The alignment of productive competence on machinery between vocational education institutions and industry

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The alignment of productive competence on machinery between vocational education institutions and industry

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ABSTRACT: The aim of this study was to analyse the alignment performance of vocational education and industry and its impact on productive competence in machinery. This study employed concurrent triangulation and the subjects of the study were vocational education institutions, the Education Department, partners in the industrial field and the professional association. The data used in this study were validated using triangulation. The results showed that the alignment performance of productive competence in machinery between industry and vocational education did not result in the expected outcome. Academically, the overall productive competence in machinery has not been implemented in the industry and the results of alignment evaluation were still low. Institutionally, the role of the industrial sector in the implementation of competence alignment was still low, and the rate of employment of vocational school graduates in the industry showed a decreasing trend. The collaboration between industry and vocational school stakeholders has not been maximised.

INTRODUCTION

Vocational education is an education, which prepares students to work in a specific field. Vocational education is also required to have an economic and strategic role in increasing economic growth. Therefore, its implementation should be *pro-jobs, pro-activity, pro-growth, pro-distribution* and *pro-prosperity*. The basic concept of vocational education should have characteristics that differ from other education in general in terms of educational criteria, substantive learning and graduates. The vocational education lesson in choosing the substantive learning must always follow the development of technology, the needs of society, the needs of individuals and the field of employment [1].

The implementation of production-based learning assists the students to prepare before joining the occupational world, to develop critical thinking, to have good moral attitudes and to motivate students to be active in learning [2]. The content of vocational education should focus on adjusting to the requirements of the labour market [3].

Vocational education is oriented to these following aspects: the performance of individuals in the occupational world; focus on the real needs in the field; the focus of the curriculum on psycho-motoric, affective and cognitive aspects; the measure of success beyond schools; sensitivity to the development of the occupational work; adequate practice facilities; and community support [4]. Vocational education plays an important role in reducing unemployment [5]. However, there are graduates of vocational education who do not get a proper job and are not satisfied with the jobs that they have, because of the unavailability of laboratory and technical equipment to develop their competence at school [6].

The conditions of vocational education indicate these following matters: 1) most vocational education institutions currently only prepare students to work in specific areas of expertise as employees; and 2) vocational education institutions are less responsive to the demands of local, national, regional and international economic development [7]. The vocational education institutions are still preoccupied with the methods and the development of learning, which may have implications on the quality of graduates who have not been able to respond to the challenges of the industrial sectors; if it is continuously carried out by the school, then, the school would be left behind [8].

One of the efforts, which has been taken by the vocational education institutions to address competency gaps is an attempt to align productive competence with the industrial sector. Management of this alignment must be conducted through an institutional establishment in a planned, integrated and sustainable manner by involving stakeholders. However, the alignment of productive competence in machinery between vocational education and the industrial sector in quantity, quality, location and time dimensions has not been formally organised [7]. The alignment could benefit both the vocational education institutions and industry, because engineering and technology education also has a pivotal role in industry [9].

The formal organisation bridging vocational education and industry is not present, and there is only one Indonesian Presidential Regulation Number 8 Year 2012 on the Indonesian National Qualifications Framework (KKNI). In 1994, there was a formal organisation, which bridged vocational education and industry, the National Vocational Education Council.

This Council was established through the Joint Decree of the Ministry of Education and Culture and the Indonesian Chamber of Commerce and Industry on the establishment of the Vocational Education Assembly, Number 0217/U/1994 and 044/SKEP/KU/VIII/94. However, now the Council is inactive. One of the success indicators in the implementation of alignment in productive competence of vocational education with industry is the reinforcement of the institutional role, hence the need for revitalising the Council's function [10].

Comprehensive collaboration between stakeholders in the industrial sector and vocational education institutions is absolutely necessary as a key indicator on quality and quantity aspects of vocational education implementation [11].

METHOD

The concurrent triangulation method was used in this study. The subjects in the study were vocational education institutions, the Department of Education, industry partners and the professional association. The study was conducted at SMK N 1, 4, 5 and 7 in Semarang City and jointly with their partners in industry. The data were gathered from the principal, task force, chairman of the competency group, the Head of Secondary Education at the Department of Education, school inspectors, partners in industry and professional associations. The validity of data was achieved by using the triangulation approach.

RESEARCH RESULTS

The results showed that industry served only as a place of an internship programme and only a small part of the partnership has a memorandum of understanding, while the role as validator competency, assessors and the authors to accept graduates is relatively low, as shown in Table 1.

Table 1: Role of industry in competence alignment.

No	Role of industry	Percentage (%)
1	Validator of productive competence	3.8
2	Assessor of productive competence test	3.8
3	Manpower recruitment	9.54
4	Providing a place for internship	100
5	Having MoU for industry internship	30.60

Table 2 shows that only a few aspects of machinery competence in the industry were practised by the vocational education students during their internship. Conventional lathing and milling competence were most often practised by the students during their internship in the industry, while lathing and milling competence using computer numerical control (CNC) were not conducted. Electrical and acetylene welding works were conducted during the internship. However, they were not included into productive competence with machinery.

