

Prosiding

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Industrial-based practical learning development for teacher competence of automobile technology

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Abstract. This research aims to: (1) produce appropriate industry-based practical learning models for students who is prospective teacher of automobile technology (AT) in vocational secondary school and (2) find out the effectiveness of industry-based practice learning in improving the initiative attitude and work discipline of Automotive Engineering Education (AEE) students at Muhammadiyah University of Purworejo. This is development research (R&D) with the subject of research was the Automotive Engineering Education students at Muhammadiyah University of Purworejo, Indonesia. PBI developed with the following development stages: (1) model development; and (2) model validation (internal and external validation). The scores of the observation of initiative attitude in each successive cycle are as follows: (a) the first trial gets a mean score of 1.44; (b) the second trial gets a mean score of 1.96; (c) the third trial gets a mean score of 2.84; (d) the fourth trial gets a mean score of 3.08; (e) and the fifth trial get a mean score of 3.40. While the score of the results of observing work discipline attitudes in each successive trial are as follows: (a) the first trial gets a mean score of 1.40; (b) the second trial gets a mean score of 2.44; (c) the third trial gets a mean score of 2.84; (d) the fourth trial got a mean score of 3.24; and (e) the fifth trial gets a mean score of 3.28.

1. Introduction

Vocational education is a level of education which is skill-oriented to produce products or graduates that facilitates labor market and able to create their own work so that it is beneficial for economic growth and development. Director General of Ministry of Blueprint stated that vocational education helps to prepare the labor requirements which is needed in economic development [1]. Economic development is divided into two dimensions. First, the quantitative dimension is the dimension relating to the functioning of vocational education programs in supplying educated and skilled employee in accordance with the existing employment needs in the region. Second, the qualitative dimension is the dimension that concerns its function as a producer of educated, trained and skilled employee that will be a trigger for regional economic development. To achieve this function, vocational education requires integration in the planning and development of vocational education work programs. Vocational education programs are important to be developed so that the vision and mission of quality vocational education will be created well.

Qualified vocational education will be achieved if the problem of vocational education can be solved well and immediately. Problems with the quality of vocational education were delivered by Siriwat in his speech at the APEC forum (Asia Pacific Economic Cooperation) with the topic "Internationalization of Vocational Education" [2]. APEC member countries faced the following problems: (a) Relations between industry and trade, government and providers of education and training are not well developed;



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(b) Technical and vocational teachers still lack experience in the work place and therefore confidence and credibility are needed to establish formal and close relationships with industry and commerce; (c) The vocational education curriculum is still theoretical and has problems in linking between the theory and application of practices needed in the field of work; (d) Education and vocational engineering training is limited to the secondary education system and higher; (e) Vocational-technical education and training systems are unable to increase intensive programs to improve existing workers; (f) The training program for vocational teachers is not yet equipped with teaching that focuses on improving technical skills; (g) Most technical and vocational curricula and learning materials are inflexible, obsolete, and resources to recover this situation have been difficult to implement lately; (h) Equipment and facilities at vocational schools and vocational engineering colleges are outdated and not well maintained.

Based on the problems of vocational education mentioned by Siriwat, since 2004 the Indonesian government has tried several steps to solve these problems. One of them is the development and change in the proportion of the number of senior secondary school (SSS) and vocational secondary school (VSS). The Ministry of National Education stated that in 2017 the proportion of VSS and SSS in Indonesia is expected to be close to 70% compared to 30%. As time goes by, the consideration of the policy of SSS and VSS proportion turns out to need deep thought, how to prepare it, its implementation, and the overall impact on the policy so that it still needs to be studied. This consideration seems logical considering that Indonesia will need concepts, funding, and educators or teachers who are decent, skilled, qualified who is prepared to overcome the increasing number of VSS.

The process of forming and debriefing prospective teacher by LPTK will differ based on the level and qualifications of their expertise, including vocational education teachers. Vocational education teachers have several characteristics or characters that are different from other teachers. Vocational education teachers have characteristics as follow: (a) able to facilitate the tasks and exercises carried out in the same way, tools, and machines as determined in the workplace; (b) can train students in the habit of thinking and working as needed in the work itself; (c) can shape experience in practicing and forming correct habits of work and thinking repeatedly so that they are appropriate as needed in the work later; (d) have successful experience in applying the skills and knowledge of the operations and work processes to be carried out [3].

