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APPLICATION OF JOB SHEET TEACHING MATERIAL PRODUCTS ON PROJECT-BASED LEARNING AT VOCATIONAL SCHOOL MIKAEL SURAKARTA

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Abstract: This study explores the role of teaching material products and job sheets in the implementation of project-based learning at SMK Mikael Surakarta. This type of research is qualitative research with a case study method. Data collection techniques through observation, documentation, and interviews. The research design uses an ethnographic design. Informants as resource persons were vice principals in the field of curriculum, heads of machining engineering competency skills, heads of production units, and teachers of machining engineering practice. The data that has been collected is then analyzed through data reduction, data presentation, and conclusion. Validity testing uses source triangulation and technique triangulation. This research shows that schools can fulfill the procurement of equipment and materials in stages. Based on the findings, learning tools provide support for project-based learning in the form of (1) preparing job sheet documents as a learning tool for students during practice. The job sheet is in the form of material stages to achieve student competency targets. (2) ensure that the results of objects that students work on through the competency stages can be used as products with use value.

Keywords: Student Practice, PjBL, Teaching Factory, Job Sheet, SMK

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INTRODUCTION

The target for graduates of Vocational High Schools (SMK) must have competencies following industry demands. The government has issued a Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 34 of 2018 concerning National Standards for Vocational High School/Madrasah Aliyah Vocational Schools. The graduate competency standard set by the government is a minimum standard. It is hoped that each SMK and its partner industry can develop their graduate competency targets (Permendikbud, 2018). Competency targets aligned with industry demands manifest link-and-match collaboration between Vocational Schools and Industry in the form of graduate competency profiles. The competency profile of graduates that have been determined will be a reference for compiling a curriculum for implementing SMK.

The application of project-based learning in vocational education must be contextual to the industrial world (Balan et al., 2019). Schools have the authority to develop graduate competency standards (Permendikbud, 2018). Educational goals and graduate profiles in the formulation of the national scope of competence are used as the basis for developing graduate competency standards in educational units according to industry demands (Shan et al., 2021). SMK is part of the national education system for vocational groups aiming to produce competent graduates who can meet the demands of the business/industry world and adapt and develop themselves with developments in science and technology (Shan et al., 2021).

The curriculum in SMK is a curriculum that is implemented according to government standards and has been synchronized with the industrial world. The project-based learning content refers to the demands of the Curriculum on the predefined Machining Engineering competency skills (Shan et al., 2021). Learning tools will be made through the curriculum, implementation plans, and teaching materials. Teaching materials for student practice activities are often called job sheets in the form of project assignments. Form projects in the worksheet with more than one number taking into account the stages of competing demands and the available time allocation (Manalu & Dr. Sogi Hermanto, 2017).

The application of learning to the subject of lathe machining techniques requires a product as a material theme that can be assigned to students (Erick Suryadi et al., 2019). The product to be worked on must be able to deliver competency demands on subjects. Products can be obtained from internal school needs and external schools. The product of the school's internal needs means that the product produced will be used to meet the needs of the school environment. External needs products are products that are produced for use by parties outside the school environment.

Project-based learning is a learning strategy that can help students achieve competence in the vocational field (Rismayawati, 2020). The project targets compiled must refer to the basic competencies set by the School (Handayaningtyas et al., 2019). Through project-based learning that refers to products, students are expected to achieve competency targets and have real experience similar to conditions in the industry. Students need training stages from simple to more complex demands to achieve competency demands.

In general, project themes for SMK can refer to products in the form of goods/services with use value. Products with use value mean that these products have standard standards and can be used by internal and external parties (WA et al., 2019). Useful for internal parties, meaning that the school uses the product results to meet learning and support needs, this can have an impact on reducing the burden of shopping costs borne by the school. The intended external parties are parties outside the school, both industry and consumers, who accept product quality standards and use the results of these products.

