Profile Of Vocational Learning In The Era Of Industrial Revolution 4.0 (Studies At Department Of Automotive Vocational High School)

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Abstract. This study aims to describe profile of vocational automotive learning technique in Vocational High School (VHS) in the face of industrial revolution 4.0 and 21st century skills, (1) to analyze the map vocational learning good practices theory and effective, (2) to analyze the performance of teaching teachers, learning theory and practice of competence vocational and conformity standardization and optimization vocational learning. The research is descriptive study. The study was conducted on teachers in automotive engineering majors, VHS in Yogyakarta city. Data were collected through interviews, observation, and documentation then analyzed a sort of descriptive set. The results of the study showed that the profile of good vocational learning seen in the input component of the characteristics of good teachers was that the professional teacher in teaching fulfilled the teacher training experience and teacher properties. Secondly, the components of the process are interrelated with aspects of active learning, namely interactive, interesting, fun learning, student center and teaching is a facilitator, in productive subjects students can market goods or services from vocational learning outcomes. The output component that has academic aspects with student graduation indicators, student exam scores and competency certificates is good. This is based on the achievement of learning objectives that refer to the characteristics of students, mastery of student competencies with the certificate of competence. Keywords— profile learning, vocational learning, automotive, industrial revolution 4.0

1. Introduction
Countries in the world through UNESCO and ILO set TVET (Technical and Vocational Education and Training) as a model of education in facing the challenges of the XXI Century. The effective TVET section is used to develop the capacity and empowerment of human resources in the world of work, namely vocational education. VHS as vocational education has a strategic role in fulfilling various skills training needs of workers. Industry challenges and opportunities 4.0 encourage innovation and creation of vocational education. Vocational education must have characteristics: oriented to individual performance in the world of work, special justification on real needs in the field, curriculum
focus on psychomotor, affective, and cognitive aspects, the benchmark of success is not only limited to school, sensitivity to the development of the workforce, need adequate facilities and infrastructure, and community support.[1, p. 11]

Educational institutions must prepare for the implementation of learning and the formation of skills to meet complex life and progress of 4C in the XXI century include: creativity and innovation, critical thinking and problem solving, communication and collaboration.[2, p. 2]. The Industry 4.0 revolution refers to the transformation of production structures into digital systems using information technologies. Innovative technology emerging from industrial revolutions have been the result of some professional groups and have led to the emergence of new business lines[3, p. 1]. In the era of industrial revolution 4.0, digitalization and automation were applied in all fields. Vocational education systems and programs need to be adapted to be relevant to the industrial revolution 4.0, through the reconstruction of a curriculum that can provide students with vocational schools: (1) broader and newer skills / competencies, and (2) using new formats in the learning process. [4, p. 1].

In Indonesia the face of the challenges industrial revolution, government policy in terms of vocational education namely Inpres Nomor 9 Tahun 2016 about concerning revitalization of VHS is one of the government’s efforts to improve the competitiveness of Indonesia’s human resources and the availability of skilled and educated workforce needed by the business/industry. Various interventions by the government (especially the directorate of vocational development) along with other stakeholders such as: (1) Scholarship, (2) Revitalization of facilities and infrastructure, (3) ICT-based learning, (4). Development of teaching industry, (5). Addition of productive teachers, (6). Partnerships with universities, (7). Industrial partnerships, and (8). Increasing the image of VHS, which has resulted in a number of achievement as a direct impact of these various remedial efforts[5]. The literacy movement is one of the novelty movements for strengthening the four elements in the education system. The new literacy movement focused on three main literacies namely (1) digital literacy, (2) technology literacy, and (3) human literacy. These three skills become skills needed in the era of industrial revolution 4.0.[1, pp. 13–14]

VHS organizes education and training (education and training) for various education programs tailored to the needs of the workforce. Vocational curriculum is designed using approaches: (1) academic, (2) life skills, (3) competency-based curriculum, (4) broad-based curriculum, (5) production-based curriculum. Competence in accordance with competency standards set by industry/business world/professional associations. The substance of education and training is packaged in various training subjects which are grouped in normative, adaptive, and productive programs.[6].