Vocational education teachers must: (a) have professional work experience and mastering areas of expertise in theory and practice; (b) have strong professional skills in their fields; (c) participate in the development of work demands regularly; (d) teach by using alternative learning in accordance with work life; (e) have real knowledge in the work place and have the ability to anticipate the needs of related competencies and (f) meeting the needs of the work place, planning, and implementing education related to the work place and sectors [4]. To achieve competency in the formation of prospective teacher of AT, Teacher Education Institution as producer is directed to compile and organize learning models which are suitable for the purpose of establishing prospective teacher of AT to fit the criteria of the work place and industry. Competence is closely related to work-based or industrial learning activities, so it is necessary to apply learning models for prospective teacher of AT with industry orientation [5].

In practical learning, educators (lecturers) must apply 4 stages of learning [6], they were: (a) The preparation step. In this stage, educators must prepare methods, tools or materials, preparing and arranging equipment with the method correctly; (b) The presentation step. In this phase, educators demonstrate the material or science with the method and infrastructure of practical learning which have been prepared. Students pay close attention; (c) The application step. The students apply the knowledge which have been provided and demonstrated by educators. Students demonstrate their expertise under the supervision of educators; and (d) The testing step. The educators provide performance tests as an important stage of success in practical learning.

Leighbody definition is supported by Trudy Harris who concluded that the steps in practical learning in a laboratory or workshop include [7]:

1.1. The Planning Step

- To analyze the curriculum by learning the skills to be taught by referring to the curriculum and syllabus including competency standards, activity procedures, and conditions needed to practice skills that are in accordance with the Graduates' Competency Standards (SKL) and Content Standards (SI).
- Making a worksheet that consists of at least; learning objectives, theoretical summaries, work steps, and evaluations.
- Checking the readiness of equipment and other supporting devices needed.
- Conducting trials and refine worksheets that have been made into the final worksheets to be used.
- Making a scoring guide that includes key steps which students must do correctly and the results which students have to achieve.

1.2. The Preparation Step

- Re-checking equipment and supporting devices that have been prepared.
- Explaining to students about an overview of simulations in relation to the topics to be studied and the learning objectives to be achieved.
- Giving worksheets to students.
- Providing opportunities for students to ask questions to clarify their understanding of practical activities to be carried out.

1.3. The Application Step

- Instructing students to carry out the steps of practical activities in accordance with the worksheet.
- Correcting the students who make mistakes.
- Making notes about things that need to be discussed after practical activities.

1.4. The Evaluation and Closing Step

- Submitting a number of questions related to practical activities that have been carried out in accordance with the notes that have been made during the practical activity.
- Providing opportunities for students to submit comments related to practical activities that have been carried out.
- Making a summary according to the learning objectives.

Industry based practical learning model is a learning model that is programmed and evaluated to develop aspects of student attitudes, knowledges, and skills. The meaning of programmed is the model requires careful planning in its implementation. Model components consist of implementers, methods, materials, and infrastructure must be prepared as optimal as possible by involving stakeholders. Evaluated means that the model must always be considered in its implementation. Evaluation is important to monitor the success of the model in developing students' attitudes, knowledge, and skills competencies.

2. Research Method

This study uses a research and development approach that refers to Richey and Klein with the stages of development including: (a) model development; (b) model validation (internal validation and external validation). The model trial subjects were students of the Automotive Engineering Education Department, Muhammadiyah University of Purworejo who were prepared to become candidates for prospective teacher of AT in 5th semester.

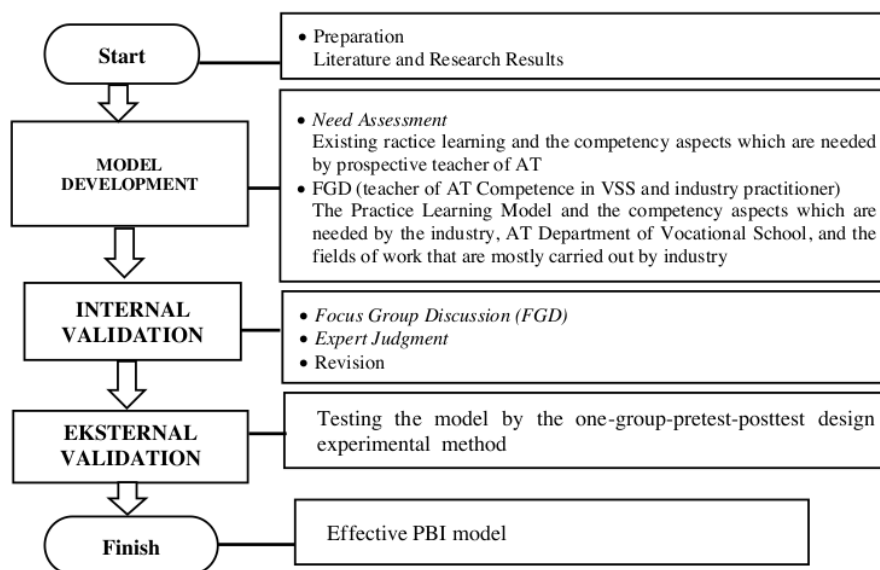


Figure 1. Stages of development research

The research data is classified into two types, qualitative data obtained from interviews and quantitative data obtained from the observation sheet. Interview is used in order to take the data about the implementation of the practice learning model by respondents, while the observation sheet that aims to see the activities of students in the implementation of the model.

