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Exploration of the Teaching Factory Program at Vocational Schools Majoring in Laboratory Testing Analysis in East Java

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Abstract: Due to the imbalance in national education goals for vocational school students in the *Teaching Factory program*, the research aims to explore the application, obstacles faced, and the role of DUDI (business and industrial) in the *Teaching Factory program* in schools. This research was carried out at five State Vocational Schools majoring in laboratory testing analysis in East Java. This research uses qualitative research with an ethnographic design. Data collection techniques include in-depth interviews, observation, and documentation. The subjects of this research were 20 people: the headmasters, deputy principal for curriculum, head of the Laboratory Test Analysis skills program, Productive Teachers, Industry, and 3 students each. Data validity techniques use prologue engagement, participant observation, and triangulation. Data analysis is done through data reduction, data presentation, conclusion, and verification. The research results obtained (1) teaching factory activities at State Vocational Schools majoring in Laboratory Testing Analysis in collaboration with DUDI, which works in the Analysis field. This collaboration is related to student competencies that students need when they work in the factories (2) Practices in the Teaching Factory program are carried out in the TeFa (Teaching Factory) Laboratory, which has been specially prepared for this program, the preparation of the program and TeFa product results have been adjusted to DUDI (business and industrial standard) work. The research results provide recommendations for improving the teaching factory program in vocational schools to align the linear learning curriculum with DUDI.

Keywords: teaching factory, vocational school majoring in laboratory testing analysis

INTRODUCTION

The National Education Goal of Vocational High Schools (SMK) requires graduates to have complex skills and soft skills. This is in accordance with the National Education System Law no. 20 of 2003, chapter 3 concerning the objectives of national education, and the explanation of chapter 15 states that vocational education is secondary education that prepares students primarily to work in certain fields. To strengthen the National Education System Law no. 20 of 2003, the *Teaching Factory program* launched in 2014, based on the *Teaching Factory learning guide*, it is explained that TeFa (Teaching Factory) is an innovative educational approach that turns schools into mini industries, where in the context of preparing students to gain direct experience in the industrial world so that they have the necessary skills and expertise—needed when they work in the future. However, Hartanto (2019) explained that vocational school graduate students still do not have adequate competencies, so in the industrial world, their competencies are still not recognized; of course, this is confirmed by data from the Ministry of National Education, which explains that only 50% of vocational school students are absorbed into the industrial world, while almost forty percent have not found work.

Inequalities in the real situation of the National Educational System need to be studied more deeply. Needing exploration of the *Teaching Factory program* in vocational schools to obtain in-depth knowledge about the application, the obstacles faced, and the role of DUDI (business and industrial standard) in the *Teaching Factory program,* which can then be drawn as a policy recommendation regarding this program in the future. Furthermore, this research focuses on the Laboratory Test Analysis department in East Java, which is in line with the field of work expected

to be fully absorbed in the industry. Laboratory Test Analysis graduates are expected to be able to work in the industrial sector as laboratory experts (Quality Control).

METHOD

This research uses qualitative methods with an ethnographic design. The study was conducted at a State Vocational School majoring in Laboratory Testing Analysis in East Java. Of the 5 existing State Vocational Schools, researchers focused on 2 State Vocational Schools that implemented the teaching factory program, namely State SMKN Kabuh and SMKN 1 Driyorejo. Three other State Vocational Schools only link and match with DUDI for students carrying out internship programs, so only two schools were focused on in this research. The focus of the research location is based on the implementation of the teaching factory program at the school which is implemented at the school. Data collection techniques use in-depth interviews, observation, and documentation.

Interviews were conducted with 10 people directly involved in implementing factory learning, including the principal, deputy principal for the curriculum department, head of the skills program, industry, and students. Interviews were conducted directly and in depth regarding the independent curriculum with the teaching factory learning program, the implementation of factory-based learning, the impacts and obstacles to implementing the teaching factory, and so on.

Meanwhile, the observation method is used to observe school facilities, facilities provided by industrial partners, and teaching factory-based learning activities. The documentation method is used to collect data related to learning design, student activity documents, curriculum documents, and other documents, which will later strengthen research data. Data validity techniques used include extended engagement, participant observation, and triangulation. Data analysis techniques include data reduction, data presentation, and conclusion.

