Buletin Poltanesa Vol. 24 No. 1 (June 2023) 52-59 p-ISSN 2721-5350 e-ISSN 2721-5369
https://doi.org/10.51967/tanesa.v24i1.2651 © 2023 Politeknik Pertanian Negeri Samarinda

A study on Relaxation Learning Factory in Vocational Higher Education during the Covid-19 Endemic Transition

Gregorius Adi Prastiantomo*
Rekayasa Teknologi Manufaktur, Politeknik ATMI Surakarta, Surakarta, 57145
adi.prastiantomo@atmi.ac.id
**Corresponding author*

Tri Hannanto Saputra
Teknik Perancangan Mekanik dan Mesin, Politeknik ATMI Surakarta, Surakarta, 57145
hannanto.saputra@atmi.ac.id

Agus Wijayanto
Teknik Perancangan Mekanik dan Mesin, Politeknik ATMI Surakarta, Surakarta, 57145
agus.wijayanto@atmi.ac.id

Submitted: 2023-06-20; Accepted: 2023-06-22; Published: 2023-06-25

Abstrak—Vocational Higher Education in providing quality vocational higher education is inseparable from its education model that implements PBET (Production Based Education and Training). To support this educational model, Vocational Higher Education has an educational facility called the Learning Factory. The concept of Learning Factory is facing challenges due to the extraordinary events post of the COVID-19 pandemic. Organizational strategic management is needed in relaxing concepts and activities related to the learning factory in Vocational Higher Education. Organizations must be able to formulate strategic policies that focus on the health and safety of students during the COVID-19 pandemic. Relaxation is a way or action to align the mind in a constructive direction so that what you want can be achieved. The main changes needed in Learning Factory Relaxation are the Implementation Model and the Learning Matrix. Both require Authorization in a process that supports teaching activities and the desired result. Therefore, principles are needed to support the achievement of modules that are open to the entire learning process and make prototypes for vocational students. As a form of a new breakthrough with technology in the industrial sector and getting around the adaptation of new habits during the Covid-19 pandemic, the learning process must be developed more innovatively and continues to be productive for the sake of mutual welfare. In realizing adaptive relaxation, it is necessary to focus on assessing the functions of Technoware, Infoware, Humanware, and Organware (THIO) as tools that Vocational Higher Education can use to improve services to stakeholders.

Keywords **–** Learning Factory, Relaxation, Vocational, Strategy, Organization.

I. INTRODUCTION

Education, including vocational education, plays an important role in human and community development in Indonesia. According to Slamet (2011), vocational education can play an optimal role in economic development if it is aligned with the needs of the surrounding the world of work and pursued continuously in terms of quantity, quality, location, and time. The government through the 2015-2019 Renstra Dikti seeks to increase the quantity and quality of vocational education through the Vocational Higher Education Revitalization policy Kemristekdikti (2017). The existence of this policy proves that the government pays great attention to vocational higher education.

Vocational Higher Education in organizing quality vocational higher education is inseparable from its education model that implements PBET (Production Based Education and Training). In summary, PBET is a vocational education model that is oriented towards production activities like in the real industrial world. The duration of lecture time is 33% theory and 67% practice. To support this education model, Vocational Higher Education has educational facilities called Learning Factory.

According to Tisch et al (2015), a learning factory is a complex learning environment that enables the transfer of high-quality competencies both informally, non-formally, and formally through the realization of a real industrial environment in which there are production activities (valued added chain). Through the learning factory, the learning atmosphere feels like in the real industrial world. This condition supports the creation of graduates who are in accordance with industry needs and allows financial income from the sale of student practicum products.

The Learning Factory concept, which began in March 2020, has been challenged due to the extraordinary events of the COVID-19 pandemic. Strategic management of the organization is needed to relax the concept and activities related to the learning factory in Vocational Higher Education. Organizations must be able to formulate strategic policies that focus on the health and safety of students during the post-COVID-19 pandemic.

