



## The Competency of Pedagogic and Professional of Vocational Teachers in Implementing 21<sup>st</sup> Century Skill-Based Learning

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### Abstract

The pedagogical and professional competence of vocational teachers is still a fundamental question in the education and learning system. In the 21st century, teachers are required to have high pedagogical and professional competencies. This study aims to analyze the extent of the pedagogical and professional competencies of vocational teachers. This research is a descriptive study using a quantitative approach. A total of 232 vocational teachers became respondents in this study. Data were collected through a questionnaire method with an instrument in the form of a 4 Likert scale questionnaire. The data collected were analyzed using descriptive analysis and inferential t-test which includes one-way ANOVA test and independent-sample t-test. The results showed that the pedagogical competence of vocational teachers was in a low category. Meanwhile, the professional competence of vocational teachers is in the high category, but in some indicators, it is still in the low category. Various retraining is needed to improve the pedagogical competence of vocational teachers; meanwhile, psychological approaches must also be taken to improve the professional competence of vocational teachers.

**Keywords:** Pedagogic; Professional; Vocational Teachers;

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## 1. INTRODUCTION

The fundamental problem of vocational education today is how to respond to the development of science and technology in the 21st century (Salleh & Puteh, 2017). Disruption of competence and disruption of old jobs which then give rise to new jobs is the focus that must be faced (Stuchlikova, 2016). This has become a special difficulty for vocational education to date, namely how to organize 21<sup>st</sup>-century competency-based learning (Malik, 2018). Teachers as a key element in the education system have the most important role in responding to these developments (Chinedu et al., 2018). Thus, one of the important factors that must be considered by vocational education is the competence of educators. Vocational teachers must have competence in managing learning that is oriented to the formation of 21<sup>st</sup>-century student competencies (Wagiran et al., 2019). Being able to facilitate students to learn interactively, collaboratively, communicatively, and innovatively is the main requirement for vocational teachers (Chai & Kong, 2017).

In the process of working, the competence of vocational teachers is very important to be developed, monitored and evaluated within a certain period. This activity is very important to do to improve the quality of vocational learning (Šafránková & Zátopková, 2017). Teacher competencies that must be developed, monitored, and evaluated are contained in the standards of educators (Almeida, 2017). Teacher competency standards are an important aspect as a standard reference for quality control of teacher performance (Halász & Looney, 2019). However, teacher competency standards must adapt to the context of changing competency needs (Caena & Redecker, 2019). Thus, it is very important to evaluate teacher competence based on the characteristics of 21<sup>st</sup>-century competency needs.

Teacher competency standards in Indonesia include pedagogic, social, personality, and professional competencies. This research will focus on the pedagogic and professional

competence of teachers. These two competencies greatly affect the quality of learning (Son et al., 2020; Sudargini & Purwanto, 2020). Pedagogical competence includes expertise competence in managing and implementing learning appropriately according to their field of expertise (Halász & Looney, 2019). Meanwhile, the professional competence of teachers includes expertise as a supporter of the implementation of pedagogical competence properly (Friesen & Kuntze, 2020). The pedagogic and professional competencies of teachers have an important role in the implementation of effective and efficient learning (Rahayu et al., 2018; Susanto et al., 2020). Especially in vocational education which aims to equip students' work competencies concerning the cognitive, affective and, psychomotor domains (Sudira, 2017).

The complexity of vocational learning requires teachers who have a high acceptance of these two competencies in managing to learn, both theory and practice (Mutohhari et al., 2021). Various education and training to support the pedagogical competence of vocational teachers continue to be carried out (Kurniasari et al., 2019; Podrugina et al., 2019). In addition, self-development is also encouraged and grown in supporting the professionalism of vocational teachers (Kasalak & Dağyar, 2020). However, the reality is that vocational teachers still have a low acceptance of pedagogical and professional competencies (Leonard & Wibawa, 2020). The low quality of vocational learning, both theory and practice, is the main impact of the low pedagogical, and professional competence of teachers (Rachmawati & Suyatno, 2021). In addition, low student learning outcomes are also the impact of the lack of maturity of the two competencies (Istiqomah et al., 2019).

