Project Based Learning Model to Increase the Competency of Automotive Engineering Teachers Candidates

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Abstract. This study aims to produce a Project-Based Learning model for vocational education in practical learning in Automotive field courses. The product of this research is the PjBL learning model in the practical course of Vehicle Body Technology. In this research is carried out through the stages of preliminary studies, model development, model validation, and implementation. The research was conducted at the Automotive Workshop of the Automotive Engineering Department, FT-UNY. The subjects of this study were lecturers and students of the Automotive Engineering Department who took practical courses in Vehicle Body Technology. Model feasibility tests were carried out by practitioners from the body repair and painting industry and Vocational School teachers on the Automotive Body Engineering spectrum. This development research was conducted in February until July 2019. The product of this research is in the form of a PjBL model for vocational education in the automotive sector that has been assessed and declared fit for use as a learning model in the automotive field of vocational education. Student responses to the implementation of PjBL learning in the Vehicle Body Technology course are also very good so that this learning model is in the very feasible category.

1. Introduction

The quality of education is closely related to the quality of teachers. Professional teachers and quality teachers are a guarantee of quality education. Without improving the quality of teachers, the quality of education will be difficult to achieve. Currently, there are 3.9 million teachers, there are 25% do not meet the academic qualification requirements and 52% do not have a professional certificate (Yunus, 2017). The teacher problem is indeed complex. At least it can be assumed that there are four causes of low teacher competence, namely the incompatibility of disciplines with the teaching field, teacher academic qualifications that are not yet equivalent to a bachelor's degree, teacher recruitment is still not through professional mechanisms and the continuous professional improvement program (PKB) of teachers is not running well.

One of the availability of excellent teachers is the responsibility of educational personnel education institutions (LPTK). LPTKs must provide quality education to produce great teachers. As stipulated by the State, education organized by the LPTK must have learning outcomes equivalent to level 6 KKNI. The formula is stipulated in Permenristek Dikti No 44 of 2015 in Chapter II article 9 paragraph 2, which states that diploma four and undergraduate graduates have at least mastered theoretical concepts specific knowledge and skills in general and theoretical concepts of specific sections in the field of knowledge and skills in depth. It is necessary to prepare teachers who master many learning methods so that teachers can be creative and innovative. Many learning methods can form the above comprehensive abilities and by the characteristics of 21st-century learning, namely critical thinking and problem-solving, communicative, collaborative, creative, and innovative. One learning method that is thought to be appropriate for creating these conditions is project-based learning.
(PjBL), which is learning based on targets and planning. PjBL is a learning method that uses a project as a learning medium. However, how the right PjBL model to improve the competence of prospective teachers must be sought immediately so that optimal learning results can be achieved, especially in the field of Vehicle Body Technology (TBK). Based on the description above, the formulation of the problem is compiled: (1) What is the current learning model for the Vehicle Body Technology practice? (2) What is the practical learning model for Vehicle Body Technology using the project-based learning method? (3) What is the feasibility of the Vehicle Body Technology practical learning model using the project-based learning method? The objectives to be achieved are: (1) Identify the weaknesses/deficiencies of the existing Vehicle Body Technology practice learning model. (2) Producing a practical learning model for Vehicle Body Technology using the project-based learning method. (3) Determine the feasibility of the learning model for the practice of Vehicle Body Technology using the project-based learning method.

