Project-based Learning Model to Support 21st Century Learning: Case Studies in Vocational High Schools

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A B S T R A K

Pendidikan kejuruan merupakan salah satu lembaga pendidikan yang mempunyai kepedulian tinggi untuk menghasilkan lulusan yang mempunyai kompetensi unggul dan berdaya saing. Beragamnya kompetensi yang dibutuhkan dunia usaha dan industri (DUDI) membuat lembaga seperti SMK dan SMK harus selalu berinovasi agar mampu memberikan kompetensi yang benar-benar sesuai dengan kebutuhan DUDI. Salah satunya melalui penerapan model pembelajaran inovatif yang diharapkan dapat membawa dampak dan perubahan iklim pembelajaran. Penelitian ini bertujuan untuk menganalisis faktor pendukung dan penghambat penerapan Project Based Learning pada Pendidikan Kejuruan, serta mengetahui pemahaman beberapa Pendidik PjBL baik secara konseptual maupun praktis. Penelitian ini termasuk dalam jenis penelitian kualitatif, dan akan mengambil sampel sebanyak 6 (enam) orang tenaga pengajar di SMK, dengan teknik pengumpulan data yaitu wawancara, observasi, angket dan dokumentasi. Data temuan penelitian akan dianalisis secara interaktif dan dideskripsikan untuk memberikan gambaran kejadian lapangan sebenarnya. Hasil penelitian membuktikan pembelajaran berbasis proyek dapat berjalan maksimal berkat dukungan seluruh warga sekolah, dan komitmen guru dalam kegiatan pembelajaran. Siswa juga terlihat sangat aktif dan terampil dalam menyelesaikan suatu proyek yang diberikan. Melalui penerapan pembelajaran berbasis proyek diharapkan siswa dapat mempelajari kompetensi atau keterampilan yang sebenarnya. Diharapkan melalui hasil penelitian ini, para pendidik dan sekolah kejuruan dapat menggunakan model pembelajaran berbasis proyek (PjBL) sebagai model pembelajaran yang masih relevan dengan implementasi kurikulum saat ini.

A B S T R A C T

Vocational education is one of the educational institutions that has a high concern for producing graduates with superior competence and competitiveness. The variety of competencies needed in the business and industrial world (DUDI) makes institutions such as vocational and vocational schools have to always innovate in order to be able to provide competences that are truly aligned with DUDI needs. One of them is through the application of innovative learning models which are expected to bring effects and changes to the learning climate. This research is to analyze supporting and inhibiting factors in the implementation of Project Based Learning in Vocational Education, and to identify the understanding of some Educators of PjBL both conceptually and practically. This research is included in the type of qualitative research, and will take a sample of 6 (six) teaching staff in vocational schools, with data collection techniques namely interviews, observation, questionnaires and documentation. Research finding data will be analyzed interactively and described to provide an overview of actual field events. Research results prove that project-based learning can run optimally due to the support of all school members, and commitment from teachers in learning activities. Students are also seen to be very active and skilled in completing a given project. Through the application of project-based learning, it is hoped that students can learn actual competencies or skills. It is hoped that through the results of this research, educators and vocational schools can use the project-based learning model (PjBL) as a learning model that is still relevant to the current curriculum implementation.

1. INTRODUCTION

The learning system in Indonesia still needs to be developed in a more comprehensive manner. The phenomenon that often occurs is that college graduates are not ready to provide education just because they master the theory, but cannot apply it to their learning practices (Rokhani & Purnami, 2021; Wijaya et al., 2016). Besides that, other problems encountered include the lack of creativity and innovation of educators to develop learning tools, and there is no process of evaluating and improving learning devices and learning designs carried out by educators (Darling-Hammond et al., 2020; Syamsuar

