



# The Influence of Entrepreneurship Competency and Leadership Challenge to Principals' Leadership Solutions

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## Abstrak

Pendidikan harus mampu menghasilkan sumber daya manusia yang kompeten. Di era revolusi industri 4.0 dan pembelajaran abad 21, SMK diharapkan semakin mampu mendiversifikasi kepemimpinan pendidikan dalam semua kegiatan pembelajaran di sekolah. Oleh karena itu penelitian ini bertujuan untuk menganalisis kompetensi kewirausahaan, tantangan kepemimpinan, dan solusi kepemimpinan kepala sekolah menengah kejuruan di era revolusi industri 4.0 dan pembelajaran abad 21. Penelitian ini merupakan penelitian korelasional dengan menggunakan penelitian *ex-post facto*. Sampel penelitian ini adalah 35 responden yang ditentukan dengan menggunakan metode *purposive sample*. Responden meliputi kepala sekolah, wakil kepala sekolah, ketua program keahlian, dan guru SMK. Teknik pengumpulan data menggunakan kuesioner. Uji prasyarat analisis dilakukan dengan uji normalitas, uji linieritas dan uji multikolinearitas. Hasil penelitian menemukan bahwa kompetensi kewirausahaan kepala sekolah (86,91%) berada pada kategori sangat baik, tantangan kepemimpinan kepala sekolah (83,48%) berada pada kategori tinggi, dan solusi kepemimpinan kepala sekolah (84,49%) termasuk dalam kategori sesuai. Terdapat pengaruh yang signifikan antara kompetensi kewirausahaan dengan solusi kepemimpinan kepala sekolah dengan koefisien korelasi sebesar 0,374. Terdapat pengaruh yang signifikan antara tantangan kepemimpinan dengan solusi kepemimpinan kepala sekolah dengan koefisien korelasi sebesar 0,806, dan terdapat pengaruh yang signifikan antara kompetensi kewirausahaan dengan tantangan kepemimpinan kepala sekolah dengan koefisien regresi sebesar 0,9 atau faktor determinan sebesar 81%.

**Kata kunci:** Kepala Sekolah, Kepemimpinan Kepala Sekolah, Pembelajaran Abad 21, Sekolah Menengah Kejuruan

## Abstract

Education should be able to produce competent human resources. In the era of the industrial revolution 4.0 and 21st-century learning, ahead of vocational school is expected to be increasingly able to diversify educational leadership in all learning activities in the school. Therefore this study aims to analyse entrepreneurial competencies, leadership challenges, and leadership solutions for vocational high school principals in the era of the industrial revolution 4.0 and 21st-century learning. This research is correlational research using *ex-post facto* research. The sample of this study was 35 respondents who were determined using the *purposive sample* method. Respondents included school principals, deputy principals, heads of expertise programs, and vocational school teachers. Data collection techniques are used questionnaires. The analysis prerequisite test is done by normality test, linearity test and multicollinearity test. The results obtained that the entrepreneurial competence of the principal (86.91%) is in the very good category, the principal's leadership challenges (83.48%) are in the high category, and the principal's leadership solutions (84.49%) are included in the appropriate category. There is a significant influence between entrepreneurial competence and the principal's leadership solution with a correlation coefficient of 0.374. There is a significant influence between leadership challenges and the principal's leadership solution with a correlation coefficient of 0.806, and there is a significant effect between entrepreneurial competence and the principal's leadership challenge with a regression coefficient of 0.9 or a determinant factor of 81%.

**Keywords:** Principal, Principal Leadership, 21st-Century Learning, Vocational High School

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## 1. INTRODUCTION

Globalization is a challenge for the world community who knows no boundaries (Fitriyanto & Pardjono, 2019; Popkova et al., 2019). One of the real challenges is that education should be able to produce competent human resources (Claudia & Mihaela, 2021;

Heru et al., 2021; Yaya et al., 2020), known as 21<sup>st</sup>-century competencies. 21<sup>st</sup>-century competence is the main competency students must have to be able to take part in real life in the 21<sup>st</sup>-century (Daryono et al., 2021; Popkova et al., 2019). In this 21<sup>st</sup>-century, schools are challenged to be able to create education that can help produce thinkers who are able to participate in building knowledge-conscious social and economic settings like citizens of the world in the 21<sup>st</sup>-century (Sima et al., 2020; Hedvicakova, 2018; Yan, 2018).

