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Analysis of the Readiness of Vocational School Teachers for the Expertise Program Electrical Engineering in Developing Learning Based on Local Potential

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Keywords

vocational education, electrical engineering, teacher readiness, local potential

Abstract

This study aims to analyze the readiness of teachers of the Electrical Engineering Expertise Program at SMK Negeri Semarang City in developing learning based on local potential in the digital era. Teacher readiness is reviewed through aspects of pedagogic, professional, digital, teaching experience, and training or certification. Local potential-based learning is understood as integrating regional resources and local wisdom into the curriculum through contextual methods with the support of digital technology. The research method uses a mixed approach. Quantitative data is obtained through questionnaires to measure teachers' readiness levels, while qualitative data is collected through interviews, classroom observations, and analysis of curriculum documents. Quantitative data analysis was carried out with descriptive statistics and linear regression to identify relationships between variables, while qualitative data were analyzed thematically to strengthen quantitative findings. The study's results are expected to reveal the supporting and inhibiting factors in implementing local potential-based learning, such as the limitations of digital infrastructure, the lack of relevant training, and education policies that are not optimal to encourage technology integration. Theoretically, this research contributes to enriching the study of teacher readiness by placing local potential as the basis for vocational learning innovation. Practically, the research results are expected to be a reference for education stakeholders to design strategies for increasing teacher capacity and policies more adaptive to technological developments and local industrial needs.

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INTRODUCTION

Vocational education, especially in Vocational High Schools (SMK), has a strategic role in preparing a competent workforce that is in accordance with the needs of the industry. [1] State Vocational Schools with Electrical Engineering expertise in Semarang City face the demands of producing graduates with superior technical competence and ensuring that their learning is relevant to the needs of the local industry and technological advancements [2]. Therefore, a learning approach based on local potential is becoming increasingly important, especially in the ever-growing digitalization of education. Teachers are expected to be able to adapt a curriculum that integrates local potential with digital technology to create a more contextual and applicable learning experience for students [3].

The readiness of vocational school teachers in Indonesia, in general, still faces challenges. Data from the Central Statistics Agency shows that in the 2018/2019 academic year, the percentage of teachers suitable to teach at the vocational level only reached 84.33%, lower than that of high school teachers, which reached 97.19%. In addition, the Policy Research Center of the Ministry of Education and Culture noted that the average score of the Teacher Competency Test (UKG) for public vocational school teachers was 60.33, while private vocational school teachers were at 57.91. This fact shows a quality gap that needs to be overcome through various professional development programs, including learning based on local potential.

In line with the national data, empirical research at the school level also reveals variations in teacher readiness. A study at SMK Negeri 8 Palangka Raya (2024) found that teachers' readiness in the planning aspect reached 80.36% (category: ready), implementation of 79.58% (category: ready), and learning assessment of 81.04% (category: very prepared), with an overall average of 80.25% (category: ready). Other research at vocational schools majoring in engineering showed similar results, with teacher enthusiasm reaching 77.67%, critical thinking skills 85.33%, and responsibility 72%. These findings confirm that although teachers are generally in the "ready" category, certain aspects still need strengthening. Hence, analyzing teacher readiness is essential for formulating strategies to improve the quality of learning in vocational schools.

The lack of readiness of teachers in implementing learning based on local potential with the support of digital technology can hinder the achievement of vocational education goals. Many teachers experience obstacles in adapting digital technology in learning due to inadequate training and limited school resources. [12]. This leads to a lack of effectiveness in delivering materials based on local potential, ultimately impacting the lack of local resources as part of the learning process.[13]

In the long run, this unpreparedness can result in vocational school graduates being less competitive in the world of work because their skills are not fully aligned with the needs of the rapidly growing industry in the digital age. [11]. The lack of teachers' readiness to implement local potential-based learning with the support of digital technology can hinder the achievement of vocational education goals.[7] Many teachers experience obstacles in adapting digital technology in learning due to inadequate training and limited school resources.[14] This leads to a lack of effectiveness in delivering materials based on local potential, ultimately impacting the lack of local resources as part of the learning process.[3] In the long run, this unpreparedness can result in vocational school graduates being less competitive in the world of work because their skills are not fully aligned with the needs of the rapidly growing industry in the digital age.[6] The lack of teachers' readiness to implement local potential-based learning with the support of digital technology can hinder the achievement of vocational education goals.

