpose of the national education and basic competence of Pancasila and Civic Education Subject had regulated about the development of critical thinking skills. Therefore, it is necessary to develop problem-based learning tools and critical thinking instruments that have been tested for their validity and reliability so that they can be used by teachers and researchers to develop critical thinking skills. The Learning tools are the Teaching Plan that can be used by teachers in teaching and learning activities.

In this research, problem-based learning strategy applied to the Pancasila and Citizenship Subject in order to train students to solve problems and make decisions in ademocracy. Because dynamic democratic life can not be separated from problems such as disintegration of the nation, threats against tolerance, terrorism threats, drugs, student brawl and provocation created by hoax news of social media. Through this problem-based learning, students are expected to become critical individuals who are honest, able to respondcontroversial issues as an interesting challenge, conduct evidence-based judgment, are interested in other people's ideas and can refrain, control feelings and think before acting.With regard to this matter, the purpose of this study are 1) to produce learning tools that are the teaching plan of problem-based learning that is tested and 2) to produce critical thinking instrument which is tested its validity and reliability.

The analyticalability or critical thinking is one of the intellectual ability that is a key element of creativity consisting of synthetic, analytical, and practical. The analytical thinking skills are a person's ability to think critically, analyze, and evaluate new quality ideas.Fischer summarized some definitions of critical thinking according to the experts. He called John Dewey the father of a modern critical thinking tradition that used the term reflective thinking. The reflective thinking was defined as an active, persistent, and cautious consideration of trust by considering the reasons for its support and further conclusions about its tendencies.Edward Glaser who was famous for his critical thinking test Watson-Glaser Critical Thinking Appraisal defined critical thinking as 1) an attitude of being disposed of considering in a range of one's experience. 2) knowledge of the methods of logical inquiry and reasoning, 3) some skills in applying of methods[12].Brodi's research results showed that analytical ability (critical thinking) was substantially related to academic achievement. The analytical ability (critical thinking) was considered to account for more than 75% of the total of prediction variant[13]. The creative and analytical abilities had a significant independent contribution in 10 out of 12 regression analyses.

The research about critical thinking in learning had been largely done through various subjects such as mathematic subjects, technical subjects, subjects of history, physic subjects economic subjects to environmental education. The critical thinking can be created in the classroom by solving real-world problems, it is possible to create more than one information or solution. The critical thinking is marked by the process of constructing and solving the problems. The last thinking process is creative thinking. The problem-based learning strategies are perceived as good approaches because they are supported by various learning theories (cognitive and constructivism) and many results of theresearch have proved that as an intervention model, PBL is effective in encouraging highthinking, constructing knowledge,

independent and collaborative learning. Masek and Yamin concluded that 1) the PBL process theoretically supported the development of students'critical thinking, 2) in general empirical evidence could explain the effect of PBL on students' critical thinking skills, especially outside the medical field, 3) some predictors that may affect PBL relationships and critical thinking such as age, gender, academic achievement, and educational background. Besides, the situation of school, teacher character, and students' attitude are crucial in encouraging critical and creative thinking and problem-solving. Kusumaningtias's research concluded that there was a difference in the mean score of students' critical thinking skills learned using PBL combined with NHT strategy used conventional learning.

2. Method

Based on the purpose to be achieved then the design of this study is development research i.e a process used to develop and validate educational products.The result of development research is not only the development of an existing product but also to find knowledge or answer to practical problems.The educational products produced can be thespecific curriculum to the certain educational need, teaching method, educational media, textbooks, module, competence of educational staff, evaluation system, competency test model, the arrangement of classrooms for specific learning model, production unit model, management model, employee guidance system, payroll systems and others.To be able to produce a certain product used research that needs analysis (used survey or qualitative method) and to test the effectiveness of the product in order to function in wide society, hence needed research to test the effectiveness of the product (used experiment method).There are 10 phases in this research: (1) theResearch and Information Collection, (2) the planning, (3) the develop preliminary form of product, (4) the preliminary field testing, (5) the main Productrevision, (6) the main field testing, (7) the operational product revision, (8) the operational field testing, (9) the final product revision, and (10) the dissemination and implementation.

