

## Revitalization of Vocational High School Roadmap to Encounter the 4.0 Industrial Revolution

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### Abstract

Vocational High School has an essential role in preparing the competent workers for the industry. To encounter the 4.0 industrial revolution era, Vocational High Schools must be able to keep up with developments by revitalizing a roadmap so the graduates have in line competencies with the industry's needs. The revitalization of the Vocational High School roadmaps is inseparable from the principles of 2013 curriculum, the improvement of teacher's quality competencies through training in the industry, and the application of student-centred learning models, such as; Project Based Learning (PrBL), Problem Based Learning (PBL) that emphasizes on ability for innovation and creativity, the improvement of education personnel's competence, and the collaboration with business and industrial world. The fulfilment of eight Indonesia National Education Standards (NES) has become absolute. The finding of this study are four main aspects as the basic of vocational road maps revitalization, namely; (1) synchronizing the curriculum with industry, (2) revitalizing the quality of teaching staff and education personnel, (3) revitalizing facilities and infrastructure, (4) optimizing cooperation with industry, and (5) strengthening soft skills competence.

**Keywords:** Revitalization; Roadmap; And 4.0 industrial revolution.



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### 1. Introduction

The rapid development of information and communication technology (ICT) changes the civilization and behaviour of human life led into the internet era in the 4.0 industrial revolution (Roblek *et al.*, 2016). Now, it is the time to organize the education system specifically vocational high school, so that it can produce graduates that can compete and do jobs that they are not familiar with. Vocational high school graduates are expected to be ready for the working world immediately; therefore the schools must be prepared for any development in the future (Hanushek *et al.*, 2017). One way to provide competency for students of vocational high schools is to implement internship and professional placement activities that suit the needs of the business world and the industrial world (Eichhorst *et al.*, 2015). Nowadays, the learning system that applies Project Based Learning (PBL) and Problem Based Learning (PBL) learning models can significantly help to achieve these needs, because learning refers to the needs of the industry since the industry always needs qualified human resources to develop the company. The 4.0 industrial revolution era, which is particular with the use of digital technology as a process and production activity in the industry, cause the world of education to be able to revitalize the teaching and learning process in schools. Based on these conditions, an initial stage that must be carried out by vocational education practitioners is the arrangement of vocational high school roadmaps. Some aspects that need to be addressed include; a curriculum that must have a future vision that suits the needs of the industry now and in the future (Alhaji, 2008). The vocational high school education curriculum is a blueprint of some materials for learning process implementation, in order to produce competent graduates that suit the industry needs. Professional educators and education personnel are significant essential components in the learning process to produce competent graduates that suit the needs of the business world and the industry or market (Andryukhina *et al.*, 2016; Grollmann, 2008). Professional educators and education personnel have abilities that can be developed to influence the development of students' competencies, in which they are working according to their abilities and experience the internships in the industry that are useful in delivering real knowledge to students during the teaching and learning process. There are more supporting factors in producing competent graduates in the future, which one of them is the availability of facilities and infrastructure since the XXI century has become the 4.0 industrial era which the technology and internet media is a must have facilities in the world of education. In this case, cooperation between the world of education and the business and the industry world must be strengthened to generate agreement in producing graduates that can meet the needs of industry in this 4.0 era. It is because in the XXI century, not only the core skill is expected by the industry, but also thinking, critical, creative, innovative and problem-solving skills, teamwork and communicative in work. Graduates are also expected to use the technology and media tools that are being and will be developed in its time. Based on the above aspects, a roadmap is needed for vocational high schools which requires strengthening according to the competency

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needs in the business world and the industrial world. The main problems that need to be strengthened in the 4.0 era are the curriculum and the teaching and learning process, competency of educators and education personnel, standards of facilities and infrastructure. Cooperation between the vocational high school and the business world and the industry (stakeholders) (Mewaidt, 2014) is also very much needed in which all of that can generate graduates who are ready to face the challenges in the future where there are many unfamiliar jobs.

## 2. Review on Literature

### 2.1. Revitalization

The 4.0 industrial revolution era requires acceleration or strengthening for schools in facing the changes, particularly for vocational high schools to follow the changes in the industry, because it relates to the competencies expected during the learning process. Revitalization is urgently needed for schools to catch up the gap of competencies between the needs of employment and the competence of graduates in the 4.0 industrial revolution era. In order to strengthen synergy among stakeholders to revitalize vocational secondary schools, revitalization is needed to improve the quality and power of human resources. Revitalization reveals to provide direction for vocational high schools in preparing graduates to be able to do work following the requirements required by the world of work. These four points include curriculum revitalization, educators & education personnel, cooperation, and graduates. (1). Curriculum; the curriculum is currently rigidly assessed. As a result, it is difficult to meet the needs of the workforce that is ready for business and industry. (2). Educators & labour; In addition to availability, revitalization is also aimed at improving teacher competence (Yoto, 2015).