3. Results and Discussion

This study adopted the concept of development research from Richey and Klein (2009) which the stages of research include model development and model validation. Model development was carried out through need assessment then carried out internal validation and external validation. At the development stage the model begins with the need assessment carried out by the interview. Interview respondents were AEE lecturers as producers of prospective teachers of AT. The main purpose of implementing needs assessment with AEE lecturers is to obtain information and description about the implementation of practical learning that has been carried out and to know the aspects of competence that must be owned by prospective teacher of AT.

The next step is to conduct FGD activities consisting of automotive industry instructors (heads of lab or senior mechanics) and teachers who graduates from these 5 universities which produce prospective teachers of AT, they are: (a) Sebelas Maret University; (b) Yogyakarta State University; (c) Semarang State University; (d) IKIP PGRI Semarang; and (e) Muhammadiyah University of Purworejo. The FGD activities are carried out to formulate aspects of competencies which have to be possessed by prospective teachers of AT and the most feasible and effective practical learning based on the criteria of AT and industrial vocational teachers. The materials for FGD activities are the results of interviews with AEE lecturers in the initial stages of need assessment.

An assessment is needed after implementation. The next step is the implementation of internal validation which is carried out through FGD and expert validation. FGD activities were carried out together with learning experts, vocational education experts, automotive material experts, teachers of AT competence, and automotive industry instructors who aimed to validate the models and guidebooks.

External validation was done as a trial model by using the experimental method with one group pretest-post test design. Validity test began by giving debriefing to the researcher or collaborators or

observers intended to equalize the understanding of the contents of the model manual and assessment instruments.

Through the implementation of PBI model, the initiative attitude aspect can be formed very well. The results of the implementation of PBI learning model for five trials on the initiative attitude can be shown by increasing the mean score in the first trial for 1.44 and increased in each trial by mean score of last tested for 3.40. The meaning of the results of this study is that students have shown a great attainment of attitudes. Students of prospective teacher of AT have embraced the attitude of initiative, students are responsive to the work that they will do and able to think quickly about the work situation without being guided again by the accompanying instructor. By achieving the initiative attitude very well, it is expected that students will be able to familiarize themselves with their daily lives and ultimately in accordance with the attitude needed by VSS teachers of AT competence and the hopes of the automotive industry.

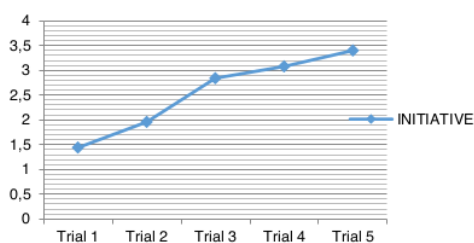


Figure 2. Improved initiative attitude score

Through the implementation of the PBI model, the discipline aspect can be formed very well. The results of the implementation of PBI learning model for five trials on the discipline attitude can be shown by increasing the mean score in the first trial for 1.40 and increased in each trial by mean score of last tested for 3.28. The meaning of the results of this study is that students have shown a great attainment of discipline. Students of prospective teacher of AT have embraced the attitude of discipline, implementing the rules and work assignments of industrial instructors. By achieving the discipline attitude very well, it is expected that students will be able to familiarize themselves with their daily lives and ultimately in accordance with the attitude needed by the VSS teachers of AT competence and the hopes of the automotive industry.

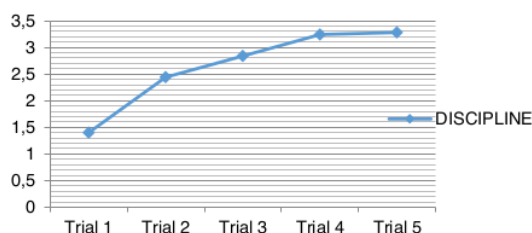


Figure 3. Improved Discipline Attitude Score

According to the results of the trial conducted for 5 times, it can produce an appropriate industry-based practical learning model to be used for students of prospective teacher of AT. The learning model can be seen in figure 4 and table 1 below.

