

IMPROVE HIGH ORDER THINKING SKILLS (HOTS) THROUGH VOCATIONAL EDUCATION IN READINESS TO FACE THE 5.0 INDUSTRIAL REVOLUTION

Ratna Fajarwati Meditama

Universitas Islam Raden Rahmat Malang, Kepanjen Jawa Timur Indonesia

Email: ratna.fajarwati@uniramalang.ac.id

Mardji

Universitas Negeri Malang, Jl. Semarang Kota Malang Jawa Timur, Indonesia

Email: mardji.ft@um.ac.id

ABSTRACT

Competent Human Resources in accordance with technological developments is a challenge that must be faced in facing the Industrial Age 5.0. In a global perspective, many developed countries such as Germany, Austria and Japan have superior vocational education systems and are references for many countries. If you look at these conditions, Indonesia still has a lot of big homework to do to improve the vocational education system so that it can have competitiveness on the international stage. An overview of trends in the growing Industry 5.0, namely towards automation and data exchange in technology and processes in the manufacturing industry. The method used in this research is descriptive research and literature study. With the presence of vocational education, it is hoped that it will produce prospective workers who have three abilities needed in the industrial era 5.0, namely 1) cognitive abilities that have skills in solving complex problems and have the ability to understand something (literacy), and think critically, 2) soft skills which are the skills to communicate, empathize, have a growth mindset, and be adaptive so that they can solve complex problems or are called High Order Thinking Skills (HOTS), 3) technology where technological capabilities are, namely, the ability to implement a set of common platforms (for example, physical components, networks, databases, software) and to determine the degree to which one can properly manage and use them. The targets for fostering students in welcoming the industrial era 4.0 include 1) mental and physical development, 2) basic OSH, 2) technical basics, 4) business processes, 5) soft skills provision, and 6) quality forging, industrial culture and entrepreneurship

Keywords: HR Challenges, Industrial Era 4.0, Vocational Education, soft skills, HOTS

INTRODUCTION

The fifth industrial revolution (5.0) is currently changing the economy, jobs, and even society itself. The essence of Industry 5.0, is the merging of physical and digital technologies through artificial intelligence, analytics, cognitive technology, and the Internet of Things (IoT) to create digital companies that are interconnected and able to make more informed decisions. Lee et al., (2015) explain, industry 5.0 is marked by an increase in manufacturing digitization driven by four factors, namely: 1) increased data volume, computing power, and connectivity; 2) the emergence of business analysis, capabilities, and intelligence; 3) the occurrence of new forms of interaction between humans and machines; and 4) improvement of digital transfer instructions to the physical world, such as robotics and 3D printing. Lifter and Tschienner (2013) added, the basic principle of Industry 5.0 is the merging

of machines, workflows and systems, by implementing intelligent networks along the chain and production processes to control each other independently.

According to (Tjandrawinata, 2016; Ghufro, 2018; Savitri, 2019) Industry 5.0 as a phase of technological revolution changes the way human activities are carried out in scale, scope, complexity, and transformation from previous life experiences. Humans will even live in global uncertainty, therefore humans must have the ability to predict a future that changes very quickly. Each country must respond to these changes in an integrated and comprehensive manner. This response involves all global political stakeholders, from the public, private, academic, to civil society sectors so that the challenges of Industry 4.0 can be managed into opportunities.

The impact of the industrial revolution 5.0 according to Winangun (2017) is the emergence of increasingly fierce competition in terms of services, capital, goods and labor or human resources. openly competitive with other countries, adaptive and anticipatory to various changes and new conditions, open to change, able to learn how to learn, have a variety of skills, easily retrained, and have broad, strong basic capabilities, and fundamental for future development. This indication shows that workers with professional qualifications are highly demanded in the world of work in the era of the industrial revolution 5.0.

Another challenge faced by Indonesia is related to the development of human resources, especially for vocational education and business competition, among others, in the digitalization era it has an impact on changing work patterns and has the potential to eliminate jobs that are simple and repetitive. Thus the quality of human resources is one of the most important determining factors in achieving the success of a development program. Kamal (2019) explains that quality human resources will be able to manage natural resources properly and efficiently. HR problems cannot be separated from labor problems. The quality of the workforce is highly dependent on the quality of human resources. Therefore, according to Ruhana (2012) the quality of human resources must receive top priority to be improved and developed in order to obtain a good quality workforce (Meditama, 2021). A qualified workforce with a high work ethic will strengthen the position of the industry which will ultimately strengthen the country's economy.

