

The Relevance of Vocational Competencies in Vocational Schools (Smk) Specialising in Industrial Mechanical Engineering to the Needs of the Industry

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DOI: <https://doi.org/10.47772/IJRISS.2026.100600672>

Received: 07 June 2026; Accepted: 12 June 2026; Published: 01 July 2026

ABSTRACT

Vocational education plays an important role in preparing graduates who possess competencies relevant to the needs of industry. This study aims to identify the competencies prioritized by industry and analyze the relevance of competencies taught in the Industrial Mechanical Engineering Specialization Program at vocational high schools to industrial needs. A quantitative descriptive approach was employed involving industrial practitioners as respondents. Data were collected through questionnaires, interviews, and documentation. The research instrument was developed based on the learning outcomes of the Merdeka Curriculum in the Industrial Mechanical Engineering Specialization Program. Data were analyzed using descriptive statistics, percentages, and frequency distributions. The findings reveal that competencies in industrial mechanical systems, hydraulic and pneumatic systems, electrical systems, electronic systems, control systems, and industrial machine maintenance are highly demanded by industry. Competencies related to machine maintenance, industrial troubleshooting, hydraulic and pneumatic operation, electrical installation, and industrial electronics received the highest ratings. Furthermore, the results indicate that the competencies taught in the Industrial Mechanical Engineering Specialization Program have a high level of relevance to industrial needs. Therefore, the curriculum has generally accommodated the competency requirements of the engineering and manufacturing sectors.

Keywords: industry, Industrial Mechanical Engineering, Merdeka Curriculum, relevance of competencies, vocational high school.

INTRODUCTION

Vocational education is designed to prepare graduates with the knowledge, skills, and attitudes required by the labor market. Vocational High Schools (VHSs) play a strategic role in producing competent human resources capable of meeting industrial demands. However, the relatively high unemployment rate among vocational school graduates indicates that there are still challenges in aligning vocational competencies with industrial requirements.

To address this issue, the Indonesian government has implemented the Merdeka Curriculum, which emphasizes competency development, flexibility in learning, and stronger collaboration between schools and industry. The Industrial Mechanical Engineering Specialization Program is one of the vocational programs expected to produce graduates who are ready to work in engineering and manufacturing industries.

The curriculum includes six competency elements: Industrial Mechanical Systems, Hydraulic and Pneumatic Systems, Electrical Systems, Electronic Systems, Control Systems, and Industrial Machine Maintenance. These competencies are designed to equip students with the technical skills required in industrial workplaces.

Nevertheless, rapid technological development continuously changes the competency requirements of industry. As a result, it is essential to evaluate whether the competencies taught in vocational schools remain relevant to industrial needs. Therefore, this study was conducted to identify industry-prioritized competencies and analyze the relevance of vocational competencies in the Industrial Mechanical Engineering Specialization Program to

industrial needs.

The objectives of this study are:

1. To identify competencies prioritized by industry in the Industrial Mechanical Engineering Specialization Program.
2. To analyze the relevance of competencies taught in the Industrial Mechanical Engineering Specialization Program to industrial needs.

METHODOLOGY

This study employed a quantitative descriptive research design. The research was conducted at SMKN 8 Kota Serang and SMKN 1 Pulo Ampel, Serang Regency, Indonesia. Industrial practitioners working in engineering and manufacturing sectors participated as research respondents.

Data collection techniques included:

- Questionnaires
- Interviews
- Documentation

The research instrument was developed based on the learning outcomes of the Merdeka Curriculum for the Industrial Mechanical Engineering Specialization Program.

Data were analyzed using:

- Descriptive statistics
- Percentage analysis
- Frequency distribution analysis
- Relevance classification

The analysis focused on identifying competencies required by industry and measuring the relevance between school competencies and industrial needs.

RESULTS AND DISCUSSION

Results

Competencies Prioritized by Industry

The findings indicate that all competency elements included in the Industrial Mechanical Engineering Specialization Program are required by industry. However, several competencies received particularly high ratings from industrial practitioners.