Based on the results of observations at SMK Negeri 2 Yogyakarta, SMK Negeri 3 Yogyakarta dan SMK Negeri 2 Depok Sleman Yogyakarta there were several problems in vocational learning especially the Automotive Engineering Program that is input aspects of teacher characteristics, student characteristics, material presented by teachers, methods learning use conventional methods, teachers who are minimal in terms of experience in industry although overcome by holding training for productive teachers Automotive Engineering program and have not implemented full revised vocational curriculum innovation that emphasizes more on the abilities and competencies of students in 4C such as in Vocational Revitalization, namely creative, critical thinking, communicative and collaborative.

Regarding these problems, what is Profile Vocational Learning in VHS (especially automotive engineering) in facing the era of industrial revolution 4.0 and challenges to the skills of the XXI century? The profile of vocational learning includes (a) automotive engineering vocational learning input consisting of students, teachers, learning materials, learning methods, and learning media, (b) the vocational learning process of Automotive vocational learning. The meaning of the learning profile in
the National Standards VHS is the component of input, process, output and outcome of national standard schools.

1.1 Input Component
The teacher is one of the input components in the national standard school profile. Educators are professionals. As formal evidence that vocational teachers are professional educators, teachers need have certificates issued by government-appointed certification. Mastery of teacher competence is evidenced by teacher certification. Especially for vocational teachers, a productive teacher skills certificate is needed for all the expertise packages in the vocational schools.[7, p. 12]. The teacher aspect as an input component can be described as follows:

Table 1. Input Component in the National Standard Vocational Profile.

| Teacher Characteristics | Aspect | Indicator                                                                 |
|-------------------------|--------|---------------------------------------------------------------------------|
| Teacher Background      | Insight| - Teachers who are upgrading about developing knowledge (broad insight is proven by various seminars, research, workshops, training, and workshops that are followed - Teacher’s attitude in teaching |
| Teacher Training Competence | Teacher Training Competence | - Teachers have education training certificates and teacher competency training from training institutions or authorized institutions |

Source: processed from the manual for the implementation of National Standard VHS

1.2 Process Component
Implementation of teaching and learning activities is an aspect of process components in the profile or national standard schools. The following is a description of the aspects of process components in implementing the teaching and learning activities presented in table 2:

Table 2. Process components in the national standard VHS profile.

| Implementation of TLA (Teaching and Learning Activities) | Aspect | Indicator                                                                 |
|----------------------------------------------------------|--------|---------------------------------------------------------------------------|
| Learning Model                                           | Implement Competency Based Training-CBT |
| Learning Strategies                                      | Moving class |
| Media                                                    | 1 student 1 machine/tool, single work station |
| Student Guidance                                         | 1 teacher maximally guides 12 students |
| Learning Process Approach                                | Production Based training (PBT) for productive fields |
| Learning Methods                                         | Application of various learning methods so that the teaching and learning climate is fun, exciting and high discipline |
| Practice Activities                                      | Guided by industry supervisors and productive |
1.2.1 Learning Model.

The learning model is a pattern of designing learning, steps and learning tools to achieve the goals of learning. Learning models applied to vocational education according to Putu Sudira are: Problem Based Learning (PBL), Project Based Learning (PjBL), Teaching Factory (TeFa), Competence Based Learning (CBL), Work Based Learning (WBL), Cooperative Learning (CL), Inclusive Learning, and Discovery learning.

![Century learning](image)

**Figure 1.** Century learning [6, p. 6]

An improvement in the effectiveness of teaching and learning is likely to result in an learner outcomes. To discuss effective vocational teaching and learning, it is helpful to use a framework and the one illustrated in figure 2 below was developed from the improving the Quality of Education for All research project.

