

Implementation of Teaching Factory Learning Based on Mockup Products on Competency of Modeling Design and Building Information Skills at SMK Negeri 1 Adiwerna

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Abstract. Teaching factory learning is basically an integration of work experience into the school curriculum. So that all equipment and materials as well as educational actors are arranged and designed to carry out the production process with the aim of producing products (goods or services). Teaching factory based on mock-up products is a combination of production-based learning with competency-based learning with products that can be sold. In mock-up production-based learning, students are directly involved in the production process, so that their competencies are built based on production needs. In teaching factory learning, schools carry out production activities or services that are part of the teaching and learning process. Teaching Factory learning based on mock-up products can be implemented with a good predicate on the competency of Modeling Design and Building Information Skills at SMK N 1 Adiwerna, so there are several parameters for the implementation of teaching factory indicators that must be met, including aspects of management, aspects of workshops and labs, aspects of learning patterns, aspects of marketing and promotion, aspects of products produced, aspects of human resources, and aspects of industrial involvement. All of these aspects must be measurable with the achievement indicators that have been determined in the research method.

Keywords: Factory Teaching Learning, Mockups, Implementation Indicators

1. Introduction

The purpose of this research is for students in learning to be in line with the needs of the industrial world. Because most of the successful people in this world have strong motivations that drive their actions. They know well what motivates them and maintain that motivation in their every action [1]

[2] stated that the teaching factory concept was found due to three factors, namely: (1) ordinary learning is not enough; (2) the benefits of students are obtained from direct practical experience; and (3) experiential, team-based learning involving students, teaching staff and industry participation enriches the educational process and provides tangible benefits for all parties. Teaching factory is a learning that requires students to produce products that are in accordance with market/consumer demands [3]. Knowing the implementation of The implementation of teaching factory learning is based on the vision and mission of the Directorate General of Vocational High School Education (DPSMK) as stated in the

2014-2019 DPSMK roadmap. The vision is the realization of vocational high schools (SMK) that can produce entrepreneurial-minded graduates who are ready to work, smart, competitive, and have national identity, as well as being able to develop local advantages and be able to compete in the global market. The achievement of this vision can be realized operationally in the form of a mission.

[4] revealed that the teaching factory has a goal, namely to make students aware that teaching students should be more than just what is contained in books. Students not only practice soft skills in learning, learn to work in teams, practice interpersonal communication skills, but also gain hands-on experience and work training to enter the world of work later.

Furthermore, [5] reveals that in the teaching factory, schools carry out production activities or services that are part of the teaching and learning process. Thus schools are required to have a factory, workshop or other business unit for learning activities. In accordance with [6] where vocational schools will be effective if the learning process is carried out in an environment that is an imitation or replica of the actual work environment. So the teaching factory program aims to bring the business/industrial environment into the school environment. Students directly carry out production activities similar to those carried out in the business/industrial world. Thus students follow the same learning process as what will be experienced in the real world of work

teaching factory learning based on mock-up products in Modeling and Building Information Design Expertise Competencies at SMK N 1 Adiwerna. Then find out how much the level of implementation or implementation of the mock-up product-based teaching factory program in the Modeling and Information Design Skills Competence of SMK N 1 Adiwerna is based on teachers and students.

Teaching factory learning teaches students how to find problems, build prototypes, learn to make business proposals, and learn to present their solutions. In the teaching factory learning process, students learn about skills that are important to master, such as how to meet the time level and assumptions that may arise, build and work in teams and work together with the various abilities that each individual has.

The first teaching factory model that is most often applied in SMK. Teaching factory is a learning model for students based on industry. The production unit in teaching factory activities has a legal basis, namely Government Regulation Number 29 of 1990 article 29 paragraph 2, namely "to prepare vocational high school students to become workers, at vocational high schools can be established work units that operate professionally. The Directorate of Vocational Development (2017: 109) states that "the teaching factory learning model is formatted to improve the competence of students in productive subjects".