RESULTS AND DISCUSSION

The Teaching Factory at the Vocational School, majoring in Laboratory Testing Analysis in East Java, aims to improve student skills. According to the guiding book of the teaching factory, the *teaching factory* is a business- and production-oriented learning model. By implementing the *Teaching Factory*, students can adapt to actual conditions in the industrial world. However, they are still under the guidance of teachers or expert technicians from companies or industries involved in their activities.

Figure 1. Interview with the head of the Skills Program

This is in accordance with the interview results, which show that teachers are productive supervisors in the *Teaching Factory program*. Learning strategies and methods prepared by teachers are aligned with industry needs. Meanwhile, learning is carried out using the Competency-based Training (CBT) and Production-based Training (PBT) methods, which are integrated into the productive material of the laboratory test analysis skills program.

Figure 2. *Teaching Factory* activities to students

In the program, *the Teaching factory* effectively utilizes student production units to improve students' vocational competence. One of the uses of the production unit in this program is the groundwater sample testing laboratory at Vocational High School. This service business sector is a business activity that aims to obtain profit value from the business activity. Testing activities carried out in schools are based on improving the quality of graduates of the Laboratory Testing Analysis skills program and improving students' entrepreneurial abilities in determining the price of the testing services carried out.

Students in this activity are at the laboratory, and this test was carried out using instruments owned by the Vocational School, such as a UV-VIS Spectrophotometer, and conventional instruments, such as burettes and extractors. This activity will improve students' ability to understand, identify, analyze, record results, and create sample test results reports. It will also elevate their competence on the final "Uji Kompetentesi" test. The groundwater testing is part of the Teaching Factory programs as a unit production for Laboratory Testing Analysis students at the school. In fact, this program has many limitations, such as teaching materials, learning experiences, and teaching approaches.

Nevertheless, it is a crucial program that students' vocational high school needs, so the activities in this program are inserted in practical subjects. The Groundwater testing unit service hopes to develop and improve the competence of Laboratory Test Analysis skills. Moreover, when they practice their theoretical knowledge, they understand what they learn, which helps them face the final test. In addition to groundwater testing, all schools carry out Industrial internships. Vocational high school collaborates with the business and industrial for Industrial internship programs. Like Kabuh Vocational High School, which collaborates with over 20 industries, such as PT. Graha Mutu Persada, and PT. Toya Indo Manungga. Apart from that, the manufactory is also part of preparing the school curriculum. It is felt that this activity within the industry can develop their work abilities by allowing them to engage in field practice activities and adapt when they work in sectors efficiently. Students experience increased knowledge, skills, and attitudes, which are the main factors in internship activities in the industry. The collaborative relationship between vocational high school and industry in the teaching factory learning pattern has positively impacted building a systematic and planned partnership mechanism. *Teaching Factory* learning can connect the world of vocational education with the world of industry. So that there is equality of competency in the skills obtained.

School laboratories are also prepared according to needs and developments based on DUDI. Schools that implement the Teaching Factory program have 2 central laboratories, namely a laboratory for practical learning and a laboratory for conducting the TeFa program. The learning laboratory is used for teaching and learning activities separate from the teaching factory program. Meanwhile, the TeFa laboratory specializes in conducting tests and groundwater testing service programs. With the many practices at school, it is hoped that it will provide an experience like

working in the industrial world. Practical activities are considered a supporting factor in implementing the teaching factory. This is very linear, with cases and activities similar to those of industrial conditions.

Other factory-based teaching activities held by schools include DUDI practitioners teaching at schools, opening stands selling products made by students and carrying out on-the-job training for class XII students who have taken their final school exams. Meanwhile, products produced from teaching factory-based activities include groundwater testing services for Hexavalent Chrome, permanganometry test, TSS (Total Suspended Solid), pH, and BOD. The unit products that schools produce are predominantly internal; they only serve the interests of students and teachers and try to penetrate society, such as making bar soap, shampoo, washing soap, wind oil, and perfume.