### 2.2. Road Map

A roadmap is a map that must be prepared to provide direction and guidance on the process of vocational high school implementation. A roadmap is needed for a reference and guideline in developing the strategies used in facing the 4.0 industrial revolution era. Many changes need to be addressed in the changes of the current era, either regarding learning models, curriculum, competencies of educators and education personnel as well as facilities and infrastructure that must be addressed and compiled based on the needs of industries that run the 4.0 industrial revolution. A road map is a direction for a strategic, large-scale, and long-term development effort (American Heritage® Dictionary of the English Language, 2016). The essence of a roadmap is the existence of development paths which when followed will bring the perpetrator to achieve the development goals. These pathways are arranged in a way that takes into account the various factors inherent in the context, situation, and development environment, to lead to the achievement of goals with a high level of effectiveness and efficiency. Effectiveness and efficiency are achieved through a measurable and systematic development process. There are three basic principles used in developing steps and stages of development: 1. Realistic planning. 2. Measured implementation. 3. Continuity between activities that are maintained. Realistic planning means that the development goals and steps to be implemented must be achieved from the current conditions. Vocational development is carried out iteratively through several stages, and each stage is carried out based on the existing condition. Each stage has specific targets, and the activities carried out to bring from baseline conditions to achieving these targets.

The second principle, measurable implementation, is used for monitoring and evaluation purposes. In the implementation of development, the progress obtained must be measurable and comparable. This interest is also related to the first principle above because, in order to be able to carry out the next step, it must be known in advance the progress achieved in the previous stage. Measurement is achieved through the identification of goals and indicators of achievement. These indicators are quantitative and are used as a reference measurement of achievement of goals. By comparing the baseline conditions, the conditions that must be achieved (the target set), and the actual achievements, it can be known how far the level of development progress. Knowledge of progress is beneficial for determining the next steps. If for example there is a deviation from the planned plan, the results of monitoring can be the basis for efforts to improve and accelerate. The third principle, continuity between activities, functions to establish one activity with other activities in building a complete program. Continuity of activities starts from the planning stage. The preparation of activities is carried out by observing the sequence and requirements (prerequisite) of each activity. There are new activities that can begin after the prerequisite activities are completed. Furthermore, continuity between activities must be maintained during the implementation of development activities, especially from the aspect of the availability of resources (human resources and budget). The problem that often arises is the commitment to allocate funds and other resources in the year budget plan.

### 2.3. Vocational High School

Some countries prioritize the improvement of vocational high schools, because there are some lessons that prioritize and focus on the employment of graduates thus they can work immediately in the industrial world, in which in the schools, there is strengthening of material and training or internships in the real working world (Eichhorst *et al.*, 2015; Zholdasbekova, 2016). Vocational schools are always required to apply industry-based learning because graduates are expected to be able to meet the competencies needed by the increasingly competitive business world and industry world. It means that vocational school is a school offering instruction in one or more skilled or semiskilled trades or occupations (Based on the Random House Unabridged Dictionary, © Random House, Inc. 2018).

### 2.4. Industrial Revolution

The 4.0 Industrial revolution is a change in which the industrial process has left the traditional system in its production activities because, in the future, they will carry out all activities by utilizing technological sophistication

using internet control in the industry's production process (Almada-Lobo, 2015; Schlechtendahl *et al.*, 2015; Schmidt *et al.*, 2015). The challenge we face is how to prepare and map the workforce in the field of 4.0 industrial revolution. The world of work in the 4.0 industrial revolution era, use the internet with production lines in the industrial world that utilize technology and information. Characteristics of 4.0 industrial revolution including digitalization, optimization, and customization of production, automation and adaptation, human interaction, value-added services and business, data and communication exchanges, and the use of internet technology

### 3. Methodology

This paper generates a concept of roadmap revitalization prepared for use by vocational high schools in facing the 4.0 industrial revolution era. The paper used a review of is literature collected from journals, books, conferences reports, and internet sources, where the results are elaborated using descriptive qualitative understanding. As a result of the elaboration of the vocational high school roadmap revitalization concept in facing the 4.0 industrial revolution era.