Improving HR capabilities and skills for the younger generation of prospective workers according to Winangun (2017) is the responsibility of the world of education, both formal and non-formal education. Education is an integral part that cannot be separated from the process of preparing qualified, tough and skilled human resources. In other words, through education, qualified prospective workers will be obtained so that they are more productive and able to compete with other countries.

METHOD

The approach used in research is descriptive research and literature study.

1. Descriptive research Descriptive research is a research method that aims to explain existing and ongoing phenomena as well as those in the past.
2. Literature study Namely searching for data and retrieving data from reference books or the like related to the object being sought for information.

RESULTS AND DISCUSSION

Vocational Education

Vocational education is a level of education that is always dynamic in making changes to the education curriculum in accordance with the growth of the job market and adapting to developments in science and technology. This means that vocational education will always experience a paradigm shift. According to Pavlova (2009) with the consideration that economic activity is largely determined by rapid technological changes in the future, the orientation of vocational education is directed to work education or technology education.

Clark & Winch (2008) mentions "vocational education is confined to preparing young people and adults for working life, a process often regarded as of rather technical and practical nature", which means that vocational education is education to enter the world of work and is intended for whom only those who want and need that are technical and practical.

Some basic principles of programs in vocational education according to (Miller, 1984; Martinez Jr., 2007), include a) the vocational education curriculum is a derivative/derivative of needs in the world of work, b) the type of worker is the basis/basis for the development of the vocational education curriculum, c) innovation is part of vocational education, and d) through vocational education, students are prepared to enter the workforce early. As for the basic principles of the process in vocational education according to Miller (1984), namely: a) community participation (world of work) is a decisive part in preparing vocational education programs, b) articulation and coordination are key parts in vocational education, and c) assessment (evaluation) is carried out continuously.

In line with this, based on Article 15 of Law Number 20 of 2003 concerning the National Education System, it states that vocational education is higher education that prepares students to have jobs with certain applied skills, equivalent to a maximum undergraduate program. Vocational education is the implementation of formal education pathways that are held in higher education, such as: Polytechnics, Academies, Colleges, Institutes and Universities (National Education System Law No. 20 of 2003).

The objectives of Vocational Education are: (a) to help individuals identify jobs that are suitable for them, and (b) to develop individual abilities to be able to do a job. Traditionally, according to Pavlova (2009) vocational education is education with the main objective of preparing to work using a competency-based educational approach. Knoll (1997); Finch & Asselin (1984); Calhoun & Finch (1976) stated that one of the main objectives of vocational education is to improve students' abilities to obtain a better life than before. Meanwhile, according to Miner (1974) states that the provisions learned in vocational education will be provisions for self-development in work. Furthermore, according to Pavlova (2009) work education is an educational program with three interrelated components, namely: learning for work), learning about work, and understanding the nature of work.

In Indonesia, the Ministry of Education and Culture, which is entrusted with the mandate to carry out and control human resource development, improve the quality of education and promote culture, always takes into

account global trends related to scientific progress, technological advances, socio-cultural shifts, and differences in the world of work in the future. Therefore the Ministry of Education and Culture through the Freedom to Learn policy seeks to embrace all education and cultural stakeholders, including families, educators and education staff, educational institutions, industry and employers, and the community to harness all the nation's potential to succeed in the promotion of high quality education and culture for all. the people in accordance with the ideals of Indonesian independence (2020 Vocational Strategic Plan).

The establishment of the Directorate General of Vocational Education based on Permendikbud Number 26 of 2020 concerning amendments to the Regulation of the Minister of Education and Culture Number 45 of 2019 concerning the Organization and Work Procedure of the Ministry of Education and Culture is a vocational education revitalization program to prepare human resources ready to face the Industrial Revolution 5.0 era, which requires workers -skilled personnel who are experts in their field. This is in line with the Vision and Mission of the Ministry of Education and Culture 2020-2024 as stated in Permendikbud Number 22 of 2020, namely: "The Ministry of Education and Culture supports the President's Vision and Mission to realize an Advanced Indonesia that is sovereign, independent, and has personality through the creation of Pancasila Students who critical thinking, creative, independent, faithful, pious to God Almighty, and has a noble character, works together, and has global diversity".

