

The Effect of Mastery Ship Engineering Theory and Practice Competence toward Learning Result through the Marine Practice of Polytechnic Limo Pelayaran Makassar

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Abstract: *The aim of this study is to analyze The Effect of Mastery of Theory and Practice on Learning Outcomes of Makassar Polytechnic Sciences Taruna (PIP) either directly or indirectly through Intervening Variables of Sea Practice. The data that is used are secondary data of cadets' learning outcomes both practice and theory, as well as the result of marine practices that conducted on board practice. Methods of data analysis used path analysis to see the direct and indirect effect between mastery of theory and practice on learning outcomes of PIP Makassar cadets. The direct effect through the variable of theory mastery and practice on marine practices and learning outcomes, as well as the direct effect of marine practices on learning outcomes. Neither is the indirect effect between the mastery of theory and practice on learning outcomes through marine practice variables.*

The result of the research shows that the mastery of the theory has a positive and significant effect on the learning outcomes of PIP Makassar, as well as the direct influence of the marine practice variables on the learning outcomes obtained positive and significant results. Meanwhile, there is also a positive and significant influence between the mastery of theory and practice on the learning outcomes of PIP Makassar through the intervening variables of marine practices. The findings of this study are the effect between the mastery of theory and practice on the results of learning are greater when compared with indirect influence through marine practices. That is, the mastery of theory and practice obtained by cadets in the process of teaching and learning mostly do not match with what they get during the sea practice on board, therefore improvements are need needed in the learning process of cadets in PIP Makassar.

Keywords: *Mastery of Theory and Practice, Learning Outcomes, Sea Practice*

Date of Submission: 23-04-2018

Date of acceptance: 10-05-2018

I. Introduction

In order to educate the nation's life as mandated in the preamble of the 1945 Constitution, there have been many efforts by the government to encourage the improvement the quality of education. This is done as consideration that education is a very important aspect in advancing the life of a nation. Based on that, the government is responsible for ensuring the implementation of a quality education system, equitable, and sustainable.

In accordance with the function and objectives of national education, as stated in Law number 20 of 2003 on the national education system, described that national education serves to develop the ability and form the character and civilization of a dignified nation in order to educate the nation's life which aims to the development of potential participants educated to be a man of faith and cautious to God Almighty, have a noble character, healthy, knowledgeable, capable, creative, independent, and become a democratic citizens and responsible.

To achieve these objectives, the government must ensure quality education standards covering several aspects, such as: the competence of graduates, curriculum, educators and education, facilities and infrastructure, management system, financing, and educational assessment that must be improved on a planned and periodic basis. This step needs to be done continuously to ensure the implementation of education in Indonesia run well and evenly in order to build adaptive human resources to the changing times.

One of the important aspects of the government's current focus in maintaining the continuity of the implementation of a quality education system, namely through the system of accreditation at all levels of education, starting at the basic level of education to higher education. This accreditation system becomes an instrument for the government to control the quality of education especially in higher education. In this accreditation system includes several aspects that already have quality standards that must be met by

universities, among others: standard management education (governance), student competency standards, quality of human resources covering Lecturers and education personnel, curriculum and financing standards.

In addition, the government has mandated in the Law for education fund allocation at least 20 percent in the APBN and APBD. This policy is issued to ensure that central and local governments are serious in dealing with education as an important aspect of the nation's development process. The allocation funds for education is not only through the budget, but the central government also makes special programs in the field of education to provide special assistance for the underprivileged through subsidies in the form of scholarships, so there is no reason for Indonesian citizens not to receive education until at higher education level. Thus, the government's attention to the field of education is expected to produce human resources that can compete in the current era of globalization.

One of the important instrument for measuring the quality of human resources from the education process is reflected in cognitive, affective, and psychometric abilities and skills. These three aspects become the standard of competence that must be possessed by someone who has been educated, both at the level of basic education and higher education, Hanushek, Woessmann and Zhang (2017).