During the post-COVID-19 pandemic period, learning factory activities cannot be run online. The government through the Circular Letter of the Minister of Education and Culture No. 4 of 2020 concerning the Implementation of Educational Policies during the Emergency Period of the Spread of Covid-19 decided that teaching and learning activities were carried out online / distance learning. This condition has the potential to cause a decrease in the quality of educational services organized by Vocational Higher Education, which in turn can reduce the level of satisfaction of graduate users and students themselves.

Relaxation is needed in the process of theoretical learning, practical learning, learning evaluation, new student admissions, graduation, and other activities. Changes are made to stabilize the impact of relaxation of these activities. Adaptation must be dynamic, meaning that it always adjusts to future policy developments, both from the government and internal stakeholders.

Strategic management of the organization is needed in relaxing the concepts and activities related to the learning factory program in vocational education. Organizations must formulate strategic policies that focus on student health and safety during and after the COVID-19 pandemic.

This research aims to describe the organization's strategy during the learning factory activities. This research tries to develop relaxation in learning factory activities so that practicum learning is still carried out and the quality of learning is also well maintained. The developed model must be able to adapt to conditions, negative consequences that occur, and the implementation of health protocols.

Based on the above background, the problem in this study is "How to develop learning factory relaxation so that learning outcomes are still carried out in the post-COVID-19 pandemic period."

The purpose of this study is to describe the implementation of a learning factory towards the learning process and outcomes after the pandemic has passed. In addition, this research also provides an argument that the learning process and outcomes are still implemented and the quality of teaching is also well maintained even in "difficult" times.

The benefits that can be obtained from this research are helping instructors in workshops to determine the relevant learning model for their time. It helps the management to ensure the quality of teaching in the workshop is well maintained. The model can be utilized as one of the learning alternatives that can be developed, especially in manufacturing.

II. METHODOLOGY

According to Trihatmoko (2019), this study is qualitative research with a phenomenological approach to describe the relaxation of learning factory in vocational education institutions in Indonesia.

This research wants to describe the procedure for developing relaxation in learning factory activities so that practical learning outcomes are carried out and maintained during the COVID-19 pandemic; shown in Figure 1.

The researcher, based on Triatmoko (2019), will collect data and try to understand the perspective and philosophy behind the approach used. Here, the researcher will explore and collect data from the research subjects regarding the learning factory relaxation experience that has been carried out. The aim is to understand the research subject's reaction to the teaching factory relaxation. Because the relationship between the researcher and the research subject is very close, even the researcher is involved in it, transcendental phenomenology is used to eliminate prejudice, reduce bias and opinion, through data validation in the form of focus group discussions.

This research proposes a problem-solving solution through learning factory relaxation. The approach chosen is a qualitative method. The relaxation system in this study is described in three main components, namely curriculum quality, competence, and acceptance in partner industries. The model was chosen because it has elements that are complete enough to meet the needs of model development in this study. The model has elements of target achievement, considers the impact of model selection, and accommodates the three main components. This concept was chosen because curriculum and competencies have the same characteristics. A good curriculum produces good competencies. Curriculum relaxation is one form of continuous improvement efforts so the step of integrating competency aspects in the developed model is important.

The framework in this research starts from problem-solving efforts to find a learning factory development model/prototype that is suitable for post-COVID-19 pandemic conditions. These problems are very important to solve so that all the negative consequences caused can be resolved. Losses can not only be experienced by service users (students) but also by vocational education program organizers. Distance or online learning models can result in the quality of training outcomes being below target. This condition can reduce service user satisfaction and the credibility of education service providers. For vocational education, the online learning model has an impact on the inefficiency of training programs to the detriment of service users. Therefore, it is necessary to find alternative solutions to overcome these problems.

This research produces a learning factory relaxation model. The novelty of this research is the relaxation aspect of the curriculum, competency achievement, and industry acceptance. The output of this model is a prototype of a learning factory as a solution to the problems of vocational education in the New Normal Era.