### 4. Discussion

The challenge we face is how to prepare and map the workforce of education graduates in the face of the 4.0 industrial revolution. The world of work in the 4.0 industrial revolution era is the integration of the use of the internet with production lines in the industrial world that utilize technology and information sophistication. Characteristics of the 4.0 industrial revolution era include digitalization, optimization, and customization of production, automation and adaptation, human-machine interaction, value-added services and businesses, automatic data exchange and communication, and the use of internet technology. This new industrial pattern has the effect of creating new jobs and job skills and the loss of several positions. The industry that will develop a lot in this new industrial revolution. The challenge must be able to be anticipated through the transformation of the Indonesian labour market by considering changes in the business and industrial climate, changes in positions and skills needs. The resulted of the interview both industries leader and vocational high school principals, 94% of the industrial declare that competency of senior high school graduates is minimal, while the poor are aware. The Competency weaknesses they provide to graduates. Almost all manufacturing industries state that the competence of graduates is still low, while from the hospitality industries 53.50% states that the competence of graduates is not sufficiently relevant to the competencies needed. From the service industry, 62% declare that the competency of the senior high school was appropriate. Nearly 90% of all industries still highlight the weaknesses of vocational high school graduates in soft skill competencies. On the other hand, the leaders of the vocational high school stated that competency weaknesses generated by their graduates were due to adhering to the syllabus which in its application depended heavily on limited support facilities. Therefore the time has come for the revitalization of the roadmap for vocational high school. Therefore, to improve the quality of graduates' competencies, especially in the context of facing the 4.0 industrial revolution, So that graduates of vocational schools that have quality competencies, government, schools, and industry are produced to monitor the learning process becomes absolute.

#### 4.1. Curriculum Revitalization in Vocational High Schools

Vocational high schools in Indonesia, there is still curriculum discrepancy between the one applied in vocational high schools with the needs of the business and the industrial world thus there is still no way to fulfil the needs of human resources in the industry. This problem occurs because there is no agreement (link and match) from the parties that compile the curriculum, which is the school, the business world, and the industrial world and the government, where each has its views on the applied curriculum. Curriculum revitalization in vocational high schools means to draw collective conclusions to determine the curriculum used that suits the needs of the business and the industry world such as, the teaching factory and learning based on Project Based Learning and Problem Based Learning. They are expected to strengthen the graduates' character and complement that is possessing an expertise certificate that is professionally certified based on the standards expected by the industry. The curriculum used is expected to be able to provide additional skills in utilizing and developing the current and future technology so that it can follow the development of the business and the industrial world in the 4.0 industrial revolution era.

#### 4.2. Revitalization of Educators and Education Personnel

Strengthening educators and the education personnel is needed to improve graduates' competencies in facing the 4.0 industrial revolution era. It does not need only the curriculum and facilities and infrastructure facilities, but the quality of educators and education personnel also influences the graduates' competence. Currently, the number of competencies of educators and education personnel is still lacking. Therefore, this is a task for schools, professional organizations, and the government to resolve the shared weaknesses. Vocational high schools expect qualified educators and education personnel with certificates. Educators and education personnel are experienced in the industrial internships thus they can provide an overview of the industrial world to students in the learning process. Teachers and education personnel own and carry out works according to their competencies, or in other words, they must work professionally. There is an additional value for certified educators and education personnel according to their expertise. An educator must have and fulfil the essential competencies of an educator, which are pedagogic competence, personality competence, professional competence, and social competence. Furthermore, an educator and education personnel must have exceptional skills in catching up with technology development where all current learning refers to the 4.0 industrial revolution era that prioritizes the use of internet access.