Cognitive ability manifested in the development of logical and creative thinking ability. Affective ability refers to one's ability to develop and cultivate a balance between feelings and emotions that functionally actualized through work commitments as part of his life. Meanwhile, the aspect of psychomotor ability is manifested in the skill and physical endurance of a person in carrying out an activity. These three aspects are expected to accumulate in the quality of Indonesian human resources with strong knowledge, skills and work attitude.

Makassar Shipping Polytechnic (PIP) is one of the University or a Technical Implementation Unit (UPT) under the Ministry of Transportation which organizes vocational education in the field of maritime, where Makassar Polytechnic of Sciences in performing its function as Education and Training Institution, educates cadets D-IV shipping program in each area of expertise where there are three (3) areas of expertise namely: Nautika, Teknik and Sea Transportation and Port Authority.

The decency of this study is being able to see the gap that occurs between ideal conditions that is expected in the process of delivery of education (according to the quality standard of education) with the real circumstances that occurred in PIP Makassar. This becomes an important point to conduct the evaluation process of output and outcomes produced by PIP Makassar during the establishment of this campus. As a vocational college and Boarding School, PIP Makassar certainly faces a number of obstacles in the process of organizing education.

Based on the expected conditions, this study will look at the extent of mastering the theory of ship machinery engineering and practice competence on cadet competence during marine practice (PRALA). Practical competence is a competence that must be possessed by learners at the Nautika Level Expert Program (ANT), Level Technicians (ATT), D-VI program. To know the level of learning objectives achievement of theoretical and practical subjects, then tested using the standard courses that have been prepared in the curriculum. In laboratory tests, simulators and workshops, different types, sizes, models and criteria are appropriate to the characteristics and essence of the learning experience using laboratories, simulators and workshops. Assessment is more focused on assessment during the learning process. Assessment is also able to provide useful information for teachers to improve teaching quality in motivating the cadets of PIP Makassar.

II. Research Methods

Location and Type of Research

This research was conducted at Makassar Sciences Polytechnic (PIP) at Department of Nautika and Teknik. The type of the research is descriptive quantitative.

Types and Data Sources

The data used in this study using quantitative data. It is obtained from the assessment of cadets on the mastery of the ship machinery theory, practice competence, marine practice competence and learning outcomes, obtained from instructors (teaching staff), and data on the assessment of practical competence and practical competence sea recorded in a training record book.

Method of collecting data

The data used in this study is secondary data derived from the assessment of cadets in the form of mastering ship engineering theory, practice competence, marine practice competence and learning outcomes. Therefore, data collection techniques that used were documentation studies, interviews, and observation. Interview technique conducted in this research is direct interview to some cadet Polytechnic of Sailing Sciences (PIP) Makassar who sit in semester V (five) and VI (six). The observation technique is structured observation using assessment instrument and cadet test according to competency standard on marine practice made by PIP

Makassar and filled in Training Record Book (TRB) and Cadet Record Book (CRB). Assessment of Cadet Record Book (CRB), covering the courses of diesel motor and gas turbine; steam aircraft; workshop technology and maintenance; control systems; electrical Engineering; construction and ship building; maritime law and shipping safety; English and reporting, using a score of 0-100 points.

Method of data analysis

Methods of data analysis using path analysis in order to see the relationship between research variables. Path analysis technique is done to see the direct and indirect effect. To produce the value of direct and indirect effect the researcher applied multiple linear regression analysis techniques using intervening variables. Furthermore the relationship between these variables is described in the form of simple (function) as follows:

$$Y_1 = f(x_1, x_2) \quad (1.1)$$

$$Y_2 = f(x_1, x_2, Y_1) \quad (1.2)$$

Before doing multiple linear regression, the equation (function) must be in linear right first. One method that can be used is CLRM (classical linear regression model) that is by transforming the equation to a linear equation by using logarithm. The use of CLRM to convert nonlinear equations into linear by using natural logarithm (ln) with a double log (log-log) model, in addition to equating the units of each different variable, so that the linear equations are translated into the following econometric equations :

$$L_n Y_1 = L_n \alpha_0 + L_n \alpha_1 x_1 + L_n \alpha_2 x_2 + \varepsilon_1 \quad (1.3)$$

$$L_n Y_2 = L_n \beta_0 + L_n \beta_1 x_1 + L_n \beta_2 x_2 + \beta_3 Y_1 + \varepsilon_2 \quad (1.4)$$