The immaturity of the pedagogical and professional competencies of teachers will of course be increasingly problematic in implementing 21<sup>st</sup>-century competency-based learning. Learning that is currently oriented towards soft skill competencies with a critical mindset of course requires the role of pedagogical and professional teacher competencies that are truly mature (Caena & Redecker, 2019). This problem certainly cannot be allowed to drag on without a clear solution. Strengthening the pedagogical and professional competencies of teachers needs to be done more maturely through more intensive education and training (Sasmoko et al., 2020). However, providing the right level of training requires an in-depth analysis of the maturity level of teachers' pedagogical and professional competencies from the perspective of 21<sup>st</sup>-century skills. Thus, this research was conducted to analyze how much pedagogical and professional competence teachers have in implementing 21<sup>st</sup>-century learning.

## **2. MATERIALS AND METHODS**

This research is a descriptive study using a quantitative approach. This study aims to analyze the level of pedagogical and professional competence of vocational teachers in organizing 21<sup>st</sup>-century learning, and the difference in levels between the two competencies. The research was conducted in a vocational high school in Yogyakarta Province. A total of 547 vocationally productive teachers became the population in this study. Sampling used cluster random sampling technique by taking samples in vocational high schools that became clusters (Sugiyono, 2017). The sample in this study obtained several 232 teachers who will be respondents. The data collection technique was carried out using a questionnaire method containing statements related to the pedagogical and professional competencies of teachers in organizing 21<sup>st</sup>-century skills-based learning. The research instrument used a questionnaire with a Likert scale design using 4 answer scales, namely Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD). The statements in the instrument are prepared based on variables and indicators of pedagogical competence and professionalism adopted from opinions (Amir, 2019) and adapted to the context of 21<sup>st</sup>-century skill-based learning. The grid of research instruments is shown in Table 1.

**Table 1.** Grid of Research Instrument

Competency	Indicators	Code	Item
Pedagogic	Mastering the area of expertise	PD1	4
	Ability to prepare lesson plans	PD2	4
	Ability to develop curriculum	PD3	4
	Mastering media and learning models	PD4	4
	Mastering student characteristics	PD5	4
	Critical and creative in solving problems	PD6	4
	Ability to evaluate learning	PD7	4
	Utilizing ICT in learning	PD8	4
Professional	Responsible	PF1	4
	Cooperative towards duties and responsibilities	PF2	4
	Strive for the achievement of learning objectives	PF3	4
	Utilize media and teaching materials appropriately	PF4	4
	Applying a good role model	PF5	4
	Continuous professionalism	PF6	4
	Total		56

Source: (Amir, 2019)

Instrument validation used content validation techniques by asking for expert opinion and item validation with product-moment correlation analysis. The results of the content validity test obtained results with a very high category and the item validity test obtained a significance value below 0.05 on all statement items. The collected data was then analyzed using descriptive and inferential statistics using a quantitative approach. Descriptive analysis was used to describe the average and percentage of each level of pedagogical and professional competence in teachers. While the inferential analysis was carried out using the one-way ANOVA test to determine the differences in more than 2 indicators and the independent sample t-test to determine differences in the level of pedagogical and professional competence. The level of pedagogical and professional competence will be determined based on the criteria in the categories determined by adopting the opinion of (Mardapi, 2012). The following are the criteria for determining the maturity level category which is shown in Table 2.

**Table 2.** Category of Competency Level

Formula	Category	Interval Score		
		Pedagogic	Professional	Indicator
$Mi + 1,5 SDi \leq M \leq Mi + 3,0 SDi$	Very High	104,26 – 128.00	78.00 – 120.00	13.00 – 16.00
$Mi + 0 SDi \leq M \leq Mi + 1,5 SDi$	High	80,00 – 104.26	60.00 – 78.00	10.00 – 13.00
$Mi - 1,5 SDi \leq M \leq Mi + 0 SDi$	Low	55.75 – 80.00	42.00 – 60.00	7,00 – 10.00
$Mi - 3,0 SDi \leq M \leq Mi - 1,5 SDi$	Very Low	32.00 – 55.75	24.00 – 42.00	4,00 – 7.00

(Mardapi, 2012)

### 3. RESULTS AND DISCUSSION

#### Results

##### Pedagogy Competence

Data on the level of teacher pedagogical competence were obtained from a questionnaire instrument with a total of 32. The maturity level of professional competence possessed by teachers was still low. The results showed that the average pedagogical competence of teachers in implementing 21<sup>st</sup>-century learning was still in the low category. The following are the results of a descriptive analysis related to the level of pedagogical competence possessed by teachers, which are shown in Table 3.