Associated with the era of industrial revolution 4.0, it is necessary to innovate school development that can adjust to the real needs of today where schools must be able to adapt to the business and industrial world (Triyono et al., 2020; Yudiono, 2018). Therefore, entrepreneurial competence is needed so that the principal in leading the school is able to compete and create an education related to school management (Hermann et al., 2020; Sanchez et al., 2020). Efforts to promote, develop, and make schools independent are inseparable from the management of education which emphasizes more on the independence and creativity of schools (Karstina et al., 2021; Okamoto et al., 2020; Rosantono et al., 2021; Tayibnapis et al., 2018). Regarding this, in order to realize an independent and creative school, it is necessary for principals who have high entrepreneurial competence (Huang et al., 2020), so that it will be easy to reach the goals and be able to show their existence in competing in the era of the industrial revolution 4.0 with other schools. (Cetrulo & Nuvolari, 2019; Febrianti et al., 2018; Sima et al., 2020)

Based on the findings of the initial observations made from 2 vocational high schools, namely SMKN 1 Sedayu and SMKN 2 Yogyakarta there are problems regarding the readiness of principals in facing the industrial revolution era 4.0. This needs to be improved, among others, in the management of equipment that are not in accordance with existing standards compared to those found in the industry (Karstina et al., 2021; Rosantono et al., 2021; Widayanto et al., 2021). Then the teachers still have not mastered the knowledge of technology and information that should be known in advance by the teacher so that it can be applied in teaching (Ismail et al., 2018).

The role of the principal's leadership is also not able to influence the existing situation in the school environment (Gawlik, 2018; Khanal et al., 2020; Marfan & Pascual, 2018), namely the existence of the latest information technology in the school has not been optimal in developing information systems that are connected between sections in the school. (Eckman, 2018; Sopa et al., 2020). On the other hand, in the 21<sup>st</sup>-century learning, the facilities in the classroom are still not optimal so that learning can be carried out that refers to 21<sup>st</sup>-century learning (Freeman & Fields, 2020; Hallinger et al., 2018). There are classes that do not yet have projectors, there are also classes that have no connection to the internet (Purnawati et al., 2019; Saifurrahman et al., 2021). The policies of the schools have not been felt to apply the principles of 21<sup>st</sup>-century learning or the principles of the industrial revolution 4.0 (Huang et al., 2020; Khanal et al., 2020).

Several previous studies related to the leadership of school principals state that the principal as a leader must be able to formulate and implement the school's vision and mission, moving his subordinates to be willing to carry out the tasks that are their responsibility with high commitment (González-Falcón et al. 2020; Sanchez et al. 2020; and Stein et al. 2016). Furthermore, they can make decisions on each step in the activities and obstacles faced by the school (Khanal et al., 2020; Zheng et al., 2017). The principal's duties include providing motivation, guidance, and direction to teachers/staff in carrying out their duties (Okamoto et al., 2020; Sopa et al., 2020; Suparman et al., 2019).

Then other previous study revealed that the task of the principal as an administrator in addition to carrying out the preparation of all resources available in the school, both from educators/non-educators and students, facilities and infrastructure, programs and school administration need to be ensured to run smoothly (Lochmiller 2015; Sebastian et al. (2019).

Furthermore, there are study that state principal as a supervisor as research (Gawlik (2018) and Marfan & Pascual (2018). The supervision activities carried out include effective coaching and mentoring for all teachers and staff, both formally and informally in order to achieve high performance (González-Falcón et al., 2020; Marfan & Pascual, 2018).

This research reveals any problems and solutions related to the leadership of the principal. What are the indicators that influence the variables of entrepreneurial competence, leadership challenges, and leadership solutions for school principals. In the end, this study aims to analyse whether there is an influence of entrepreneurial competence and leadership challenges on leadership solutions for vocational high school principals in the Industrial Revolution 4.0 and 21st-Century Learning.