In order to see the effect of mastering ship theory (X1) and practice competence (X2) on learning outcomes through marine practice variables (Y1), the analytical model is using reduce form, by substituting equation (1.3) into equation (1.4) to obtain the function equation to be:

$$Y_2 = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 Y_1 + \varepsilon_2 \quad (1.5)$$

$$= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 (\alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \varepsilon_1) + \varepsilon_2 \quad (1.6)$$

$$= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + (\alpha_0 \beta_3 + \alpha_1 \beta_3 x_1 + \alpha_2 \beta_3 x_2 + \beta_3 \varepsilon_1) + \varepsilon_2 \quad (1.7)$$

$$= (\beta_0 \beta_3 \alpha_0) + (\beta_1 + \alpha_1 \beta_3) x_1 + (\beta_2 + \alpha_2 \beta_3) x_2 + \varepsilon_2 \quad (1.8)$$

The above equation uses (Ln), so the equation becomes:

$$Y_2 = (\beta_0 \alpha_0 \beta_3) + (\beta_1 \text{Ln } \alpha_1 \beta_3) x_1 + (\beta_2 \text{Ln } \alpha_2 \beta_3) x_2 + \varepsilon_2 \quad (1.9)$$

The results of the equation based on the model, it can be concluded about the direct and indirect influence between the variables of the study.

Operational Definition

Variable mastery of the ship's machinery theory is the mastery of a number of theoretical understandings and the abilities associated with thinking, knowing and solving problems to act with a particular purpose, and adjusting to the proper way for the Makassar Polytechnic Makassar cadets. Indicator that were used in mastery view of cadet theory that is seen from aspect of goal, mental attitude, quality and requirement. Mastery of ship machining theory in this research is seen from the result of assessment to cadets who sit on the semester I to IV recorded at the end of each semester. Practical competence variables are the mastery of a number of abilities to perform practice based on psychomotor skills and ability to act after cadets receive certain learning experiences. The competence variable of marine practice is the education for cadets who already in semester V and VI with some aspect of assessment including: diesel motor and gas turbine, steam aircraft and auxiliary aircraft, equipment and maintenance technology, control system, electrical engineering, construction and ship building, maritime law and shipping safety, English and reporting, in which all forms of assessment are recorded in the training record book.

III. Result and Discussion

The Effect of the Mastery Ship Machining Theory of Learning Outcomes, Either Directly and through the Competence of marine practice

As has been explained previously that the results of data processing in this study showed a positive and significant relationship between the mastering of ship machinery theory to the learning outcomes of Makassar Polytechnic Ship Sciences (PIP) either directly or through intervening variables namely, the competence of marine practices. The result of data processing obtained that direct correlation between mastering of ship machinery theory to marine practice competence are positive and significant with coefficient value equal to 0,170. This means that increasing the mastery of shipyard theories of PIP Makassar cadets will encourage improvement in the field practice competence through marine practice taken by cadets for several months on board.

The ability of cadets in mastering the theory becomes provision for them to practice the marine (PRALA). Thus, if the basic theory as supporting implementation of field practice through the marine practice is not understood well in advance, it will affect the readiness of the cadets in implementing the marine practices.

So that will ultimately impact on the learning outcomes. If it is related to the result of data processing, the influence of mastering of ship machinery theory to the learning result is positive and significant, it means that if there is an increase in the ability of cadets in mastering the ship machinery theory, it will have positive impact on the cadet's learning result, ship machining against practice competence. If there is an increase in the mastery of ship theoretical theory of the cadets of both nautical and technical majors will have a positive impact on the ability of the cadets during the practice of the sea.

The findings of this study are in line with some of the findings of several previous studies. Stenberg (2014), which concludes that there is a significant relationship between mastering machining theory and student practice achievement. So the results of this study reinforce the reason that the mastery of theory is able to equip the learners at the time with the practice in the field. In relation to these results, the theory for Makassar Polytechnic ships (PIP) from the first semester up to the fourth semester will be a provision for the cadets to facilitate field practice for them especially during marine practice (PRALA).