As a requirement for teachers teaching in SMKs with mechanical engineering expertise programs, teachers are required to make student learning resources in the form of job sheet stages that refer to products (Permana et al., 2018). The product used results from a recommendation from the school's marketing to achieve the basic competency demands set by the school. Problems arise when there are limited facilities, limited capacity and product completion time, limited teacher abilities, and uncertain product orders from consumers. This problem can occur in uncertain conditions, so team collaboration in the production unit is needed. Products that students can work on both in terms of capacity and time, then students work on as teaching materials. Teachers can conduct basic competency analysis on subjects to design job sheets and industries as standard achievement verifiers.

Evaluation of project-based learning outcomes is carried out by students and teachers (Harefa et al., 2019). The process of checking the results aims for an assessment in measuring the level of achievement of student competencies (Balve & Albert, 2020) and to check the fulfillment of the quality of product results against demands (Sibarani et al., 2022). The product-based learning assessment carried out includes aspects of the work process (Siti Yuni Sufinah, Saifuddin, 2019) and product results (Sudianto et al., 2019). Product checking refers to the demands of work drawings that consumers have set. Assessment and checking of the quality of the results are carried out holistically because these two things are interconnected (Sudianto et al., 2019).

This research was important at SMK Mikael Surakarta, which has implemented real product-based learning to achieve the profile of SMK graduates (Priyatama & Sukardi, 2013). There has been

a lot of research regarding project-based learning, which affects student competencies' achievement levels (Balve & Albert, 2020). Real object-oriented project learning can motivate students (Kurniawan et al., 2021b), hone creativity skills (Retnoningsih et al., 2018), and ability to manage the production (Kusumaningrum et al., 2018). Real products are an effective medium for students' understanding processes (Kurniawan et al., 2021a). Product quality demands are used as a reference in assessment (Yudiono et al., 2021) and evaluation (Park et al., 2021). This study emphasizes the application of link and match between Vocational High Schools and the Industrial World through project-based learning using real products.

METHODS

A qualitative approach is research that uses an approach in which the investigator seeks to make a statement of knowledge primarily referring to the constructivist perspective, namely through various understandings based on one's experiences that are developed socially and historically (Sharp, 2003). Social and historical experience to develop a theory or advocacy/participatory perspective that includes: problem-oriented, collaborative, or change. This study uses a case study strategy. Researchers collect data through observation, documents, interviews, and the data that appears is used to support the main goal (Creswell, 2014).

Data collection techniques used during the study used several methods that have been adapted to the characteristics and data requirements needed in the study. The data collection method consists of observation, interviews, and document analysis. The process of obtaining data in a qualitative research approach goes through the following stages: (1) orientation stage, the researcher describes what is felt to be seen, heard, and asked; (2) reduction stage, at this stage the researcher reduces all the information that has been obtained; (3) In the selection stage, the researcher describes in detail the focus that has been set. Data or sources of information at each of these stages are carried out circularly, repeatedly in various ways, and from various sources (Prof.Dr.Sugiyono, 2015).

Observation is a technique or way of collecting data by making observations of ongoing activities (Sharp, 2003). Researchers use observations by seeing, hearing, and feeling things done by the subjects and objects of research. Parties observed include marketing, teachers, and students. Observations were made on the process of collaboration with industry, the process of preparing job sheets, the process of working on products, and the process of checking results. During the observation, the researcher participated in ongoing activities.

Document analysis is a method of finding data about the things or variables being studied through notes, transcripts, books, meeting minutes, agendas, and so on (Arikunto, 2010). Specifically

in research, the documents that were dug up included product order data, teaching tools, student report results, grade evaluation results, and product delivery data. All document data is in the SMK workshop area. The person in charge of the documents examined is the documents used by the production unit section, the teaching documents for the group, and the student learning documents.

Researchers conducted interviews with related parties to ensure that in-depth information could be explored to obtain views and opinions (Creswell, 2014). Interview techniques that are generally used by researchers are (1) informal conversational interviews, (2) interviews with a general guideline approach, and (3) open interviews conducted (Patton, 2009). Researchers conducted interviews after observing and reading the documents used. The parties interviewed included: the person in charge of the production unit as product marketing, heads of departments, and supporting teachers and students. The results of the interviews were in the form of confirming document data and observations obtained and obtaining data on the learning culture that had taken place.