Many teachers still experience obstacles adapting digital technology in learning due to inadequate training and limited school resources [11]. This leads to a lack of effectiveness in delivering materials based on local potential, ultimately impacting the lack of local resources as part of the learning process. In the long run, this unpreparedness can result in vocational school graduates being less competitive in the world of work because their skills are not fully aligned with the needs of the rapidly growing industry in the digital age [10]. Teachers' readiness to implement local potential-based learning with the support of digital technology can hinder the achievement of vocational education goals.[6]

Furthermore, this research is relevant to the global development agenda, especially the Sustainable Development Goals (SDGs) point four on Quality Education. SDG 4 emphasizes ensuring inclusive, equitable, and quality education and supporting lifelong learning opportunities for all (United Nations, 2015). Efforts to increase the readiness of vocational school teachers in developing local potential-based learning align with the SDG 4.4 target, which is to increase the number of young workers and adults with relevant technical and vocational skills to increase decent employment and entrepreneurship opportunities. Thus, this research contributes to the development of vocational education at the local level and supports the global commitment to sustainable development.

As a national context, Indonesia has achieved around 62% of the achievement of SDGs indicators in 2022, and according to Bappenas, Indonesia is among the countries with the best progress in the group of middle- and upper-income countries. However, the government emphasized that many indicators must be accelerated, including education. Thus, improving the quality and readiness of vocational teachers is essential for strengthening vocational education at the local level and making a real contribution to accelerating the achievement of SDG 4: Quality Education at the national and global levels.

In addition to individual teacher competency factors, infrastructure support and education policies are crucial in successfully implementing local potential-based learning. Some schools still face obstacles regarding access to technology devices, internet connections, and digital-based learning resources. [9]. On the other hand, education policies that have not maximally encouraged technology integration in the curriculum are an additional challenge. Therefore, this study urgently identifies State Vocational School teachers' readiness in Electrical Engineering in Semarang City in implementing learning based on local potential, as well as examining the challenges they face in the digital era. [14]. The results of this research are expected to provide strategic recommendations for increasing teacher capacity and designing education policies that are more adaptive to technological developments and industrial needs.

METHODS

Research Design

The research method used in this study is a quantitative method with a descriptive approach. According to Sugiyono (2017), descriptive quantitative research aims to provide a systematic, factual, and accurate picture of the phenomenon being studied by collecting numerical data. This research is focused on analyzing the level of readiness of vocational teachers in the electrical engineering expertise program in developing learning based on local potential. The research instrument was a closed questionnaire based on teacher readiness indicators, including pedagogic competence, professional competence, digital competence, and relevant training experience. The questionnaire was given to 40 teachers of Electrical Engineering Vocational Schools in Semarang City, who were respondents to the research.

Location and Research Participants

The research was conducted at several state vocational schools in Semarang City, which have electrical and electrical engineering expertise programs. These schools were chosen because they represent state vocational education institutions relevant to the needs of the workforce in the electrical sector. The research participants are productive teachers who teach in the expertise program. The respondents were selected using a *purposive sampling technique*, which only involved teachers who actively teach according to their fields of expertise and are willing to be research respondents. [4,10].

Details of the schools where the research was located and the number of teachers teaching in the relevant skills programme are shown in Table 1.

Table 1. Data on State Vocational Schools that have electronic engineering expertise programs, and data on the number of teachers [11].

No	School Name	Membership Programs	Number of Teachers
1	State Vocational School 1 Semarang	Industrial Electronics Engineering	10 people
2	State Vocational School 4 Semarang	Industrial Electronics Engineering	10 people
3	State Vocational School 7 Semarang	Communication Electronics Engineering	10 people
4	Central Java State Vocational School	Electrical Technician	10 people

Research Instruments

The research instrument is in the form of a teacher readiness questionnaire developed based on five main dimensions, namely: (1) pedagogic competence, (2) professional competence, (3) digital competence, (4) teaching experience, and (5) training and certification. Each dimension consists of five statement items, so there are 25 items. Respondents were asked to answer on a five-point Likert scale, ranging from strongly disagree to agree strongly. Instruments with a Likert scale are commonly used in vocational research because they can measure teachers' perceptions in a structured manner. (Li & Pilz, 2019; Zulkarnain & Widodo, 2025). To ensure the quality of the instrument, the validity of the content is checked through expert review. At the same time, the internal reliability will be tested using *Cronbach's Alpha coefficient,* with the criterion of $\alpha \geq 0.70$ as the acceptance limit. [5,14].

