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The Effect of the Project Based Learning Model on Improving the Competence of Practical Learning of Vocational Students: A Review

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ABSTRACT

This research aims to evaluate the effect of implementing the Project Based Learning (PjBL) Model on increasing the practical learning competence of Vocational High School students. Data collection was carried out through a literature review. This research is a literature review research that adopts a narrative review type, which aims to comprehensively investigate and analyze various scientific articles related to the research topic. Identify relevant literature, researchers conducted a search using the keyword "project-based learning model" on Google Scholar. Of the 13 journals found, 6 journals were not relevant and were excluded from the analysis. The results of this research indicate that project-based learning has the potential to be an effective method in improving students' practical skills in vocational schools, helping to build students' self-confidence in studying practical material, and providing a positive impact on students' participation in learning. The implication of this research is the importance of implementing PjBL as an effective learning strategy in improving vocational school students' competence in the context of practical learning.

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INTRODUCTION

The significant consequences arising from global events and the ongoing development of the fourth and fifth industrial revolutions require more than just developing technical and digital skills. Success in using effective, intelligent, ethical, and sustainable technology depends largely on the role of humans (Poláková et al., 2023). Companies need to always develop themselves continuously to fully meet the demands of the new era and expectations in the business world, with the aim of achieving competitive advantage (Keränen et al., 2023). The importance of evaluation also lies in avoiding the separation and gap between the world of higher education and the daily work environment in society. (Handayani, 2015). Competence is the result of a combination of basic skills, behaviors, knowledge,

and values that can be reflected or demonstrated through the habits and thinking and acting abilities of learners. This is achieved through meaningful and significant teaching. (Prabaningrum &; Son, 2019).

The impact of globalization and technological innovation is increasingly affecting all people and institutions (Ozdemir et al., 2023). Technological advances have an impact on the industrial sector, where high technology is integrated with each other, such as machines that automatically move from the initial stage to the final completion in the production process. (Margaretha Pramesti et al., 2023). The growth of this increasingly effective and efficient industry along with the development of the industrial revolution 4.0 continues to spread to all corners of the world with various systematically brought and all the consequences (Nabilah et al., 2021). Technological advances must be in line with increasing the competence of workers, because the impact of technological developments greatly impacts the workforce. Every individual who has limited skills must receive new training from the company, and above all, must have a strong determination to improve their capacity to remain relevant to the needs of the retail industry in the future. Only a workforce with an understanding of STEM sciences (science, technology, engineering, and math) can meet these demands.(Saragih, 2019).

On the other hand, although technology is important, quality as human resources is responsible at the "front line" (Destiana &; Utami, 2017). The involvement of the workforce in Indonesia in collaboration between vocational education institutions and the industrial sector cannot be separated from the role of schools in establishing relationships with the community. Vocational School has the main responsibility in forming useful and useful cooperation. (Wibisono et al., 2020) However, in reality, the ability of the workforce who graduated from Vocational School is still inadequate to meet the needs of industry and business. Vocational School graduates are also often faced with new technology that is not yet commonly mastered, so they need additional time to understand the technology. (Septyani &; Mappalotteng, 2022)

In relation to increasing the competence of vocational workforce graduates, educators must create an atmosphere or teaching and learning climate that is in accordance with the climate in the workplace (Vanassche & Kelchtermans, 2014). The dominant pedagogy for engineering education is still in the form of theoretical delivery, although many educational studies that do so show its ineffectiveness (Campus & Penrith, 2003). There are many factors that can affect competency improvement, one of which is the learning model so that an appropriate learning model is needed. Learning models that are able to influence student learning outcomes (Astiti et al., 2021)

In the scope of education, the role of teachers is very important in determining the quality of learning. The efficiency of the learning process depends on the effectiveness of teaching, the teaching methods used by educators, and the level of extensive knowledge in mastering learning material. (Yunarman, 2023). One element that plays a role in measuring the quality of learning is the learning model. There are various learning models available for use by educators, and one of them is the Project

Based Learning Model (PJBL). This PJBL model is one of the models that is widely applied by educators in the current learning process. (Chen & Yang, 2019). Activities using the Project Based Learning model are considered capable of being an influence in increasing learning motivation as well as learning outcomes by students (Sukmana &; Amalia, 2021). Project-based learning is a learning model that provides opportunities for teachers to manage learning in the classroom by involving project work (Nadya et al, 2017)