The main components of the teaching factory learning model according to the technical guide of the teaching factory in 2017 consist of: 1) Products, 2) Job sheets, 3) Block schedules. The three components are interrelated and inseparable from the planning stage to the implementation stage of the teaching factory learning model. Educational institutions that have just implemented the teaching factory learning model need to pay attention to the sequence/stages that must be carried out so that the implementation of this model takes place as planned.

Teaching factory is an innovative learning technology and productive practice which has a concept of educational method that is oriented towards student management in learning so that it is in line with the needs of the industrial world. Teaching factory is a new idea that aims to become a new paradigm of academic and industrial learning. The concept of "factory in the classroom" aims to transfer knowledge and the actual production/manufacturing environment to the classroom [7].

CBT is a vocational learning system that focuses on defining different skill systems but must be accessible externally, as a standard for competency assurance. This approach first appeared in the UK and then quickly became popular in the Commonwealth of Nations and was then continuously promoted and introduced in developing countries as a “best practice”. In addition, CBT is a competency-based training, which is a learning approach that emphasizes the development and improvement of students' skills and knowledge according to job requirements. Students who have succeeded in achieving competence will have the skills and knowledge needed to complete work activities in various conditions and different environments according to industry standards. Competency-based training generally refers to the competencies and performance standards set by the industry. In this method, student assessment is designed in such a way as to ensure that each student has achieved the skills and knowledge required for each unit of competency taken. Competency-based training allows students to complete their studies faster because learning is divided into competency units.

When students have fulfilled the competencies in a competency unit, they can move on to the next competency unit. The direction of the implementation of CBT is that students have skills in a competency stated in a certification. PBET is a production-based learning approach. Competencies that have been possessed by students need to be strengthened and their skills confirmed by providing experience in making real products needed by the world of work (industry and society). Implementing PBET production-scale equipment and machinery support is required. However, it can also be fulfilled by collaborating with industry in the context of student internships in the industrial world. This internship is a transfer of a number of practices (job sheets) to the industry directly according to real practice conditions in the industry (job orders).

Mockups are an addition to architectural designs and a primary way of conveying ideas and drawing layouts. The motivation for making mockups is to allow the designer to test the quality of the design on a small scale and to assist the designer in developing a touch of space, aesthetics, and materials [8]. Mockup is a form of miniature models of building designs that are designed or can be built, development projects, both buildings (residential buildings, office buildings and so on) or the development of an area. But now, the model of the building which was originally identical to the building design of a project, can now become a souvenir or souvenir to be traded which is an object of art. Actually this is less common among architects, but mockups are also interesting souvenirs or displays. Along with the times, the shape and quality of the mock-up has increased rapidly, and it really helps someone in presenting the shape of the building and helps consumers to see clearly in buying buildings such as mock-ups of housing or office buildings for example. The existence of mockups actually has quite a lot of functions, which are taken from one example when you want to create a residential or office building. Mockups can be a very practical and effective medium for giving information and presentations to potential buyers or consumers. Because prospective buyers or consumers get a clearer picture of the details of the building they will own.

The use of mockups can also be an attraction as property in addition to brochures and other media that are often used in sales. Because brochures can only show in one-dimensional form such as pictures, mockups can show the visual form of buildings in three dimensions in a complete form, not separated. The design and architecture of the building from the outside as well as the interior inside can be seen at the same time.

Therefore, mockups can be said to be the easiest communication tool for sellers and potential buyers. Because usually prospective buyers are ordinary people who don't really understand the world of architecture if you want to ask something you can do it by pointing to a certain part of the mockup. A good mockup is a mockup that does not only describe the

shape of the building from its interior, but also has to be complete with the environmental conditions around it. For example, whether the house is on the edge of a major road or located in the middle of the city or on the bank of a river and so on. All of these can be explained through mockups, so that potential consumers can get an idea of the environmental conditions. The most important part in making a mockup is the scale. Count each part of the building carefully so that there are no size errors. From this scale the original shape of the building can be depicted in a mockup.

