European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.999994 Volume 3 | Issue 9 | 2017

THE DEVELOPMENT OF COLLABORATION COMMUNICATION SKILLS AND METACOGNITIVE OF MECHANICAL ENGINEERING VOCATIONAL EDUCATION PROGRAM

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Abstract:
This study tries to achieve two major purposes, the development and experiment. The development within this study aims at developing learning instrument. In addition, this study also aims at discovering the influence of learning instrument developed on the students' communication skill, discovering the collaboration skill of students, revealing the effect of learning instrument on the metacognition ability of students, revealing the effect of learning instrument on the Fabrication conceptual understanding of students. This study employed Four D Model and the experiment design was used quasi-experiment with non-equivalent control group design. The data analysis data of this study employed descriptive analysis and covariant analysis or Anakova. The findings of this study reveal that the learning instrument developed based on scientific approach is effective to enhance the communication skill, collaboration skill, metacognition ability, and fabrication conceptual understanding of the Mechanical Engineering Vocational Program Students of UNESA Surabaya. Considering that communication skill, collaboration skill, metacognition ability are imperative in recent days, therefore it is suggested to utilize this learning instrument during Fabrication Practice Learning as well as evaluating the instrument to generate an improved instrument.

Keywords: communication skill, collaboration skill, metacognition ability

1. Introduction

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Law No. 20 of 2003 article 3 concerning on the National Education System explains that national education aims at generating and developing the capability and characters of society to be able to stand as proficient and reliable individual—supporting the advancement of national intelligence, improving the potency of learners in order to become an individual who possesses a good faith in Religion, good character, become a qualified, persistent, creative, independent, and responsible individual to the nation.

Educational system in Indonesia is divided into two groups, namely (1) academic education, and (2) professional education. Academic education is an education program, which aims at preparing learners in developing their potency to continue the study in further degree. Meanwhile, professional education program is to ensure learners' preparation for competency improvement in accordance with the areas of expertise. Professional education program belongs to the education which is oriented to professional working.

Within education, system which is oriented to the professional working in Indonesia it commonly used the term vocational education in different degree. In Article 15 of the Law on National Education System Number 20 of 2003, it is explained that the meaning of vocational high school is secondary education which prepares students primarily to work in certain fields, whereas vocational education program is higher education which prepares learners to have jobs with certain applied skills maximal equivalent with undergraduate programs.

One university in East Java providing vocational education program, is State University of Surabaya or UNESA. In UNESA, vocational education program is provided in several faculties in the form of Diploma III Education Program. During 2008-2013, the interest of people in Mechanical Engineering Vocational Program was really high. The graduates of Senior High School and Vocational High School competed to get a slot in Mechanical Engineering Vocational Program in UNESA. The student's enrollment had achieved five to six times from the quota given. As well as the graduates of the program, almost the entire graduates directly get a job in a big company in Yogyakarta, Surabaya, or Jakarta. Even, before the students were graduating the company asked for an employment support to the faculty. Unfortunately, in the beginning of 2014, the interest was significantly decreased. The students enrolled, even, lower than the quota provided. Thus, the faculty had no chance to select the input. This condition is urgent to be resolved if the faculty aims at preserving the existence of the program and also developing the management.

According to the self-evaluation result report performing for accreditation preparation, it obtained that the vocational education program is weak on several

elements. The weaknesses are in the Fabrication Practice Learning. The learning or lecturing process of Fabrication Practice remains instructive. It was not directed on the students active process or what so-called student-centered learning in improving the skill and ability. In addition, the lecturers did not place themselves as a facilitator of learning. In conclusion, it illustrated that Fabrication Practice Learning was not conducted optimally.

Then, it is normal if the graduates also possess the weaknesses such as communication skill, collaboration skill, and problem-solving ability (metacognition). It also indicated from the products of practice which did not meet the standard, the raw-material wasting for the practice due to the error in practice, and the completion of product which exceeded the due date given. The moment, the coordination, communication, collaboration and evaluation are generated the results would be better. Therefore, the aforementioned issues indicate that the communication, collaboration, and metacognition skill of students are important to be developed. Since such elements are necessary in the real life (Slamet PH, 2003).

Pursuant to the above-mentioned issues within the learning process in Vocational Program of UNESA, the researcher believes that to resolve such issues, it needs a brand-new learning instrument which effectively improve the communication, collaboration, and metacognition skill of students in Mechanical Engineering Vocational Program UNESA.