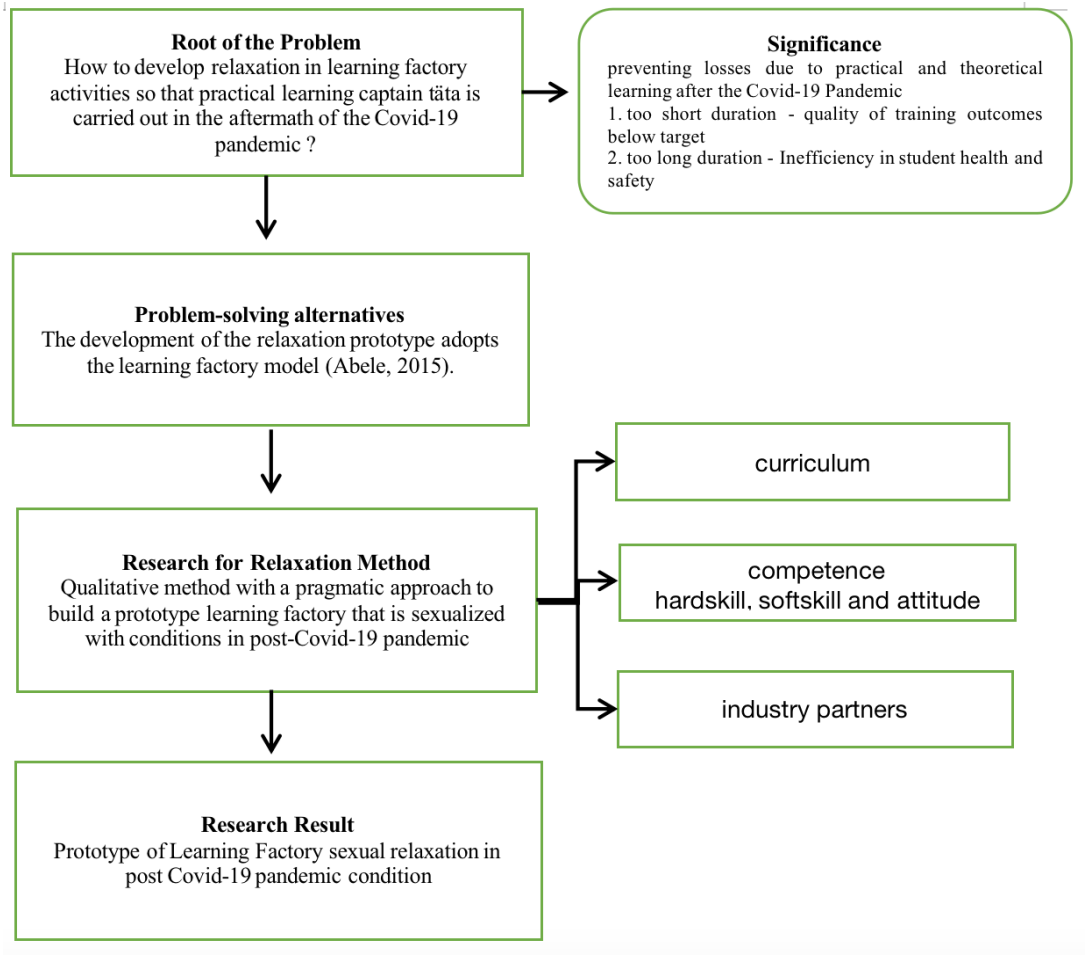


Figure 1. Thinking and conceptual foundation chart

According to Triatmoko (2019), this research is qualitative research with a phenomenological approach to describe the relaxation of the learning factory in Vocational Higher Education. Researchers describe the COVID-19 experience that has an impact on the world of vocational education, especially in the learning factory activity program. Thus, in this study, the impact experienced is explored and described as an important experience.

Researchers collect data and try to understand the perspectives and philosophies behind the approaches used. Here, researchers explore and collect data from research subjects about the learning factory relaxation experience that has been carried out. The goal is to understand the research subject's reaction to learning factory relaxation. Because the relationship between researchers and research subjects is very close, even researchers are involved in it, transcendental phenomenology is used to eliminate prejudice, and reduce bias and opinion, through data validation in the form of focus group discussions.

According to Fatchan (2011), The pattern of data collection is carried out simultaneously or by process. This means that during data collection, researchers also carry out data processing activities in the form of data analysis. Data analysis techniques use componential analysis, where researchers try to sort and describe the differences in data found in the field notes data. The difference in data is then sorted according to the flow. Contrasting elements are sorted out and then categorized based on the system used. The depth of understanding is reflected in making the flow and system of this componential analysis.

