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A Preliminary Analysis Of Problem Based Learning Model Development To Improve Scientific Thinking Skills Of Students

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Abstract

This article is the result of preliminary research of the ongoing development research project. This study aims to produce a model and learning tool based on problem based learning (PBL). The learning tools include: Learning implementation plan (RPP), module, and model book based on problem based learning method (PBL), this study also aims to improve students' scientific thinking skills. The research method used was a research development approach. This development research adopted the Thiagarajan, Semmel and Semmel model which modified through four stages: define, design, development and disseminate. The subjects of this research were two lecturers from the Knowledge of Food Material class and 32 students of that class. Data collection technique was done by using test method, non-test and observation. Data analysis technique was descriptive analysis technique.

The results showed that for the model guidebooks and devices, the validity test of three experts was obtained respectively (model book = 3.13, Learning implementation plan (RPP) = 3.25; Module = 3.10) the average total of 3.16 with the index coefficient of expert judgment was equal to one valid category. The test result of the practicality of learning model of PBL responded positively by the students with the average of 85.03%, the module device used as supporting in learning was 88.14%, the RPP was 86.8%. Overall, positive response given by the students was 86.45% with a good category, so it can be said that the model and the device is practical to use.

The implementation of learning can be seen from the observation of student activities related

to formulate problems, diagnose, formulate alternative strategies, determine and implement problem-solving strategies, collect and analyze data, discussion, team work and concluding, obtained an average of 75.83%. This indicator shows that these models and tools are effective for improving learning outcomes and scientific thinking skills. The outcomes to be achieved in this research are: (1) Produce a problem based learning Implementation Plan Model (RPP), (2) Module, (3) BPM (a problem based learning guidebook model) that has been validated by experts, practitioners and has been tested and analyzed. (2) A National Seminar Proceedings (3) Published in the Accredited National or International Journal.

Keywords: Development, Learning Model, Problem Based Learning, Scientific Thinking.

INTRODUCTION

The government is always concerned about improving the quality of education, this is due to the demands and imperatives to face the dynamics of society and regional and global challenges. Improvement of quality is of course a necessity and must be done because otherwise society will be disappointed and we will be left behind and dismantled by the change itself. The authoritarian paradigm becomes the paradigm of democracy, is one of the dynamics within the society and has implications for the field of education, one of the implications is the desire of the community to accept the curriculum in which the content of participatory learning instead of the passive, the dogmatic learning compared to the creative and innovative learning style. The society in which the learner is no longer happy to be given learning with the conventional approach such as Teacher Center learning oriented), they demand to be given the freedom to think innovatively and creatively through student center learning oriented approach.

The student center learning oriented approach so far has been made the learners are imprisoned, deprived from their reasoning and creativity, they accept dogmatic teaching material without alternative choice, so that rational and objective scientific principles are ignored. Research by Jusniar (2015) revealed that the model or pattern of learning done by the teacher is not varied and still centered on the

teacher (Teacher center) and less in using the available media. These consequently made the students in being uncreative and have uncritical thinking. Loss of sense and creativity in thinking and behave is certainly a problem that needs to be solved through new and more creative and innovative learning models. One such instruction model is a problem based learning (PBL) model.

Howard Barrows and Kelson quoted Ibrahim, M et al. (2010) suggests that problem-based learning (PBL) is a curriculum and learning process. The curriculum is designed in a variety of issues that require students to gain important knowledge, make them adopt at solving problems, and have their own learning strategies and have the skills to participate in teams. The learning process uses a systemic approach to solve problems or facing the challenges that will be needed in career and everyday life as well as developing self-reliance and self-confidence.

Meanwhile, according to Ibrahim, M, et al (2010) and Butcher, C., & Highton, M. (2006) the problem-based learning model (PBL) is a learning model in which students involve trying to solve problems with several stages of the scientific method so students are expected to be able to learn the knowledge related to the problem and at the same time the students are expected to have the skills in solving the problem. PBL will be a learning approach that seeks to apply problems that occur in the real world, as a context for learners to practice how to think critically and gain skills to solve problems.