The Directorate General of Vocational Education formulates the Program Targets and Performance Indicators for the 2020-2024 Program, to describe the size of the mission implementation and achievement of the Ministry's vision (Meditama, 2021). The Program Targets and Performance Indicators for the Directorate General of Vocational Education Program within the Ministry of Education and Culture for 2020-2024, can be described as follows:

- a. Increasing the number of vocational education and training graduates who find jobs and become entrepreneurs within one year after graduation
- b. Increasing industrial-standard SMK education
- c. Realization of quality and industry-standard Vocational Higher Education
- d. Realization of Vocational Training in accordance with industry needs and standards
- e. The realization of quality governance of the Directorate General of Vocational Education

Vocational Education Learning Strategy

The learning strategy applied depends on where the education takes place. If the place of education is in a vocational education school/campus, then the strategies below are relevant to use. However, if the place of education is in DUDI and in a teaching factory, then the most appropriate strategy is learning by doing, followed by a performance test evaluation method.

To provide an overview of which learning strategies to choose at school, below are given examples of learning strategies that can be used.

1. Theory and practice of communication (presentations and discussions)
2. Application of mathematical theory in everyday life

3. Computer theory and applications for various purposes
4. Conduct laboratory/field research
5. Writing scientific papers in Standard Indonesian
6. Theory and practice of English (reading, listening, conversation)
7. Project work and entrepreneurial practice
8. Vocational practice in the workshop/laboratory/field

Spectrum of Industrial Age Vocational Education Expertise 5.0

The presence of the Industrial Revolution 5.0 has totally disrupted the world of work, both formal and non-formal jobs. The production process and service process for Industry 5.0 based on the Cyber Physical Production System (CPPS) change work systems, procedures and work processes. As a result, the fields of work, job titles, work competencies and skills, job structure, work techniques, know-how capabilities at work have also changed completely. Industrial Revolution 5.0 technology has an impact on the structure of the workforce into 3 groups, namely: reshape, regrow, and reduce.

Effective and Efficient Vocational Education Model

The main goal in vocational education is to build Eight Competencies for Graduates, namely:

1. Communication Skills
2. Critical and Creative Thinking
3. Information/Digital Literacy
4. Inquiry/Reasoning Skills
5. Interpersonal Skills
6. Multicultural/Multilingual Literacy
7. Problem Solving
8. Technological Skills

Competency 1 to.d. 7 are called soft skills, while Competency 8 is called hard skills. To produce prospective workers who have the Eight Graduate Competencies as formulated above, an effective and efficient vocational education model is shown in Figure 2 below.

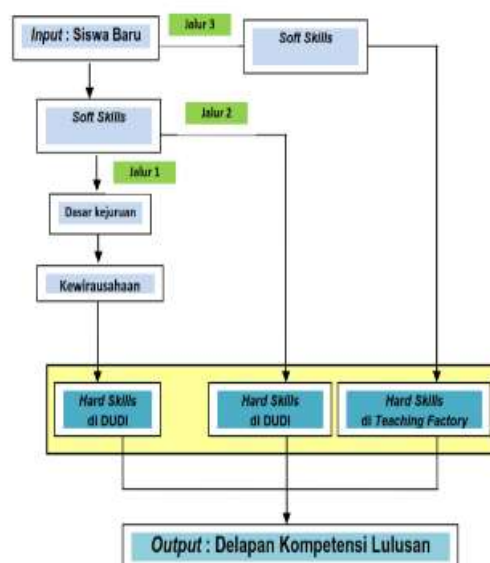


Figure 2. Three Alternative Pathways to the Vocational Education Model

In track 1 new students (input) are enrolled in vocational education. Education on soft skills aspects plus vocational basics and entrepreneurship is carried out in schools, while education on hard skills aspects is carried out in DUDI. **On track 2** new students (input) are enrolled in vocational education. Only soft skills aspects of education are carried out in schools. Other aspects of education (aspects of hard skills, vocational basics, and entrepreneurship) are carried out directly while practicing work at DUDI. **On track 3** new students (input) are enrolled in vocational education. Only soft skills aspects of education are carried out in schools. Other aspects of education (aspects of hard skills, vocational basics, and entrepreneurship) are carried out directly while practicing work in the teaching factory.