Improving the capabilities of vocational schools by implementing effective learning models is an obligation to keep up with the rapid changes in the world of education and the changing needs of the job market. Effective learning models such as Project-Based Learning (PJBL) can make vocational school students more practical and creative in facing the challenges of the world of work. In PJBL, students not only gain theoretical knowledge, but also have the opportunity to apply their skills in real situations. This encourages the development of practical skills, critical thinking and collaboration, which are important elements of the capabilities required by industry. adopting innovative learning models such as PJBL, Vocational Schools can produce graduates who are better prepared to contribute to the industrial sector and society, thereby providing real benefits for individuals and the country's socio-economic progress. Thus, increasing vocational school capabilities through appropriate learning models not only increases student competitiveness, but also supports the positive development of society and industry.

METHOD

This research is a literature review research that adopts a narrative review type, which aims to comprehensively investigate and analyze various scientific articles related to the research topic. The evaluation method consists of four steps: database search, records screening, eligibility assessment, and completion selection. The database search is carried out using certain keywords such as The influence of learning, Project base learning models, and Competence

The criteria for scientific articles used as data are scientific articles sourced from journals and proceedings with updates in the last 10 years, namely from 2011-2023. The scientific article data used is a minimum of 15 articles. Scientific articles are articles that are openly accessed by the public. The steps taken to search for articles as literature research data are as follows: (1) Visit the following websites, https://scholar.google.co.id, https://www.sciencedirect.com/; (2) Enter the search keywords The influence of learning, Project based learning models, and Competence in the web search box. The keywords for searching for inte The influence of learning, Project base learning models, and Competence in the web search box. Based on the search results obtained

RESULTS AND DISCUSSION

Articles are searched using search engines in the Google Scholar and Science Direct databases using keywords such as Project Based Learning, learning influence, Competency improvement, and Vocational School Machining. As many articles as in accordance with these keywords, then selection is carried out by considering completeness and deleting articles that are duplicates. After the process, 15 articles remained. Then, these articles were reanalyzed based on inclusion and exclusion criteria, and 6 articles that met the exclusion criteria were deleted, so that 7 articles that fit the research criteria were found and were ready for review.

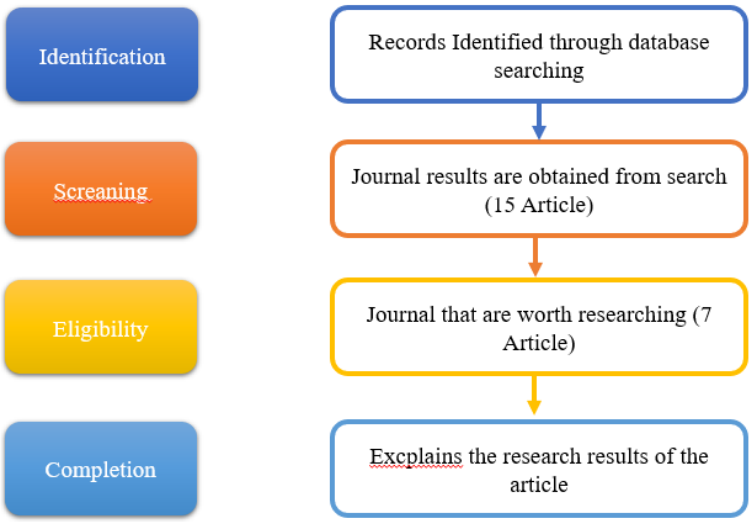

Figure 1. Research flow

Figure 1 is a visualization that illustrates the focus of this research which provides a clear understanding of the course of the research. Using Figure 1 to provide a comprehensive picture can help readers to better understand the essence of this research quickly and effectively.

Table 1. Review of 13 Journals

No	Researcher Name	Year	Research Title	Research Methods	Research Results
1.	(Fadillah et al., 2021)	2021	Meta Analysis: The Effectiveness of Using Project Based Learning Method in Vocational Education	Literature Review	Project-based learning methods are very effective and appropriate to be used in learning in vocational education.
2	(Abid et al., 2020)	2020	Application of Project Based Learning Learning Model to Improve Learning Outcomes of Class XI Students in Milling Engineering Subjects at Vocational School Negeri 1 Tanjung Raya	PTK Method	This research shows that a project-based approach is effective in improving student learning outcomes in the subject of Milling Engineering.