The parameters for the success of teaching factory implementation according to the Directorate of Vocational Development include: Management, Workshops and Labs, Learning Patterns, Marketing and Promotion, Products, Human Resources, and Industrial Involvement. Where the program contains indicators for the implementation of the teaching factory program.

a. Management

Management in teaching factory occupies an important role in supporting the implementation of the teaching factory according to the original purpose of the teaching factory, namely increasing the competence of graduates while meeting the needs of DU/DI in the form of products/services. To achieve this goal, commitment and management functions are at the forefront of teaching factory management. The management functions in question include planning, organizing, actuating, and controlling (POAC).

b. Workshop and Lab

Workshops or labs are places where practical learning is carried out, so a good workshop/lab must meet workshop and laboratory standards according to the standard for vocational school infrastructure based on Permendiknas Number 40 of 2008 which regulates the minimum criteria for facilities and minimum infrastructure criteria.

c. Learning Pattern

The learning pattern implemented is directed at industry-based learning.

d. Marketing and Promotion

Marketing and Promotion relates to the implementation of the teaching factory in the clarity of targets and market segments as well as market reach, as well as adjusting the methods and actors of promotional activities.

e. Product

Products in the teaching factory are in the form of goods and services, which are media to deliver competence and are part of the learning process.

f. Human Resources (HR)

Human resources in the teaching factory are people who provide their energy, talent, creativity and effort in carrying out the objectives of the teaching factory. The implementation of the teaching factory must have experienced human resources in production and teaching factories.

g. Industry Engagement

Involvement or collaboration between SMK and Industry is the key to success in running a teaching factory.

Vocational High School is one of the institutions that organize vocational training that must be able to provide the best educational services to its students even though the conditions of the facilities are very diverse. Vocational High School's job is to do what's best for its students by utilizing all available internal and external resources. Competency-based training learning patterns are expected to help Vocational High Schools gradually improve their programs' quality and relevance. By providing the best educational services to its students,

vocational high schools also mean that they have done the best for the business industry and the world of work and society[9].

Vocational High School / Madrasah Aliyah Vocational, called SMK / MAK is a formal educational institution designed to prepare its graduates directly into work. Vocational high schools must produce graduates as expected by schools, society, the business industry, and the world of work[10,11].

The competencies of vocational education graduates as a sub-system of the national education system, according to the [12], are: producing graduates who have skills and mastery of science and technology with fields of expertise level per development (2) producing graduates who have productive abilities, producing themselves, changing the status of graduates from burden status to independent national assets, (3) producers of drivers of the development of Indonesian industry that are competitive in facing competitive global market, (4) graduate generation and a solid mental attitude to be able to develop itself sustainably

These competencies can be obtained through education at SMK. Furthermore, vocational education is an institution that can carry out the learning process of specific skills along with competency-based evaluation. It can prepare students to become workers at the level of its graduates, to be directed to become an educated, trained, and skilled workforce needed in the industrial sector of the business world and the world of work, to hope to reduce unemployment that is not educated, untrained and does not have Skills. Another thing that can be expected is that SMK can compete in the business and industrial world, especially in entering the Asian Economic Community (AEC), becoming the government's concern for employment in Indonesia and Asia

Based on the demands of the constantly developing science, authority holders in Vocational Schools seek to realize a dream of making a school a Center of Excellence. However, schools face many obstacles, one of which is the limitation of improving the quality of schools, limitations in meeting the school education process based on the Center of Excellence so that it can make its students absorbed in the business and industrial world quickly and correctly. Therefore, many schools compete to realize it optimally in various ways. This requires an accurate strategy to realize it. In line with [13] opinion on "The Principal's Strategy in Improving the Quality of Education in Vocational High Schools (Case Study of SMKN 1 Mojokerto)", it is stated that the quality of education is a pillar to producing good and reliable human resources so that efforts to improve it must always be carried out continuously so that the quality of education is getting better. Therefore, it is necessary to carry out a special policy for improvement. One of them is to innovate education management through the concept of Internal Quality Assurance Standards as a requirement to become a Center of Excellence school.

SMK as a Center of Excellence (SMK Center of Excellence) is a SMK development program with certain expertise competencies in improving quality and performance, which is strengthened through partnerships and alignment with the business world, the industrial world, the world of work, which eventually becomes a vocational reference school that can function as a driving school and a center for improving quality and performance. SMK Center of Excellence (SMK Center of Excellence) is school that can produce graduates who are competent in certain skill competencies and are absorbed in the business world, the industrial world, and the world of work. It can continue to the higher education level, through a systematic and comprehensive vocational education alignment program with the business world, the industrial world, and the world of work.