Mulyasa (2014) states that PjBL is a learning model that aims to focus students on the complex problems needed to investigate and understand lessons through investigation. This model also aims to guide students in a collaborative project that integrates various curriculum subjects, provides opportunities for students to explore content (material) using various ways that are meaningful to themselves, and carry out collaborative experiments. Summarized based on the opinion of Daryanto & Raharjo (2012), Saefudin (2014), Sugihartono DKK (2015), it can be concluded that the PjBL learning model is a student-centered learning model that departs from a problem, with the main activity of investigating so that students gain new experiences from activities. significantly in the learning process and can produce a project to achieve affective, cognitive, and psychomotor competencies. The result of the project work is a product that includes, among other things, a product/design, a service, a written or oral report, a presentation, and or a recommendation. Meanwhile, Fathurrohman (2016) states that project-based learning is a learning model that uses projects/activities as a means of learning to achieve attitudes, knowledge, and skills competencies. This learning is a substitute for the learning that is still teacher centered. The emphasis of this learning lies in student activities which at the end of the lesson can produce meaningful and useful products. Meanwhile, according to Isriani (2015), project-based learning is a learning model that provides opportunities for teachers to manage classroom learning by involving project work. Based on the explanation above, it can be concluded that the principle of the PjBL learning model is student-centered learning because this learning model uses problems experienced in real life that have already been determined by themes and topics, then experiments or research are carried out so that they can produce real products according to the abilities of these students, so that students can solve problems with the appropriate concepts, principles, and knowledge, so that they become more meaningful. The advantages of the PjBL learning model from the explanation of Daryanto & Raharjo (2012, Widiasworo (2016) include increasing students’ learning motivation, making students more active and successfully solving complex problems (initiative and creative), increasing student collaboration, and providing an experience for students learning and practice in organizing projects. However, there are also some disadvantages to these advantages, there is a possibility that students are less active in group work, and if the topics given to each group are different, it is feared that students do not understand the topic as a whole. Self-help in completing the project, minimizing costs by using simple tools in the surrounding environment, and selecting research locations that are easily accessible. The steps for implementing the PjBL learning model according to Mulyasa (2014) are (1) Preparing questions or project assignments (2) Designing project planning (3) Developing schedules (4) Monitoring project activities and progress. Meanwhile, Widiarso (2016) added (5) tested/assessed the results (6) evaluated experience.

The project-Based Learning model begins with questions that can stimulate students in carrying out an activity. The question must be relevant to problems that students may experience in real life. From these problems, a small group is then formed, where the group will design the project plan and prepare a schedule to complete the project. The role of the teacher here is to monitor the work of students, assess / test / evaluate the work of students. According to Widiasworo (2016) project appraisal is an assessment of a task that must be completed within a certain period/time. The task is in the form
of investigation from planning, data collection, organizing, processing, and presenting data. Project appraisal can be carried out to assess student competencies, namely knowing understanding, application skills, investigative abilities, and the ability to clearly inform students on certain subjects.

Competence is a set of smart actions, full of responsibility that a person has as a condition for the ability to perform tasks in certain fields of work (Skep Mendiknas RI No. 045 / U / 2002). Meanwhile, according to Hakim (2005) competence is a basic characteristic consisting of knowledge, attitudes, and skills, as well as other personality, attributes that can distinguish a person who works with high and low performance in carrying out tasks in certain fields of work. The competence of prospective automotive engineering teacher-students is an ability that must be possessed by students to be able to work immediately during college, without requiring a time-consuming adjustment period. This is in the context of creating a product or adding value to a resource with maximum results according to predetermined targets. Competence in preparing the workforce includes competence aspects of knowledge (knowledge), attitude (attitude), and skills (skills) in accordance with the standards set. The benefits of competency for prospective automotive engineering teacher students include: (1) clarifying work standards and expectations to be achieved; (2) as an employee selection tool; (3) maximizing productivity; (4) basis for developing a remuneration system; (5) facilitate adaptation to change; (6) align work behavior with organizational values. Researchers who have conducted previous research include, among others, Rezeki, R.D, Nurhayati, N.D & Mulyani, S (2015): The results of the study show that the PjBL method has a positive effect on student learning outcomes and learning activities. Research on the PjBL method was also carried out by Maulidyah Alawiyah, Sudarti, Trapsilo Prihandono (2015 with the results of the study showing that the PjBL method has been proven to have a positive effect on learning activities and student learning outcomes.

Based on the studies that have been described, it is known that in order to achieve the competence of prospective automotive engineering teachers, it is hoped that many factors will influence, one of which is the learning model. The learning model is one of the factors that can influence the success or failure of learning activities, so the selection of a learning model is important. Choosing the right learning model is one of the efforts a lecturer can make in achieving the expected results of student competencies. However, to find a learning method requires several considerations so that the learning process is effective and efficient. Things that need to be considered in choosing a learning model include the character of the subject matter, the availability of learning facilities, the basic abilities of students, and the allocation of learning time. Project-Based Learning Model is expected to increase student learning motivation, improve problem-solving skills, and make students more initiative, active, creative in solving complex problems.