& Reflianto, 2018), This then results in a lack of relevance of ongoing learning activities to the needs and developments of the times. Vocational High Schools, which were expected to become a link and match bridge because they have a dual education system, also failed to fulfill them. There are still many outcomes of Vocational High Schools (SMK) that have not been absorbed by the world of work (Husein, 2019; Wibisono et al., 2020). The low outcome of SMK graduates is not absolute because there are no jobs, but partly because of the low competence of graduates, this is indicated by the number of available job vacancies that are not filled because SMK graduates do not meet the competency requirements needed for this type of work (Qureshi et al., 2021; Wibisono et al., 2020). Many are found among graduates who work, not in accordance with the areas of competence that students study. Several companies that still care about and make use of SMK graduates, mostly place SMK graduates working in industry (Fatah et al., 2022; Rokhani & Purnami, 2021; Sudira, 2012). Vocational high schools emphasize the preparation of students to enter the world of work armed with the skills gained from the practical learning process (Lytvyn et al., 2020; Sudira, 2012). Skills learned in formal education are not fully usable in the world of work. This missmatch occurs because there is a mismatch between the fields of study and the needs of the world of work (Christian Pilarta Oliquino, 2019; Nahriana & Arfandi, 2020). One of the efforts that can be made by schools as educational institutions is to provide innovations for learning activities. One of the innovations that can be done is to try to identify and implement relevant and appropriate learning strategies. The application of an efficient and diverse learning model is also difficult to implement, so it is limited to conventional delivery of material and practice questions (Sukardjo & Salam, 2020; Wahjusaputri et al., 2020). This causes students to be limited to being listeners and not involved in material concept discovery activities, so that training in critical thinking processes is lacking, and students are also unable to produce original and innovative products when solving problems (da Vinha, 2021; Linden & OECD, 2016). Students also find it difficult to achieve minimal mastery of the learning objectives set by the school.

Facts from the field show that during the learning process the teacher has implemented various learning models and strategies, but it seems that they are not optimal in facilitating students to achieve their learning goals. The results of the initial interviews conducted by researchers with vocational school teachers showed that they sometimes forgot the material being presented, especially if the majority of the material at this time was theory, even though during the learning stages, the teacher often gave questions at the end explaining the material but most of them could not answer the questions given. to students, according to him, only a few students were able to provide answers and respond to questions asked by the teacher. Based on the problems above, teachers must be able to improve teaching and learning activities as teachers must innovate using active and innovative learning models and media so that learning becomes more interesting. Among them by applying the project-based learning model as an alternative to managing and implementing learning in the classroom. With the presence of project-based learning innovations, students can explore their knowledge and in learning activities, they will tend to be more active and involved in various projects to be completed (Deveci & Nunn, 2018; Karnoto, 2022). Project-based learning (Project Based Learning) is considered to be effective in equipping various 21st century competencies needed by students, both affectively and psychomotor (Mohamadi, 2018; Rahayu, I., & Sukardi, 2021; Tahmidaten, 2021), because indeed in vocational education it is not only cognitive which is the main focus in learning, but skills and competency relevance in accordance with industrial developments is the key to the absorption of vocational school graduates and one of the characteristics of superior vocational school graduates.

Many previous research findings state that the project-based learning model can increase student participation and make the learning atmosphere in the classroom more dynamic and collaborative (Anazifa & Djukri, 2017; Dewanti, 2022; Karnoto, 2022). Other research findings also state that the project-based learning model is able to make it easier for students to improve skills according to what they learn (Faridah et al., 2022; Syahril et al., 2020). Therefore, the Project Based Learning model fits the characteristics and goals of modern learning which requires students to be equipped with various skills. Many studies consider it important and useful to implement project-based learning in schools, and some of the research mentioned is still a little leading to findings in vocational high schools, and the challenges faced by teachers have not been identified, and the views of school management. This research is certainly different from some previous research, where the subject of this research is teachers with schools that have implemented the centre of excellence vocational curriculum, as well as information from school management such as school principals, deputy principals will also be explored to provide a comprehensive picture of project-based learning that is carried out at school. So that it does not rely on the answers given by the teacher, but other components also provide insights and will be analyzed in this research. Therefore, this research has the aim analyze the application of project-based learning in vocational education, describing project-based learning activities, and the views of school members

(principals to teachers) regarding their support for project-based learning as an effort to create graduates, challenges faced by teachers and analyze how the school's role is in the successful implementation of project-based learning in the implementation of the SMK Center of Excellence curriculum. One of the implications of this research is that it can be used by teachers to become a basis for applying project-based learning to other learning in order to create a participatory and collaborative learning atmosphere.