**Table 3.** Results of Descriptive Analysis of Pedagogic Competence and its Indicators

Indicator	Mean	Percentage	Median	Mode	Std. Dev	Category
PD1	12,50	78,13%	10,50	10	3,686	High
PD2	9,25	57,81%	5,75	6	3,148	Low
PD3	8,12	50,75%	5,00	4	3,102	Very Low
PD4	8,72	54,50%	7,23	8	2,988	Low
PD5	7,36	46,00%	7,00	6	2,831	Low
PD6	8,02	50,13%	7,38	7	2,093	Low
PD7	7,50	46,88%	6,50	7	1,908	Low
PD8	9,64	60,25%	8,26	8	3,273	Low
<b>Pedagogic</b>	<b>68,10</b>	<b>56,75%</b>	<b>65,25</b>	<b>65</b>	<b>4,572</b>	<b>Low</b>

The categorization of the results of data processing above refers to the indicator score interval and the pedagogic score interval shown in Table 2. From these data, the percentage value of the teacher's pedagogical competency level for the average of all indicators is 56.75%. with an average competency value of 68.10. Vocational teachers in the province of Yogyakarta have a low level of pedagogical competence in implementing 21st century-based learning. Of all indicators, only the ability in the field of expertise (PD1) is included in the high category with a percentage of 78.13% and an average of 12.50. Then the pedagogical competence of teachers in developing 21st century-based learning curricula is included in the very low category. Meanwhile, the seven indicators have low acceptance of pedagogical competence. After obtaining descriptive data on the level of teacher pedagogical competence, then the results obtained were analyzed using one-way ANOVA to determine differences in teacher pedagogical competence from all indicators. Based on the results of the one-way ANOVA test, it is known that the significance value is 0.446. The sig value of 0.446 > 0.050 means that the average teacher pedagogical competence indicator in implementing 21st century-based learning does not have a significant difference. Furthermore, to find out the different indicators, a post hoc test was carried out using the Tukey method. The following are the results of the post hoc test with the Tukey method shown in Table 4.

**Table 4.** Tukey Post Hoc Test Result on Pedagogical Competence

PD	PD	Mean. Diff	Sig	PD	PD	Mean. Diff	Sig
PD1	PD2	3,250	0,593	PD5	PD1	7,360	0,056
	PD3	4,380	0,415		PD2	-5,140	-0,918
	PD4	3,780	0,682		PD3	-1,890	-0,578
	PD5	5,140	0,211		PD4	-0,760	-0,189
	PD6	4,480	0,389		PD6	-1,360	-0,441
	PD7	5,000	0,252		PD7	-0,140	-0,459

PD	PD	Mean. Diff	Sig	PD	PD	Mean. Diff	Sig
PD2	PD8	2,860	0,729	PD6	PD8	-2,280	-0,611
	PD1	-3,250	-0,654		PD1	-4,480	-0,793
	PD3	1,130	0,833		PD2	-1,230	-0,398
	PD4	0,530	0,921		PD3	-0,100	-0,321
	PD5	1,890	0,787		PD4	-0,700	-0,164
	PD6	1,230	0,846		PD5	0,600	0,887
	PD7	1,750	0,802		PD7	0,520	0,803
	PD8	-0,390	-0,369		PD8	-1,620	-0,661
PD3	PD1	-4,380	-0,898	PD7	PD1	-5,000	-0,899
	PD2	-1,130	-0,263		PD2	-1,750	-0,556
	PD4	-0,600	-0,96		PD3	-0,620	-0,172
	PD5	-0,760	-0,189		PD4	-1,220	-0,368
	PD6	0,100	0,997		PD5	0,140	0,994
	PD7	0,620	0,825		PD6	-0,520	-0,179
	PD8	-1,520	-0,578		PD8	-2,140	0,596
	PD4	PD1	-3,780		-0,889	PD8	PD1
PD2		-0,530	-0,167	PD2	0,390		0,803
PD3		0,600	0,887	PD3	1,520		-0,661
PD5		1,360	0,716	PD4	0,920		-0,899
PD6		0,700	0,824	PD5	2,280		0,649
PD7		1,220	0,745	PD6	1,620		0,773
PD8		-0,92	-0,928	PD7	2,140		0,603