Table 2: Students' competence during internship in industry.

No	Competence of internship industry	Percentage (%)
1	Conventional lathe	89.58
2	Milling	72.92
3	Acetylene welding work	64.58
4	Electrical welding work	58.33
5	Operating taps and dies	56.25
6	Sawing	50.00
7	Drilling	52.08
8	Honing	54.17

Table 3: Competence of vocational teacher with machinery expertise.

No	Vocational teacher competence	Percentage (%)
1	On-the-job training	54.05
2	Test assessor	22.14

Table 3 shows that the development of teacher productive competence in machinery is achieved through on-the-job training that amounts to 54.05%, and machinery test assessments, which amounts to 22.14%.

Table 4 shows that the results of the machinery competence test indicate that learners have a good score. However, the scores of the students fluctuate annually.

Table 4: Competency test results of machinery expertise.

No	Academic year	Score
1	2011/2012	85.30
2	2012/2013	89.80
3	2013/2014	91.41
4	2014/2015	89.36
5	2015/2016	89.40

The employment of graduates from the mechanical engineering programme as industrial workers, as workers in higher education and entrepreneurs showed a declining trend, as shown in Table 5.

Table 5: Employment of graduates.

No	Academic year	Percentage (%)
1	2011/2012	82.00
2	2012/2013	73.45
3	2013/2014	71.46
4	2014/2015	66.34
5	2015/2016	70.05

DISCUSSION

The results of the study showed that the alignment of productive competence on machinery between industry and vocational education institutions did not yield outcomes as expected. Academically, overall machinery competence of graduates did not suit the needs of industry. Therefore, the evaluation of the learning process in vocational education should not only be covered in the class learning process, but also should include competence from the alignment with the industrial sector. The management of vocational training should include pre-entering behaviour, entering behaviour, the learning process, assessment, evaluation and output [12].

The important roles of soft skills and hard skills are critical to success in the workplace [13]. Institutionally, the role of the partner from the industrial sector was still low in terms of the implementation of competence alignment with vocational high school. The rate of employment of the vocational school graduates in industry showed a declining trend and the partnership between the vocational high school and the industrial sector must be improved.

The results of this study indicated the needs of institutional management by formulating a framework of productive competence management in a more efficient, integrated and sustainable manner by involving stakeholders in both vocational education institutions and industry. One of the integrated and sustainable productive competence alignments is the *Engineers in Residence* programme at the College of Engineering and Engineering Technology (CEET) at Northern Illinois University (NIU). The students of Northern Illinois University were provided with experiential learning in industry due to the support of the College stakeholders, government, industries, students and alumni [14].

The process of alignment of *outside in* must also consider the elements outside the organisation [15]. The alignment process must be conducted at the same time in a predetermined order [16]. Comprehensive collaboration between stakeholders in the industrial sector and vocational education institutions is absolutely necessary as a key indicator of quality and quantity aspects of vocational education implementation [11].

The concept of the institutional framework of competence alignment should pay attention to three main components; namely, the demand, the supply and the alignment mechanism. The formulation of the comprehensive alignment programme requires visions of relevant dimensions. The projection of the future needs of the competence required by the industrial sector and its numbers for every business/industry is indispensable and should refer to the special characteristics and potential of the industry.

The alignment of the productive competence mechanism must be designed to ensure the implementation of the programmes. The alignment mechanism includes three main aspects:

1. the mechanism must be associated with a number of required activities and programmes that the information needs on the demand side can be obtained accurately and sustainably;
2. the mechanism must be associated with the activities and programmes needed for the availability of employable graduates and create employment (entrepreneurship);
3. the mechanism must ensure communication of the needs for information from the demand side to the supply side.

CONCLUSIONS

It can be concluded from the study that:

1. The alignment of the productive competence on machinery between industry and vocational school was still problematic. The problems were centralised on the competence of the graduate, which did not suit the needs of industry. The role of the partners from the industrial sector was still low in terms of the implementation of competence alignment with vocational high schools. The rate of employment of the vocational school graduates in industry showed a declining trend, institutional reinforcement of the productive competence alignment must absolutely be improved, and the productive competence alignment evaluation in vocational education should not only cover the conventional learning process in the class, but also focus on the evaluation of the competence from the alignment with the industrial sector.

2. The institutional reinforcement is required to improve the performance of productive competence alignment of vocational education with industry. The aim is to develop an institutional management framework with advanced aspects, such as competence alignment, optimisation of the role of industry and stakeholders, empowerment of resources, integration of curriculum and learning and performance evaluation of the alignment.

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