Problem-based learning model has been known since the time of John Dewey. According to Dewey who was

rewritten by Trianto (2009), learning based on the problem is the interaction between stimulus and response is the relationship between the two directions of learning and the environment. The environment provides input to the students in the form of help and problems, while the brain's nervous system functions to interpret the help effectively so that problems encountered can be investigated, assessed, analyzed, and sought the problem solve well.

Problem Based Learning is a learning approach that begins with solving a problem, but to solve that problem learners need new knowledge to be able to solve it. Problem-based learning (PBL) approaches are learning concepts that help teachers create learning environments that begin with important and relevant issues (learners) for learners, and enable learners to gain a more realistic learning experience (real).

Problem-based learning involves learners in an active, collaborative, learner-centered learning process that develops the problem-solving and self-learning skills which will be needed to meet the challenges of life and careers, in today's increasingly complex environment. Problem-Based Learning can also begin by doing group work among learners. Learners investigate on their own, find problems, and then solve the problem under the guidance of the facilitator (teacher) (Bakhtiar, A. 2004).

Problem-based learning suggests learners to seek or determine relevant sources of knowledge. Problem-based learning provides challenges for learners to learn on their own. In this case, learners are more invited to form knowledge with little guidance or teacher direction while on traditional

learning learners are more treated as recipients of structured given knowledge by a teacher.

Furthermore, according to Sanjaya, W, (2010) Problem-based learning, hereinafter abbreviated as PBL, is one of innovative learning model that can provide active learning condition to learners. PBL is a learning model that involves learners to solve a problem through the stages of a scientific method so that learners can learn knowledge related to the problem and also have the skills to solve the problem.

To achieve optimal learning outcomes, learning with Problem Based Learning approaches needs to be well designed from the preparation of problems that are in line with the curriculum to be developed in the classroom, raising the problems of the learner, the equipment that may be required, and the assessment used. Teachers applying this approach should develop themselves through the experience of managing in their classes, through continuing formal training or formal education (Ibrahim, M. and M. Nur, 2010)

Therefore, problem based learning is an effective approach for high-level thinking learning processes. This learning helps learners to process the ready-made information in their minds and develop their own knowledge of the social world and its surroundings. This learning is suitable for developing basic and complex knowledge.

Based on the above opinion it is concluded that the model is a long-term learning plan, containing a conceptual framework that can guide the learning objectives. If added to the problem-based learning model, then this model

actually contains the concept of problem-based learning, for example learners are treated to various problems and given the opportunity to solve itself. This model according to (Slavin, R. E. 2008) aims to make tough and independent participants, accustomed to taking the initiative and skillfully using critical thinking to solve problems.

Development of problem based learning (PBL) model, to improve problem solving skill and students' scientific thinking is relevant to be applied to students of Family Welfare Education, the Faculty of Engineering, Makassar State University, especially those who take subject of Food Material Knowledge. Because this course was not only demands credibility and innovation as well as skillful decisions for students but also required to be skillful in thinking by using the principles of science.

During this time, the subject of food Knowledge is taught with a teacher-oriented learning approach (Teacher Center learning oriented), this subject is a prerequisite course that provides a solid foundation on the advanced subject, consequently the students are less creative and innovative and often can not do adaptability in advanced courses both theoretically and practice. The other which is no less important is the reality that students are less accustomed to taking a role in solving problems scientifically.

Based on that background, this research development needs to be done in order to find a model of learning that can improve students' thinking skills in solving problems scientifically or based on objective science principles,

methodological, systematic and universality.

RESEARCH METHOD

This research uses development research approach (research and development). Adopted from Thiagarajan, Semmel and Semmel (1974) models through four stages: define, design, development and disseminate.

In its implementation, the operationalization of development activities used a number of research approaches that are viewed in accordance with the needs of the application of certain phases. In the preliminary phase, for example, a review of needs and field characteristics for the materials of model development and learning tools, using both quantitative and qualitative research approaches. The combination of both designs was also expected to increase the scope, depth, and strength of the research.