Data Collection Procedure

Data is collected in the even semester of the 2024/2025 school year by distributing questionnaires to teachers directly. The researcher provides directions regarding the purpose of the research and the procedure for filling out the questionnaire, as well as ensuring the confidentiality of the respondent's identity. This approach aligns with vocational education research practices emphasizing data transparency and accuracy. [15].

Data Analysis Techniques

The data analysis in this study uses descriptive statistics, as explained by Sugiyono (2017), which describe or give an overview of the object being studied through sample data or population as it is, without making inferential generalizations. Descriptive statistics, such as mean values, percentages, and frequency distributions, determine the data trend.

The data from the questionnaire obtained from 40 respondents of the Electrical Engineering Vocational School teachers was analyzed by calculating the average score of each teacher readiness indicator, and then categorized based on specific criteria. According to Riduwan (2015), the assessment category can be divided into several levels, such as very ready, ready, moderately prepared, less prepared, and unprepared, which is determined through the range of scores on the Likert scale.

Research Ethics

This research was carried out by paying attention to the ethical principles of research. Respondents' participation is carried out voluntarily after obtaining *informed consent*. The identity of the respondents is kept confidential, and the data is only used for research purposes. In addition, research permits are obtained from the relevant schools, and research is carried out per the provisions of educational research ethics.

RESULTS AND DISCUSSION

Results of the Teacher Readiness Survey of Electrical Engineering Vocational Schools

Teacher readiness data collection is carried out through a questionnaire covering five dimensions: pedagogic competence, professional competence, digital competence, teaching experience, and training/certification. Data analysis uses quantitative descriptive statistics to derive average scores, percentages, and readiness categories.

The reliability test of the instrument showed that *Cronbach's Alpha* value = 0.82, exceeding the minimum limit of 0.70 as suggested in the vocational competency measurement study. [12] and the development of vocational school teacher readiness instruments [13]. This confirms that the teacher readiness questionnaire has good internal consistency, so the survey results data can be interpreted reliably.

Table 2. Average Score and Category of Teacher Readiness Level of Electrical Engineering Vocational School

Dimension	Average Score	Percentage (%)	Category
Competence in Education	4,07	81,4	Tall
Professional Competencies	3,98	79,6	Tall
Digital Competence	4,03	80,6	Tall
Teaching Experience	4,04	80,8	Tall
Training & Certification	4,04	80,8	Tall

In addition to being in the form of a table, the survey results are also visualized to clarify the distribution of Likert scores and the average score per dimension.