In line with the Regulation of the Director General of Vocational Education Number 24 of 2020, concerning Vocational High Schools which are developed into Centers of Excellence (Centers of Excellence) priority for the creative economy sector, it is conveyed that the development and development of Vocational High Schools (SMK) is currently facing multidimensional challenges, especially in seeking the suitability of graduates with the dynamics of existing employment needs, both at the regional, national and international levels.

Globalization, especially the impact of the Industrial Revolution with a touch of advanced ICT, has spread and applied rapidly throughout the world to become a trending emergence of a new era called the Industrial Revolution or RI 4.0. The structure of the employment needs of all countries is affected and directly affected at least in the manufacturing industry sector with the increasing use of automation and robotic systems, which replace the position of a large number of skilled operators who are generally Vocational High School graduates

Domestically, due to the onslaught of economic development programs carried out by the government, the dynamics of labor needs are not much different. National priority programs, development and acceleration of the government's economy in 6 (six) sectors or fields, manufacturing, agribusiness, tourism, health workers, creative economy and migrant workers as well as a program of 10 (ten) tourism destinations, special economic zones (SEZ), as well as various government programs at the district / city and provincial levels to support, develop and improve and explore the advantages and wisdom of each local, obviously all require workers with different skill competencies to support them [12].

Thus, the qualifications of Indonesian Human Resources, especially the middle level, most of whom are vocational high school graduates, must be prepared in order to be able to anticipate the dynamics of labor needs at the regional, national, international or global / international levels. The revitalization of Vocational High Schools with programs and strategies implemented starting in 2020 aims to solve all obstacles, shortcomings and problems that exist in schools until they are completed or called "multiple treatments", so that in the end they are able to improve the quality of the teaching and learning process that produces graduates in accordance with the demands of the employment dynamics mentioned above.

SMKN 1 Adiwerna is five of the SMKs located in Central Java that have received high trust from region IV Central Java which is mandated to organize a Center of Excellence, when viewed from the internal conditions of the school, the readiness and requirements that must be met or owned by the school in order to get it as a Center of Excellence are; 1) There is a proposal for submitting assistance approved by the Education Branch Office, 2) a decree for the appointment of a definitive principal, 3) a decree for the CoE development/development team, 4) a decree for the technical team of planners and supervisors, 5) a decree for the inspection team and recipients of equipment procurement results, 5) a decree for strengthening the industrial-based learning process, 6) Permission for the establishment of school operations, 7) Certificate of accreditation of at least B, 8) Land ownership, 9) Photos of land conditions, 10) Site plan / master plan, 11) layout of mechanical and electrical network equipment / furniture, 12) availability of electrical power, 13) Aerial photos of school locations, 13) Analysis of renovation needs, 14) Number of students, 15) Certificate of managerial training of the head of SMK from the Ministry of Education and Culture, 16) Certificate of teacher competence from company at least 2 teachers, 17) Cooperation with active and credible industries, and 18) Evidence of previous TAKOLA uploaded reports. The readiness and requirements mentioned above have been owned by SMKN 1 Adiwerna

This research uses a qualitative approach with a qualitative descriptive type of research. The data collection techniques are obtained based on the results of observations, interviews and documentation. Then check the validity of the data using triangulation techniques. The data analysis techniques used by researchers start with data collection, data reduction, presenting data and finally verification (drawing conclusions).

2. Method

This research is a qualitative descriptive study. Descriptive research seeks to describe and explore, to explain and predict a symptom that applies, based on data findings in the field. This research uses a qualitative approach that according to Lexy J. Moleong (2012: 6) qualitative research is research that intends to understand phenomena about what the research subjects experience, for example: 1) behavior; 2) perception; 3) motivation; and 4) action holistically in a descriptive way in the form of words and language in a special, natural context and by utilizing various scientific methods.