Based on the needs of the development of this learning tool then the subject was the second semester students from Department of Family Welfare Education Academic Year 2015/2016. Research subjects were 32 students.

Data collection was done by filling out the review / validation sheet (Jihad, 2008), the implementation of RPP (Susanto, 2008) and questionnaire of student and lecturer responses to the model and learning tools. The data of this research will be processed and analyzed descriptively (Arikunto, 2006) including data of validation / review, learning management, student activity, data analysis result of mastering concept of food knowledge, RPP implementation

and questionnaire of student and lecturer response to model and learning Media. Processing and data analysis is done with the help of SPSS 15.0 for windows program.

The validity criterion of the instrument refers to Gregory's standard index in Arikunto (2006) with a 50% instrument implementation rate of at least 70% of the observed aspects, and the effectiveness of the instrument referred to the coefficient of reliability (Trianto, 2009).

RESULTS AND DISCUSSION

A. The defining stage

1. Front End Analysis

Based on the observation from front-end analysis found that the learning approach used by the lecturer in the subject matter is still dominated by teacher learning approach, although the student-based learning model (problem based learning) is done but not implemented maximally, became less effective.

From the observations also found that two lecturers who conducted the learning process in the subject of food knowledge, one (50%) of them was still used more conventional method of lecturing, and the remaining one (50%) have implemented discussion learning model which is based on the philosophy of constructivism.

Student-based learning model (student center) and lecturing method considered

irrelevant and not suitable to improve students' scientific thinking skills. This conventional model is not only eliminating the potential of creativity, but also does not nurture students' independence, motivation, innovation and initiative, therefore more innovative and constructive models are needed so that students' potential, both cognitive, affective and psychomotor potential can develop maximally. And through a problem-based approach known as Problem-based Learning, the learning process can produce students with intelligent, skillful outcomes and have excellent scientific thinking skills.

2. Student analysis (University Student)

Student analysis is conducted to examine the characteristics of students included the background, especially the basic skills of knowledge and skills of food knowledge. This analysis is done through tests, and questionnaires.

The result of the analysis shows that the students' scientific thinking ability in the Department of Family Welfare which is the subject of this research is in the category of developing and the result of the learning of food knowledge is enough, with the average score of 64.22 from the maximum score of 100. However, the result has not been able to create a

maximum learning process to improve students' scientific thinking skills.

The low student's scientific thinking ability is associated with the conventional learning model as described above. It is recognized as true by some lecturers who know the subject of food knowledge that during this one-way learning, it is considered the best, since innovative learning is not fully understood and recognized. Problem-based learning model has not been popular, both among lecturers especially among students.

3. Concept Analysis

The course of food knowledge discusses a number of basic competencies ranging from basic concepts of food knowledge, basic competence on the classification of foodstuffs, and then discusses the types of vegetable and animal food ingredients, good criteria. The course of knowledge of foodstuffs also includes material related to the way of storing groceries as well as the sample – both vegetable and animal foods processed.

Characteristics of food knowledge subject is slightly different from other subjects, means the instructor of the course is required to creatively choose the model and learning instrument in accordance with the characteristics of the subject of food knowledge. However, based on the results of in-depth

interviews of lecturers who became the subjects in this study found that generally they did not understand and recognized the existence of this course that should be taught with creative and constructive model, but taught with conventional models that more lectures and was dominated by teacher (teachers center approach).

In many literature, it is mentioned that the learning model which is suitable for food science subject is model of inquiry learning, collaborative learning (CL), competence based training (CBT), discovery learning, and project based learning (PJBL) (Trianto, 2009). The learning models are also very relevant to the model of problem based learning (PBL) and with this model is expected to provide benefits on improving students' scientific thinking skills.

4. Task Analysis

Assignment to students is done by testing how their knowledge and skills about the concept of knowledge of the grains. Assignment given in the form of topic of problem of grain knowledge with real situation to be developed and solution for example through literature study and so on.