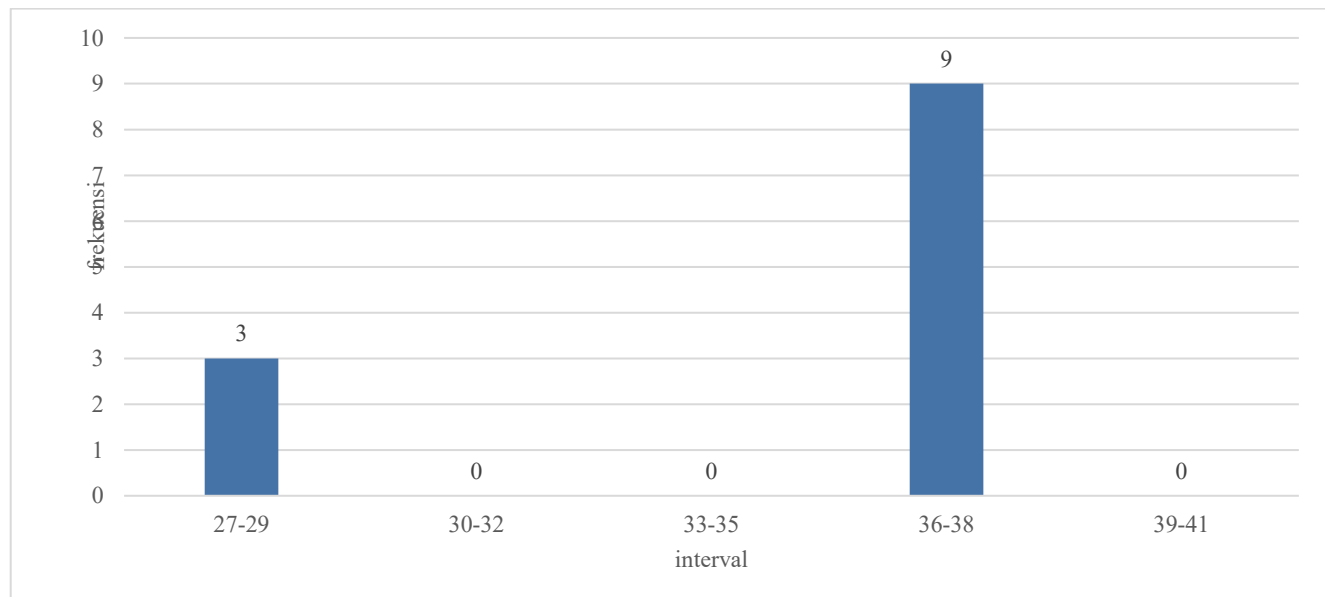
The most highly demanded competencies include:

- Preventive maintenance of industrial machinery
- Troubleshooting industrial control systems

- Operation of hydraulic and pneumatic systems
- Installation and maintenance of electrical systems
- Operation of industrial electronic systems
- Mechanical repair of industrial equipmen.