Vocational Education Reform and New Paradigm

In accordance with the Indonesia Vision 2045 and the 2020-2024 RPJMN, it is necessary to improve the quality of vocational human resources so that the revitalization of vocational education focuses on the fields of work 1) Vocational Development in the Machinery and Construction Sector; 2) Creative Economy; 3) Hospitality; and 4) Nursing Services as shown in Figure 2 below:



Figure 3. Vocational revitalization focus (Source: Vocational Strategic Plan 2021-2024)

Reform of the vocational education program in Indonesia has started, this can be proven by the following programs: 1) industrial-based HR competency development (teachers/lecturers/instructors/other educational staff), 2) vocational education must be close to the reality of work, what must be done is to increasing industry involvement in vocational education, adjusting the accreditation of vocational education institutions to industry needs, aligning the curriculum with industry by simplifying the spectrum of expertise and developing a soft skills curriculum, 3) vocational education is no longer differentiated, one of which is by transforming the Polytechnic into an Applied University, then 4) evaluate the percentage of graduates'

absorption in the industry, the median salary of graduates and the percentage of time to get a job.

The government and industry have collaborated to improve the quality of vocational education graduates by requiring students to study in two places, namely on campus and in industry. National standards that apply as a process reference, as well as quality teaching staff and instructors are determining factors for the success of vocational education. Vocational graduates are expected to have high competence and competitiveness through the implementation of the 321 curriculum (three active semesters on campus, two semesters in industry, and one final semester on campus or industry).

The link and match between vocational education and the world of business and industry (DUDI) continues to be pursued (Kemdikbudristek, 22 December 2020). The super tax deduction tax incentive policy for DUDI will be a driving force in advancing vocational education and as well as expanding opportunities for vocational education in collaboration with industry in curriculum development, increasing the quality and quantity of learning, as well as apprenticeship opportunities.

The consequences of increasing industry involvement in the education process include:

1. Readiness of teaching factory facilities, mastery of technology, mastery of standards (norm and code), work ethic and attitude that are relevant to the industrial situation. If the above requirements have not been fulfilled by the vocational education unit, students can be brought into the industry through apprenticeship activities.
2. The achievement of industry-accepted standard competencies in industrial apprenticeship activities must be sufficient so that it is not considered to be transferring educational responsibility. On the other hand, the industry must continue to view the apprenticeship program as an activity to encourage competency development from standard limits to readiness to support industrial competitiveness. Industry may not use apprentices as cheap labor provided by educational institutions.
3. Industry involvement in the vocational education process both on and off campus demands dignified, transparent and accountable governance regarding the beliefs and principles espoused by DUDI, so that governance regarding HR assets and goods and financing needs to be accommodated so that the program reform process vocational education can be realized.

The point of view that the mission of education is to prepare students to enter certain professions in the types of social roles that are already structured in society will soon become obsolete, and the task of education will become more important to meet the self-development needs of students in creating their profession (Berry, 2013). In addition to generational demands, the changing role of education is also caused by the emergence of new realities about changing learning ecology, the ease of in and out connections in the cybernetic world, and the increasingly widespread teacher-preneurism. That reality has been present in the midst of today's life and has changed the task of education 180 degrees from before. The success of education in carrying out its duties and functions in this century will be determined by innovation in managing learning in line with the emergence of this new reality. This change in perspective on education and the role of educators cannot be

separated from the phenomenal generational changes at the beginning of this century. The implication is, of course, that our educational praxis needs innovation and dynamics of evolution, in other words, education revitalization.

The change in educational orientation from competence to capability has become a general awareness in the world of vocational education since the past decade (Staron, 2006). As also stated by Stephenson & Weil (1992), one of the models that challenges the concept of competency-oriented traditional learning is the capability-oriented learning model. Capable people are those who know how to learn, are creative, have a high level of self-efficacy, can apply competence in new (novel) situations as well as familiar situations, and work well together with others. Compared to competence, which involves the acquisition of knowledge and skills, capability is a holistic attribute. Capable people are more likely to be able to deal effectively with problems in a turbulent environment because they have an "all-in" capacity.

This expansion from the competency model to the capability development model is a fundamental change in the orientation and focus of vocational education in the second decade of the 21st century, namely what we know as the shift from the "teaching" paradigm to the "learning" paradigm, or from a "job" orientation. expanded to a "life" orientation, which provides opportunities for the growth of independence. The vocational education approach which is closely related to expert-centered learning and work-based learning, in the 21st century moves or expands its learning orientation from expert-centered learning to life-based learning (Staron, 2006). The educational model has expanded from the training model and professional development model to the capability development model.