Obstacles felt by schools in implementing teaching factories include (1) the rapidly changing needs of industrial conditions making it difficult for schools to follow, (2) lack of support from DUDI to provide information about the industrial current needs, (3) schools can not support facilities for modern analysis equipment which is often used by industries. (4) The limitation of industrial ability to facilitate all existing internship students. (5) insufficient allocation of school funds to complete facilities and carry out activities.

The school overcame this obstacle by implementing learning using the teaching factory model in the classroom. The curriculum and learning materials are structured like activities in industry using teaching factory model technical guidelines such as block scheduling, and the final results of the program must have goods/services. However, no job sheets are used in the teaching factory model, considering that industrial needs change over time. So, to cover the lack of teaching media in this program, students are given exercises and questions taken from real or similar cases in the industry. It is hoped that students know and understand knowledge related to their job and have the skills expected by the industry condition.

Teaching factories can improve students' work abilities, knowledge, skills, attitudes, and character to adapt to the world of work. The results of research conducted by Dewi and Sudira in Priyanto (2021) state a similar statement that teaching factories contribute to students' readiness in the industry's condition. The teaching factory model can also build students' entrepreneurial spirit. Through teaching factory activities, Students are trained according to their competencies and entrepreneurial spirit with mentoring and encouragement from teachers so that they can open up employment opportunities after graduating. Teaching factory fosters students' entrepreneurial character, such as discipline, responsibility, independence, and creativity in creating new work. This has been stated in the research of Gozali, Dardiri, and Soekopitojo in Suranto (2022).

Teaching factories are very useful for producing graduates with work skills that suit industry needs; the advanced level track of vocational school students proves this. Apart from that, preparing work programs or planning activities, carrying out theoretical and practical learning processes, and carrying out assessments or evaluations of teaching factories helps schools to be able to adapt to current industrial developments, the principal and deputy principal of the curriculum section regarding the teaching factory program stated this. Evaluation activities are used to plan better programs in the future; some things are not far away when it is essential. Feedback from the industry is necessary so that the links and skills of vocational school graduates can align with industry needs.

Overall, the researchers concluded that Teaching Factory activities had only been implemented in 2 vocational schools majoring in Laboratory Testing Analysis out of 5 vocational schools in East Java, meaning that not all vocational schools had implemented *Teaching Factory*. Some of the main obstacles are in the facilities that must be provided. Meanwhile, *Teaching Factory* in 2 existing vocational school programs can be implemented well by involving industry in several activities with students. The school offers facilities such as a teaching factory laboratory and a collaboration office

to support the implementation of the teaching factory. The school collaborates with industries in student internships, curriculum preparation, preparation of learning materials, and guest teachers. However, schools believe that the implementation of the teaching factory is still not optimal, there is still a need for a planned program and maximizing involvement in industries.

CONCLUSIONS

The teaching factory program implemented by one of the vocational schools in East Java includes groundwater testing, industrial work practice, practical activities in the Teaching Factory laboratory, and sales of goods and services. Meanwhile, other teaching factory activities include inviting industry practitioners to teach at schools, opening stands (training tents) to sell products made by students, and conducting on-the-job training for class XII (twelfth grade) students. The school has collaborated with industries, including implementing fieldwork practices, curriculum preparation, preparation of learning materials, and guest teachers. Teaching factories can improve students' work abilities, knowledge, skills, attitudes, and character to adapt to the industry's conditions. The teaching factory program can also build students' entrepreneurial character through discipline, responsibility, independence, and creativity in creating new work. The obstacles in implementing the teaching factory experienced by vocational schools majoring in Laboratory Testing Analysis are:

1) The rapidly changing needs of the Industrial condition, given the effect difficulties of schools to follow
2) Lack of support from industries to provide information about the current industrial needs
3) Schools can not provide facilities for modern analysis equipment often used by industries.
4) The limitation of industrial ability to facilitate all existing internship students
5) Insufficient allocation of school funds to complete facilities and carry out activities
6) Schools do not have adequate modern equipment to match industry equipment.

Implementing teaching factories at State Vocational Schools in East Java, especially in the Laboratory Testing Analysis department, still needs to be optimized by improving communication in developing planned programs and maximizing involvement in industry student learning activities. This research implies that many aspects have to improve to tackle standard students' practical skills, lack of job readiness, and lack of match with industry needs

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