Two important findings in this research are: (1) the control of the ship's machinery theory gives positive and significant effect to the ability of marine practices and learning outcomes, and (2) the maritime machinery theory's contribution to marine practice skills found to have a relatively small coefficient of 0.023, or in other words most of the ability of marine practice for PIP Makassar cadets are influenced by other factors beyond the mastering of ship's machinery theory. The results of this study differ from the findings of research conducted by Crepon (2013), and Kartiani (2015), who found that most of the practical competence is influenced by mastery of theory. From these findings, it is necessary to improve the quality of theoretical learning to increase the theoretical basic knowledge for the cadets, especially the mastering of ship's machinery theory. The improving of theoretical basic knowledge can be done with various strategies or relevant learning methods. Knowledge of the theory can be built in the classroom with the method of learning that is more in line with the ability of cadets. The building of theoretical knowledge can be done by optimizing the resources possessed by Makassar's shipping polytechnic (PIP), either from lecturer aspect (Lecturer / Instructor), curriculum, administration system, the latest use of book or journal reference, support the teaching and learning process.

The development aspects of theory mastery for cadets becomes an important thing that needs to be prioritized by PIP Makassar. Based on the achievement of cadets learning results, it was found that the learning outcomes on the competence of the practice is higher than in the theoretical aspects of learning. This is based on 2 (two) reasons, namely: (1) learning style, which is a tendency in the procedures or individual preferences in the learning process. Each individual has a distinctive learning style in which they feel comfortable in the process of receiving information. Feel comfortable will facilitate learners (cadets) in absorbing information. Learning is considered to be a two-step process comprising, the process of receiving and processing information (Felder and Silverman, 2002).

Educational providers should be aware that learners (cadets) have differences in the way of learning with each other. Nevertheless, in the Felder and Brent study (2005) it is seen that the tendency of learning styles of learners is an active learning style, sensing and visual. The three learning styles are identical to the lab activities, where the process of practicum is an active process, requiring a number of limbs to perform certain activities. In other words, today's learners prefer to practice in the laboratory than in theory-oriented learning. Therefore, the comfort factor of learning has an impact on the learning achievement of PIP Makassar cadets. The reason for this is that the average value of learners (cadets) on the competence of practice tend to be higher than the mastery of his theory, although this conclusion cannot be generalized in all courses oriented to the introduction of theory.

The Effect of Practice Competence on Learning Outcomes, Both Directly and Through Sea Practice Competencies

The result of data processing shows a positive and significant correlation between the practices competences toward cadets learning result of Makassar Polytechnic Science (PIP) either directly or through the competence variable of marine practice. The output result of data processing obtained that direct correlation between practice competences to marine practice competence with coefficient value equal to 0,021. This means, an increase competence of practice will encourage an increment in the practice competence of cadets PIP Makassar.

Practice of the sea or abbreviated PRALA is a learning activity on board for the cadets of Nautika and Teknik majors in order to practice theories and practices they have learned previously under the direction or guidance of the Master and Ship officers. PRALA is intended for cadets to be able to apply the knowledge that has been on the bench lectures and seek new knowledge or experience that can be taken from work on the boat or on land, Kobayashi (2008).

The implementation of practical learning methods that implemented in the learning process undertaken by the department of Nautika and Technical PIP Makassar, has a coefficient value of 2.304. As an outline, the involvement of learners (cadets) in the learning process activities both physical and psychological will lead to a

very meaningful personal experience. Successful learning should be through various activities both physical and psychological activity. All the roles and desires of learners are mobilized and directed so that the energy is activated to get the optimal learning outcomes, as well as following the process of learning actively.