This study uses qualitative descriptive research to describe a systematic, factual and accurate picture of the phenomenon being investigated. The phenomenon investigated in this study is the implementation of the Center of Excellence, the important idea is that the researcher goes to the field to make observations about a phenomenon in a scientific state. So during this research process, researchers will have more contact or contact with research subjects at SMK Negeri 1 Adiwerna, Tegal Regency.

This research was carried out at SMK Negeri 1 Adiwerna, located at Jalan Raya II Po.Box 24 Pesarean, Adiwerna District, Tegal Regency. The selection of the research site is because this school is one of the schools designated as the Center of Excellence School for the Creative Economy Sector in 2020 based on a letter from the Ministry of Education and Culture of the Director-General of Vocational Studies Number 24 of 2021 in Annex Number: 9557 / D2.3 / TU / 2020 by the Director of SMK that SMK Negeri 1 Adiwerna.

The subjects of this study were all residents of SMK Negeri 1 Adiwerna in general and students of SMK Negeri 1 Adiwerna in particular. The research time was conducted for 2 months, namely January 2022 to February 2022.

In this study, the populations and samples are: 1) the principle, 2) the vice-principal for curriculum, public relations, infrastructure, student affairs, and SPMI, and 3) LSP-P1 head, 4) school committee head, 5) company, 6) Network Computer Engineering and Welding Engineering productive/vocational instructor, (7) SMK Negeri 1 Adiwerna Network Computer Engineering and Welding Engineering students While the data used in this study comes from two (two) different sources: primary data and secondary data. In this study, the populations and samples are: 1) the principle, 2) the vice-principal for curriculum, public relations, infrastructure, student affairs, and SPMI, and 3) LSP-P1 head, 4) school committee head, 5) company, 6) Network Computer Engineering and Welding Engineering productive/vocational instructor, (7) SMK Negeri 1 Adiwerna Network Computer Engineering and Welding Engineering students While the data used in this study comes from two (two) different sources: primary data and secondary data..

This study's data collection techniques and strategies used two methods: observation and Interviews. The data was obtained by observations, researchers directly observe at the location and object of study. An important data source is a human being who is positioned as a source or informant. The second data collection is interview. The interviews focused on questions related to the opinions, assessments and experiences of the research subjects, and the decision-making officials.

The researcher identify the documents during the study, in the form of photos, videos, archives, recordings of interviews with the concerned informant and other data related to research problems. The research approach used is qualitative. Thus, the main instrument of this study is the researcher himself (key instrument) who goes directly into the field, as explained by [14]

Triangulation was considered relevant to test the validity. The triangulation technique means that researchers use different data collection techniques to obtain data from the same source [15] In carrying out data processing and analyzing data, steps are carried out including; data collection, data reduction, presenting data (display data), verification.

3. Result & Discussion

Based on the results of assessment data in the realization of improving the quality of education towards Center of Excellence at SMK Negeri 1 Adiwerna has done various things including revitalization of 1) the main office to support public activities and services, 2) human resources to improve the managerial capability of the head of an industry-based vocational school internship teachers in industry, and industrial class activities in each expertise competency, 3) Collaborated by sign in Memorandum of Understanding (MoU) with company, 4) curriculum synchronization with company, 5) teaching factory-based learning activities, 6) professional certification test, 7) facilities and infrastructure, in each expertise competency has been arranged and approached with company standards, 8) the school has implemented a Mou with the kaliwadas village government with SMK mbangun desa, with various activities, 9) the school has implemented a program of caring and cultured schools for the environment and green schools, 10) academic achievements have been achieved by many students in several events of activities.

The concept of Vocational High School as a model at SMKN 1 Adiwerna Tegal Regency for the 2021/2022 Academic Year Based on the results of research data, in preparing SMK as a model the school has developed a learning model with a Teaching Factory. The activity has collaborated with seven competencies of expertise in learning. In addition to develop teaching factory, the school has also carried out a partnership with the company with the competencies of expertise it has, namely the competence of DPIB expertise, Welding Engineering, Machining Engineering, Electrical Power Installation Engineering, Audio Video Engineering, Automotive Light Vehicle Engineering, Network Computer Engineering, which is marked by (Mou) in writing.