2. Method
This study uses a research and development (R & D) approach. In this research and development is carried out through the stages of preliminary studies, model development, model validation, and implementation. A preliminary study was conducted to analyze or identify the current TBK practice learning model, identify the competency needs of TBK teacher candidates needed by SMK, and identify the competency needs of mechanics/technicians in body repair workshops. After the preliminary study was carried out, the next step was to develop a design for the PjBL model. After the model is compiled, an expert is asked for an assessment, and improvements are made if there is input. After that, the model is implemented, and student responses are asked for in small groups. These responses are used to improve the PjBL model. After going through the repair stage, the next step is the implementation of the PjBL model in the full practical class. The research was carried out by the Department of Automotive Engineering, FT UNY as the LPTK, with the research subjects being lecturers and students.

Data collection in the preliminary and development studies selected to interview and discuss techniques (FGD), observation, documentation, and literature review. Preliminary studies through observation and interviews to determine the conditions of existing and ongoing TBK lectures. FGDs are conducted to capture the competencies needed in Industry and Vocational High Schools and determine
the competencies that will be achieved through TBK lectures with their projects. After the model is compiled, an expert is asked for an assessment.

The implementation of PjBL is observed through observation when students carry out the project they are working on. Monitoring is carried out to ensure students are learning properly, as well as conducting process assessments. The assessment of the competence that is controlled by students is done by looking at the final project results. The selection of student responses to the PjBL learning model is carried out using a questionnaire technique. The research instruments used in this study included observation sheets, interview guides, and questionnaires. Observations are made to monitor the course of the learning process which can be continued and combined with discussions and interviews. Interviews were conducted with all respondents to obtain responses and evaluate the implementation of learning with PjBL. Meanwhile, the questionnaire was used to explore responses that included students' interest in learning with PjBL, responses to the content and design of PjBL worksheets, as well as stages and implementation of TBK with PjBL.

Data analysis techniques used in this research is descriptive analysis techniques. To determine the feasibility category of the results of this learning implementation, a Likert measurement scale is used, in which the data obtained is in the form of numbers which are then interpreted in a qualitative sense (Sugiyono, 2013). Based on the data obtained with 23 research subjects, the minimum value obtained is 23 and the maximum value obtained is 115. The results obtained are converted into values on a scale of 4 (Suharso, 2006) with the following categories:

| No | Category          | Score Interval |
|----|------------------|----------------|
| 1  | Very unworthy    | 23 – 45        |
| 2  | Not feasible     | 46 – 68        |
| 3  | Well worth it    | 69 – 91        |
| 4  | Very worthy      | 92 – 115       |

3. Result and Discussion

3.1. Result

Learning practices for existing or running Vehicle Body Technology are as follows: (1) Technical learning tends to use "direct instruction", the simple command is: "make it like this", then students are directed and given examples of how to do the job, (2) Learning leads to PjBL, but has not used good syntax. (3) The vehicle object used in practice is very limited and is not suitable for use. It is necessary to add vehicle body panels as practical materials/media. (4) Job for sheet metal forming with hammer and anvil application is good.

In addition to the learning conditions as above, the practice of TBK at the Automotive Engineering Department of FT UNY has the potential / supporting factors, including: (1) The existence of partner workshop institutions (Djokdja Dab) that supports the needs of panels, although they cannot be uniform and usually, the damage is already severe, (2) Partner workshops also provide places, tools, and materials as well as other supporting elements to be used in learning Through a focused group discussion (FGD) TBK projects that will be carried out are as follows: (1) 1st basic sheet metal forming (2) 2nd basic sheet metal forming (3) Hammer & dolly panel repair (4) Washer welder panel repair (5) Cut and joint panel repair (6) Primer & putty application

After discussing with a team of lecturers, technicians, and TBK laboratory coordinators, and considering the existing support capacity, synchronization was carried out. Cut & join is carried out in the Basic Work Technology course, while the putty application is in the Painting Technology course. The work of removing, installing, and adjusting the panels was added to ideas from the industry. In the initial plan, the work of removing, installing, and adjusting panels was not included in the activity plan, however, after going through discussions with industry, it was found that the implementation of this project could be facilitated by partner industries.
The learning implementation in the four projects was carried out by modifying the PjBL model. Modifications are made in the first step, which usually starts with determining basic questions, but in practice TBK with the PjBL model starts directly from giving projects or project assignments. With the project order determined by the teacher, it will be easier to adjust the equipment and materials that must be prepared. After the project is given, students begin to compile a work plan and a project work plan. Students plan projects by collaborating and discussing between students and between students and lecturers. Planning contains a selection of activities that can support project work, by integrating various possible sources, as well as tools and materials that can be accessed to assist project completion. Planning includes rules and division of labor if it is a project for the group. After going through guidance, monitoring, presentation and approval from the teacher, the next step is to work on the project or implement the project.

