The Impact of *Problem Based Learning* Model on Critical Thinking Ability in Vocational Education

Damoyanto Purba
Universitas Negeri Surabaya, Indonesia
damoyanto.purba@gmail.com

Mustaji
Universitas Negeri Surabaya, Indonesia
mustaji@unesa.ac.id

Miftakhul Janah
Universitas Negeri Surabaya, Indonesia
miftakhuljanah@unesa.ac.id

Fajar Arianto
Universitas Negeri Surabaya, Indonesia
fajararianto@unesa.ac.id

ABSTRACT

The various skills are needed of the 21st century must be explicitly taught to cadets in market needs and tight competition. The problem could be a challenge or experience a description of the problem in terms of the difficulty experienced, then it could be irrelevant results, or an unexpected event that occurred. In relating with the curriculum pattern that requires Sailing Polytechnic cadets for one year to practice on commercial ships. The purpose of this study was to determine whether there is an effect of the *Problem Based Learning* model. This research is an experimental study using a control class with the sample t-test method. The impact of the *Problem Based Learning* model is known from the comparison between the control class and the experimental class. The total number of samples used was 24 cadets out of a total population of 144 cadets or 20% of the population. Based on observations and interviews conducted by researchers, it can be concluded that the *Problem Based Learning* model has a positive effect on the critical thinking of Marine Polytechnic cadets.

Keyword : problem based learning, vocational education, critical thinking

1. Introduction

The 21st century education model has one of its features which focuses on creative teaching and learning methods. Each individual has uniqueness and expertise that is different from one another, thus teaching and learning methods that are applied theoretically in the classroom and in practice in laboratories, simulators and workshops must be paid attention to the diversity (learning style) of each individual. Therefore, a learning model that emphasizes the characteristics of each individual and this diversity needs to be developed, as introduced in PBL (problem based learning), PLP (personal learning plans), PBA (performance based assessment), and so on. 21st century skills are a very popular educational topic that has become very often discussed and publicized today and is a challenge in preparing young people to master 21st century skills. Researchers want to answer these challenges by preparing the data presented to look for correlations and interactions in accordance with market demands in the marine world. So that the curriculum, the appropriate syllabus is corrected by the presence of measured input to answer and prepare Marine Polytechnic graduates according to the wishes of the 21st century.

Life in the 21st century demands a variety of modern skills and technologies that must be mastered by Marine cadets, so that it is hoped that the education and training that has been prepared in curriculum and syllabus can prepare Marine Polytechnic cadets to master these modern skills and technologies to become successful individuals in life. . The important skills in the 21st century are still relevant to the four pillars of life of the United Nations which include learning to know, learning to do, learning to be and learning to live together. The four principles each contain specific skills that need to be empowered in teaching and learning activities and are very suitable to be applied in vocational education and training carried out at the Marine Polytechnic. Competency and professional competence in both education and training held are full of skills such as critical thinking skills, problem solving, metacognitive skills, communication skills, collaboration, innovation and creation, information literacy, and various other skills.

What is needed to achieve of 21st century skills is to take action in practice by updating the quality of learning, helping cadets of Marine Polytechnic to develop and include cadets' participation, adjusting personalization of learning, emphasizing project / problem based learning, especially in laboratories, simulators and workshops. , encouraging cooperation and intensive communication between cadets and instructors as well as fellow cadets, increasing the involvement and motivation of cadets in the slightest matter in learning, cultivating creativity and innovation

continuously in learning, using existing learning facilities appropriately, designing learning activities that are relevant to the field of work in the shipping world that will be entered, maximally empowering metacognition abilities, and developing student-centered learning models.

Jerome Bruner is the originator of the concept of developing a *problem-based learning* model, discovery learning is a theoretical concept that supports the problem-based learning model that is oriented towards information processing skills. The educational and training professions that must be obtained from the first semester cadets to the final semesters are regulated and are skills that must be possessed by every cadet as evidenced by a skill certificate. Processing information in a process is a daily work that cadets will do which are applied in a fixed daily basis and in the implementation of the Regulations for the Prevention of Collisions at Sea and the Guarding Service.

Problem Based Learning is a learning method with a unique characteristic, namely the existence of problems in the real world which is a context for students to learn to think critically, skills in solving problems, and how to gain knowledge (Duch, 1995). The problem-based learning method is developed from the curriculum and teaching system simultaneously as a problem-solving strategy and a basic foundation of knowledge and skills by placing students in an active role as solvers for everyday problems that are not well structured (Finkle and Torp, 1995). The two definitions described above mean that *problem based learning* is learning that is focused on a problem in everyday life.