Based on the results of the post hoc test, it can be explained that all the average differences in each indicator have a significance value of more than 0.050. These results mean that there is no difference in the average between the indicator of teacher pedagogical competence.

### Professional Competence

Data on the level of professional competence of teachers were obtained from a questionnaire instrument with a total of 24. The maturity level of professional competence possessed by teachers was still low. The results showed that the average professional competence of teachers in implementing 21<sup>st</sup>-century learning was still in the low category. The following are the results of a descriptive analysis related to the level of pedagogical competence possessed by teachers, which are shown in Table 5.

**Table 5.** Results of Descriptive Analysis of Professional Competence and its Indicators

Indicator	Mean	Percentage	Median	Mode	Std. Dev	Category
PF1	11,04	69,00%	10,50	10	3,786	High
PF2	10,75	67,19%	5,75	6	3,037	High
PF3	11,92	74,50%	5,00	4	3,102	High
PF4	8,65	54,06%	7,23	8	2,868	Low
PF5	12,85	80,31%	7,00	6	3,906	High
PF6	8,32	52,00%	7,38	7	2,277	Low
<b>Professional</b>	<b>62,34</b>	<b>64,98%</b>	<b>60,15</b>	<b>61</b>	<b>5,612</b>	<b>High</b>

The categorization of the results of data processing refers to the indicator score interval and the professional score interval shown in Table 2. From these data, the percentage value of the professional competence level of teachers on all indicators is 64.98% with an average competency value of 62.34. Vocational teachers in the province of Yogyakarta have a high level of professional competence in implementing 21st century-based learning. Of all indicators, the ability to be a good role model (PF5) is the indicator that gets the highest score and is included in the high category with a percentage of 80.31% and an average of 12.85. Meanwhile, teacher competence in developing professionalism following the development of the 21st century got the lowest score and was included in the low category with a percentage value of 52.00% and an average of 8.32. Meanwhile, the four indicators have a high acceptance of professional competence. After obtaining the data describing the level of professional competence of teachers, then the results obtained were analyzed using one-way ANOVA to determine the differences in the professional competence of teachers from all indicators. Based on the results of the one-way ANOVA test, it is known that the significance value is 0.616. The sig value of  $0.616 > 0.050$  means that there is no significant difference between the indicators of teacher professional competence in organizing 21st century-based learning. Furthermore, to find out the different indicators, a post hoc test was carried out using the Tukey method. The following are the results of the post hoc test with the Tukey method shown in the following Table 6.