## 2. METHODS

This research is quantitative research with a correlational research design with a post-facto method. This study aims to analyse the relationship between one variable and another. It is descriptive because this study aims to describe entrepreneurial competencies, challenges, and solutions for principals' leadership in the era of the industrial revolution 4.0 and 21<sup>st</sup>-century learning. The research subjects were the principal, vice-principal, head of department and teachers of SMKN 2 Yogyakarta and SMKN 1 Sedayu. The sampling technique used in this study is purposive sampling because the sample to be studied is the researcher's consideration to determine the individual characteristics of the principal. Respondents in this study are shown in Table 1.

**Table 1.** List of Sample Respondents

No	Schools	Position	Total	Information
1	SMKN 2 Yogyakarta	Principal	1	Principal (1)
		Vice principal	4	WK 1 (Curriculum), WK 2 (Students), WK 3 (Facilities and Infrastructure), WK 4 (Public Relations)
		Head of Expertise Program Teachers	7	TGB (1), TTL (1), TPM (1), TAV (1), TKJ (1), TKR (1), and TPT (1)
2	SMKN 1 Sedayu	Principal	1	TGB
		Vice principal	4	Principal (1) WK 1 (Curriculum), WK 2 (Students), WK 3 (Facilities and Infrastructure), WK 4 (Public Relations)
		Head of Expertise Program Teachers	6	TGB (1), TTL (1), TPM (1), TKJ (1), TKR (1), and TPL (1)
		Teachers	3	TGB
<b>Total</b>			<b>35 Respondents</b>	

In this study there are two variables consisting of two independent variables and one dependent variable. The independent variable is the principal's entrepreneurial competence ( $X_1$ ) and the principal's leadership challenge ( $X_2$ ). The dependent variable in this study is the principal's leadership solution ( $Y$ ). The research paradigm can be visualized according to Figure 1.

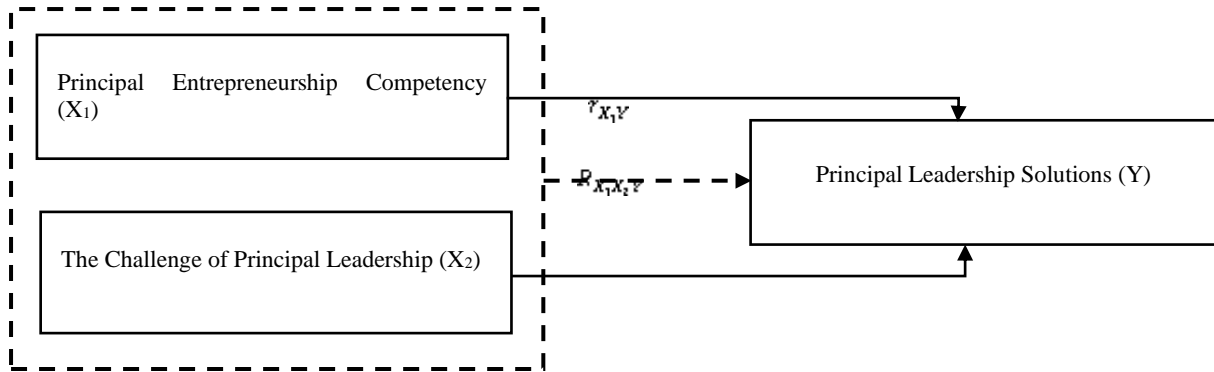


Figure 1. The Research Paradigm

Data collection techniques are questionnaires or questionnaires as the main reference. In this study, the rating scale is set in numerical value by using percent (%) to show estimates of entrepreneurial competence, challenges and solutions for principals' leadership in the era of the industrial revolution 4.0 and 21<sup>st</sup>-century learning. The principal's entrepreneurial competency instrument consists of 5 aspects of indicators consisting of 75 statement items. The instrument of leadership challenges consists of 2 aspects, namely the challenges of principals' leadership in 21<sup>st</sup>-century learning and the era of the industrial revolution 4.0, in total there were 87 statements. The Principal Leadership Solution Instrument consists of 2 sub-variables, namely the principal's leadership solution in 21<sup>st</sup>-century learning and the era of the industrial revolution 4.0, overall, there are 75 statements. Furthermore, the analysis prerequisite test is done by normality test, linearity test and multicollinearity test. Normality Test with the Kolmogorov-Smirnov (K-S). Multicollinearity test by looking at the value of inflation factor (VIF) in the regression model and the value of the individual determination coefficient ( $r^2$ ) as well as looking at the eigenvalue and condition index values. The final analysis is the hypothesis test between sub-variables. Look for the correlation coefficient  $X_1$  and  $X_2$  to  $Y$  calculate the Relative Contribution and Effectiveness Contribution.

