



Evaluation of the Relevance of Vocational School Basic Machinery Materials to the Industrial World

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Abstract. This study aims to: (1) Obtain information about the level of implementation of machining competency learning at SMK Negeri Surabaya; (2) Obtain information about the level of competency needs of Machinery in Industry in Surabaya; and (3) Obtaining information about the level of relevance of machinery competencies in SMK with those needed by the industrial world in Surabaya. The object of the study was 10 teachers who taught basic machinery engineering subjects at SMK Negeri 2, 3 and 7 in Surabaya (Public Vocational of Senior High Schools) and industry who became the spouse of industrial work partaken as many as 10 employees. This research is a qualitative descriptive study. The results of the study are as follows: the level of relevance of competencies taught in SMK with competencies needed by industry is 88%. This is in the very relevant, even if not at the maximum level of relevance.

Keywords: Machining competency · Competency needs · Basic machinery

1 Introduction

Vocational high schools play an important role in preparing the workforce for Small and Medium Industries and play an important role in preparing the workforce to develop products that require adjustment and technological developments. Related to this through Presidential Instruction (Inpres) no. 9 of 1916 concerning the Revitalization of Vocational Schools as an effort to improve the quality of Vocational Schools in order to improve the quality and competitiveness of Indonesian human resources [1]. This is to prepare SMK graduates to easily adapt to the world of work which is very rapidly advancing, so that SMK graduates are better prepared to train and work.

BPS data shows that the unemployment rate of vocational schools is getting higher. The percentage of vocational unemployment in 2018 was 24.74% compared to the national level of unemployment [2]. This shows that the education system is not yet effective in producing competent graduates according to industry needs or there are other causes that cause these gaps to occur.

One of the efforts in terms of SMK development is through the development of expertise programs that are relevant to the needs of the job market [3–5]. This expertise

program is the spearhead of creating a link and match between SMK and the world of work. The Directorate of Vocational Development always carries out the evaluation and realignment of the expertise program at SMK, which is called the 'reengineeringization' program of the SMK expertise program [6]. The aim is to increase the relevance of expertise programs in Vocational Schools to the needs of the job market, both in terms of quality and quantity. The approach with employment is a form of one of the policies of educational planning.

Vocational education is one of the efforts made to produce a medium and quality workforce [7–9]. However, what happens is that most vocational high school graduates who have not been able to meet the needs and demands of the business world and the industrial world, this indicates that the quality of SMK graduates has not been as expected, both in terms of attitudes, knowledge, and skills. For this reason, the development of a curriculum relevant to the needs of society today is absolutely necessary [10].

The main subject matter in the mechanical engineering study program at SMK is machinery which consists of 8 subjects. To sharpen the research results, it is centered on 4 machining subjects, which include: a) Engineering Drawing; b) Basic Work of Mechanical Engineering; c) Basic Role of Mechanical Engineering; d) Manufacturing Engineering Drawings. These four subjects are called basic machinery subjects. Another thing to note in this study is that there is an excess of labor supply in certain sectors and there are also job opportunities in various fields that have not been met [11]. It is clear that there are several study programs in SMK whose level of alignment between the curriculum and needs in the world of work has not been optimal.

Related to this, it is necessary to know the suitability between the learning competencies contained in SMK and the competencies needed by the industry. This needs to be done to plan the SMK curriculum that is in line with the needs of the industry.

To answer the above inequality, it is necessary to obtain information about: 1. The level of implementation of learning Basic Machinery competencies at SMK Negeri Surabaya? 2. The level of competence needs of Basic Machinery in Industry in Surabaya? 3. The level of relevance of basic machinery competencies in SMK with those needed by the industrial world in Surabaya?

2 Method

The object of the study was a teacher who taught basic machinery engineering subjects at SMK Negeri 2; 3 and 7 in Surabaya, as well as industry who are the spouses of industrial work practices. This research is a qualitative descriptive study. Instrument refers to the curriculum used by SMK Negeri in Surabaya. The description of the instrument is described into a question item, as shown in Table 1.