**Table 6.** Tukey Post Hoc Test Result on Professional Competence

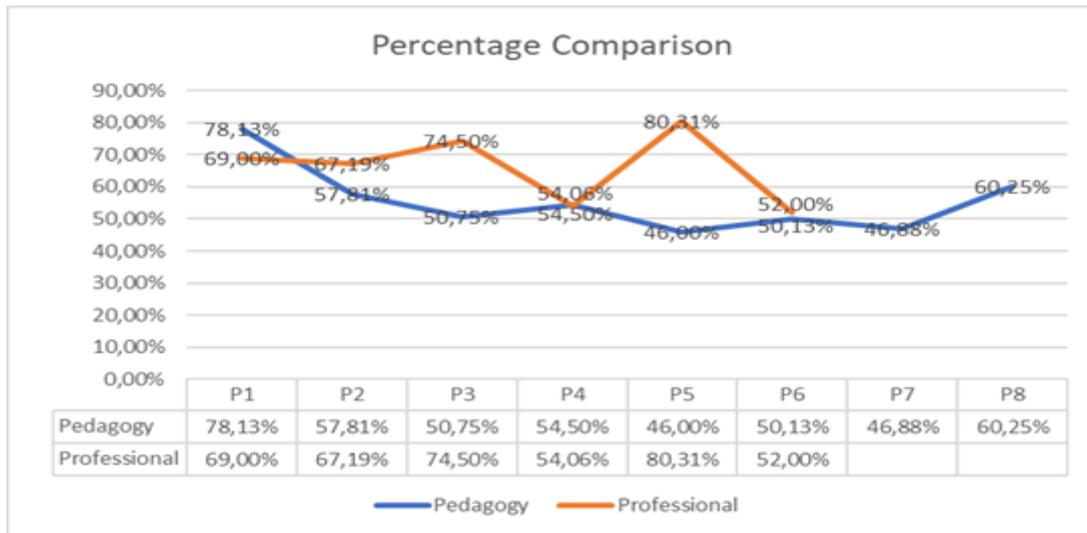
PF	PF	Mean. Diff	Sig	PF	PF	Mean. Diff	Sig
PF1	PF2	0,290	0,699	PF4	PF1	-2,390	-0,856
	PF3	-0,880	-0,308		PF2	-2,100	-0,818
	PF4	2,390	0,682		PF3	-3,270	-0,578
	PF5	-1,810	0,211		PF5	-4,200	-0,989
	PF6	2,720	0,389		PF6	0,330	0,841
PF2	PF1	-0,290	-0,654	PF5	PF1	1,810	0,459
	PF3	-1,170	0,833		PF2	2,100	0,311
	PF4	2,100	0,221		PF3	0,930	0,203
	PF5	-2,100	-0,887		PF4	4,200	0,108
	PF6	2,430	0,146		PF6	4,530	-0,321
PF3	PF1	0,880	0,102	PF6	PF1	-2,720	-0,864
	PF2	1,170	-0,263		PF2	-2,430	-0,867
	PF4	3,270	-0,96		PF3	-3,600	-0,903
	PF5	-0,930	-0,189		PF4	-0,330	-0,609
	PF6	3,600	0,107		PF5	-4,530	-0,980

Based on the results of the post hoc test above, it can be explained that all the average differences in each indicator have a significance value of more than 0.050. These results mean that there is no difference in average between indicators of teacher professional competence.

### Comparison Between Pedagogical and Professional Competence

The results of the analysis of the level of pedagogical and professional competencies possessed by teachers in implementing 21<sup>st</sup>-century skills-based learning were compared to know the difference in levels of the two competencies. An independent sample t-test was used to compare the two competencies. Based on the results of the t-test analysis, the calculated t value is -2.814 with a significance value of 0.005. The calculated t value is  $-2.814 < 1.97353$  and the sig value is  $0.005 < 0.050$ . Thus, it can be concluded that there is a

significant difference between the pedagogical and professional competencies of teachers in implementing 21<sup>st</sup>-century skills-based learning. The pedagogical competence and professional competence of teachers have significantly different levels of acceptance. Pedagogical competence has an average percentage difference of -8.230 from the professional competence of teachers. The results of the comparison of pedagogical and professional competencies are also presented based on the difference in the percentage of each indicator shown in Figure 1.



**Figure 1.** Comparison of the Percentage of Pedagogical and Professional Competence Levels

Based on the graph above, it can be interpreted that the indicators of professional competence have a higher percentage value than the pedagogical competence of teachers. Only the first indicator of professional competence has a lower percentage than the first indicator of pedagogical competence.

**Discussion**

Based on the results of the data analysis of the research conducted, information was obtained that the pedagogic competence possessed by vocational teachers was still low. Meanwhile, the professional competence of vocational teachers is known to be high in the overall average, but still low in several indicators, so that it is not maximized. Then, vocational teachers have a significant difference in maturity between their pedagogic and professional competencies.