### 3. RESULTS AND DISCUSSION

#### Result

This research on entrepreneurial competencies, challenges, and solutions for principals' leadership in the era of the industrial revolution 4.0 and 21<sup>st</sup>-century learning was conducted at 2 SMKs in SMKN 2 Yogyakarta and SM N 1 Sedayu, producing data from the field in the form of scores from questionnaires. This study discusses three variables consisting of two independent variables and one dependent variable, as the independent variable, namely the entrepreneurial competence of the head ( $X_1$ ) and the challenges of the principal's leadership ( $X_2$ ), while the dependent variable is the solution of the principal's leadership ( $Y$ ). This section will describe the results of research data processing which includes scores and percentages of each indicator and sub-variables, Me, SD, frequency distribution tables.

#### Variable Description of Principal Entrepreneurship Competency

Principal's entrepreneurial competence can be seen from the acquisition of 5 subvariable percentages, namely: (a) innovative actions. (b) work hard, (c) strong motivation, (d) never give up and always look for the best solution, and (e) have an entrepreneurial instinct. Based on the principals' entrepreneurial competency questionnaire distributed, it can be seen that the maximum score for the principal's entrepreneurship competency variable is

297 and the minimum score is 221. The recapitulation of the average percentage results for each sub-variable obtained from the results of the study shown in Table 2.

**Table 2.** Recapitulation of Percentage Results for each Sub Variable of Entrepreneurship Principal Vocational School Competency

No	Sub Variable	Average	Percentage	Category
1	Creating innovations that are useful for school development	120.00	85.71	Very good
2	Work hard to achieve school success as an effective learning organization	125.17	89.40	Very good
3	Having a strong motivation to succeed in carrying out the main tasks and functions as a school leader	122.94	87.82	Very good
4	Never give up and always look for the best solution in facing obstacles faced by schools	121.55	86.82	Very good
5	Having an entrepreneurial instinct in managing production/ service activities as a source of learning for students	118.74	84.82	Well
<b>Total</b>		<b>608.4</b>	<b>434.57</b>	<b>Very good</b>
<b>Average</b>		<b>121.68</b>	<b>86.91</b>	

*The Principal Leadership Challenges in the Industrial Revolution 4.0 Era and 21st-Century Learning*

The challenges of the leadership of vocational high school principals in the era of the industrial revolution 4.0 and 21<sup>st</sup>-century learning can be seen from the acquisition of 2 sub variable percentages, among others: (a) the challenges of the leadership of vocational high school principals in 21<sup>st</sup>-century education. The industrial revolution era 4.0. Based on the headmaster leadership challenge questionnaire distributed, it can be seen that the maximum score for the principal challenge leadership variable is 322 and the minimum score is 228. The following table lists the frequency tendency categories for the headmaster leadership challenge variable ( $X_2$ ). The recapitulation of the results of the average percentage of each sub variable obtained from the results in Table 3.

**Table 3.** Recapitulation of Average Percentage Results for each Sub Variable of the Challenges of Vocational School Leadership Leaders

No	Sub Variable	Average Score	Percentage (%)	Category
1	Tantangan kepemimpinanThe challenges of leadership of vocational high school principals in the industrial revolution era 4.0	118.09	84.35	High
2	Leadership challenges for vocational high school principals in 21st Century Learning	115.65	82.60	High
<b>Total</b>		<b>233.74</b>	<b>166.95</b>	<b>High</b>
<b>Average</b>		<b>116.87</b>	<b>83.48</b>	

*Solutions for Vocational High School Principal Leadership in the Industrial Revolution Era 4.0 and 21st-Century Learning*

Vocational high school principal leadership solutions in the 4.0 industrial revolution era and 21<sup>st</sup>-century learning can be seen from the acquisition of 2 sub variable percentages, including: (a) vocational high school principal leadership solutions in 21<sup>st</sup>-century education, (b) vocational high school principal leadership solutions in the industrial revolution era 4.0. Based on the school principal leadership solution questionnaire distributed, it can also be seen that the maximum score for the school leadership leadership variable is 258 and the minimum score is 182. The recapitulation of the average percentage results of sub variable obtained from the results of the study in [Table 4](#).