2. METHODS

This research is classified as qualitative research, which conceptually means a research procedure that produces descriptive data, in the form of written or oral data that can be observed as research objects (Matthew B Miles et al., 2016). Data collection techniques in this research used non-test techniques consisting of observations and interviews, while the data collection instruments consisted of observation sheets and lists of questions (Lubis et al., 2019; Sholihan & Nur, 2023). The data collection technique was aimed at research samples. The research sample that would be used as a source of informants was teachers, namely school principals and teachers in vocational high schools with the sample selection technique was purposive sampling a total of 6 people. The instrument grids used in this research is show in Table 1 and Table 2.

Table 1. Observation grid

No.	Aspect	Indicator
1.	Opening Phase	Motivation to learn
		Learning objectives
		Brain Storming
2.	Learning Phase	Management Class
		Use of Learning Models and Strategies
		Use of Learning Media
		Quiz and Practice
3.	Closing Phase	Summary
		Reflection

Table 1. Instrument Grid of Interview Questions

No.	Aspect	Indicator
1.	Curriculum Implementation	Implementation commitment
		Difficulties in implementing the center of excellence curriculum
		Barriers to implementation
2.	Use of project-based learning models	Application of the project learning model
		Project learning model evaluation strategy
		Barriers to implementing project learning
		Student feedback on the implementation of project-based learning
3.	Facility	Availability of practice facilities
		Project-based learning facility support

Prior to distribution, the instrument was first validated by consulting with experts or known as expert judgment qualitatively, to see if there are any deficiencies in the data collection tool to be used. The data that is then collected through several techniques or methods of data collection will then be validated. In short, the data validation technique in this study uses a triangulation technique, from several triangulation techniques with all the considerations this research uses triangulation "Data Sources" (Ormancı & Çepni, 2020; Patel & Patel, 2019). The data that has been collected through the triangulation process will then be analyzed descriptively, in the hope of providing an overview of the implementation of project-based learning in schools. Furthermore, the selected data analysis technique is descriptive and carried out interactively and continuously. Which is divided into three stages, namely data reduction, display or presentation of data, and data verification (M. B. Miles & Huberman, 2012).
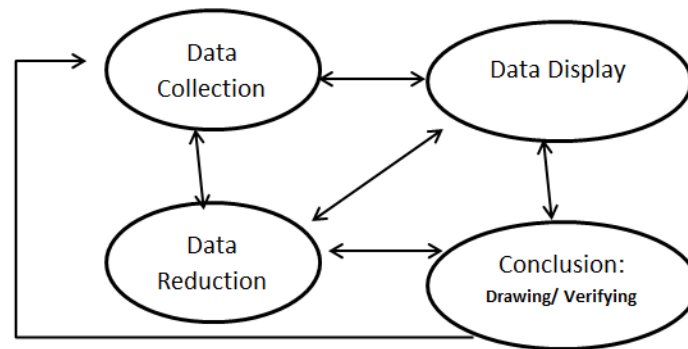
Figure 1. Model Analisis Interaktif (M. B. Miles & Huberman, 2012)

3. RESULT AND DISCUSSION

Results

Learning in the era of the industrial revolution 4.0 requires teachers to always adapt to competency needs that are always updated and changing, so there is a need for direct interaction with business players and industry players to create harmony between the competencies needed and what is taught in schools. The data that was successfully collected from the results of interviews with teachers, principals and deputy principals stated that they had prepared suitable and relevant learning strategies to be implemented to accommodate theory and practice. According to the principal, the results of the interview stated that the application of project-based learning strategies to students needs attention and must be monitored together, both the process and the results. Because schools are committed to being able to produce graduates who are skilled and competitive, it is important to innovate strategies and apply learning models so that graduates can be equipped with the competencies they need to compete in the industrial revolution 4.0 era. In addition, the support provided by schools to optimize project-based learning (PjBL) is by collaborating and buying industry-standard practice equipment, so that students can get optimal learning experiences.