Based on the data collected, the researcher will describe the design or idea of learning factory relaxation in a patterned language. The design will be reviewed with the collected data to identify key issues and opportunities for improvement. The results of the identification will be formulated into the meanings that emerge behind the relaxation phenomenon. Then, the researcher will create a scenario, based on the design, to structure and organize the workflow using images and text in a series of tables. The result is a learning factory relaxation prototype that is suitable for the conditions in the post-COVID-19 pandemic has been validated.

Data interpretation in this research uses the descriptive textual method. This method aims to provide a systematic, factual, and accurate description of the facts that occur. The selection of textual descriptive method is used in order to provide a clear picture of the problems in this research. In addition, the data that has been processed will be presented in the form of description in the form of narration regarding the form and structure of learning factory relaxation.

Testing the truth of the research data is done by two methods, namely Focus Group Discussion (FGD) and Comparative Study. FGD was conducted at Politeknik ATMI Surakarta by considering the following: materials, time scheduling, place settings, FGD implementation techniques, equipment and documentation, and FGD notes/results.

Comparative studies are conducted to confirm the truth of the data. The comparative study will be conducted at reference schools engaged in manufacturing. We chose Politeknik ATMI, Ostschweizer Fachhochschule, Campus St Gallen and Politeknik Manufaktur Bandung.

III. Results And Discussion

A. *Definition Of Organizational Management Strategy*

Management according to G.R. Terry (2006) is a process to determine predetermined goals through the use of human resources and other sources consisting of planning organizing, controlling, and directing (POAC). Meanwhile, Strategy is a complete plan; a plan that determines the choices to be made in every possible situation.

Referring to the 1944 Theory of Games and Economic Behavior written by mathematician John von Neumann and economist Oskar Morgenstern: "to achieve maximum profit requires maturity in the weakest planning that can be a threat to the survival of the organization". Therefore, strategic measures are needed after the COVID-19 pandemic so that the organization can survive and protect the people in it.

The Plan-Do-Check-Action (PDCA) cycle is a systematic problem-solving step. To be able to apply PDCA in the post-pandemic context, the spirit of continuous change to improve the quality and sustainability of the organization, not only requires an understanding of the PDCA concept but requires skills in using quality management tools. However, the implementation of each stage of PDCA, starting from the P (Plan) to the A (Act) stage requires a set of tools that can be used to streamline the actions in each stage. The relationship between each stage in PDCA and a set of quality tools can be seen in the figure 2.

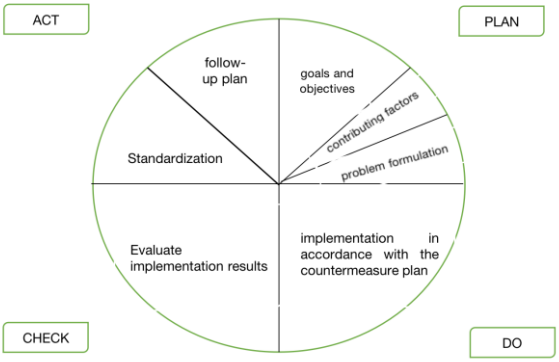


Figure 2. PDCA cycle (Poerwanto, 2012)

B. *Definition of Relaxation*

The Big Indonesian Dictionary defines relaxation as a way or action to harmonize the mind in a constructive direction so that what is desired can be achieved. The definition of relaxation from experts mostly refers to the relaxed state of human muscles. However, in this study, relaxation is defined as an effort to improve the quality of learning that focuses on student competence and the results/products achieved.

Research by Chitpin (2016) with the title Leading school improvement: using Popper's theory of Learning identified educational relaxation focuses on efforts to improve student competencies that meet learning outcomes and reduce the 'achievement gap' that occurs due to external factors, for example, extraordinary events and lack of resources that support these educational activities.

The Learning Factory is a hands-on facility for engineering students to use in conjunction with capstone design and other courses, as well as research projects and student organizations. Learning Factory Relaxation is a process where a Learning Factory adopts a more relaxed and flexible approach to developing students' skills and knowledge. It aims to create a more inclusive and collaborative environment and facilitate continuous learning and innovation in higher education.