Basic Machining instrument grilles

- a) Mechanical Engineering Drawings: a. Applying the rules of the machine drawing; b. Applying workmanship marks; c. Reading European projection images; d. Reading American projection images; e. Operate CAD. Number of instruments 7 items

Table 1. Instrument answer gradation options

Answer Choice		Skor
Vocational Schools	Industry	
Well Done	Urgently needed	4
Simply Done	Needed	3
Less Done	Less needed	2
Done Ugly	Not required	1

- b) Basic Work of Mechanical Engineering: a. Implementing work safety; b. Operating precision mechanical measuring instruments; c. Operating the machine. Number of instruments 5 items.
- c) Basics of Machine Design: a. Applying material knowledge; b. Implementing control and electrical systems; c. Perform light planning calculations. Number of instruments 9 items.
- d) Manufacturing Engineering Drawings: a. Applying mechanical drawing techniques; b. apply the workmanship mark; Applying CAD 2D drawings; c. Applying CAD drawings 3 D. Number of instruments 9 grains

Research Instruments, the items arranged refer to the grid [12]. Validity of the instrument is carried out with expert validation [13], which is carried out by teachers and industry parties. This research involved 10 teachers and 10 employees from 6 industries in Surabaya.

2.1 Data Analysis

2.1.1 Implementation of Learning Basic Machinery Competencies at SMK, Provided that:

$$X = \frac{Fk}{Nk} 100\% \quad (1)$$

X = Percentage of Learning implementation

Fk = Number of learning implementation scores

Nk = Number of competency scores (Table 2)

2.1.2 The Need for Basic Machining Competencies in Industry

$$X = \frac{Fk}{Nk} 100\% \quad (2)$$

X = Percentage of Competence of Industrial Needs

Fk = Number of Needs Competency scores Industry

Nk = Number of Competency Scores (Table 3)

In terms of competency needs, also pays attention to the results of an open questionnaire about the need for competencies needed by the industry.

Table 2. Percentage of Learning Implementation at SMK

No	Percentage X	Category
1	76%–100%	Well Done
2	51%–75%	Simply Done
3	26%–50%	Less Done
4	0%–25%	Done Ugly

Table 3. Percentage of Competency Needs in Industry

No	Percentage X	Category
1	76%–100%	Urgently needed
2	51%–75%	Needed
3	26%–50%	Less needed
4	0%–25%	Not required

Table 4. Percentage of Relevance of Basic Machinery Competencies

No	Percentage X	Category
1	83%–100%	Highly Relevant
2	64%–82%	Relevant
3	45%–63%	Less Relevant
4	0%–44%	Irrelevant

2.1.3 Relevation of Basic Machinery Competencies in SMK with Those Needed by the Industrial World

$$X = \frac{\text{Number of competencies carried out}}{\text{The amount of competence required}} \times 100\% \tag{3}$$

See Table 4.

3 Result and Discussion

3.1 Implementation of Learning Basic Machinery Competencies at SMK

3.1.1 The Implementation of Machine Drawing Learning at SMK

In the Table 5 can be read the frequency and the percentage of each level of implementation. Drawing Machines at SMK The implementation of machine drawing learning is 82.14%.

Table 5. Percentage of Implementation of Machine Drawing Learning at SMK

Drawing Techniques				
Level of implementation	Score	f	Sxf	%
Done	4	28	112	40.00
Simply Done	3	34	102	48.57
Underperformed	2	8	16	11.43
Not done	1	0	0	0
Total		70	230	100
Maximum value $7 \times 10 \times 4 = 280$				
Average Learning Implementation = 82.14%				

Table 6. Percentage of Implementation of Basic Mechanical Engineering Work at SMK

Basic Work of Mechanical Engineering				
Level of implementation	Score	f	Sxf	%
Done	4	25	100	59.5
Simply Done	3	18	54	32.1
Underperformed	2	7	14	8.33
Not done	1	0	0	0
Total		50	168	100
Maximum value $5 \times 10 \times 4 = 200$				
Average Learning Implementation = 84.00%				

3.1.2 Basic Work of Mechanical Engineering at SMK

In the Table 6 explained that implementation of learning basic work of mechanical engineering at SMK work of 84.00%.

3.1.3 Basic Role of Mechanical Engineering in SMK

In the Table 7 can be read the frequency and the percentage of each level of implementation. Basic Role of Mechanical Engineering in SMK The implementation of basic learning in mechanical engineering is 81.94%.

3.1.4 Manufacturing Engineering Drawings at SMK

Table 8 can be read the frequency and the percentage of each level of implementation. The implementation of learning Manufacturing Engineering Drawings was 79.72%.