Industrial Mechanical Systems

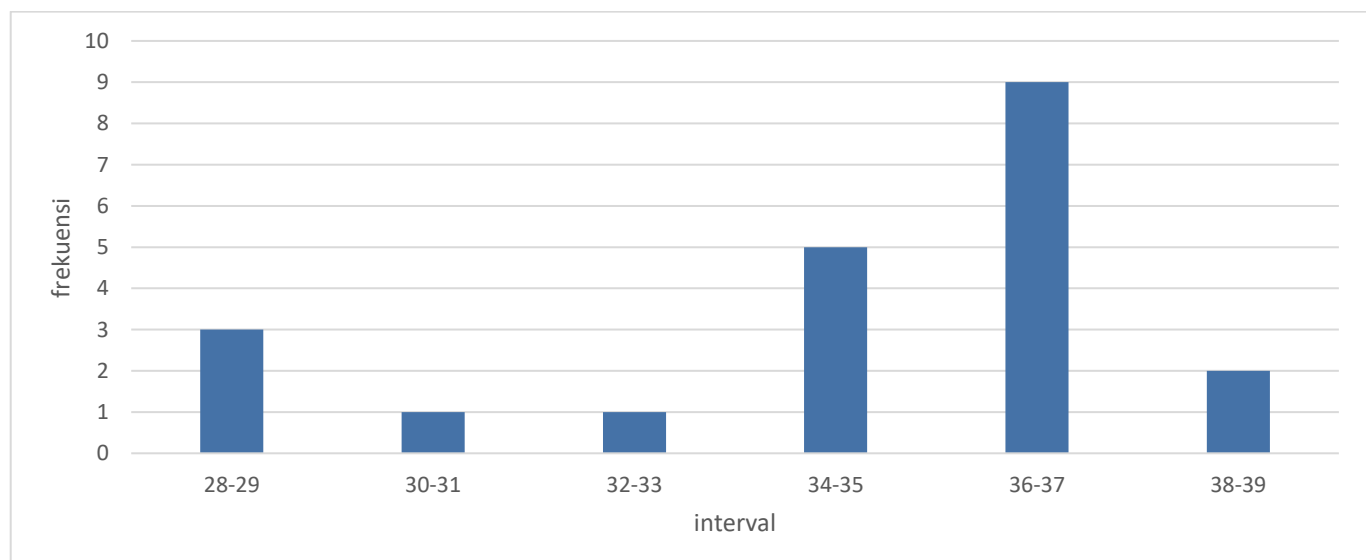
Figure 1. Frequency Distribution Histogram of Competency Data for the Industrial Mechanical Systems Element



Competencies related to industrial mechanical systems received high ratings from respondents. The most important competencies include technical drawing interpretation, mechanical repair, machine vibration analysis, and occupational safety procedures.

Hydraulic and Pneumatic Systems

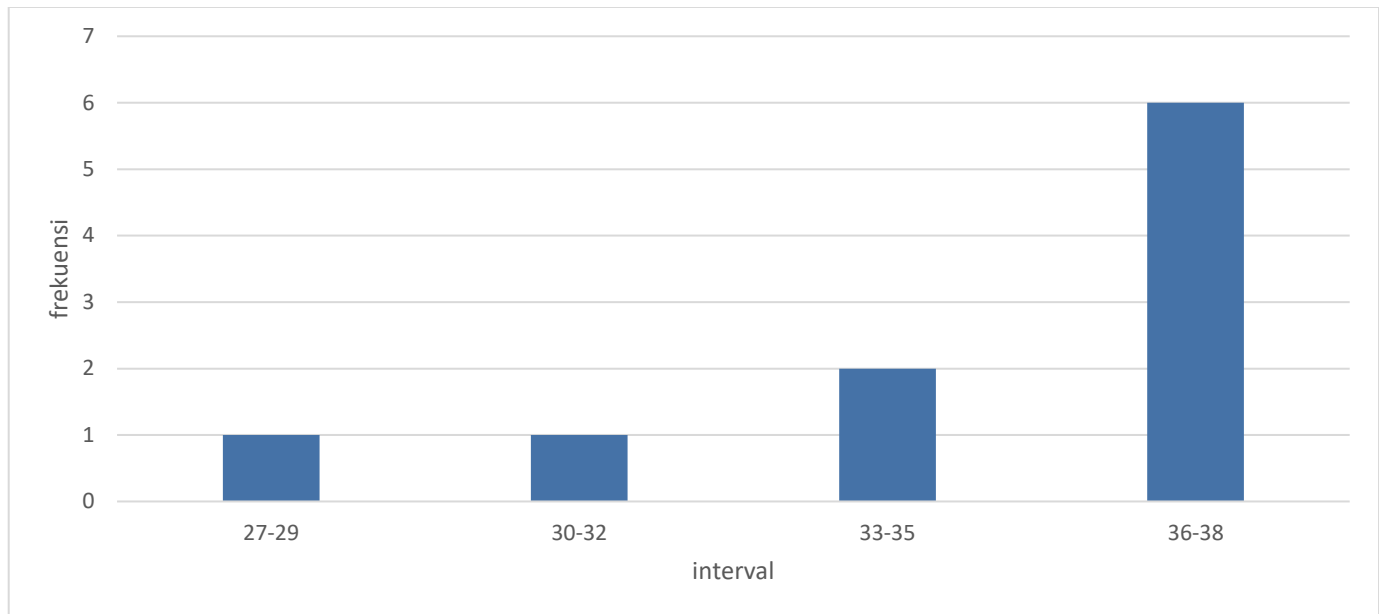
Figure 2. Frequency Distribution of Competency Scores for the Hydraulic and Pneumatic Systems Element