![Figure 1. The PjBL Learning Model.](image)

Student activity in project implementation is to realize the design through a planned stage plan. The teacher conducts direction/guidance, monitors, and provides examples or demonstrations so that students carry out projects correctly according to the correct design and working rules. Monitoring is at the same time integrated with conducting process assessments because competency-based assessments are not only the results that are assessed but also the work process by the rules and/or standard operating procedures.

After the student completes the project, PjBL’s next step is to evaluate the project results. Results are assessed quantitatively. Because lectures still apply gradations from 0 to 0 s.d. 100 then the assessment of the project results uses that scale. After the assessment is carried out, the next step is a reflection and/or evaluation, as a form of evaluating the experience of students and providing feedback from the teacher. Based on the description above, the PjBL model in this study can be described in the Figure 2.

The practicing learning model of TBK was assessed for its feasibility by practitioners of the body repair and painting industry as well as teachers at Automotive Body Engineering Vocational Schools.
After going through several stages of discussion and validation, the PjBL learning model in the TBK course was declared feasible to be implemented. The average rating of the first expert was 4.47 and that of the second expert was 4.67, so the average score was 4.57. After the model is declared feasible by the expert, the model is implemented. At the time of implementing PjBL learning in class, two assessments were carried out, namely:

3.1.1. Competency Assessment
The assessment of the results of the implementation of the project as a measure of student practical competence obtained the average score on project 1 was 76.61, the average score in project 2 was 83.22, the average score in project 3 was 85.83, and the average score on project 4 is 86.96. Apart from the results of the project, students are also assessed for their competence through practical competency tests through direct personal practice tests. In this study, the assessment of competence that was tested directly was the hammer application. The results obtained from the competency test conducted showed that 5 students were not yet competent out of a total of 23 students. Based on the results of the competency test, there were 22% of students were not yet competent at using a hammer which included how to hold the hammer, the angle of the stroke, and the intensity of the blow. Students are given the opportunity to practice again independently and do remedies when students are ready. Students who are not yet competent to use a hammer cannot do any work on a real car panel. So, students are required to be competent in the competence of using a hammer, even though they must go through remedies. Students who are not yet competent in the phase 1 test, after going through the first remedy and it turns out that the results meet all, then all are declared competent.

3.1.2. Response to the PjBL Learning Model
The results of the questionnaire analysis of student responses to the implementation of TBK practical learning with the PjBL method obtained the results on indicator 1 obtained an average score of 101.3 included in the Very Appropriate category, indicator 2 obtained an average score of 97 in the Very Appropriate category, Indicator 3 obtained an average score an average of 97.7 is included in the Very Eligible category, indicator 4 is obtained an average score of 98.7 is in the Very Appropriate category and the total mean value is obtained: 98.7 is in the Very Eligible category.

During the implementation of PjBL learning, discussions and evaluations were held with students as respondents. The results can be summarized as follows: (1) Students' perceptions of PjBL are positive (2) Students become aware of project objectives (3) Students become accustomed to working in a planned manner and have targets and monitoring (4) Students become accustomed to structured work (5) Students become accustomed to expressing opinions (6) The main drawback that is highlighted is related to work equipment and equipment (7) Lack of resources makes students creative and innovative (8) Weaknesses, especially in terms of quantity of tools, make the need for more synergistic collaborative work management (9) Less variations in object and time (10) Work practice in a workshop is more interesting, because there are more objects (11) Work practice in a workshop is actually more real and challenging (12) Work practice in a workshop actually needs better communication skills.