Table 7. Percentage of Basic Implementation of the Role of Mechanical Engineering in SMK

Basics of the Role of Mechanical Engineering				
Level of implementation	Score	f	Sxf	%
Done	4	38	152	51.53
Simply Done	3	39	117	39.66
Underperformed	2	13	26	8.814
Not done	1	0	0	0
Total		90	295	100
Maximum value = $9 \times 10 \times 4 = 360$				
Average Learning Implementation = 81.94%				

Table 8. Percentage of Implementation of Manufacturing Engineering Drawings at SMK

Manufacturing Engineering Drawings				
Level of implementation	Score	f	Sxf	%
Done	4	36	144	50.17
Simply Done	3	35	105	36.59
Underperformed	2	2	38	13.24
Not done	1	0	0	0
Total				
Maximum value = $9 \times 10 \times 4 = 360$				
Average Learning Implementation = 79.72%				

3.1.5 The Competence Needs of Basic Machinery in Industry

3.1.5.1 Drawing Techniques

The need for competence in Drawing Engineering in Industry is 93.00%. In the Table 9 can be read the frequency and large percentage of each level of need.

3.1.5.2 Basic Work of Mechanical Engineering

Competency needs of Basic Mechanical Engineering Work in Industry of 93.5%. In the Table 10 can be read the frequency and large percentage of each level of need.

3.1.5.3 Basics of the Role of Mechanical Engineering

Basic competency needs the Role of Mechanical Engineering in Industry of 91.39%. In the Table 11 can be read the frequency and large percentage of each level of need.

3.1.5.4 Manufacturing Engineering Drawings

The competency need for Manufacturing Engineering Drawings in industry is 93.61%. In the Table 12 can be read that the frequency and large percentage of each level of need.

Table 9. Percentage of Competency Needs of Engineering Drawing in Industry

Drawing Techniques				
Level of need	Score	f	Sxf	%
Done	4	51	204	78.16
Simply Done	3	19	57	21.84
Underperformed	2	0	0	0
Not done	1	0	0	0
Total		70	261	100
Maximum value $7 \times 10 \times 4 = 280$				
Average Learning Implementation = 93.0%				

Table 10. Percentage of Basic Mechanical Engineering Job Needs in Industry

Basic Work of Mechanical Engineering				
Level of need	Score	f	Sxf	%
Needed	4	37	148	79.14
Enough needed	3	13	39	20.86
Less needed	2	0	0	0
Not required	1	0	0	0
Total		50	187	100
Maximum value $5 \times 10 \times 4 = 200$				
Average Learning Implementation = 93.5%				

Table 11. Percentage of Basic Needs of the Role of Mechanical Engineering in Industry

Basics of the Role of Mechanical Engineering				
Level of need	Score	f	Sxf	%
Needed	4	63	252	76.60
Enough needed	3	23	69	20.97
Less needed	2	4	8	2.43
Not required	1	0	0	0
Total		90	329	100
Maximum value = $9 \times 10 \times 4 = 360$				
Average Learning Implementation = 91.39%				

Table 12. Percentage of Manufacturing Engineering Drawing Needs in Industry

Manufacturing Engineering Drawings				
Level of need	Score	f	Sxf	%
Needed	4	67	268	79.53
Enough needed	3	23	69	20.47
Less needed	2	0	0	0
Not required	1	0	0	0
Total			337	100
Maximum value = $9 \times 10 \times 4 = 360$				
Average Learning Implementation = 93.61%				

Relevation of Basic Machinery competencies in SMK with those needed by the industrial world

$$X = \frac{\text{Number of competencies carried out}}{\text{The amount of competence required}} \times 100\% \tag{4}$$

$$X = \frac{82.14 + 84.00 + 81.94 + 79.72}{93.0 + 93.5 + 91.39 + 93.61} \times 100\% = 88\% \tag{5}$$

Based on the results of the percentage of the level of relevance obtained and interpreted into the level of competence relevance the level of relevance of the machining engineering competence of 88%.

4 Conclusion

The findings above provide information that the level of relevance between the competencies taught and the needs of the industry still needs attention so that the relevance in question can be more optimal.

The level of relevance of competencies taught in SMK with competencies needed by industry is 88%. This is in the very relevant, even if not at the maximum level of relevance.

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