Hydraulic and pneumatic competencies are highly required due to their extensive application in industrial machinery and automation systems. Competencies involving circuit diagram interpretation, fluid power system operation, and maintenance activities were identified as priorities.

Electrical Systems

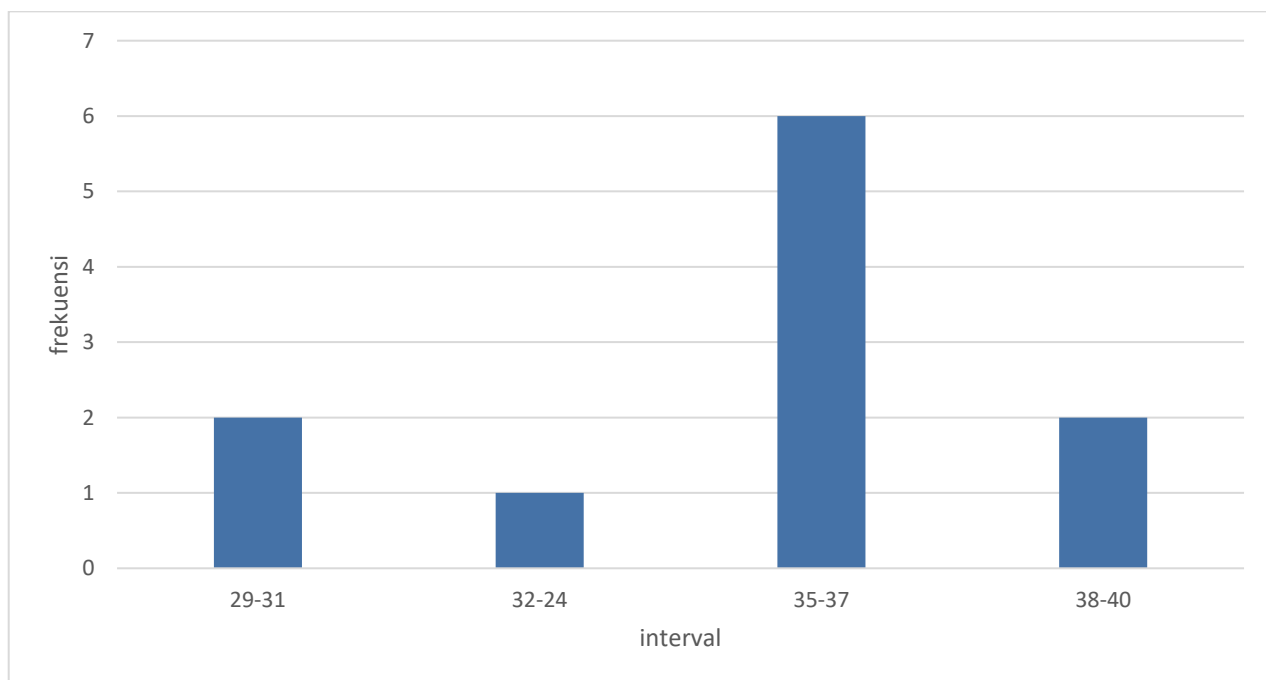
Figure 3. Frequency Distribution of Competency Scores for the Electrical Systems Element



Industrial practitioners emphasized the importance of competencies related to electrical installation, electrical measurement, panel wiring, and electrical troubleshooting.