Vocational learning institutions should re-examine their learning content, learning description, curriculum, and program output, focusing on learning human resources that industry 4.0 already needs. Industry 4.0’s workforce expectation are technology use, knowledge competence, motivation for learning, problem solving, cooperation, team work, easy adaption of change, agility, etc.[8, p. 1]

1.2.2 Learning strategies

Four ways of thinking about teaching. These four components: teaching relationships, teaching models, teaching skills and teacher reflection, were adopted as the basis for analysis. We also drew on effect-size research which identified consistently high correlations between learner achievement scores and classroom processes.

Teaching skills refer to the everyday competence of teachers, research on teacher effects has consistently identified a set of teaching skills sed which support learner achievement and their improvement over time. Teaching relationship were identified both in the literature and by teachers as crucially important. Effective teachers were reflective, they constantly reviewed their practice, discussed it with their colleagues and sought to develop new and better ways to teaching. Teachers reflection is the process by which practice is evaluated and improved. [8, p. 3]

Principal types of productive learning strategies based on competency-based curriculum and production-based curriculum. Some learning strategies that use are in accordance with learning productive subjects[2, pp. 8–9] yaitu:
• Mastery learning, complete learning where students are given enough time to master the competencies learned
• Learning by doing, learn through activities that can provide learning experiences
• Individualized learning, learn by paying attention to the uniqueness of each individual
• Group learning, study in groups
• Learning to know, students can understand and appreciate how knowledge is obtained from phenomena that exist in their environment.
• Learning to do, application of learning so students appreciate the learning process by doing something meaningful.

In practice, behaviourist and cognitive theories have acted as the theoretical cornerstones of vocational pedagogy. The kinds of pedagogical strategies that are based on behaviourist theories include instructional cues, demonstration, practice, reinforcement, behavioural objective and positive feedback mechanism. [8, pp. 91–92]

1.2.3 Learning Media
Learning media is a tool or means of learning that is used as a tool to deliver learning material. The function of the media is to clarify the material to be more concrete or tangible to students. Examples of learning media are modules, photos, books, videos, slides etc. Learning aids such as LCD, Projector, whiteboard, computer etc. It is necessary to update the learning media (training object), to teach vocational material needed learning resources, tools or learning media that support the practice in the workshop. Because the tools in VHSare limited and the products are old, so the media for practical learning in the workshop needs to be updated [9, p. 348]

1.2.4 Learning methods
According to Leighbody [10] the learning methods applied in vocational education are 6 types of methods. These methods can be described as follows:

| Type               | Description                                      |
|--------------------|--------------------------------------------------|
| Demonstration      | To present skills                               |
| Explanation        | To present theory or information                 |
| Questioning        | To accompany demonstration, to recall facts      |
| Directed Study     | To present sjop theory and related shop information |
| Experiment         | To emphasize and clarify certain related information |
| Discussion         | To review information, to clarify class, to stimulate thinking |

1.3 Output Component
The profile of vocational learning in the aspect of output based on the implementation of National Standard Vocational Schools can be described as in Table 4.

| Academic Aspect | Indicator |
|-----------------|-----------|
|                 |           |
Aspects

| Graduate | Graduates have a diploma |
|----------|--------------------------|
| Test scores | The average UN score is above the Provincial Average |
| Competency Certificate | Graduates get competency certificates |
| Appreciation | Vocational High Schools receive various awards in the scientific field and skill competitions |

2. METHODOLOGY

2.1 Research Design

The overall research design a detailed literature review, primary research, analysis and synthesis of data, a final report and resulting guidance for vocational education in the era of revolution industry 4.0. Any 2 step in this research. The research is descriptive study. The study was conducted on teachers in automotive engineering majors, VHS in Yogyakarta city. Data were collected through interviews, observation, and documentation then analyzed a sort of descriptive set. Step 1 involved a literature review exploring effective teaching and learning based on evidence based research. This step describes the vocational education context, current vocational provision and explores the quality of current vocational provision. It also explores teaching skills, teaching models, teaching reflection and teaching relationship.