CONCLUSION

Based on the results and discussion above, it can be seen that the potential for the labor market for vocational education graduates is still very broad. The competencies needed broadly include soft skills and hard skills which are formulated into Eight Graduate Competencies. To produce a workforce that has these competencies can be pursued through three alternative paths. These three pathways, if implemented with a simple curriculum structure and productive learning strategies, and supported by creative teachers/instructors, are believed to be effective and efficient when compared to the current system. The effectiveness lies in the simplicity of the system offered which is characterized by being straight to the point. Efficiency can be achieved by optimizing cooperation with DUDI and learning by doing in the teaching factory, resulting in prospective workers who have soft skills and hard skills with critical thinking skills and problem solving skills to face the world of work in the globalization era. The national policy on vocational education is directed at realizing an Indonesia that is superior, cultured and masters science and technology, so that with quality human resources (HR), it is hoped that the Indonesian economy can grow forward and sustainably, development will be more equitable and inclusive, and Indonesia can become a country that increasingly democratic, strong and clean (Perpres Number 18 of 2020 concerning the 2020-2024 RPJMN). Policies and strategies that will

be produced both in the form of decrees and other operational policies which include increasing the role of industry in vocational education, reforming the implementation of vocational education, improving the quality of human resources, strengthening governance of vocational education and training and strengthening the Competency Certification system and technical matters others, are expected to be of benefit to stakeholders and the community in order to form superior and character human resources as well as to increase the productivity of the Indonesian workforce and the nation's competitiveness at the international level.

BIBLIOGRAPHY

- Calhoun, C. C., & Finch, A. V. (1976). *Vocational and Career Education: Concepts and Operations*.
- Finch, C. R., & Asselin, S. B. (1984). *A Conceptual Framework for Vocational Special Needs Teacher Competence*.
- Ghufron, M. . (2018). Revolusi Industri 4.0: Tantangan, Peluang, Dan Solusi Bagi Dunia Pendidikan. *Seminar Nasional Dan Diskusi Panel Multidisiplin Hasil Penelitian Dan Pengabdian Kepada Masyarakat 2018*, 1(1), 332–337.
- Hanafi, I. (2012). Re-orientasi keterampilan kerja lulusan pendidikan kejuruan. *Jurnal Pendidikan Vokasi*, 2(1).
- Kamal, M. (2019). KEBUTUHAN AKAN SDM SUATU DOKTRIN EKONOMI (KONSEP SDM, IDENTIFIKASI NILAI SDM, PENAWARAN DAN PERMINTAAN TENAGA KERJA DAN KARAKTERISTIK TENAGA TERDIDIK). *Jurnal Bina Ilmu Cendekia*, 1(1), 1–12.
- Knoll, M. (1997). *The project method: Its vocational education origin and international development*.
- Lee, J., Bagheri, B., & Kao, H.-A. (2015). A cyber-physical systems architecture for industry 4.0-based manufacturing systems. *Manufacturing Letters*, 3, 18–23.
- Martinez Jr, R. L. (2007). An Evolving Set of Values-Based Principles for Career and Technical Education. *Journal of Career and Technical Education*, 23(1), 72–84.
- Meditama, R.F., 2021. Pendidikan Vokasi Sebagai Elemen Fundamental Menghadapi Tantangan Revolusi Industri 4.0. In International Seminar On Islamic Education & Peace (Vol. 1, pp. 443-452).
- Miller, M. D. (1984). *Principles and a philosophy for vocational education*.
- Pavlova, M. (2009). The vocationalization of secondary education: the relationships between vocational and technology education. In *International handbook of education for the changing world of work* (pp. 1805–1821). Springer.
- Ruhana, I. (2012). Pengembangan kualitas sumber daya manusia vs daya saing global. *PROFIT: Jurnal Administrasi Bisnis*, 6(1).
- Savitri, A. (2019). *Revolusi Industri 4.0: Mengubah Tantangan Menjadi Peluang di Era Disrupsi 4.0*. Penerbit Genesis.
- Tjandrawinata, R. R. (2016). Industri 4.0: Revolusi industri abad ini dan pengaruhnya pada bidang kesehatan dan bioteknologi. *Jurnal Medicinus*, 29(1), 31–39.
- Triyono, M. B. (2017). Tantangan revolusi industri Ke 4 (I4. 0) bagi pendidikan

vokasi. *Proceeding Semnasvoktek*, 2(1), 5.
Winangun, K. (2017). Pendidikan Vokasi Sebagai Pondasi Bangsa
Menghadapi Globalisasi. *Taman Vokasi*, 5(1), 72.
<https://doi.org/10.30738/jtvok.v5i1.1493>