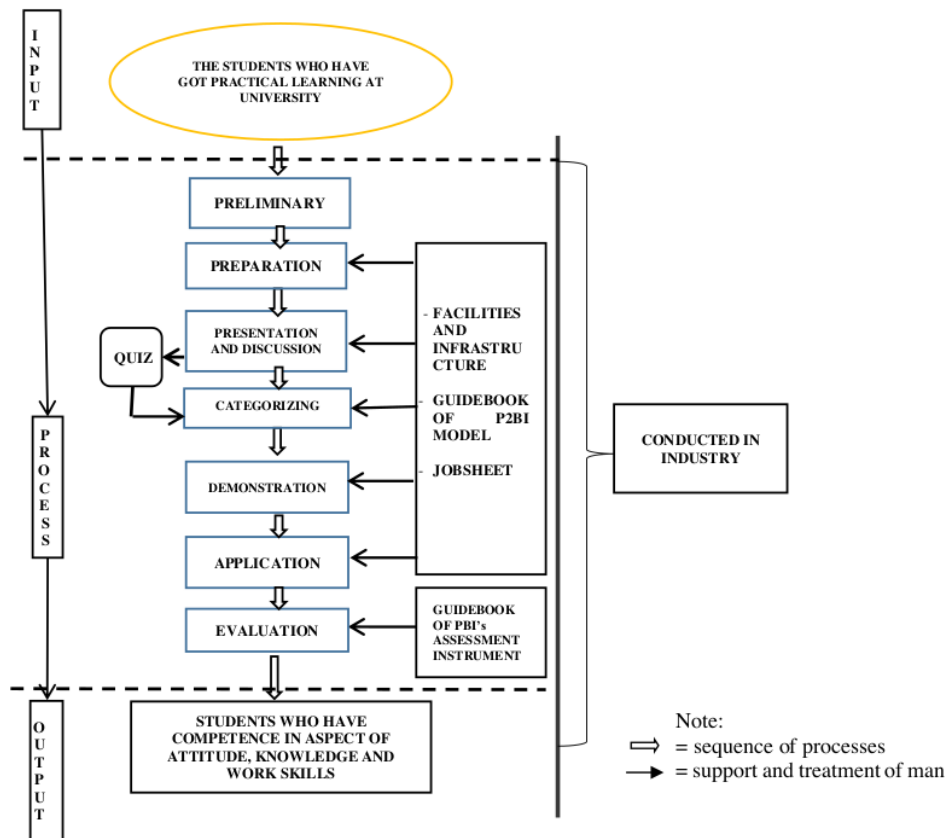


Figure 4. Industrial Based Learning Model (PBI)

Table 1. Action plan of PBL model

Syntax	Lecturer's	Students'
Preliminary	Lecturer and Industrial Instructor meet to equalize practical learning goals Industrial Instructors explain about planned learning activities	The students ask questions if something has not been understood in the delivery of the learning plan
Preliminary	The instructor provides material related to practical learning and aspects of attitudes, knowledge, and work skills The instructor gives a quiz to see the material achievement	The students follow the process and asking questions if something is not understood The students pay attention and answer when getting a turn for questions
Presentation and discussion	The instructor guides the grouping. One group consisted of 8-10 students with 1 accompanying industry instructor The instructor shares worksheets to each student The instructor demonstrates the job sheet step	The students form groups according to Instructors' directions The students get worksheets The students pay attention to demonstration carefully
Demonstration	The instructor gives time for feedback	The students ask if there are steps in the worksheet that have not been understood
Application	The instructor gives students time to work on the job sheet steps The instructor guides the quality of work according to the job sheet	The groups of students work on tasks according to the job sheet The groups of students interact with Instructor to achieve qualified work according to the job sheet
Evaluation	The instructor gathers all students to provide an explanation of the practical exam The instructor conducts the practical exam	The students prepare themselves The students do the practical exams

4. Conclusion

The process of developing this learning model is carried out through two stages, models' development and validation. Model development is carried out with the need assessment stage which is followed by the model validation stage which consists of internal validation and external validation. The model validation began through internal validation stages with FGD activities and expert judgment consisting of vocational education experts, learning experts, material experts in the automotive field and automotive industry instructors. Furthermore, the results of internal validation were tested in three automotive industries (Suzuki Ultratune UGM Lab, Daihatsu Lab, and Toyota Lab) to get the level of implementation and effectiveness of PBI model.

The P2BI model is the development of a practical learning model that implemented apa that has been implemented in university that produce a candidate SMK TKR teacher. The stages of the model developed are: preliminary, presentation and discussion, demonstration, application and evaluation. The implementation of PBI model can be used as a solution to improve the quality of students in learning. This can be proven by an increase in the mean score of the initiative aspect of 1.96 and discipline aspects of 1.88.

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