Figure 3 shows, diagrams that can be taken in the Learning Factory relaxation process.

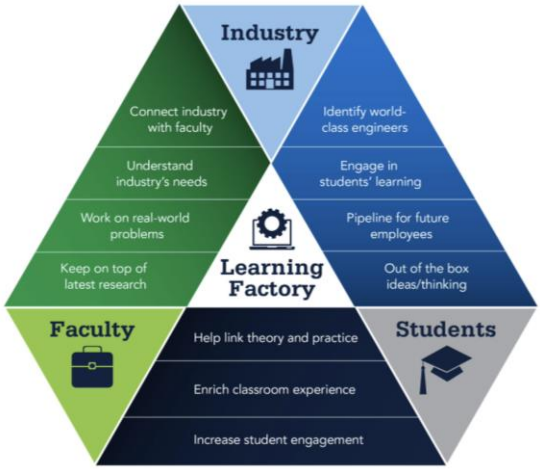


Figure 3. learning factory diagram (Penn State, 2023)

From the above diagram, it can be concluded that relaxation can reduce the stress associated with student learning and development. Do not emphasize perfect results or strict targets. Focus on the learning process and the problem solving that occurs during the process.

In addition, there is a process of collaboration between students by encouraging teams to share knowledge and experiences. By creating an inclusive work culture, teams of students will feel

more comfortable to share ideas and learn from each other.

What needs to be underlined is that learning is a continuous process, not just a one-time activity. We often need to encourage students to continue developing their skills and knowledge independently and facilitate access to relevant resources.

C. *Definition Of Learning Factory*

The term Learning Factory first emerged in 1994 in the United States at a consortium led by Penn State University. The consortium aimed to create a strong collaboration between educational institutions and industry in various disciplines. The result of this consortium was a 2000 m2 infrastructure equipped with machining facilities, materials, and production equipment. This infrastructure became the first model of a Learning Factory (Abele et al., 2015).

Determining a facility as a Learning Factory can refer to the description model recommended by NIL (Network of Innovative Learning Factories) (Abele et al., 2015). This model consists of seven main dimensions, namely operating model, goals and targets, processes, settings, products, didactics, and metrics. Each dimension consists of several more detailed description features. This model can also be used to distinguish the characteristics and types of Learning Factory. The model can be shown in figure 4.