No	Researcher Name	Year	Research Title	Research Methods	Research Results
3	(Arief et al., 2022)	2022	Implementation of Project Based Learning to Increase Student Creativity in Lathe Mechanical Engineering Subjects	PTK Method	The implementation of the Project Based Learning learning model can increase the creativity of students in lathe machining engineering lessons.
4	(Handoyono et al., 2020)	2020	Project-based learning model with real objects in vocational learning	Quasi-experiments used in studies with unequal control group designs	Learning outcomes using the PjBL model with Real Objects are higher than conventional learning methods
5	(Ismiyatin, 2021)	2021	Efforts to Improve Student Learning Outcomes through Project Based Learning Learning Model	PTK Method	The conclusion of this study by applying the learning model (PjBL) in NC / CNC and CAM Machining Engineering subjects can improve student learning outcomes
6	(Firmansyah &; Marlina, 2023)	2023	Application of Project Based Learning Model on Energy Material and Its Changes to Improve Student Activeness and Learning Outcomes at SMK N 1 Kertosono	PTK Research Methods	The results of this study explain that student activeness has a moderate relationship with student learning outcomes
7	(Parhusip &; Wijanarka, 2018)	2018	Application of Project Based Learning with Lesson Study to Improve Mechanical Engineering Learning Outcomes	Quasi-Experimental Research Methods	Research conclusion (1) Lesson study activities that use project-based learning approaches and models are proven to be able to realize active and skilled students. (2) There is an increase in student knowledge learning outcomes taught with a project-based learning model with lesson study. (3) There is an increase in learning outcomes of student skills taught by applying project-based learning with lesson study.
8	(Alfonis et al., 2020)	2020	Development of ProjectBased Learning Based Mechanical Engineering Basic Work Module in the Department of Mechanical Engineering SMK Negeri 5 Padang	RND (Research and Development) Method	Based on the results of validation and practicality, it can be concluded that the learning module is suitable for educational media.
9	(Irman, 2020)	2020	Validation of Project-Based Learning Based Modules on Simulation and Digital Communication Subjects	RND (Research and Development) method	The results of this study concluded that the Project-Based Learning based module on the subjects of Simulation and Digital Communication that had been developed was declared valid
10	(Takatur et al., 2014)	2014	The Effect of Cooperative Project-Based Learning on Motivation and Learning Outcomes of Automotive Motor Repair Practices at SMK N 1 Seyegan	Quasi-Experimental Research	The results of this study show that the motivation and learning outcomes of students who take part in cooperative project-based learning are better than students who take part in direct learning as implemented so far.

No	Researcher Name	Year	Research Title	Research Methods	Research Results
11	(Goyal et al., 2022)	2022	A meta-analysis approach to measure the impact of project-based learning outcome with program attainment on student learning using fuzzy inference systems	Meta-Analysis Research Methods	The Project Base Learning method conducted for one year is promising, helping educators evaluate the performance of candidates individually or in groups on several assessment criteria, assisting in achieving the knowledge, values, attitudes, deep learning, and skills needed for the development of continuing education.
12	(Khairat, 2020)	2020	Application of the Project Based Learning model in improving student activities and learning outcomes in the subjects of Creative Products and Entrepreneurship	Classroom Action Research	Based on these results, it is concluded that the PjBL learning model can say the activeness and learning outcomes of class XII BDP 1 students, semester V of SMK Negeri I Bogor City or the research hypothesis is accepted.
13	(Andrianto Pangondian et al., 2019) (Adhitya, 2023)	2023	Application of the Project Based Learning (Pjbl) learning model to student learning outcomes in the Machining Technology course at the Department of Mechanical Engineering ft UNP	Quantitative correlational	The conclusion of this study is that there is an influence between the application of project base learning and the learning outcomes of Mechanical Engineering in the Department of Mechanical Engineering FTUNP in 2022

Based on critical apprasial, from 13 journals there are 5 journals that discuss the influence of the project base learning learning model on increasing the practice competition of vocational students. These explanations are interrepresented in the following table

Table 2. Journals related to the influence of the project base learning learning model