2.1.The Research Phases

2.1.1. Identification of Information

This phase is the basic phase in identifying and analyzing the needs and problems in learning relating to arranging the Teaching Plan, learning process and the goals to be achieved. The results of this analysis then continued with the analyst on the learning objectives and themes used as listed in Teaching Plan used so far. The activities included:

a. Preliminary analysis

The preliminary analysis in this study wasthe analysis of the information collected with regard to the need for critical thinking skills for students undertaking aliterature review, research results, interviews, and observation.In this preliminary analysis also conducted an analysis of the teaching plan and learning implementation process that has been used by teachers. Based on this preliminary analysis the researcher found a set of theories that underlie the preparation of the device to suitable with the needs and can develop students' critical thinking skills in accordance with the intended use of the tools.

b. Theme analysis

The theme analysis was conducted to identify the themeswill be chosen in order to suitablewith theexistingmatter, actual, challenging and possibly scientifically solved problems by the students.The result of the analysis was the basis for developing a teaching plan to be used in developing critical thinking skills, Furthermore, it was arranged product draft that will be developed, namely the teaching planbased on problem-solving and instrument of critical thinking skill. Arranging draft of this product was done at the development phase then be tested validity and reliability.

2.1.2. The Development

The development phase consisted of 2 activities, namely design and development. Its activities were a series of continuous activities. At the design phase, the activities undertaken were making product design and validity test. The activity of making the product design was done by a) designing the theme with specified time allocation, b) developing the theme mapping and problem-solving, c) selecting appropriate media, d) developing evaluation tools, and e) designing the product draft. After the product draft was compiled, the next step was to test the validity to assess the validity of the product in which case it was the teaching plan and the instrument of critical thinking. The validity test for teaching plane was done through the expert test and user test used validity test sheet that had been prepared. The results of this test then followed up by revising the product for its refinement. As for the critical thinking, instruments was done validity and reliability test by using statistical formula and SPSS assistance. If the result of the test was valid, then the product that had been developed can be used for further research, but if not valid then be revised until l the product test result was completely valid.

The process of testing the validity and reliability of critical thinking instruments were as follows. The validitytest of critical thinking instrument construct was done by Pearson product moment correlation technique. Testing of construct validity also is done by factor analysis. Therefore, to test the validity with product moment or factor analysis used the help of IBM SPSS Statistic 20 for Windows application program. Meanwhile, examining the reliability of the instrument used Alpha Cronbach formula. The value of the acceptable Alpha Cronbach coefficient ranges from 0.70-0.80 or 0.60-0.80 for areas that are difficult to measure.

3. Results and Discussion

Based on the purposes of research had been described above, this research could produce two products, that is 1) instructional tools, in this case, was the teaching plan that had been tested acceptance and, 2) the critical thinking instruments that were tested the validity and reliability. The results of these two products, presented as follows:

3.1. Learning Tools

Learning tools that were produced in this research were the Teaching Plan for Pancasila Education subjects and Civics Class for a tenth grade in the even semester in Academic Year 2016/2017. The results of each phase of the activities are described as follows: at the identification phase, this study had resulted in an analysis of the teaching plan design used by the schools on which the research was conducted. To reinforce the findings, the researchers searched the source of the teaching plan design in the deliberations of teachers of Pancasila And Civic Education Subject. As a result, of the 45 teaching plan that had been designed by the teachers of Pancasila And Civic Education Subject, 87% had not been implicitly used to develop the critical thinking skills because the dominant learning objectives for developing the cognitive domain, the methods used and the learning steps were the stillest conventional, as well as in its assessment activities. It also happened in teaching and learning activities, it means that learning was more teacher-centered rather than student-centered learning.

Based on these findings, the researcher believed that a learning tool should be developed that implicitly reflects the development of critical thinking skills. After that, the researcher determined the right strategy that could be used to develop critical thinking skill to the student through literature study, which resulted in the determination of problem-based learning strategy.