This research was conducted at SMK Mikael Surakarta with the consideration that the school had implemented a project-based learning model in practical learning in all productive subjects. The research focuses on applying project-based learning models in the practical learning of students at Mikael Vocational School. The competency skills held at SMK Mikael are machining techniques.

RESULTS AND DISCUSSIONS

Results

Mikael Vocational School has implemented project-based learning for students. Its application has been carried out since starting production in the field of sheet metal and construction welding. The result is hospital equipment, including hospital beds, infusion stands, medicine cabinets, and others. These products began to be made in collaboration with the university, which was then called ATMI and production units. The resulting products are oriented to consumer needs.

Project-based learning materials refer to products needed by consumers. Product consumer demand is studied by considering the linearity of the fulfillment of achievement indicators of student competence. Products are used as materials used by students in training their competence. Products also have the benefit of measuring the quality of competency achievement results. Quality products will be fulfilled if the work is structured according to the job sheet.

Jobsheet as student training material in achieving a certain level of competency, then all students are required to complete the material on the job sheet. The teacher will make a job sheet according to basic competencies in the form of working drawings of competency stages, with the

final result as a product. Products used as teaching materials for basic competencies are standard product parts from PT. ATMI Solo. The product's result must follow the demands contained in the working drawings. Each product can be designed with one or more stages of work that are adjusted to the demands of the basic competencies in the syllabus.

The process of compiling learning tools in the form of job sheets that have been carried out involves the curriculum team, heads of competency skills, heads of production units, and teachers, as shown in Figure 1. The curriculum development team synchronized with the World of Business and Industry (DUDI). The head of the expertise competency gathers productive teachers to coordinate the preparation of teaching tools. Coordinating participants were followed by all vocational teachers. The coordination agenda includes the presentation of school policies related to learning and curriculum, lesson schedule plans, products used as teaching materials, and targets for the completion of teaching devices. Teachers develop teaching tools together with a team of allied teachers in productive subjects.

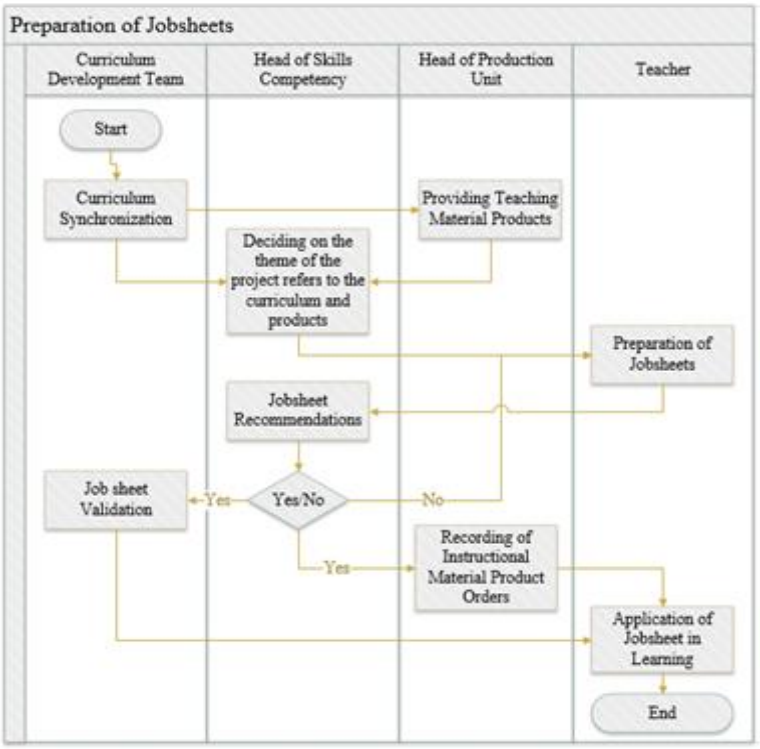

Figure 1. Preparation of Jobsheet Tools

Demands from consumers in the form of quality results and target completion time. The quality of the product results is expressed in the language of working drawings. Working drawings have explained the demands of the shape and size that must be produced. Form demands can be seen from the shape of the line and its symbols. The size can be read by giving the size on the object line and the size tolerance price listed on the picture.