Furthermore, obtain information from interviews with the vice principal in the field of curriculum, and the vice principal in the field of learning also stated their commitment to implementing project-based learning as a step to prepare excellent resources and graduates. The school has made a full commitment to the realization of skilled and superior resources and graduates, this has been proven by the school by providing technical guidance and workshops for educators in implementing project-based learning in the classes and subjects they hold. This is of course based on a hope that, when educators have mastered the essence and application of the project-based learning model (PjBL) then what is conveyed by teachers in class and during practical activities is in harmony with developments in the industrial world and teachers will have awareness how important a project and collaboration must be realized in learning activities. Not only that, the commitment and support for the implementation of project-based learning (PjBL) is also evident from the provision of facilitation to equip students' practical activities, the deputy principal for learning stated that he had succeeded in purchasing and preparing practice equipment with quality and quality according to industry standards. From here it can be seen that in general the results of the interviews show that, school residents, especially educators or teachers, and school principals have a commitment and fully support the policy of implementing project-based learning models during learning activities. They think this model will be able to provide students with more optimal learning experiences and supplies, both in theoretical learning activities and in project- or practice-based learning processes.

Apart from the results of interviews with school members, the important information found in this research is regarding the implementation of project-based learning in the classroom obtained from the results of observations during learning activities. Through the observation process it was identified that classroom learning at the concentration or department of light vehicle automotive engineering had carried out project-based learning and had implemented theoretical and practical learning in the laboratory. In general, learning is divided into three stages, namely the preparation stage, the learning stage, and the closing stage of learning. At this learning preparation stage, it begins with a morning apple activity, which is led by the head of each class, who then the teacher gives directions during the apple activity. After that, the teacher explains about technical practice and learning objectives to be achieved by students, and explains a project that students must work on. After being explained about a project to be completed, students then closed the morning assembly activities and read a prayer for the smooth

running of the learning activity. Furthermore, at the learning stage, it was seen during the observation process that the learning took place quite dynamically, was active and the students felt happy with the group they chose in completing their project. The teacher's initial project was that he asked students to complete a key chain making project. The first meeting begins with the types of materials that can be used to make the project, as well as the steps in making the project. Furthermore, at the end of the learning session, the teacher gives assignments so that students are able to prepare a budget in order to complete this project, then present it on the next day or meeting. Continuing the previous day, the next meeting discussed the stages of making keys together in groups, students looked enthusiastic in dividing tasks and completing assignments in the group. After the theory in class, it was time for the students to be invited to the laboratory to complete the designs and designs of the key chains they had previously developed. Students then mix the ingredients for making key chains. At the closing stage of learning, after students have succeeded in making key chains as an output of project-based learning, the teacher then provides feedback and a summary of the material that has been studied by students. Feedback provided by the teacher in verbal form as a form of appreciation for the activeness of the students while participating in the project.

Referring to the results of observations for several days in the learning process, it appears that the teacher has implemented project-based learning quite well. However, it was identified that due to limited class hours, the project was continued in the next meeting which of course this could make students forget a bit and also sometimes they forgot what they had done at the previous meeting. So, the teacher needs to occasionally recall knowledge and convey information or review activities in the previous learning session. Overall, from the results of the interviews and observations it appears that the application of the project-based learning model has been implemented quite optimally and the school has also provided full support for the implementation of this program, therefore it is hoped that this model will become an innovation for creating human resources and graduates who are ready to work and aligned with the needs of the industrial world.