3. The Purpose of Research

The purpose of this research is to conduct an experiment and produce a development instrument. The development of this research is to develop learning instrument. While, the experiment purpose of this research is to test the learning instrument developed in order to discover: (1) the influence of learning instrument developed on the students' communication skill; (2) the influence of learning instrument developed on the students' collaboration skill; (3) the influence of learning instrument developed on the students' metacognition skill; (4) the influence of learning instrument developed on the students' conceptual understanding of Fabrication.

4. Theoretical Framework

According Sanjaya Wina (2011), a good learning device capable of measuring the competence held by students through the evaluation instrument. According to Benta, at., al. (2009), the achievement of learning objectives is the achievement of competence that can be measured through authentic assessment. In the context of learning by using approach scientific assessment type of portfolio is one of the four types of authentic assessment suggested, for obvious advantages can explore the capabilities of the students and also can be used as a component of evaluation *feedback* on the learning process has been implemented (Bryant and Temmins, 2002; Baume and Yorke 2002). Moreover Gronlund (2001: 2), suggests that the advantages of using authentic assessment portfolio types are: (1) the learning progress of the students can be seen clearly; (2) emphasis on the best results of students' work has a positive effect on learning; (3) provide greater motivation for learning; (4) provide opportunities for students to work according to individual differences; and (5) when properly implemented can be a clear communication tool of learning progress for the students themselves, parents, and others.

Particularly for vocational education, according to Bragg, DD (1995), having held reflection and development, the use of authentic assessment expanding portfolio types. According to Zita M. Wagner (1998), an authentic assessment of the type of portfolio is the most appropriate assessment for vocational education. Because besides having strong relevance to the scientific approach, it also has many advantages, among others: (1) is able to describe the learning outcome of students, both in the GKA ran observing, reasoning, tried, building networks, and others; (2) tend to focus on complex or contextual tasks; and (3) enable learners to demonstrate their competence in more authentic settings.

Along with the rate of development of science and technology is rapidly increasing, authentic assessment type of portfolio is also experiencing growth forms into electronic portfolios *(e-portfolios)* to support the implementation of learning. Based on the tasks, forms, as well as their possible application to the *e-portfolio* were identified as potentially develop communication skills, collaboration and student metacognition which will impact on cognitive ability. The new form of such web-based portfolio has the potential to support the learning process as well as to motivate students as reported in Cheng Chang (2009). The results of the study by Meyer, et. al., (2010) also showed that the use of *e-portfolios* can improve cognitive ability, while recognizing the progress of students with examining a collection of his work. In addition to the progress and the ability of students will also be reflected in the *e-portfolio* (Barrett, 2000). It was also reported in the research results Cheng Chang, (2009) that the learning outcomes were

collected during a certain time period in *an e-portfolio* is able to increase the level of student motivation.

The development of course outline and course meeting plan are equipped with evaluation tools in the form of e-portfolio needs to be equipped also with teaching materials as another important component. Teaching materials can be realized in the form of textbooks, modules, practice guides and others. Furthermore Kemp (1977) states that good teaching materials are a combination of knowledge (facts and detailed information), skills (steps, procedures, circumstances and conditions) and attitudes. In the selection of teaching materials which are effective according to Gerald & Ely in Karim, M (1980) must meet the following criteria: 1) the accuracy of cognitive *(cognitive Appropriate),* 2) the level of thinking *(level of sophistication),* 3) cost *(cost),* availability of materials (*availability)* and 5) the technical quality *(technical quality).* While Romiszowski, A., (1986) states four important aspects in the preparation of teaching materials shaped books, namely academic, social, recreational, and personal development.

Rokhman & Yuliati (2010), suggest that the teaching materials are an essential requirement in learning as a means of improving interaction and communication. The reason is very acceptable for teaching materials that have a high relevance to the material and arranged systematically in order to be able to generate learning process becomes more dynamic and build curiosity of students greater.

According to Mulyasa (2006), the learning materials used can be in the form of hand out, book, module, poster, brochure, and leaflet. Learning materials in the form of module can encourage the participation, motivation, and achievement of students. In line with Mulyasa, Rachman (2000) explains that learning system with module is one strategy of learning teaching which has proved enriching the pedagogy knowledge and as a programmed learning improvement. The improvement of module learning program is continuously conducted and has proved that it enhance the participation of learners. Vembriarto (1995) also state that learning system using module provides a various benefits such as student-centered activity, quality control is higher than conventional learning, the relevance of learning with curriculum is improved, and learning objectives of learners is accomplished.

From the explanation above regarding module in learning and its benefits, it is believed that the implementation of module learning system could improve the quality of learning. If the learning quality is improved then the students' competence will also be improved. In addition, the quality of lecturer indeed needs to be improved. .