No	Author Name	Research Methods
1	Rahmat Fadillah, Ambiyar, M. Giatman, Fadhilah, Mukhlidi Muskhir, Hansi Effendi	Meta Analysis: The Effectiveness of Using Project Based Learning Method in Vocational Education
2	Zuanda Arief, Nizwardi Jalinus, Yufrizal, Budi Syahri	Implementation of Project Based Learning to Increase Student Creativity in Lathe Mechanical Engineering Subjects
3	Ibn Abid Al Rashid, Abdul Aziz, Purwantono, Eko Indrawan	Application of Project Based Learning Model to Improve Learning Outcomes of Class XI Students in Milling Engineering Subjects at Vocational School Negeri 1 Tanjung Raya
4	Nurcholish Arifin Handoyono, Suparmin, Samidjo, Arif Bintoro Johan, Suyitno	Project-Based Learning. and the quality of vocational school education
5	Bastian Rikardo Parhusip, Bernadus Sentot Wijanarka	Application of Project Based Learning with Lesson Study to Improve Mechanical Engineering Learning Outcomes
6	Budi Syahril, Nizwardi Jalinus, Refdinal, Antoni Hilman	Efforts to Improve Student Learning Outcomes through Project Based Learning Model in Vocational School
7	Rizky Firmansyah , Lilik Marlina , Dwikoranto	Application of Project Based Learning Model on Energy Material and Its Changes to Improve Student Activeness and Learning Outcomes at SMK N 1 Kertosono

DISCUSSION

Based on the results of the analysis of 10 journal articles on differentiated approaches, it can be described, including the type of research used, mostly using the type of classroom action research and Quasi Experiment. Classroom action research is a type of research that describes both processes and results, which conducts PTK in its classroom to improve the quality of learning (Arikunto, 2021). Classroom action research is a research activity to solve learning problems (Widayati., 2008). Quasi Experiment (Pseudo-Experiment) is an experiment that in controlling the research situation is not too strict or uses a certain design and / or the designation of research subjects is not random to get one level of various levels of research factors (Wahyudin, 2012). This research method is often used to test the implementation of the project base learning learning model. Qualitative approaches are still very few, this allows other studies related to differentiated approaches to be carried out using quantitative research types of research in determining hypotheses from the sample tested.

Rahmat Fadillah, Ambiyar, M. Giatman, Fadhilah, Mukhlidi Muskhir, Hansi Effendi (2021) in an article entitled "Meta Analysis: The Effectiveness of Using the Proyect Based Learning Method in Vocational Education" in this study the research method used in this study is the meta-analysis method. Secondary data were obtained from the post-test scores of experimental classes and control classes in research reports in the field of technical and engineering vocational education with project learning methods. Post-test results from each control and experimental class were obtained after reviewing 23 research articles with project learning methods. This data comes from research conducted between 2015 and 2020 involving various areas of vocational expertise. After collecting posttest score data for both experimental and control classes, the average score of the experimental class was 83.35, the average score of the control class was 71.86, and the standard deviation collected was 10.58. Thus, the final value is 1.09. It is possible that project-based learning methods are very effective and suitable for vocational learning.

Zuanda Arief, Nizwardi Jalinus, Yufrizal, Budi Syahri (2022) in the journal "Implementation of Project Based Learning to Increase Student Creativity in Lathe Mechanical Engineering Subjects". This research uses a classroom action research model which explains that the research that has been carried out on the subject of Lathe Machining Engineering through the implementation of a project-based learning model at SMK Negeri 1 West Sumatra class XI TP-2 by conducting research on all 14 students and observing each student's creativity, results were obtained based on observations of all aspects in cycle 1 with The creativity of students totaling 52% is categorized as quite good and there is an increase in cycle 2 with an average class total of 77% with a good category and in cycle 3 with an average total of 81% with a very good category. So that success indicators have been achieved and it is concluded

that the implementation of the Project Based Learning learning model can increase the creativity of students in lathe machine engineering lessons.

Ibnu Abid Al Rasyid, Abdul Aziz, Purwantono, Eko Indrawan (2020) in a journal entitled "Application of Project Based Learning Model to Improve Learning Outcomes of Class XI Students in Milling Engineering Subjects at SMK Negeri 1 Tanjung Raya". This study used a classroom action analysis method which explained that when the first learning method was applied as a work-based learning method, the average score of students from 76.3 to 79.7. The number of students who got an increase in grades was 14 people. and a classic completion percentage of 53.84%. During the implementation of stage 2, the average score of students increased from 79.7 to 85.5. The percentage of completion of traditional education increased from 53.84% to 88.46%. After conducting research by conducting round 2, it was concluded from the results of the analysis of classroom activities that the application of project-based learning in mechanical engineering courses can improve student learning outcomes and increase confidence in work.