3.2. Discussion
The learning of TBK practical courses that was carried out previously was the provision of jobs containing assignments that must be completed by students through practical activities. Students are given a job/project, directed, or given an example in working on it and then students work on it within the specified time duration. During the process, the teacher monitors, and guides students to work properly and safely. After completion, the product or project results are assessed. The learning activities are not well structured using the PjBL syntax but looking at the characteristics of the process being carried out, basically, the implementation of the learning leads to the PjBL form. To further direct the PjBL learning, changes are needed to comply with the PjBL syntax. As for the project material, it is necessary to conduct a screening/analysis of industrial needs and of course SMK as a prospective user of the S1 Automotive Engineering Education program.
The carrying capacity for the implementation of PjBL learning does need to be improved, such as the availability of vehicle body panels in proportions to the number of students. The availability of equipment and supplies needs to be improved in their arrangement and maintenance. In terms of CO₂ welding equipment, the quality is sufficient, but the quantity is not sufficient. This, when referring to Prosser’s Theory, which is widely referred to in the development of the vocational education curriculum in Indonesia, is certainly not good. Prosser's sixteen theorems very much animate vocational education. Prosser’s sixteen theories emphasize strongly that vocational education should be a replica of the industry with tools and equipment and habits that are as similar as possible to the reference industry.

Prosser emphasized that training must refer to real jobs/jobs as it is done in the work field, not only with partial training or simulations. The right and reliable sources and the role of experts in the job position will greatly affect the success of vocational education. Repetitive practice for both an effective and efficient way of thinking and working will be very meaningful. The jobs are given in the TBK practice actually lead and refer to real jobs as in the work field, it's just that the quality and quantity need to be improved. Partnerships with Industry are needed to increase the quantity and quality of jobs or jobs that students do during their practice. The industry has real problems that must be resolved. The partner workshops that are owned are a valuable asset, moreover, the commitment of partner workshops is very high, which is shown by the willingness to provide vehicle body panels as objects of practice. In addition, partner workshops offer and provide a special place to accommodate and train students who will study and or increase their practice hours.

The PjBL model in TBK practical learning is a modification of the existing PjBL model which is synchronized with the character of the course. Because the TBK course focuses on maintenance and repair work, not manufacturing, learning is also directed at maintenance and repair work on vehicle bodies. To be able to carry out maintenance and repair work, students must have basic skills/competencies, so that these basic competencies need to be trained. The formation of these basic competencies will be easier with projects that have been determined or formulated by the teacher (lecturer). This is an attempt to overcome one of the shortcomings of the PjBL model which takes too much time to find the right project idea by students. In addition, it is also to make it easier to adjust equipment and materials.

The provision of the project is followed by an explanation by conveying the basic objectives of the project. The competencies that will be trained with the project are explained in detail so that students understand them. After students understand the goals to be achieved, students are asked to design the steps for the project. In designing the project, students are asked to review references and make observations in body repair and painting workshops, so that students understand the literature review and understand its application in the field of work. Discussions between students and between students and lecturers are needed to get a good idea, in addition to training students' soft skills in collaborating and fostering a creative and innovative spirit. This is in synergy with the explanation of Daryanto & Raharjo (2012, Widiasworo (2016) regarding the advantages of the PjBL learning model.

Project implementation is the actualization of the draft that has been prepared. In this activity, the teacher's role is to direct students so that implementation refers to planning. If the planning is not right, then students are directed to study how it is better and more appropriate. A little demonstration from the teacher is needed if students have difficulty working on their projects. At the time of implementation, integrated monitoring was carried out with process assessment, because it was not only the results that were assessed but also the process of the process. Learning activities are centered on student activities, this is in synergy with Fathurrohman (2016). Product appraisal is paramount, but the process should not be ignored. Evaluation and reflection are needed to assess the accuracy of the design, the project execution process, and the results/products produced so that students get constructive feedback.

Based on the expert judgment from Industry and Vocational Schools which can be seen in table 8, there are good results, namely the overall score of 4.57 from the maximum score of 5, which is very feasible. The average score of indicators 1 is 4.50, indicator 2 is 4.83, indicator 3 is 4.33, indicator 4 is 4.5, and indicator 5 is 4.67. Indicator 1 relates to student responses because the PjBL model is new, it is attractive and increase passion but not necessarily fun. Indicator 3 relates to the implementation stage
because the PjBL model is considered unfamiliar, so the implementation is assumed to take a little time for adaptation, so the score is only 4.33. In addition, related to indicator 5 related to project material in the PjBL model, it is felt that it has not fully taught/trained the competencies needed by the Industry. Researchers realize that this is because as has been stated above, namely due to the limited facilities, infrastructure, tools, and materials available.

The increase in the competence of undergraduate students who are prospective educators can be seen from the increase in the achievement of the product value of the project results which simultaneously increases, namely in project 1 the average score is 76.61, up to 83.22 in project 2, up to 85.83 in project 3 and up to 86.96 in project 4. In addition, the competency test conducted by all students is competent, even though in the first stage of the competency test, only 78% of students were immediately competent. There are 22% of students who need additional time to practice until finally competent.