The thinking ability of a person does not develop by itself with increasing human age. The thinking ability of humans will develop well if everything is planned to be developed. Learning activities that are planned and implemented from the start in accordance with well-defined rules will develop a person's thinking ability to be good and this is a very important factor in the process of shaping it. In relating with the above statement, Corebima (1999) states that if you want to encourage one's thinking ability, the implementation of learning including its evaluation must be carried out with planned management to support these interests. In this interest, of course, it cannot be separated from the aspects of implementation that are really of concern such as aspects of the approaches, strategies, methods and other learning techniques used. Its implementation should ensure that the implementation aspects of learning are not only for the benefit of information transfer or even information discovery, but must still refer to the needs and higher-order thinking skills.

The theory of critical thinking is also influenced by several theories, among others, according to Piaget, the development of the ability to think normally is very important in mastering a concept, because conceptual knowledge itself is a result or result of a constructive process. The ability to think can be said to be a necessary tool in this process. Meanwhile, scientific thinking skills which show many characteristics of the normal level of thinking as an essential tool not only for scientists, but also for all people in their life journey (Lawson, 2000).

The various skills needs of the 21st century must be explicitly taught to cadets in market needs and tight competition. In short, the point is that 21st century learning has the main principle that learning must be centered on cadets, collaborative, contextual, and integrated with society which is no less important. The role of lecturers and instructors in implementing 21st century learning is very important in realizing a better future for the nation's children and ready to use in the real world.

To relate new information to prior knowledge Barrows and Tamblyn 1980, Boud and Feletti (1998). This is related to the curriculum pattern that requires cadets of Marine Polytechnic for one year to practice on commercial ships. The knowledge obtained in the previous campus is basic and advanced information as knowledge that will be simulated and put into practice on the simulator to get maximum results or that are closer to the actual event. So that after what knowledge has been obtained at Marine Polytechnic campus during education and training, it will be implemented on board commercial ships. The transformation of knowledge (the process transfer of learning) as new knowledge information will take place as long as cadets practice on board. According to Barrows (1985), the problems faced in problem-based learning require students to find further information on the problem to be solved. An active role is needed for cadets such as gathering as much information as possible so that they can make and weigh decisions, reflecting on experiences in developing learning abilities that may be applied in different situations.

2. Method

This research is an experimental study using two groups, namely experimental and control. The control group was treated using the *problem-based learning* method, while the control group used the method commonly used in the learning process for the participants. The participants of this study were 144 students at the Surabaya shipping polytechnic, which were divided into 72 experimental class people and 72 control class students. The data analysis technique was used by comparing the two groups after receiving the treatment.

The procedure of this research is that after being given intervention, the participants are given an ill-structure problem-solving test related to collision prevention material at sea. The results of participants' answers are scored based on indicators of critical thinking from Facione (1990).

3. Result and Discussion

The *problem based learning* model based on data analysis in this study shows the influence on the critical thinking of cadets. Students who get treatment with problem-based learning models in critical thinking are better than the control class. (Benbow, Rutishauser, Stoddart, Andrew, & Freemont, 1996) state that problem based learning can achieve higher academic standards in studying learning topics. In problem-based learning, cadets are more active in participating in learning so that it affects developments in terms of critical thinking (Tiwari, Lai, So, & Yuen, 2006). Research from Santiprasitkul, Sithivong, & Polnueangma (2013) shows an increase in critical thinking skills when problem-based learning is implemented compared to before it is implemented.

The achievement of problem based learning is different from classical style learning, problem based learning is a learning style that is able to encourage cadets to become thinkers, this process makes cadets gain knowledge, experience to look for various credible sources and solve problems with their own methods. In addition, they learn how to do as teamwork. An important result of the *problem-based learning* process is giving cadets to become lifelong learners (Santiprasitkul, Sithivong, & Polnueangma, 2013). *Problem-based learning* is effective in improving critical thinking skills, conceptual change and success in academics (Hursen, 2020).