On the other hand, a good lecturer should have good competence in choosing and determining the right method that will be used in the teaching and learning process. A lecturer will not be able to perform its duties if he/she does not master any method of teaching that have been formulated and expressed by psychologists and education experts. As one of the learning component, learning method occupies a role that is not less important than other components in the learning activities. None of the learning activities did not use learning methods. This means, the lecturer should acknowledge the position of the learning method a factor of an extrinsic motivation in the learning activities. In this section the method of practice becomes crucial in the process of teaching and learning as a provision for cadets before entering the practice of the sea, Gunawan (2017). In addition, the practice competence for cadets becomes a distinct advantage for the cadets as it becomes part of the additional experience in understanding the technical implementation of marine practices through workshops, laboratories and simulators.

As the results of research conducted by Utami and Gafur (2015), stated that experience can affect the psychology for the individuals development which is one of the principles of developing the readiness of learners in preparation of entering the world of work (practice of the sea). Experience is knowledge or skills that are known and controlled by someone as a result of deeds or work that has been done before for a certain period of time.

Along with that, Oosterbeek (2007), said that the readiness of work is a condition that indicates the existence of harmony between physical maturity, mental, and experience so that individuals have the ability to perform a certain activity in relation to work or activity. Therefore, cadets who are actually considered ready to practice the sea are those who already have adequate practice competence. This knowledge they have gained in workshop, lab and simulator activities, Kobayashi (2009).

This study are also in line with previous research conducted by Musa (2016), which found that there is a significant relationship between knowledge of practice and theory on achievement or student learning outcomes with a value of R (correlation) of 54 percent.

The experience that gained through practical activities either workshops, laboratories and simulator activities. In addition, before participating PRALA cadets are included in the training ship activities owned by PIP Makassar as a first step for the process of adjustment or introduction of the type of vessel to be used at PRALA. It's just that the activity of this training ship has a very short time frame and a relatively shorter route. This becomes one of the causes why the low coefficient of practice competence of the cadet PIP Makassar Makassar.

The practical activities through workshops, laboratories and simulators become part of teaching and learning process coupled with the introduction of basic theories. Thus, the quality of learning through practice competence becomes unfocused because it only becomes part of the classroom learning activities, Kobayashi (2008).

Another result of this study shows that a direct correlation between the competences of practice toward cadet learning outcomes have showed positive and significant correlation with the coefficient value of 0.303. This means that when there is an increase in the practice competence of PIP Makassar cadets, it will encourage the improvement in learning outcomes. Neither the indirect effect between the competence of practice on learning outcomes through intervening variable that is the competence of marine practice that has a positive and significant correlation with the coefficient of 0.003, so that the total effect is 0.306.

When compared with the coefficient value of direct influence between the practice competences and marine practice, with a direct relationship between skill practice and the results of learning cadets, it can be concluded that the value of coefficient relationship between competence practices on learning outcomes is much greater, that is 0.303. These results are reinforced by the results of data processing that shows that the influence of practice competence on the results of learning indirectly through the competence of the practice of the sea is even smaller that is 0.003. This means, the material given to cadets in practice is not used wholly when practicing the sea (PRALA).

The results of this study showed that the material that given to cadets during the first semester to IV in the form of material mastery coupled with practical activities for some particular subjects did not contribute significantly to the competence of cadet practice. This means that the competence of PIP Makassar cadets is derived from the experience they gained while aboard the ship under the guidance of the ship's officers as a substitute of their lecturers on board.

Basically the learning process will produce a learning outcome. However, although the purpose of learning is formulated clearly and well, it is not necessarily will give an optimal learning outcomes. Since the good results are influenced by other components, such as the use of methods in learning in this case the method of practice learning. Although the purpose of learning is formulated clearly and well not necessarily the optimal learning outcomes, because good results are influenced by other components such as the use of methods in learning in this case learning methods of practice, Maesaroh and Rostrieningsih (2010)

The learning method using learning practice will further clarify and facilitate cadets to practice the material that have been learned in the theory that obtained in the classroom. Practical learning methods will also develop the ability to think and train intellectual skills in addition to skill / psychomotor, Maesaroh (2013). Therefore, learning with the practice of output is a change in cadet competence from skills aspect. Skills that are expected at PIP Makassar cadres are a change in the skill side in mastering vessels over the sea associated with nautical and technical.