The materials on the job sheet contain the stages of performance tasks starting with simple demands and leading to more complex demands. The material for the stages of the task in bench work practice, lathe machining, and milling machining is presented in the form of pictures as in Figure 2. which is an example of a working drawing of a milling machining technique. The material on the job sheet is a package of performance tasks that students must carry out and complete.

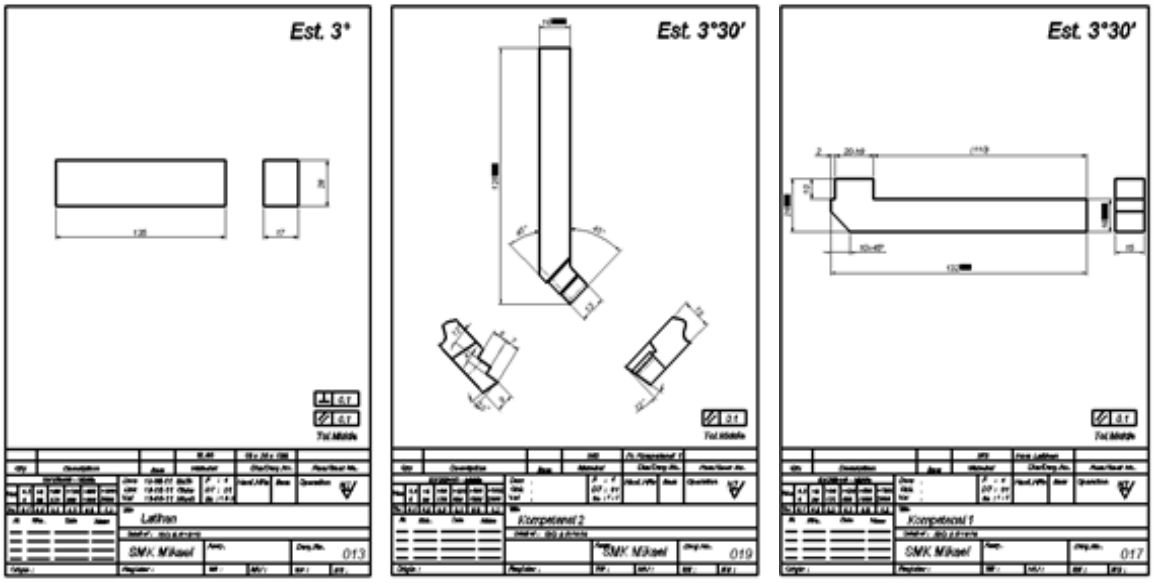

Figure 2. Work drawing

The target completion time is listed on a separate sheet as an estimated time and product delivery deadline. The estimated processing time is listed on the production sheet, as shown in Table 1. This sheet contains the sequence of work processes and work units that must be done. Production sheets are made by the Production Planning and Inventory Control (PPIC) work unit.

Table 1. Production Sheet

UNITS PRODUCTION			
No. Order		:	
Customer		:	
Name of goods		:	
Amount		:	
Sent date		:	
Sign		:	
Process			
	Design		LW CNC
	Material		LW CNC Okuma
	Bubut Manual		Bubut CNC
	Frais Manual		Frias CNC Neutron
	BW		*Subcont*

The assessment in the job sheet is used as a reference in measuring student competency achievement after completing performance tasks. The job sheet contains an assessment guide in the form of a rubric established as a standard for evaluating performance in bench work, lathe machining, and milling machining. The published rubric regulates the size assessment score, the processing time assessment score, and the attitude assessment score during the performance.