Step 2 explored vocational teaching and learning in practice. We conducted site visits to SMK N 2 Yogyakarta, SMK N 3 Yogyakarta and SMK N 2 Depok Sleman Yogyakarta (VHS) involving observation across curriculum area and interviews with productive teachers of the observed lessons. The data collected were analysed and presented in section 3 of this paper. This primary research provide the opportunity to understand how the range of teaching and learning skills, strategies and models, identified in the literature review, are being used in practice VHS Learning In The Era Of Industrial Revolution 4.0.

3. Results and Discussion

Based on research conducted at Yogyakarta N 2 Vocational School, Yogyakarta N 3 Vocational School and Depok Sleman Yogyakarta N 2 Vocational High School, the Automotive Engineering Vocational Learning Profile is produced in terms of three aspects, namely input, process and output.

3.1 Input component

The component of vocational learning input consisting of aspects of the teacher reveals data on the teacher’s background with indicators of the level of education, teaching experience. Data obtained through interviews with the Chair of the Automotive Engineering Department at SMK N 2 Yogyakarta, SMK N 3 Yogyakarta dan SMK N 2 Depok Sleman Yogyakarta the number of productive teachers in SMK N 2 Yogyakarta of Automotive Engineering there are 13 teachers with 12 classes, SMK N 3 Yogyakarta terdapat 14 teachers with 12 classes, dan SMK N 2 Depok Sleman Yogyakarta have 7 teachers with 8 classes.

Table 5. Result of Aspects of Teacher Characteristics in Profile of VHS

| School          | Teacher background | Insight                        | Teacher Competence | Training                                                     |
|-----------------|--------------------|--------------------------------|--------------------|--------------------------------------------------------------|
| Teacher Characteristics | All Linear S1 Automotive Engineering | teacher training by Mitsubishi companies and | The teacher has good personality competencies, professional competencies |
Education, on average have teaching experience $\geq 3$ years

| School                        | Teaching Experience | Industry | Curriculum | Teaching Training |
|-------------------------------|---------------------|----------|------------|-------------------|
| SMK N 2 Yogyakarta            | $\geq 3$ years      | other industries, IHT programs, curriculum teaching training |
| SMK N 3 Yogyakarta            | $\geq 3$ years      | that master the material, educator certificates, portfolios |

Bring in experts to hold training in theory and practice

The teacher has good personality competencies, professional competencies that master the material, educator certificates, portfolios

The existence of teacher training in VEDC Malang, VEDC Bandung, training held by Nissan and Honda.

The teacher has good personality competencies, professional competencies that master the material, educator certificates, portfolios

The characteristics of the teachers possessed by several Vocational Schools show that the overall characteristics of the teacher are good, professional teachers teach about teacher training experience and teacher properties.

### 3.2 Process Component

Based on data collected from the literature review, interviews were limited to the heads of automotive engineering majors at SMK N 2 Yogyakarta, SMK N 3 Yogyakarta dan SMK N 2 Depok Sleman Yogyakarta and observations included teacher aspects, learning processes, and learning atmosphere. The learning process needed by students is basically interactive where students are active in the process of teaching and learning activities and the teacher as a facilitator. The components of the vocational learning process consisting of aspects of the learning model, learning strategies, learning media, learning models, student guidance, process approaches and practical activities can be presented in the following table 6:

| School                        | SMK N 2 Yogyakarta | SMK N 3 Yogyakarta | SMK N 2 Depok Sleman Yogyakarta |
|-------------------------------|--------------------|--------------------|---------------------------------|
| Implementation of TLA (Teaching and Learning Activities) | Teaching Factory, Product Based Learning, Project Based Learning, Inquiry Learning | Product Based Learning, Project Based Learning | PjBL, PBL, PrBL, Inquiry Learning |
| Learning model                |                     |                    |                                 |
| Learning strategies           | Theoretical learning and practice are combined in workshop, 1 | Theoretical learning and practice are combined in workshop, 1 semester | 3 years of theoretical learning and 1 year practice in industry |