The school already has Professional certification institution established by the school through the Steering Board Decree NO.800/0439/2016 dated April 13, 2016 and declared licensed on May 31, 2017, with the id BNSP-LSP-747-ID, which functions as a BNSP supporting institution responsible for carrying out professional competency certification as well as a forum to synergize with schools in student certification.

Quality assurance of Vocational High Schools is the Center of Excellence at SMKN 1 Adiwerna Tegal Regency for the 2021/2022 Academic Year. The implementation of quality assurance of SMK CoE has been carried out verification of Quality Assurance of SMK Center of Excellence by verification officers of the Directorate of SMK and supervisors of SMK Tegal Regency on November 20, 2020. From the results of quality assurance verification, the results of; Input: 75.24 (Good), Process: 88.57 (Excellent), Output: 80 (Good), Outcome: 55.20 (Enough), Impact: 54.00 (Sufficient), so that if on average the overall quality assurance obtained by SMKN 1 Adiwerna is 79.27 and the category is good.

Principal's Strategy in Improving the Quality of Education Towards a Center of Excellence at SMK N 1 Adiwerna, Tegal Regency, Academic Year 2021/2022. The strategic

steps taken by the principal in improving the quality of education towards the Center of Excellence at SMKN 1 Adiwerna are broadly speaking, making policies, including; 1) Training of teachers according to their competencies, 2) Developing innovations in learning, 3) Development of BMW student career centres (Work, Continue, Entrepreneurship), 4) Improve and expand cooperation with company, 5) Renewal of facilities and infrastructure.

4. Conclusion

Based on the results of the research above, the conclusions of the study "Improving the Quality of Education Towards SMK Center of Excellence (CoE) at State Vocational High School 1 Adiwerna Tegal Regency academic year 2021/2022" are as follows: Improving the quality of education towards the SMK Center of Excellence at SMK Negeri 1 Adiwerna, various things are done including; 1) revitalization program with the face of the main office as a means of supporting public activities and services, 2) revitalization of human resources starting with the training of the principal in the field of improving the managerial capability of the head of an industry-based Vocational School internship teachers in industry, and industrial class activities in each expertise competency, 3) seven expertise competencies have collaborated Mou (link and match) with company, 4) the curriculum used in the seven expertise competencies has been aligned with company, 5) teaching factory-based learning activities have been carried out with a block schedule in seven skill competencies, both services, or products, 6) students based on schemes and klsters in each expertise competency have been carried out professional certification tests with LSP-P1 SMKN 1 Adiwerna, 7) facilities and infrastructure, in each expertise competency has been arranged and approached with company standards, 8) the school has implemented a Mou with the kaliwadas village government with SMK mbangun desa, with various activities, 9) the school has implemented a program of caring and cultured schools for the environment and green schools, 10) academic and academic achievements have been achieved by many students in several events of activities

In preparing the Vocational High School Concept as a model at SMKN 1 Adiwerna Tegal Regency Academic Year 2021/2022 the school developed a learning model with a Teaching Factory (Tefa) and collaborated with seven competencies of expertise in learning, carrying out company partnerships with the competencies of the expertise it has, namely dpib expertise competencies, welding techniques, machining techniques, electrical power installation engineering, audio video engineering, automotive light vehicle engineering, network computer engineering, which is marked by (Mou) in writing, then the school has an LSP-P1 (Professional certification body) which functions as a supporting institution for BNSP which is responsible for carrying out professional competency certification as well as a forum to synergize with schools in student certification

The principal has an important role in the strategies applied to improve the quality of education towards the SMK Center of Excellence in schools through the preparation of superior school programs that implement the quality of education in schools. Of course, the strategy of each principal and other principals to improve quality in schools is different both because of experience factors and the ability of insight into school management. It may be that what is applied at SMK Negeri 1 Adiwerna Tegal Regency will be different from other schools, so that the study of the principal's strategy in improving the quality of education of

the SMK Center of Excellence in schools through school superior programs needs to be studied in depth because the uniqueness of each school which of course between one school and another school is different.

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