The first assignment of a student in a group was making a paper / assignment related to grain, the second task was to put the paper in front of the class and the third task was to discuss it

with the students and the discussion was carefully monitored by the lecturer whose position was the facilitator. Students' habits to formulate problems, discuss and express opinions in front of peers and lecturers were expected to improve the ability to analyze, initiate, solve problems, presentation and so on in accordance with the efforts to improve students' scientific thinking skills.

Based on observations found that the ability of students to make papers or tasks and discussions have not been maximized, this is due to their knowledge and skills about the concept of knowledge of grain studied which so far has not been also well understood.

5. Specification of Learning Objectives

This specification was done by extending the activity time in the classroom (lecture hall and laboratory). This method was set by a constructivist environment that was expected to give students the opportunity to work on the problems given in small groups and find the right strategy to solve the problem. This method was done in the form of planning, action, monitoring and evaluation, the purpose so that students understood and skillfully to plan, executed and evaluated at the same time and in this way of course would make students with good ability in scientific

thinking.

Based on the results of observations and interviews found that students who become subjects in this study generally did not understand and recognized how to do the task / problem given and accuracy in choosing problem-solving strategies so that the ability to do the planning, action and analyze the problem were also still weak.

Based on the analysis of preliminary research results, especially in the defining stages of points 1 to 4, the objectives of learning materials were set as follows: (1) students were able to explain the classification of vegetable and animal food ingredients and then skillfully present them in front of the class (2) Students were able to explain the characteristics of good plant and animal food ingredients (3) students progressed in improving the skills of scientific thinking (4) students became independent learners, creative and innovative.

The stages are done in the development of this learning model were: Design stage

1. Instrument Arrangement

Based on the results of the analysis of the front end, the analysis of students (students), concepts, task analysis and learning objectives specifications, then compiled:

(1) making the responses questioners of the students and lecturers about the implementation of RPP (The Learning Action Plan) , (2)

Preparation of validation formats of RPP, BPM and modules, (3) Preparation of observation sheet: learning activities and implementation of RPP (4) Preparation of observation sheet: Learning activities and modeling, (5) Scientific thinking skills tes. This test is based on cognitive, affective and psychicomotor levels.

2. Selection of Learning Model

The learning model chosen in the development of learning tools was Problem based learning (PBL).

3. Format Selection

Selection of learning device format based on scientific approach.

4. Initial draft of learning Instruments

The initial designs that have been produced at the design stage are: (1) Plan of learning implementation of PBL model (2) PBL-based module (3) Model Manual

These three drafts will be validated by two learning experts and one material expert, to assess the validity level and to correct and provide suggestions and inputs for the improvement of the draft models and learning tools before being tested.

B. Development Stage

At this stage, the final form of the model and the learning instrument produced after going through the revision phase based on the input from the expert validator and the test result

data. The steps taken during this test phase were:

1. Expert Validation

Assessment of validators of instructional devices included format, language, construction and content coverage. Based on validator input, models and learning tools were revised to obtain valid models and devices.

2. Trial

Models and learning tools that have been revised tested on the student department of Family Welfare Education Department, Faculty of Engineering, Makassar State University. The test of the device included aspects of the use of models and devices in the learning process. The data obtained in this trial was processed and analyzed for use in assessing and revising learning models and tools prior to dissemination or dissemination.

C. Deployment Stage (dissemination)

This stage will be done in the second year of this research period in 2018. At this stage, the model and learning tools that meet the criteria of valid, practical and effective will be widely disseminated both in undergraduate program and D3 program for food knowledge of Family Welfare Education Department, Faculty of Engineering, Makassar State University.

CONCLUSION

1. Learning on the subject food ingredients has not been effective due to the use of models and learning tools which have not been maximized, and the

learning model was still conventional. Front-end analysis based on observations found that the learning approach used by lecturers during this course was still dominated by teacher learning approach, and generally used more conventional and non-constructive lecturing methods. 2. A valid learning and development tool has been obtained based on validation results by experts or qualified people.

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