Nurcholish Arifin Handoyono, Suparmin, Samidjo, Arif Bintoro Johan, Suyitno (2020) in an article entitled "Project-Based Learning. and the quality of vocational school education" using a quasi-trial method where different treatments will be given in 2 classes given pre-test and post-test. The normal test of both classes with a score of > 0.05, which means the pretest data is distributed. The homogeneity test showed the same result of significance of 0.815 > 0.05. The equilibrium test was obtained using a t-tcount test of 1.311 < ttable of 2.021 and the significance level was 0.197>0.05. These results allow us to draw conclusions about student learning outcomes Both classes are the same. Both classes had normal sig test results> 0.05, which means that the data after analysis were normally distributed. Homogeneity Test Significant results of 0.246 > 0.05 which means the difference in test data. is one. Once the research requirements are met, test the idea Work. Hypothesis testing using the t test allows obtaining statistical data of 2.618 > ttable of 1.6.83 with a significance level of 0.006 < 0.05. The results concluded that student learning outcomes in the experimental class were better and class control. These results show that using the PjBL model and its good thing, you will get better learning outcomes when compared to conventional methods such as teaching.

Bastian Rikardo Parhusip, Bernadus Sentot Wijanarka (2018) in an article entitled "Application of Project Based Learning with Lesson Study to Improve Mechanical Engineering Learning Outcomes". This study adopts a Quasi-experiment research method using the One Group Pretest-Posttest design. The results of the research analysis showed that the average pretest score was 88.23, while the posttest was 90.67 from a sample group of 30 students. The Wilcoxon hypothesis test shows that the p value or Sig. (2-tailed) is 0.000, which is lower than the predefined significance level of 0.05. Thus, it can be concluded that there is a significant difference between learning outcomes in the pre-test and post-test. That is, the application of the Project Based Learning model with Lesson Study provides a significant improvement in students' learning skills. Based on data analysis and discussion, the conclusions that can

be drawn are: (1) Lesson Study that uses Project Based Learning approach and model is proven to be able to increase active participation of students and their skills. (2) There is an increase in students' understanding of learning material when using the Project Based Learning model with Lesson Study. (3) Students' skills in applying knowledge also improve when they are taught using Project Based Learning and Lesson Study. As a next step based on the results of the research and the conclusions obtained, the researcher provides the following suggestions: (1) In choosing learning methods, teachers should consider the characteristics of students and prioritize methods that encourage students to become active learning subjects, with teachers acting as facilitators. (2) Teachers of Milling Mechanical Engineering subjects should consider the application of Project Based Learning with Lesson Study as an effective learning method.

Budi Syahril, Nizwardi Jalinus, Refdinal, Antoni Hilman (2022) in a journal entitled "Efforts to Improve Student Learning Outcomes through the Project Based Learning Model in Vocational School**".** This research utilizes the classroom action research method as a research approach. The subjects of the study consisted of 20 students of grade XI TM-2, and this study was conducted during May-June 2022 in two cycles. Evaluation of student learning outcomes each cycle is carried out through multiple-choice tests. The results of the study in the first cycle showed an average score of 75.24, which experienced a significant increase in the second cycle to 80.81. The percentage of classical completeness in the first cycle is 70%, which increases in the second cycle to 85%. The research instrument used is a multiple-choice test, and the research success indicator is set with KKM 75 and classical completeness of at least 85%. From this research, it can be concluded that the application of the Project Based Learning (PjBL) learning model in NC / CNC and CAM Machining Engineering subjects can improve student learning outcomes.

Rizky Firmansyah, Lilik Marlina, Dwikoranto (2023) in a journal entitled "Application of Project Based Learning Model on Energy Materials and Its Changes to Improve Student Activeness and Learning Outcomes at SMK N 1 Kertosono". This research is a type of classroom action research (PTK) conducted through collaboration between researchers, pamong teachers, and field assistant lecturers. Data collection methods involve observation, field recording, and documentation collection. The research process involves stages of planning, implementation, observation, and reflection. The results showed that the application of the Project Based Learning learning model succeeded in increasing the level of student participation and achievement. It is proven by the increase in the percentage of student participation and learning achievement in the first cycle by 57.14% and 74.29%, and in the second cycle it reached 82.86% and 88.57%. The results of this study explain that there is a significant positive relationship between student participation and their learning achievement, which means that the higher student participation, the higher their learning achievement.

CONCLUSION

The conclusions of this research are divided into several points: First, as a feature of the education system, the project-based learning system is an effective method of many well-integrated studies so that it can be used as a learning reference, especially by supporting the improvement of students' practical skills in schools Vocational. Second, the model Project-based learning can build students' confidence in learning practical things in school. The third influential voice increases productivity, works hard, and other students participate.

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