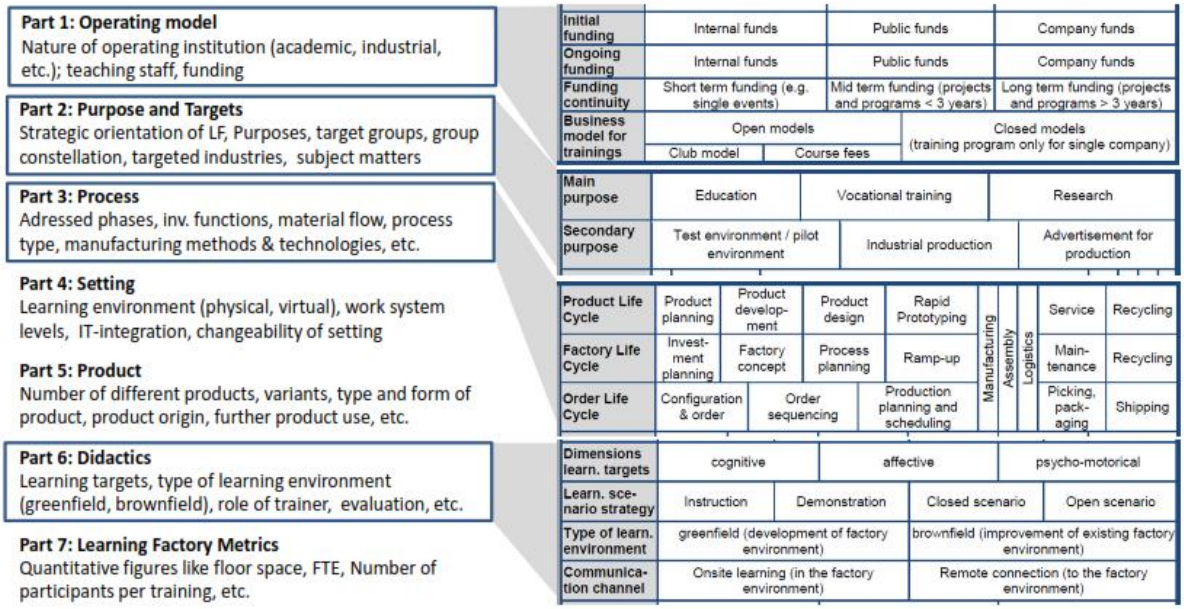


Figure 4. Learning model in Learning Factory Workshops (Abele, 2015)

Key Resources in a learning factory are divided into two interacting lines, namely education and production. These two key resources overlap and form a key activity segment in the middle. The interaction between the education and production sides is formulated in a workshop facility that has seven main dimensions.

Learning Factory is an adaptation of vocational education developed in Switzerland and Germany. In essence, the learning factory is a distillation of the concept of practical technical education that has been organized in Indonesia, with the addition of production units on a simpler and more limited scale. The main objective is to improve and complement competencies in terms of hard skills, soft skills, and attitude.

The concept of learning factory with the composition of two words "learning" and "factory" is used to refer to two terms: learning elements and production environment. The learning model integrates practice and theory in a real problem, which is a problem in the industry. The main objectives of the learning factory are technological innovation and effective competency development.

D. *Relaxation Principles And Techniques In Learning Factory*

In implementing the learning relaxation process, it is necessary to adhere to several principles. These principles provide guidance and direction to the academic community so that these activities can achieve the goals that have been set. These principles are:

1. The principle of authority.
   Learning Factory Learning Relaxation must be carried out by people who have authority.
2. Simplicity principle.
   Related programs must be simple and clear.
3. Principle of sensitivity.
   Handling issues related to the relaxation of learning factory learning must be sensitive to the needs and expectations of stakeholders.

4. The principle of honesty.
   Matters conveyed to stakeholders must be what they are and conveyed honestly.
5. The principle of permanence.
   Subjects conveyed by vocational higher education to stakeholders must be precise, both in terms of content, time, media used and objectives to be achieved.

The relaxation technique can be explained in the Figure 5.

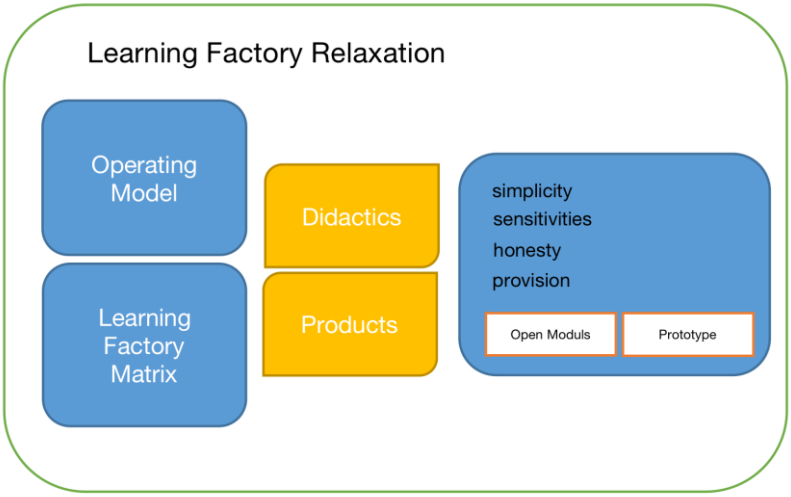


Figure 5. Learning Factory Relaxation Model for Vocational Higher Education

The main changes required in the Learning Factory Relaxation are the Implementation Model and the Learning Matrix. Both require Authorization in the process which supports the teaching activities and the desired outcomes. Therefore, principles are needed to support the achievement of modules that are open to the entire learning process and prototyping for vocational students.

The implementation of learning factory relaxation requires supporting factors. Those factors are Product, Block schedule, Learning plan and Learning factory culture.