Pedagogical competence and professional competence are very important for the continuity of the learning process according to standards. Without these two competencies, the potential that exists in students will not be able to be developed properly (Istiqomah et al., 2019). In addition, the need for complex competencies in the 21st century will have a significant effect on student work competencies later if the two teacher competencies are not mature (Rachmawati & Suyatno, 2021). Pedagogical competence is needed as the main capital for learning operations. While the professional competence of teachers will play a role in supporting the application of pedagogical competence (Wahyuni & Sugihartini, 2021). The low pedagogical competence of the teacher will affect the low competence of students as well (Fauth et al., 2019). As a learning facilitator, through these competencies, teachers should be able to manage to learn appropriately. Especially at this time learning is required to develop student competencies through 21<sup>st</sup>-century learning (Kunter et al., 2013). The pedagogical competence of teachers must be high if they want to apply the media and learning models.

Thus, the low pedagogical competence of the teacher will not be able to develop learning in the classroom following the development of science and knowledge. Intensive education and retraining are very important to be held to overcome the low pedagogical competence of vocational teachers (Leonard & Wibawa, 2020).

Meanwhile, the not-yet maximal professional competence of vocational teachers will also affect the quality of learning. This competency is needed by teachers to support the implementation of learning effectively and efficiently (Lauermann & König, 2016). Without professional competence, teachers will not be able to maximize their pedagogical competence (Hanifah et al., 2019). In addition, professional competence is needed to give teachers confidence, authority, and interpersonal skills (Rahayu et al., 2018). Furthermore, the maturity of this competence will also affect the social attitudes and self-confidence of other students or teachers (Sunarti & Rummyani, 2018). Moreover, vocational teachers need these competencies, one of which can play a role in setting a good example for vocational students. Vocational teachers are required to develop sustainable professional competencies following developments that occur (Urbani, 2020). Based on the findings of this study, which are relevant to previous research, it indicates that the problem of pedagogic competence and professional competence still occurs in teachers, especially vocational teachers.

The problem of the low pedagogical competence of teachers and the lack of maximum professional competence of teachers is fundamental in vocational education. This research is supported by previous research which analyzed the loss of teacher competency standards in Indonesia (Estriyanto et al., 2017). The competence of teachers in Indonesia tends to be low, both competence in teaching theory and practice (Astuti et al., 2021). The results of the study reveal that the professional competence of teachers in teaching is still not optimal, especially for teachers in vocational education where the results of teacher professional competence obtained are in a low category (Estriyanto et al., 2017; Fakhrutdinova et al., 2020). Likewise, other studies reveal that the pedagogic competence of teachers in the perspective of 21<sup>st</sup>-century skills and the era of the industrial revolution 4.0 is still very low (Ana et al., 2020). The two studies provide comparisons that are relevant to the research results obtained. These problems must be addressed by vocational education quickly and accurately. Various pedagogical and professional competency-based training must be carried out more intensively (Leal et al., 2017). Competency-based training in the field of teacher expertise is very important to be upgraded again according to developments that occur. This can improve the pedagogical competence of teachers in teaching 21<sup>st</sup>-century skills to students (Kim et al., 2019). In addition, various steps of an emotional approach and a social approach must also be taken to encourage teacher self-development (Rahayu et al., 2018). Strong teacher self-development will mature the teacher's professional competence. In addition, self-assessment and reflection also need to be carried out to develop vocational teacher competencies (Martínez-Izaguirre et al., 2018).

#### **4. CONCLUSION**

Pedagogical and professional competencies are basic abilities that every teacher must have in managing learning. The pedagogical competence of vocational teachers has a low level of maturity and requires a thorough improvement. Meanwhile, although the average percentage of teacher professional competence is high, it is not maximized and requires improvement in several aspects, namely in using appropriate media and teaching materials and developing professionalism on an ongoing basis. The low pedagogical competence of teachers needs to be improved through various training and approaches. Competency-based training following the field of expertise is very important to be done immediately. Meanwhile, the lack of maximum professional competence of teachers requires

psychological approaches such as emotional and social approaches and strengthening teacher self-development. This study has limitations in selecting a wider range of respondents to be used as samples due to the policy of limiting activities in schools during the COVID-19 pandemic.

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