Psychomotor learning results like this have been put forward by Muhibbin (2001) which stated that the results of this psychomotor learning appears in the form of skills and ability to act individually. "This psychomotor learning result is actually a continuation of the cognitive learning outcomes (comprehending things) and the affective learning outcomes (new ones appear in the form of behavioral trends). Cognitive learning outcomes and affective learning outcomes will be the result of psychomotor learning when young people have shown certain behaviors or deeds in accordance with the meaning contained in the cognitive and affective domains with nautical discipline material and technical.

Based on the findings of this study, the results of learning through indicators of changes in aspects of psychomotor that tested through the practice of sea cadets PIP Makassar. The results of the assessment and testing of marine practices are summarized in Training Record Book (TRB) and Cadet Record Book (CRB). The aspects of skills in TRB include assessment and testing in function I (marine engineering at the operational level); function II (electrical, electronic and control engineering at the operational level); Function III (maintenance and repair at the operational level) and function IV (controlling the operational at the ship and care for person on board at the operational level). While assessment of Cadet Record Book (CRB), covering several aspects such as: diesel motor and gas turbine; steam aircraft and aircraft; workshop technology and maintenance; control systems; electrical Engineering; construction and ship building; maritime law and shipping safety; English and reporting.

IV. Conclusions and Suggestions

Based on the formulation of the problem described earlier, then performed the data processing to test the hypothesis on the problem, so the researcher get some conclusions as follows: (1) there is a direct positive and significant effect between the competence of ship machinery theory to the competence of practice civet fishery Makassar Polytechnic ; (2) there is a positive and significant direct effect between the competence of practice on the competence of the practice of Makassar Fishery Polytechnic Makassar; (3) there is a positive and significant direct effect between the competence of ship's machining theory to civic learning result of Makassar Polytechnic Science; (4) there is a direct positive and significant effect between the competence of practice toward civic learning outcomes Makassar Polytechnic Science; (5) there is a direct positive and significant effect between the competence of marine practice on civic learning outcomes Makassar Polytechnic Science; (6) there is a positive and significant indirect influence between ship theoretical competence of the vessel to the learning result through intervening competence variable of marine skill practice Makassar Polytechnic of Science; (7) there is a positive and significant indirect effect between the competence of practice on learning outcomes through intervening variables of marine skill competency of Makassar Polytechnic Science.

Based on the results of this study, the authors recommend some important suggestions for educational services improvement, especially in Makassar Sciences Polytechnic (PIP): (1) The results of this study illustrates that the mastery of the ship's engineering theory and practice have a positive and significant impact on the competence of marine practices and learning outcomes, only with small coefficients. Therefore, PIP Makassar should presumably encourage the learning methods undertaken by lecturers who are innovative and in accordance with the level of cadet needs so that it will be easy to understand in order to increase the contribution of mastering ship machinery theory and practice to cadets learning outcomes; (2) Based on the experience of some PIP Makassar cadets who have done PRALA, most of the skills of mastering ship theory of machinery in class and practice activities are not used when cadets do PRALA. Therefore, PIP Makassar would need to revise the curriculum according to the level of work requirement or company request that will use PIP Makassar Alumni; (3) The ratio of lecturers to the number of cadets that are very lame indicates that PIP Makassar needs to make new lecturers in accordance with departmental or linear majors. This is a priority for PIP Makassar, in addition to Porlap Dikti's insistence that requires a normal ratio between the number of cadets and lecturers, as well as the level of company needs that require PIP Makassar Alumni; (4) PIP Makassar needs to optimize the trainer program for cadets before joining PRALA. The balance is that when doing PRALA, cadets will be assessed or evaluated by the company. Therefore, the presence of training ships become an opportunity for PIP Makassar to improve the competence of practice for cadets before joining PRALA. In addition, the results of this study also show that the competence of cadets has little effect on cadet learning outcomes despite having a positive and significant influence.

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Aslang "The Effect of Mastery Ship Engineering Theory and Practice Competence toward Learning Result through the Marine Practice of Polytechnic Limo Pelayaran Makassar." IOSR Journal of Research & Method in Education (IOSR-JRME) , vol. 8, no. 3, 2018, pp. 13-19.