Based on the student responses as stated in table 11, the student responses are very positive. All indicators are categorized as very good responses so that the PjBL model is categorized as very feasible based on student responses. In the work/project work on the PjBL learning model, students are required to make designs, process designs, and time plans and present them, so that according to what students feel, this adds to work, so that the indicator scores related to the PjBL device are the lowest responded to.

In addition to responses with closed questionnaires, responses were also conducted through open interviews. Of the many open responses given, basically are positive and constructive responses. Students respond well to the PjBL learning model even with all the limitations of existing facilities, infrastructure, and facilities. All limitations have been responded positively by being more creative and innovative in finding alternative ways to complete the project. The implementation of learning by involving partners from the Industry has also been responded well to adding insight, a variety of objects and equipment, and providing a real job description.

4. Conclusion
Based on the data, data analysis, and discussion, from this research on a project-based learning model to improve the competence of prospective automotive engineering teachers, the following conclusions can be drawn: 1. The practical learning model for the TBK course that has been running so far is basically PjBL but has not followed the PjBL model learning syntax. The job is given, the teacher gives directions and examples then the students work on it by following the directions and examples given. 2. The TBK practice learning model using PjBL starts with project delivery, designing steps, and time for project work, project work/implementation, project appraisal, and evaluation of experiences. 3. Based on expert assessments from Industry and from Vocational Schools on the Vehicle Body Engineering spectrum, the PjBL learning model in the TBK course is considered very feasible. Likewise based on the progress of the achievement of values and competencies that have been achieved by students. The responses from students based on their experience of participating in learning with the PjBL model also showed very well, so that overall learning practice TBK with this PjBL model was very feasible.

5. Reference
[1] Daryanto and Rahardjo M 2012 *Model Pembelajaran Inovatif* (Yogyakarta: Gava Media)
[2] Fathurrohman M 2016 *Model Pembelajaran Inovatif: Alternatif desain Pembelajaran Yang Menyenangkan* (Yogyakarta: Ar-Ruzz Media Group)
[3] Gora W and Sunarto 2010 *Pakematik: Strategi Pembelajaran Inovatif Berbasis TIK* (Jakarta: Elex Media Komputindo)
[4] Mulyasa E 2014 *Implementasi Kurikulum 2013* (Bandung: PT Remaja Rosdakarya)
[5] Sugihartono et al 2015 *Psikologi Pendidikan* (Yogyakarta: UNY press)
[6] Hakim T 2005 *Belajar Secara Efektif* (Jakarta: Puspa Swara)
[7] Isriani and Puspitasari D 2015 *Strategi Pembelajaran Terpadu: Teori, Konsep & Implementasi.* (Yogyakarta: Relasi Inti Media Group)
[8] Maulidyah A, Sudarti, Trapsilo P 2015 Pengaruh Model Pembelajaran Project Based Learning Berbasis Pemanfaatan Barang Bekas Terhadap Sikap Ilmiah dan Hasil Belajar Mata Pelajaran IPA di MTs Kecamatan Jenggawah Downloaded from https://jurnal.unej.ac.id/index.php/JEUJ/article/download/3512/2726/

[9] Rezeki, Nanik D N and Sri M 2015 Penerapan Metode Pembelajaran Project Based Learning (Pjbl) Disertai Dengan Peta Konsep Untuk Meningkatkan Prestasi Dan Aktivitas Belajar Siswa Pada Materi Redoks Kelas X-3 Sma Negeri Kebakkramat Tahun Pelajaran 2013 / 2014 downloaded from https://media.neliti.com/media/publications/120886-ID-penerapan-metode-pembelajaran-project-ba.pdf

[10] Saefudin A and Berdiati I 2014 Pembelajaran Efektif (Bandung: PT Remaja Roskadarya)
[11] Widiasworo E 2016 Strategi Dan Metode Mengajar Siswa Diluar Kelas (Outdoor Leaning) Secara Aktif, Kreatif, Inspiratif, Dan Komunikatif (Yogyakarta: Ar-Ruzz Media Group)
[12] Yunus S 2017 Mengkritisi Kompetensi Guru downloaded from https://news.detik.com/kolom/d-3741162/mengkritisi-kompetensi-guru