1. Product

Products in the learning factory are goods or services that become a medium to deliver student competencies. Product-making activities are part of the learning process. The product is the result of the study process as well as the production process. The specificity is that the output of learning activities is not only competent students but also products in the form of goods and services.

The main flow in the learning factory method is that the product becomes inseparable from learning activities. The product becomes an important component because the product is a bridge or link between the world of education and the industrial world. Through learning factory learning, changes that occur in the industrial world can be conveyed in the learning process.

The characteristics of the products used include:

1) Based on quality that is equivalent to industrial quality.
2) Worked with an efficiency rhythm that is equivalent to industrial efficiency.
3) Hone flexibility/innovation to face market fluctuations or problems.
4) Using industrial culture as training culture.

2. Learning Schedule

Based on the research results, the study schedule used is a block schedule model. The scheduling model here is different from the scheduling model in general education institutions. In the block schedule, theoretical and practical activities are spread intermittently according to their weight; 70% practice and 30% theory. The 70% practice weight is translated into a 4-week time duration, while the 30% theory weight is translated into a 2-week time duration.

Through the block schedule, the arrangement of teaching and learning activities is arranged in such a way as to allow students to have optimal learning time (especially interacting with production objects) and assistance (mentoring with instructors in small learning groups) when learning a particular competency.

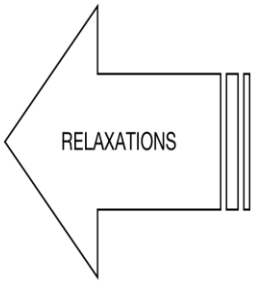
The duration of lecture time (hours) in the block schedule amounts to 8 hours a day or 40 hours per week. This time duration aims to create an industrial culture, so that students can immediately adapt when they work later. The benefits of a block schedule are:

1) Organizing the continuity of the learning process in achieving competence,
2) Aligning learning culture with industrial culture,

3) Aligning the learning process with the production process,
4) Optimizing the use of practical tools for the learning process.

3. Learning Plan
The learning plan is aligned with the learning outcomes and curriculum, as can be seen in the Figure 6

Body of Knowledge Desain Enggineering	Normal Periode	Post Covid-19 Periode
Basic Sciences (Math, Physic, etc.)	Applied 1	Comprehension
Machining Processes	Applied 1	Comprehension + Applied 1
Design	Analitic	Analitic
Materials Science	Applied 2	Applied 2
Control Engineering	Applied 2	Applied 2
General Fundamental Courses		
Basic and social ethics	Comprehension	Comprehension + Applied 1
Civic and National building	Comprehension	Comprehension + Applied 1
Engineering Ethics	Applied 1	Comprehension + Applied 2
Communication Techniques	Applied 1	Comprehension + Applied 2
Management	Applied 1	Comprehension + Applied 2
Entrepreneurship	Applied 1	Comprehension + Applied 2



Implementation Focus	Grade 1	Grade 2	Grade 3
Basic	70%		
Medium		90%	
Advanced			90%

Figure 6. Relaxation of Learning Outcomes and Plans

4. The Learning Factory Culture

Based on the results of the research, it is found that education must internalize the basic values that guide the behavior of students and lecturers/instructors in it. This value will create a culture that becomes the foundation of soft skills for students. The value in question is called 4C.

Briefly, these values are formulated with the term 4C, namely Competence, Conscience, Compassion, and Commitment. From this educational model, students are invited to consider the meaning and human meaning of what they learn and integrate the meaning that has been obtained during the learning process.

The simple description is, **First**, inviting to have a sense of responsibility for the development of the elements of brain and mind abilities. **Second**, they are invited to have the responsibility of awareness of what is good and bad or have the ability and courage to live morally, **Third,** they are invited to have responsibility for others by defending the feelings that are lived for the love of others. And **fourth**, the important thing while instilling these values is loyalty to the value of goodness that has been lived.