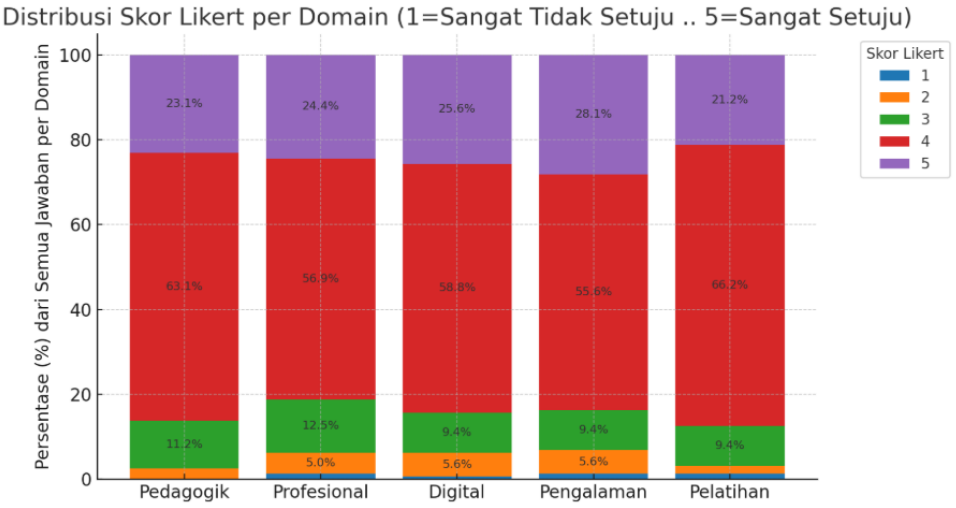

Figure 1. Likert Score Distribution Per Domain

The distribution of Likert scores shows that most respondents gave answers in categories 4 (Agree) and 5 (Strongly Agree) across all dimensions. A score of 4 dominates across domains, with the highest percentages in Training (66.2%) and Pedagogic (63.1%). Meanwhile, the contribution of a score of 5 is quite prominent in the Experience (28.1%) and Digital (25.6%) dimensions.

This pattern confirms that the readiness of Electrical Engineering Vocational School teachers in Semarang City is in the high category in all aspects, with the main strength in teaching experience (because the portion of the score of 5 is the largest), as well as areas that still have opportunities to improve in training/certification, which although dominant at a score of 4, relatively less reaches a score of 5.

Interpretation of Results by Dimension

1. Competence in Education

The average score of pedagogic competence reached 4.07 (high category), indicating that teachers of Electrical Engineering Vocational Schools have a good understanding of learning strategies and the ability to deliver expert materials. These findings are consistent with research that *pedagogical readiness* is the primary foundation for improving the quality of practice-based vocational learning. [17]. In the era of Independent Learning, pedagogic competence also determines teachers' ability to innovate a more flexible and contextual curriculum. (Hidayah et al., 2024).

1. Professional Competencies

With an average score of 3.98 (high category), teachers show adequate mastery of expertise material. Strong professional competence ensures that vocational school graduates are better prepared to face the needs of the fashion industry. [19]. Another study confirms that the professionalism of vocational teachers is a key factor in the success of vocational education revitalization programs towards *Society* 5.0 [20].

2. Digital Competence

Digital competence obtained an average score of 4.03 (high category). Even though it is good, teachers' digital literacy must be strengthened to support technology-based learning optimally. Recent research emphasizes that teachers' digital readiness is often stronger regarding device use, but still weak in applying innovative digital pedagogy. [21]. Therefore, even though it is in the high category, teachers' digital competence still has room for improvement towards a very high category. [22].

3. Teaching Experience

The teaching experience dimension obtained a score of 4.04 (high category). This confirms that teachers have sufficient flying hours in managing practical learning. This experience supports the stability of the teaching and learning process and the use of laboratory facilities. However, long experience needs to be complemented by *lifelong learning* so that teachers can adapt to new industrial innovations and technologies. [23].

4. Training and Certification

An average score 4.04 (high category) indicates that teacher participation in training and certification is relatively good. However, the quality and relevance of training are still significant issues. Recent research confirms that vocational teacher training is often out of sync with the latest industry needs, so it is necessary to align industry-based training programs. [24]. Thus, even though the score is in the high category, strengthening certification and continuous training remain a priority. [25].

The survey results show that Electrical Engineering Vocational School teachers have high readiness in all dimensions, pedagogical, professional, digital, teaching experience, and training/certification. This illustrates a relatively even and solid readiness. However, the "high" category does not automatically mean optimal. The two dimensions of digital competence and training/certification still need to be improved to "very high", especially to answer the challenges of the digitalization era of vocational education and the needs of industry 4.0–5.0 [26].

Thus, the results of this study confirm the importance of teacher *upskilling* and *reskilling* strategies through industry-based training, strengthening digital literacy, and sustainable government policy support. [27]. In addition, teachers with high readiness will more easily integrate local potential into learning, so vocational education is relevant to global needs and supports regional development. [28].

CONCLUSION

The readiness of Vocational Electrical Engineering teachers is relatively high, with an average of 4.03; 90% are in the Ready category and 10% Very Ready, so the prerequisites for contextual learning, projects, and authentic assessments are already in place. However, about 81% of responses were concentrated at grades 4–5, indicating a ceiling effect: current instruments/practices are not sufficiently sensitive to distinguish truly proficient teachers from those who meet standards. The combined reliability of $\alpha = 0.45$ is reasonable for multidimensional constructs (pedagogic, professional, digital, partnership, assessment). It emphasizes the need for per-aspect mapping and advanced practice indicators so that capacity building programs can be directed more on target.

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