Critical thinking is related to dispositions where individuals tend to use critical thinking when facing problems to be solved, ideas to evaluate, and decision making (Giancarlo & Facione, 2001). Critical thinking is a detailed thinking skill in problem solving and takes a long time to develop, and problem-based learning is able to increase the perception of problem solving and critical thinking disposition (Temel, 2014). Increased critical thinking skills in *problem-based learning* because in the process, cadets carry out the process of clarifying problems, assessing information needs, identifying relationships between concepts, collaborating between new forms of knowledge, formulating hypotheses, debating related problems, considering alternative solutions, investigating, searching for the truth , suspend or revise the assessment and acceptance of different views

(Gholami, et al., 2016). In problem-based learning, cadets become more proficient in critical analysis, problem solving, group work, and communication (Allison & Pan, 2011).

4. Conclucion

Based on observations and interviews conducted by researchers, it can be concluded that the *Problem Based Learning* model has a positive impact on the critical thinking of Marine Polytechnic cadets. During the problem solving process, cadets clarify problems and formulate hypotheses, and consider solutions, as well as investigations. So, it is suggested to use the *Problem Based Learning* model in the marine guard service course DP-III. Establishment of the Department of Nautics at the Marine Polytechnic.

Reference

Allison, J., & Pan, W. (2011). *Implementing and Evaluating the Integration of Critical Thinking into Problem Based Learning in Environmental Building*. *Journal for Education in the Built Environment*, 93-115.

Barrows, H. S. (1985). *How to design a problem-based curriculum for preclinical years.* New York, NY: Springer Publishing Company.

Barrows, H. S., & Tamblyn, R. M. (1980). *Problem-based learning: An approach to medical education.* New York, NY: Springer Publishing Company.

Benbow, E. W., Rutishauser, S., Stoddart, R. W., Andrew, S. M., & Freemont, A. J. (1996). Medical Education. Pathologists And Problem-Based Learning. *The Journal of Pathology*, 340—342.

Boud, D., & Feletti, G. (1997). *The challenge of problem-based learning* (2nded.). London: Kogan Page.

Corebima, A.D. 1999. Proses dan Hasil Pembelajaran MIPA di SD, SLTP dan SMU: Perkembangan Penalaran Siswa Tidak Dikelola Secara Terencana. *Proceeding* Seminar *Quality Improvement of Mathematics and Science Education in Indonesia (JICA)*. Bandung, August 11.

Fisher, D., Yaniawati, P., & Kusumah, Y. S. (2017). The Use of CORE Model by Metacognitive Skill Approach in Developing Characters Junior High School Students. *The 4th International Conference on Research, Implementation, and Education of Mathematics and Science (4th ICRIEMS)* (hal. 1-24). Yogyakarta: AIP Publishing.

Gholami, M., Moghadam, P. K., F. M., Tarahi, M. J., Sak, M., Toulabi, T., et al. (2016). Comparing the effects of problem-based learning and the traditional lecture method on critical thinking skills andmetacognitive awareness in nursing students in a critical care nursing course. *Nurse Education Today*, 16–21.

Giancarlo, C., & Facione, P. (2001). look across four years at the disposition toward critical thinking among undergraduate students. *The Journal of General Education*, 29-55.

Hursen, C. (2020). The Effect of Problem-Based Learning Method Supported by Web 2.0 Tools on Academic Achievement and Critical Thinking Skills in Teacher Education. *Technology, Knowledge and Learning*, 1-19.

Jonnasen, D.H. & Serrano, J.H. 2002. Case-Based Reasoning and Instructional Design: *Using Storiesto Support Problem Solving;ETR&D*: Vol. 50 (2) pp 65 – 77.

Lawson, A.B. 2000. The Development of Reasoning Among College Biology Student. A review of Research. *Journal of College Science Teaching, XXI(16): 338-344.*

Santiprasitkul, S., Sithivong, K., & Polnueangma, O. (2013). The First Year Nursing Students' Achievement and Critical Thinking in Local Wisdom Course Using Problem Based Learning Process. *Wireless Personal Communications*, 1077—1085.

Santiprasitkul, S., Sithivong, K., & Polnueangma, O. (2013). The First Year Nursing Students' Achievement and Critical Thinking in Local Wisdom Course Using Problem Based Learning Process. *Wireless Personal Communications*, 1077—1085.

Temel, S. (2014). The effects of problem-based learning on pre-service teachers' critical thinking dispositions and perceptions of problem-solving ability. *South African Journal of Education*, 1 - 20.

Tiwari, A., Lai, P., So, M., & Yuen, K. (2006). A comparison of the effects of problem-based learning and lecturing on the development of students' critical thinking . *Medical Education*, 547–554 .