According to Ono and Ferreira (2010), lesson study is able to improve professional competence of lecturer if it is conducted continuously and planned consistently. Lesson study with team that supports the entire stages of learning is

basically served as a strength to ensure the quality of learning. Lecturer model supported by Lesson Study team could explore the ability in order to improve the performance and professionalism.

Safilu (2013), in his research claims that Lesson Study applied could improve the quality of learning process and enhance the students complex thinking ability. Professionalism development program through LS is basically to reform and improve the learning instrument in order to improve the quality of learning execution. Both direct and indirect effect could be felt by students and lecturers, particularly on this research, it could improve the metacognitive skill and conceptual understanding in Fabrication science.

Within the development of LS, it composes of cycles consisted of plan; learning activity planning is arranged by LS team. Do is the cycle of learning activity in accordance with the planning arranged by the team who serve as observer to reflect the learning conducted. Embracing the principles of esprit de corps and collectivity, the learning process will be beneficial for both students and lecturers

Rock and Wilson (2005) and Andrew (2012) report in their research that LS activity could improve the confidence feeling of lecturers to teach as well as facilitating students in giving suggestions for the upcoming learning activity. On the other words, the improvement in each cycles of LS could enhance the quality of learning ad eventually improve the metacognitive skill of students and conceptual understanding.

The importance of research development of learning instrument on Fabrication Practices supported by authentic assessment *e-portfolio* through *Lesson Study* activities consider that these efforts will build collaborative of lecturers based on the principle of collegiality and improve *mutual learning* college to build a *learning community* as stated by Arani, et al, (2010). The team of lecturers who are members of the *LS* will systematically compile lesson plans and then implemented as well as observation and evaluated. Thus, improving the quality of the learning process that will have an impact on student learning outcomes expected to be realized through the development of scientific innovative learning instrument supported *by authentic* website-based assessment. Based on the exposure delivered, the development of learning instrument on Fabrication Practices supported by *authentic* assessment *e-portfolio* through *LS* to improve communication, collaboration and metacognition skills, and understanding of the concept of student fabricating is important to be performed.

5. Methodology

This research was conducted in the Department of Mechanical Engineering Fabrication Laboratory UNESA at even semester 2016. Innovative learning instrument developed using *four-D modeling* approach through *Define, Design, Develop, and Disseminate stages.* To obtain a decent learning instrument then it was validated by *expert judgment* learning through discussions, suggestions, and questionnaires. To test the effectiveness of the learning instruments, quasi experimental research with *pre-test* and *post-test design was conducted.* The study population was 60 students of Practice program subjects of Fabrication Practice taken at random, and 30 students used as control group, 30 students as treatment group. The treatment group carry out lectures using learning instrument developed, while the *placebo* control group as usual following the instructions of lecturers and instructors. The independent variables are communication skills, collaboration skills, metacognition skills, and conceptual understanding of Fabrication. The control variable (as well as its covariate variables) is a learning instrument with a scientific approach. Techniques of collecting data were using tests, interviews, questionnaires, and documentation.

To discover the metacognition skill of students, then metacognition instrument developed by Corebima (2006) was employed. To determine the dynamics of communication and collaboration skills, and conceptual understanding of Fabrication, instrument arranged based on variable operational definition. Before the instrument is used, it was tested for validity and reliability, and lastly was revised. Data analysis techniques used descriptive analysis, and covariance analysis (Anakova). Descriptive analysis was used to describe the results of the validation of *expert judgment* and the response of students, whereas Anacova analysis was used to determine: 1) the influence of the developed learning instrument on the communication skills of students; 2) the influence of learning instrument on student collaboration skill; 3) the influence of learning instrument on students' metacognition skills; and 4) the influence of learning instrument on conceptual understanding of fabrication.

6. Results and Discussion

Descriptive analysis result of this study indicates that the learning instrument for Fabrication Practices based on scientific approach consisted of Course Outline, Course Meeting Plan, Modul and Authentic Assessment Instrument based on web (e-portfolio) developed is successful and considered as feasible. In addition, it obtained a positive response from the students.

The Anakova result with the significance rate 5% indicates that sig. value from the entire variable was less than 0.05. it means that there is an influence of learning instrument developed based on scientific approach on the communication, collaboration, and metacognition skill, and students conceptual understanding of Fabrication.

7. Conclusion

Based on findings and discussion in this study, the development of learning instrument based on scientific approach for improving communication, collaboration, metacognition skill, and conceptual understanding of Fabrication on Mechanical Engineering Students of UNESA is valid and feasible. Considering that communication skill, collaboration skill, metacognition ability are imperative in recent days, therefore it is suggested to utilize this learning instrument during Fabrication Practice learning as well as evaluating the instrument to generate an improved instrument.

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