**Table 4.** Recapitulation of Average Percentage Results for each Sub Variable of Vocational School Leadership Solutions

No	Sub Variable	Average Score	Percentage (%)	Category
1	Solutions for leadership of vocational high school principals in the industrial revolution era 4.0	117.94	84.24	Suitable
2	Leadership solutions for vocational high school principals in 21st-Century Learning	118.64	84.75	Suitable
<b>Total</b>		<b>236.58</b>	<b>168.99</b>	<b>Suitable</b>
<b>Average</b>		<b>118.29</b>	<b>84.49</b>	

*Hypothesis Testing*

The hypothesis is a temporary allegation of the formulation of the problem for that hypothesis must be empirically tested for truth. Testing the hypothesis in this study using simple regression analysis for hypotheses 1 and 2 with Product Moment correlation analysis and using multiple regression analysis for hypothesis 3. The analysis is used to determine the correlation coefficient both individually and together between the independent variables to the dependent variable.

*Hypothesis 1*

Hypothesis 1 testing is performed using a variant analysis, which is a simple regression analysis of 1 predictor. The data is processed with the help of the SPSS. The following [Table 5](#) summarizes the results of regression of 1 predictor between X<sub>1</sub> to Y.

**Table 5.** Summary of Results of Simple Linear Regression Analysis X<sub>1</sub> Against Y

Coefficient	Constant	R	R <sup>2</sup>	P	Decision
53.116	0.606	0.611	0.374	0.00007	Positive and Significant

Based on [Table 5](#) show calculations using SPSS Statistics 25, the probability value (p) of 0.00007 is obtained. Thus the value of p <0.05 (0.00007 <0.05), then there is a positive and significant relationship between entrepreneurial competence and the leading solution of the principal. Thus, Ho is rejected and Ha is accepted. From calculations using SPSS it can be said the magnitude of the constant (a) = 53.116 and the value of the regression coefficient (b) = 0.606. The equation shows that the coefficient value of X<sub>1</sub> is 0.606 which means it is positive and if entrepreneurial competence (X<sub>1</sub>) increases by 1 point, the principal's leadership solution (Y) will increase by 0.606 points. Based on the results of data analysis using the SPSS shows an R<sup>2</sup> of 0.374, this value means that 37.4% of changes in the

principal leadership solution variable (Y) can be explained by the entrepreneurial competency variable ( $X_1$ ) while 62.6% is explained by the variable other variables not examined in this study.

### Hypothesis 2

Hypothesis 2 testing is carried out using variety of analysis, namely simple regression analysis of 1 predictor. The following table summarizes the results of a simple regression of 1 predictor between  $X_2$  to Y shown in Table 6.

**Table 6. Summary of Results of Simple Linear Regression Analysis  $X_2$  Against Y**

Coefficient	Constant	R	R <sup>2</sup>	P	Decision
4.580	0.763	0.898	0.806	9.948x10-8	Positive and Significant

Based on Table 6 show calculations using SPSS, the probability value (p) of 9,948 x 10-8 is obtained. Thus the value of  $p < 0.05$  ( $9.948 \times 10^{-8} < 0.05$ ), then there is a positive and significant relationship between the challenges of the principal's leadership and the principal's leadership solution. Thus,  $H_0$  is rejected and  $H_a$  is accepted. It can be said the magnitude of the constant (a) = 4,580 and the value of the regression coefficient (b) = 0.763. The equation shows that the coefficient value of  $X_2$  is 0.763 which means that it is positive and if the challenges of the principal's leadership ( $X_2$ ) increase by 1 point, the principal's leadership solution (Y) will increase by 0.763 points. Based on the results of data analysis using the SPSS shows R<sup>2</sup> of 0.806, this value means that 80.6% of changes in the principal's leadership solution variable (Y) can be explained by the leadership challenge variable ( $X_2$ ) while 19.4% is explained by other variables not examined in this study.