The supporting factors above consist of complete and independent units. The supporting factors are organized into a unit of a series of activities arranged in an open way, which helps students achieve several goals formulated in several vocational courses. The initial model or example made by students can be intended to replace the Final Project and/or thesis so that the achievement of tasks and functions in conducting trials of direct concepts can be combined. Especially if this has entered the realm of work performance. Of course, it will further ease the task of vocational students and learning outcomes can still be met.

IV. Conclusion

As a form of new breakthrough through the utilization of technology in the industrial sector and getting around the adaptation of new habits in the post-Covid-19 pandemic including learning in the vocational field. The Director of Vocational Higher Education continues to encourage his work unit to transform into a more innovative and productive work unit for the common welfare. The efforts are continuously developed to socialize, create and test industrial solutions through education, consulting, certification, training, and sustainable technology utilization services.

In realizing adaptive relaxation, guidelines have been prepared on Learning Factory Relaxation and assessment of Technoware, Infoware, Humanware, and Organware (THIO) functions as tools that can be used by Vocational Higher Education to improve services to stakeholders. Learning Factory relaxation in the post-Covid-19 pandemic is an industrialized platform.

The level of success is not only measured in terms of prototype formation, but also from intangible benefits, such as the number of industries involved, the number of up-skilling human resources, the number of appropriate technologies, and the number of research and products produced by lecturers and students.

Assessment of this relaxation is to see the extent of the readiness of technology, human resources, as well as information systems, and organizations. Identification of obstacles and points faced is very important because

it will be the basis for recommendations in utilizing industry 4.0 technology, one of which is the availability of network connections and supporting digital facilities.

The scale of research can be developed at a larger level, namely, the institutional level where it has 1 (one) fast-track two diploma study programs, 3 (three) three diploma study programs, and 3 (three) applied undergraduate study programs. So that it can see the level of target achievement, success, and failure of learning outcomes more objectively and validly.

For other researchers, further research is needed that examines protection policies for the safety and health of educators, students, and education personnel who implement learning factory learning in the post-pandemic.

REFERENCES

Abele, Eberhard., Metternich, J., Tisch, M., Chryssolouris, G., Sihn, W., ElMaraghy, H., Hummel, V., Ranz, F. 2015. Learning Factories for research, education, and training. ScienceDirect. Procedia CIRP 32 , 1 – 6 (https://www.sciencedirect.com/science/article/pii/S221282711500503X, accessed March 2, 2023).

Chitpin, Stephanie. 2016. Leading school improvement: using Popper's theory of learning. Open Review Of Educational Research. Vol. 3. No.1, 190-203. (https://www.tandfonline.com/doi/full/10.1080/23265507.2016.1217742, accessed March 2, 2023)

Fatchan, H. A. 2011. Metode Penelitian Kualitatif. Surabaya: Jenggala Pustakan Utama.

Kemristekdikti. 2017. Kebijakan Pendidikan Tinggi Vokasi: Revitalisasi Pendidikan Vokasi.

Kemristekdikti. 2017. Genjot Penguatan Pendidikan Vokasi, Wapres Kunjungi ATMI Surakarta. Siaran Pers Kemristekdikti No: 81/SP/BKKP/XI/2017.

Kinsey, Mc. 2020. Covid-19: Implication for business. USA. (https://www.mckinsey.com/capabilities/risk-and-resilience/our-insights/covid-19-implications-for-business, accessed August 4, 2020)

Lea, Ruth. 2020. The coronavirus crisis:recession and modest lockdown relaxation. Perspectives. Arbuthnot Banking Group. United Kingdom: 18th May 2020. (https://www.arbuthnotlatham.co.uk/sites/default/files/documents/14%20April%202020_0.pdf, accessed August 4, 2020)

Politeknik ATMI Surakarta. 2020. Seleksi Penerimaan Mahasiswa, (https://www.atmi.ac.id/admissions.html, accessed August 4, 2020).

Slamet, P. H. 2011. Peran pendidikan vokasi dalam pembangunan ekonomi. Jurnal Cakrawala Pendidikan, (2). (https://journal.uny.ac.id/index.php/cp/article/view/4227, accessed May 8, 2023)

Trihatmoko, R. A. 2019. Metode Penelitian Kualitatif Filosofi, Teori, Desain, dan Implementasi. Yogyakarta: Publika Global Media.