Electronic Systems

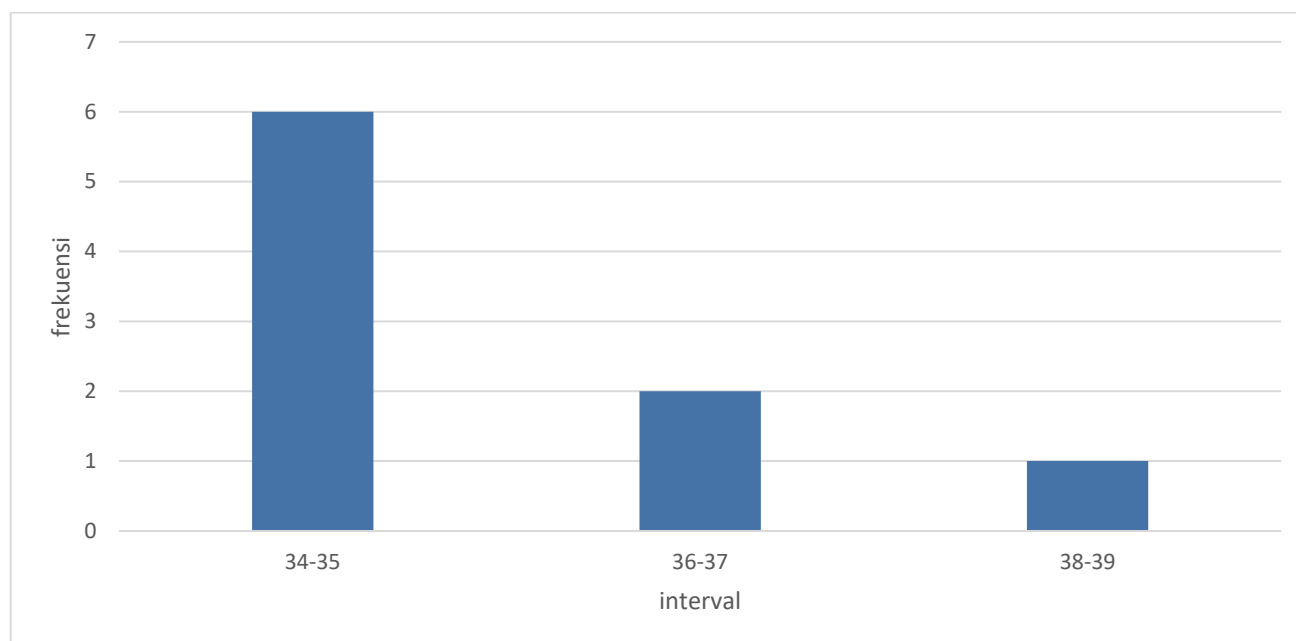
Figure 4. Frequency Distribution of Competency Scores for the Electronic Systems Element



Competencies in industrial electronics include understanding sensors and transducers, operating electronic circuits, and controlling motor speed systems.