One form of collaboration between SMK Mikael and the industry is related to products as the theme of teaching materials—for example, PT. ATMI Solo gave product orders to SMK Mikael to work on. The work on the product given to SMK Mikael is in the form of mechanical part products. Two types of products are worked on by SMK Mikael, namely the standard mechanical parts of PT. ATMI Solo and order parts from consumers. Standard mechanical parts are usually stock products, and delivery times can be within one year. Part orders from consumers usually take days or weeks to complete. Mikael Vocational High School can also work on products from their customers from Mikael Vocational High School and other DUDI production units.

The advantage of the theme of teaching materials is using assembly products and standard mechanical parts of PT. ATMI Solo can be used for all students' basic competency material with uniform material. This basic competency is for measuring the achievement of the minimum standard of student competency achievement. The number of assembly products and standard parts can change every year because it depends on the existing stock of each mechanical part.

The theme of the teaching material products used is in the form of part orders from consumers. Products made by SMK Mikael with engine capacity requirements of SMK Mikael. The characteristics of part orders from consumers have a very varied level of job complexity and require a limited time for completion. This product can be used as competency enrichment material for students. Each student can do enrichment according to their level of ability. The teacher has the right to arrange production enrichment materials so students can learn according to their abilities and produce results according to demands.

Discussion

Other research shows that teachers have the main task to develop teaching tools by involving Subject Teacher Consultation and have not focused on producing useful products. This study shows that preparing teaching tool attachments in job sheets involves a curriculum development team, a head of competency skills, a head of a production unit, and allied teachers. Each party has duties according to their fields and responsibilities.

The curriculum development team has a role in developing the curriculum with industry, and a head of competency has the task of coordinating the preparation of the job sheet. The head of the production unit provides support by providing products that can be used as student learning materials. The teacher is a job sheet maker in the form of competency stages to use practical learning. Learning devices have a role in project-based learning, as shown in Figure 3.

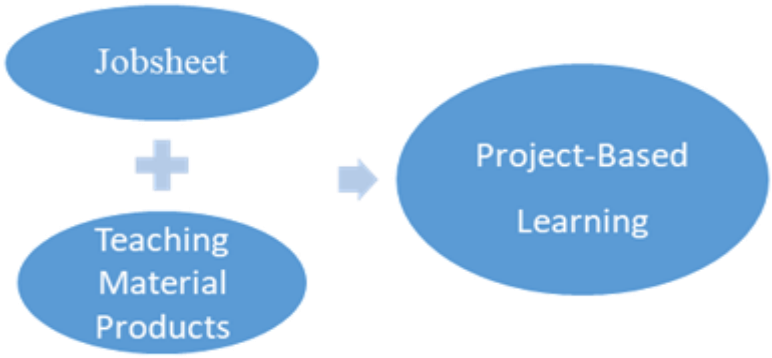

Figure 3. The Role of Learning Devices in Project-Based Learning

Products used as teaching materials in the form of job sheets have requirements to deliver student competence. The process of working on linear products to achieve competency refers to the curriculum set by the school. The products used as teaching materials are spare parts and assemblies. Product quality demands are outlined in the form of working drawings.

The data obtained is in the form of a job sheet containing the stages of performance tasks starting with simple demands leading to more complex demands with the result of a product. Observations found that students' motivation independently worked on products until they were finished according to the requirements of the demands. This showed that students were passionate about practicing to achieve skill and creative abilities. Project learning research based on real products that previous researchers have carried out in the light vehicle engineering department can also be done in project learning at the Mechanical Engineering Vocational School at Mikael Vocational School. The study of data in documents, observations, and interviews shows that product-based project learning has been going well by involving industry and producing competent students.

CONCLUSION

The fundamental findings in this article are the research results from the thesis. This research is very useful in the application of project-based learning in vocational schools. Project-based

learning has been carried out at Mikael Vocational School with a well-managed system. Good practices in learning management have been used as references by other SMKs. This study concludes that learning tools provide support in project-based learning in the form of (1) Preparing job sheet documents as a learning tool for students during practice. Job sheets in the form of material stages to achieve student competency targets, (2) Ensuring that the results of objects that students work on through competency stages can be used as products with use value. Job sheets and products are related as contextual support for learning vocational subjects.

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