Discussion

The application of the project-based learning model can be seen from this research which is very relevant to be applied to learning at the vocational and vocational education level, because apart from theory they also need to be skilled with tools commonly used in industry. As is known, graduates from vocational and vocational education need to adapt their skills to the industrial world so that they can become a part of it when they have completed their education (Jain & Jain, 2022; Nursyifa, 2019). In addition to cognitive competencies, it is necessary for them to be equipped with supporting competencies for the 21st century (Rohida, 2018; Suswanto et al., 2019; Wibisono et al., 2020). Moreover, the development of the industrial world is quite fast. Therefore, schools are starting to implement innovations in their learning activities, one of which is through the application of a project-based learning model. In addition, support from the school community is very important for managing and monitoring project-based learning so that it can be implemented optimally (Fadillah et al., 2021; Karnoto, 2022). Through this project-based learning activity students don't just stay silent listening to theory, but participate in completing assignments or projects given by the teacher, so that they will easily understand and master the material presented (Findeisen & Wild, 2022; Prastyaningtyas & Wulansari, 2021; Yanti et al., 2012). Because in this project-based learning students are divided into several groups, in addition to mastery of the subject matter, later students will also have other skills that are trained such as collaboration, communication and analytical thinking (Berezovska et al., 2020; Mutakinati et al., 2018; Ningtyas & Jati, 2018). Of course, these are competencies that are expected to be mastered by students so they can compete in the era of the industrial revolution 4.0 (Halili, 2019; Sá et al., 2021). In addition, through project-based learning it can also make students more active and disciplined during the learning process, because when they are not disciplined there will be a setback in time in completing the project which results in not completing or not maximizing the results they are working on (Roll & Ifenthaler, 2021; Syahril et al., 2020), as well as being able to involve students in a problem or situation similar to the industrial world (Indrawati et al., 2022; Roll & Ifenthaler, 2021).

Several findings in previous research also state that project-based learning can activate students in learning (Fadillah et al., 2021; Nurtanto et al., 2019; Ruiz-Rosa et al., 2021), increase student motivation in learning so as to improve student abilities (Anjelina Putri et al., 2018; Jabarullah & Iqbal Hussain, 2019; Sukatiman et al., 2020). The results of this study turned out to be relevant to the findings of this study where the students were very active and enthusiastic while participating in learning that had a project as the output. Through this research, it is hoped that broader insights will be opened regarding the application of project-based learning models in vocational education in vocational high schools. These implications include a better understanding of the effectiveness of this learning model in preparing

students to develop the critical, collaborative, creative and communicative thinking skills that are so necessary in the modern world of work. The results of case studies conducted in various vocational high schools can provide practical guidance for educators and policy makers to adapt learning models that are relevant to the demands of the times. In addition, this research also has the potential to encourage changes in traditional teaching methods towards a more interactive and contextual approach, in accordance with technological developments and the current dynamics of society.

Although the results of this research have the potential to provide valuable insights to readers, there are still some limitations that need to be considered. First, the generalizability of the research results may be limited due to the focus on case studies in certain vocational high schools, so the results may not be fully representative for various vocational education contexts. Furthermore, this research may not be able to thoroughly measure the long-term impact of implementing project-based learning models on student learning outcomes over a longer period of time. Finally, aspects such as the influence of external variables, such as school support and the social environment, may also influence the results of this study but may not be fully controlled within the case study framework. Therefore, research proves that project-based learning will make students especially in vocational or vocational schools play an active role in constructing their own knowledge through making a project, actively collaborating, communicating, and being skilled in completing and managing time, in addition to project-based learning. students are given the opportunity to be creative so that they can be skilled in using technical equipment in accordance with industrial world standards.

4. CONCLUSION

In general, the results of this study indicate that so far project-based learning has been selected as a relevant learning model to equip students with the skills needed for the 21st century. Project-based learning that has been implemented has been supported by practical tools that meet industry standards. All teaching staff, from school principals to teachers, provide full support so that the implementation of project-based learning can run optimally, because they think that project-based learning is an innovative learning model to be able to combine theoretical and practical learning efficiently. Vocational or vocational school students, apart from having to be proficient in theory, must also be skilled in practice, therefore this learning model is considered relevant to equip them with cognitive and psychomotor skills. The findings from this study can become the basis and recommendations for vocational school members in other places to be able to implement or even modify project-based learning according to the characteristics of the students and their subjects.

5. ACKNOWLEDGE

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