Table 6. Result of Process Components In The VHS Profile.
From the data above, it can be concluded that learning has gone well and active and interactive learning between students and teachers with student centered and teacher is a facilitator. Teachers are required to create conducive learning activities using the appropriate learning process approach for productive subjects so that the learning climate is fun and meaningful. In practical learning, aspects requested by students such as giving clear practice examples and choosing the right practice work steps. The profile of vocational learning refers to the implementation of the revised 2013 curriculum where there are additional new subjects, namely the PKK (Creative Program and Creativity) students who enter the subject group C (productive) and are taught by two teachers namely productive teachers and entrepreneurship teachers. Entrepreneurship teachers teach product management to be produced by students, while productive teachers teach in the process of making products or services. There are 7 hours of this PKK subject, the implementation is done in class XI using the revised 2013 curriculum. The learning approach is collaboration, producing products related to competence and general depending on each student's creativity. After the process of producing a product, then the product can be sold.

3.3 Output Component
Data obtained from SMK N 2 Yogyakarta, SMK N 3 Yogyakarta dan SMK N 2 Depok Sleman Yogyakarta namely the profile of vocational learning in the output component there are academic aspects and indicators such as graduation, test scores, competency certificates and awards.

| School                  | Graduate                                  | Test scores                  | Competency Certificate                     |
|-------------------------|-------------------------------------------|------------------------------|--------------------------------------------|
| SMK N 2 Yogyakarta      | Working in industry, studying and         | Average UN score 246.60 in   | Students have a competency certificate     |
|                         | entrepreneurship                          | the 2017/2018 school year    | after participating in the UKK at           |
| SMK N 3 Yogyakarta      | Working in industry, studying and         | The average score of UN      | Students have a competency certificate     |
|                         | entrepreneurship                          | is 256.60 in 2017/2018[10,   | after participating in the UKK at           |
|                         |                                          | p. 16]                       |                                             |

Table 7. Result of Output Components In The National Standard VHS Profile
Entrepreneurship

The highest average score of National Examination in DIY in 2018 is a total of 300.48 4-year programs, followed by a second order of 3-year programs with an average score of 293.30[11]

Based on the description of the data above, it is known that the output of vocational learning that has been carried out is good because it fulfills the implementation of National Standard VHS, and in terms of the specified indicators, namely the achievement of learning objectives in the form of graduate students who meet the objectives of Vocational School competency certificates possessed by students after implementing UKK at TUK TKR LSP-P1.

4. Conclusion

Based on the results of the research and discussion described, it can be concluded that the profile of vocational learning in the face of the industrial revolution era 4.0 and challenges to 21st century skills must meet the components of learning that are in accordance with the demands of the current revised 2013 curriculum. First, the input component of the characteristics of good teachers is that professional teachers teach according to teacher training experience and teacher properties. Second, the components of the process are interrelated with aspects of active learning, namely interactive, interesting, fun learning, student center and teaching is a facilitator. In general, the implementation of vocational learning theory and practice is running well, several aspects that need to be improved and updated are competency-based and production-based learning curriculum, the practical learning system that should be a continuous block system. Media or facilities that apply the principle of single work stations, guiding students every 1 teacher guides a maximum of 12 students, a scoring system with objective value criteria. Machines or tools that are updated and still suitable for use, assessment and evaluation are carried out openly on subjective and objective aspects. The output component that has academic aspects with student graduation indicators, student exam scores and competency certificates is good. This is based on the achievement of learning objectives that refer to the characteristics of students, mastery of student competencies with the certificate of competence.

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