After determining PBL learning strategy, then researcher conducted a theme analysis to determine the themes of actual learning and can encourage critical thinking of students. The themes chosen and in accordance with the current issues was lesson theme of Subject of Pancasila and Civic Education subject in the tenth class of the even semester was "Beautiful Rights and Obligations in

Democracy, Knitting Togetherness in Diversity and Building Awareness of Nation and State". The themes were then elaborated in six teaching plan with Problem Based Learning Strategy that resulted in a "Draft of Research Guide for Implementing Problem-Based Learning Strategy for Improving Student Critical Thinking Skills". This draft then tested through a user trial and expert test. The user test was conducted on two teachers of Subject of Pancasila and Civic Education with criteria of a professional teacher, while the expert test was done by four experts in their field with S3 education criteria and experts in their field at least 5 years. The expert was a design expert, two content experts, and one linguist. The data was taken from the "Questionaire" compiled by using the Likert scale and provided a line "notes" that can be filled by both users and experts. Based on these test results, the draft research guidelines need to be revised. After revising, then book guiding was tested to a small group, namely the seven teachers of Pancasila and Civic Education Subject who selected random sampling, as the results were all user given mean score 4 scale. It means that the book guiding had been designed can be used by the mirror revision. The minor revision is a revision on using punctuation, the suitability of the task with the PBL and critical thinking skills. In accordance with the explanation above, the effectiveness test of this learning tool in developing critical thinking skills will be done through experimental research activities.

3.2. The Instrumentof critical thinking

The critical thinking instruments were based on Watson-Glaser Critical Thinking Appraisal (WGCTA) with five dimensions: Inference, Recognition Assumption, Deduction, Interpretation and Evaluation of Arguments based on literature review of research results. From the five dimensions, each of them was elaborated into ten questions so that the total was fifty questions which refer to the themes Pancasila and Civic Education Subject in the teaching plan that had been prepared in the form of an open-ended instrument to become "Draft of Critical Thinking Instrument "In accordance with WGTA.Providing additional columns at each end of the selection was intended so that students can write down the reason for selecting the answer from the item's question. Before being tested validity and reliability, this draft was tested on five students for giving their opinion. As a result, all students stated that the draft was too many questions, the use of language was difficult to be understood, and from 5 students only 2 people wrote the reasons for the choice of answers in the column provided.

After discussing with the counselor then decided each of 5 question items so that the total number of 25 questions. This instrument was testedto 40 students who had received the above material. The validity test was done by looking at the level of significance and correlation index of Pearson moment product.If the score of calculation significance ≤ 0.05 then item is declared valid, whereas an item is valid if correlation index of product moment Pearson (r) ≥ 0.3[23]. Based on the results of validity test conducted in the first phase of the instrument items used in this study showed that 5 items of instruments declared invalid and other instruments declared valid because it produced correlation index product moment Pearson (r) ≥ 0.3 with significant level ≥ 0.05.After that designed draft of the critical thinking instrument more by losing 5 items of instruments to 20 items. Therefore, a second phase test was performed, with results indicated that the correlation (r) of each item was greater than or equal to 0.3 or r = ≥ 0.3 with level significant was ≤ 0.05. This means that a number of 20 critical thinking items that had been tested can be declared valid.

Based on the results of factor analysis above, it showed that the score of KMO and Bartlett's test or MSA (Measure of Sampling Adequacy) was 0.700 with a significance of 0.000. This shows that the number of MSA (Measure of Sampling Adequacy)> 0.5 and significance <0.05, which means that the variable couldbe predicted without error by other variables. It could be interpreted that variable could be predicted and analyzed further. In other words, that critical thinking instruments that had been prepared could be used and analyzed further. After testing the validity to all critical thinking items, then tested the reliability to determine the level of reliability of the instrument. The results of a reliable test of instrument criticism thinking showed that the critical thinking instrument that had been compiled showed a score of 0.891 with a very reliable reliability level. These results could be interpreted that all items of research instruments could be said to be very reliable, because it met the criteria of reliability test of instrument items that were used i.e upper of the Cronbach Alpha value> 0.80 -

1.00. This means that critical thinking instruments with 20 items of question can be used to measure students' critical thinking skills as expected.

4. Conclusion

This development research produced two products in the form of learning tools that was the teaching plan that had been tested its acceptability and critical thinking skills instruments that had also been tested the validity and reliability. Both instruments could be used to conduct experimental research with regard to the use of learning strategies to improve students' critical thinking skills. Nevertheless, the implementation the teaching plan as one of the instructional tools needed to be supplemented by the treatment book for a conventional strategy to avoid refraction. In research. The importance of the arrangement of instructional tools was also raised by Birgili said that if we want to raise the learners who might be the possible young scientists of the future, both skills need to be developed critically in the instructional design process. Namely, it should not be forgotten that learner and context analysis,anorganization of instructional objectives, development of instructional strategy or assessment techniques become distinct in the instructional design step with regard to critical and creative thinking skills under the problem-based learning approach.

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