Control Systems

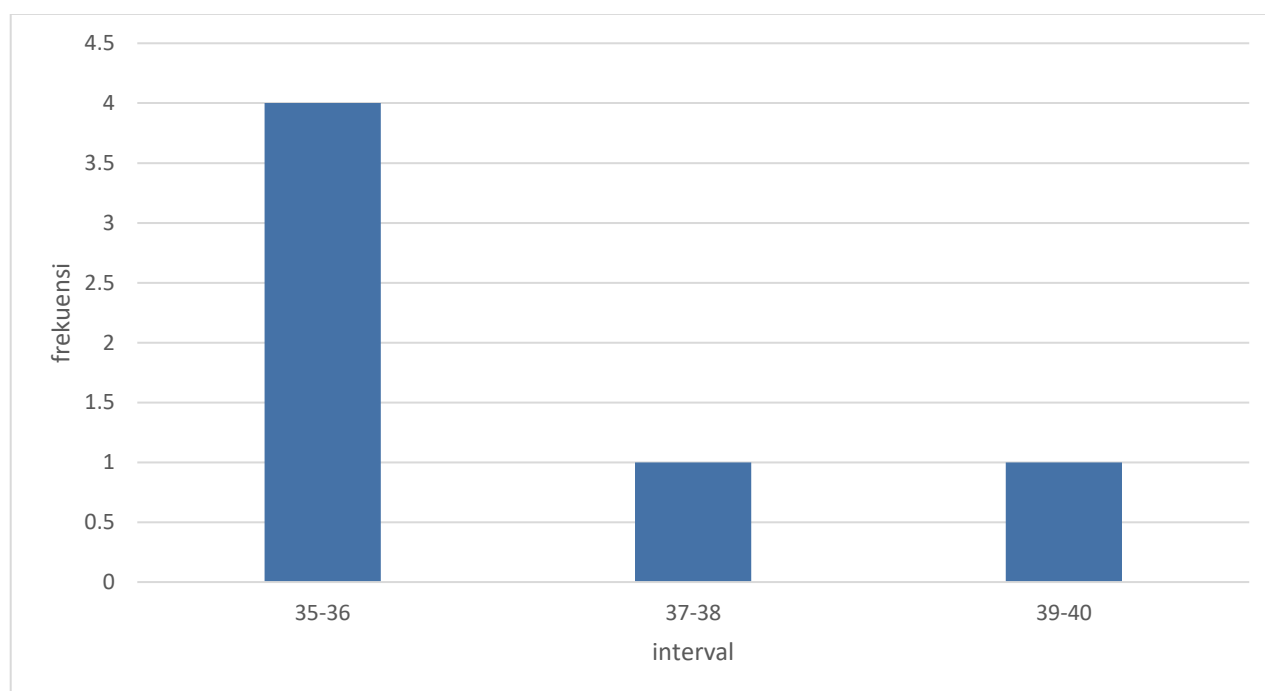
Figure 5. Frequency Distribution of Competency Scores for the Control Systems Element



Control system competencies were considered essential for maintaining production efficiency. Troubleshooting, fault diagnosis, and industrial automation control were identified as highly important competencies.

Industrial Machine Maintenance

Figure 6. Frequency Distribution of Competency Scores for the Industrial Machine Maintenance Element



Industrial machine maintenance emerged as the most important competency area. Preventive maintenance, machine inspection, maintenance planning, and component replacement were identified as critical competencies required by industry.

Relevance of Vocational Competencies to Industrial Needs

The analysis revealed that the competencies taught in the Industrial Mechanical Engineering Specialization Program demonstrate a high level of relevance to industrial needs. Most competency indicators were categorized as "needed" or "highly needed" by industrial practitioners.

These findings suggest that the Merdeka Curriculum has successfully incorporated competencies that align with current industrial requirements. The curriculum provides students with technical competencies necessary for employment in engineering and manufacturing industries.

The results are consistent with the concept of vocational education that emphasizes alignment between educational outcomes and labor market requirements. Strong relevance between vocational competencies and industrial needs contributes to graduate employability and workforce readiness.

Implications

The findings provide evidence that the Industrial Mechanical Engineering curriculum is generally aligned with industrial needs. Therefore, vocational schools should continue strengthening industry collaboration to ensure that competency development remains responsive to technological advancements and changing labor market demands.

Furthermore, the results can serve as a reference for curriculum improvement, competency development, and vocational education policy formulation aimed at enhancing graduate employability and industrial competitiveness.

CONCLUSION

Consequently, the skills taught on the Industrial Mechanical Engineering specialisation are aligned with the needs of the industry and help ensure that vocational school graduates are ready for the workplace.

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