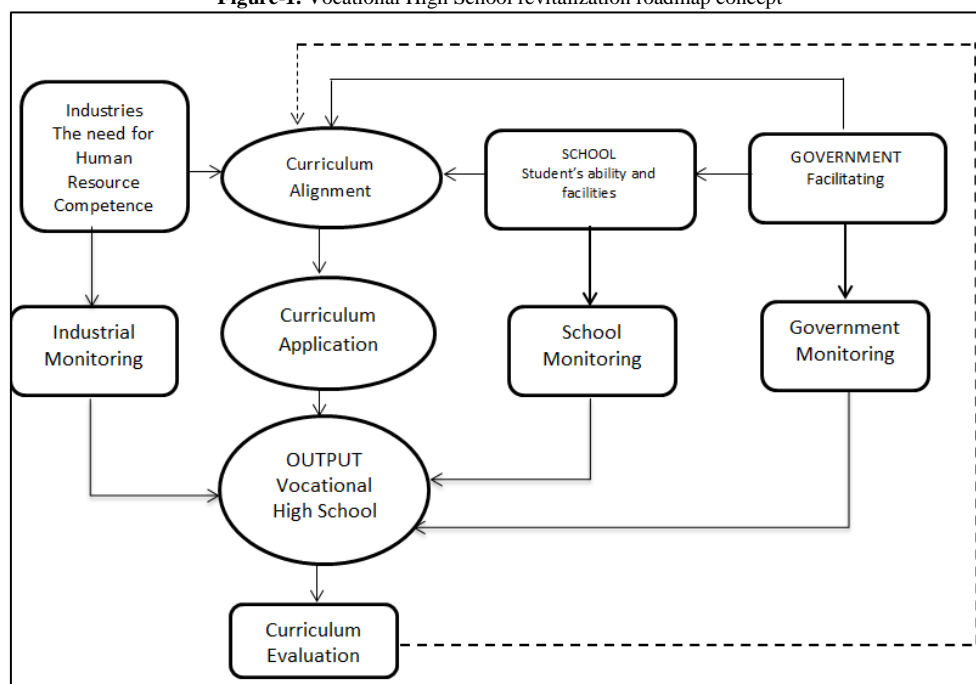
### 4.3. Revitalization of Facilities and Infrastructure

The facilities and infrastructure in vocational high schools is still far from fulfilling, due to the lack of involvement and attention from various parties such as the industry and the government itself. It is true that vocational high schools need a lot of facilities and infrastructure to support the teaching and learning process implementation. For example, the laboratory in vocational high schools should be designed based on a real condition in the industry so that students can learn according to the reality so they can be to enter the working world after completing their study vocational high schools, in facing of the 4.0 industrial revolution. Besides, the revitalization of facilities and infrastructure includes the classrooms used and also the availability of suitable workshops and practical tools like those in the industrial market.

### 4.4. Revitalization of Cooperation

Currently, the collaboration between Vocational High Schools and the Business World/Industrial World is considered not good enough so that the beneficial strengthening of the schools collaborating with the industries is needed. The collaboration is expected not only from the Business World/Industrial World, but it is hoped that universities can play a role finding problems in Vocational High Schools and provide solutions and resolutions thus they can improve their graduates' competencies and the quality of teaching and learning processes in Vocational High Schools in facing the 4.0 industrial revolution era.

**Figure-1.** Vocational High School revitalization roadmap concept



### 4.5. Strengthening Soft skills Competence

In the industrial revolution era 4.0, hard skill skills are not a determinant of a vocational school graduate to enter the workforce, but other competencies need to be given to graduates known as soft skills. In the Industrial Revolution 4.0 era, hard skill skills did not become a determinant of vocational school graduates to be able to enter the world, but other things needed and had to be given to graduates known as soft skills. In the industrial revolution era 4.0, soft skill components that need to be mastered by another SMK graduate; (a) communication skills, (b) collaboration, (c) critical thinking, (d) creative, (e) ability management, (f) emotional intelligence, (g) services, (h) negotiation skills, (i) cognitive flexibility

## 5. Summary

To realize vocational high schools that can produce competent graduates that can meet the needs of the working world in the 4.0 industrial revolution era, the revitalization of vocational roadmaps is a must in preparing and implementing the learning. There are several components need to be revitalized in realizing vocational high schools that can follow the development of the 4.0 industrial revolution era. Revitalization of the curriculum that is compiled based on the needs of the business world and the industrial world in the 4.0 industrial revolution era and which involve stakeholders in the preparation is one of the components. The other component is a revitalization of educators and education personnel, in this case, requires educators' development in teaching students both learning methods and also materials that are tailored according to the needs of the working world. In other words, an educator and education staff nowadays requires recognition of their professional certification of the expertise that is pursued to prove the feasibility of an educator and education personnel. Revitalization of facilities and infrastructures requires the development of facilities and infrastructure of Vocational High Schools to be able to realize a learning that leads to the 4.0 industrial revolution era where currently, the picture is still far from the word "match"; 4)

Revitalization of cooperation requires strengthening and expansion of vocational high school cooperation with the industries that can support learning in schools to approach the same expected competency.

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