### Hypothesis 3

Hypothesis 3 testing was performed using multivariate analysis, namely multiple regression analysis of 2 predictors. The following is a summary table of the results of the multiple predictors of 2 regression between  $X_1$ , and  $X_2$  to Y shown in Table 7.

**Table 7. Summary of Results of Multiple Regression Analysis  $X_1$ , and  $X_2$  Against Y**

Coefficient	Constant	R	R <sup>2</sup>	P	Decision
0.082	-4.8	0.900	0.810	5.216x107	Positive and Significant
0.719					

Based on Table 7 show calculations using SPSS, a probability value (p) of 5.216 x 107 is obtained. Thus the value of  $p < 0.05$  ( $5.216 \times 10^7 < 0.05$ ), then there is a positive and significant relationship between entrepreneurial competence and the challenges of the principal's leadership with the principal's leadership solution. Thus,  $H_0$  is rejected and  $H_a$  is accepted. From calculations using SPSS it can be said the magnitude of the constants (a) = -4.8 and the regression coefficient values ( $b_1$ ) = 0.082 and ( $b_2$ ) = 0.719. From the Table 7 equation it can be seen that the coefficient value of  $X_1$  is 0.082 which means that if the entrepreneurial competency of the principal ( $X_1$ ) increases by 1 point, the added value of the principal's leadership solution (Y) is 0.082 points, assuming  $X_2$  remains. The coefficient  $X_2$  is 0.719 which means that if the challenge of the principal's leadership ( $X_2$ ) increases by 1 point, the added value of the principal's leadership solution (Y) is 0.719 points, assuming  $X_1$  remains. The correlation coefficient ( $R_{y(1,2)}$ ) was sought to test hypothesis 3 by looking at how much influence between the principals' entrepreneurial competence ( $X_1$ ) and the challenges of the principal's leadership ( $X_2$ ) on the principal's leadership solution (Y). Based

on the analysis conducted using SPSS, the correlation coefficient between  $X_1$  and  $X_2$  to  $Y$  was 0.900. The correlation coefficient value is then consulted with the correlation coefficient interpretation shown in [Table 8](#).

**Table 8.** Interpretations of the Coefficients  $X_1$  and  $X_2$  with  $Y$

Correlation	r value	Value of Interpretation	Decision
$X_1$ and $X_2$ to $Y$	0.900	0.80 – 1.00	Very Strong

The [Table 8](#) shows that the calculated R-value is between 0.80 - 1.00 so that the resulting correlation coefficient is included in the category strong with positive values. The results of r arithmetic were consulted with the price of r table with a significance level of 5% and  $N = 35$  was 0.344 (used N table = 35). This shows that  $r_{\text{arithmetic}} > r_{\text{table}}$ . So it can be concluded that  $H_0$  was rejected and  $H_a$  was accepted, namely there was a positive and significant influence between entrepreneurial competence and the challenges of principals' leadership to the leading solutions of vocational high school leaders in the era of the industrial revolution 4.0 and 21<sup>st</sup>-century learning.

### Discussion

Based on the results of data analysis using the SPSS, shows  $R^2$  of 0.81, this value means that 81% change in the variable Principal leadership solution ( $Y$ ) can be explained by the entrepreneurial competency variable ( $X_1$ ) and the challenge of the principal's leadership ( $X_2$ ) while 19% is explained by other variables not examined in this study ([Oyerinde et al., 2020](#); [Triyono et al., 2020](#)). Based on the results of the above analysis, it can be seen that entrepreneurial competence ( $X_1$ ) provides a Relative Contribution (SR) of 5.02% and the challenge of school principal leadership ( $X_2$ ) of 75.98%. Effective Contribution (SE) of each variable is 6.2% for entrepreneurial competence ( $X_1$ ) and 93.80% for the challenges of school principal leadership ( $X_2$ ). Together the feasibility of the production unit and entrepreneurial interest gives an SE of 81% to the entrepreneurial spirit, and 19% is determined by other variables not examined in this study.

Entrepreneurship competency in vocational high school principals' in 2 schools that researchers reviewed, can be categorized very well with the acquisition of a percentage of 86.91%. From the analysis of the data it was found that the leadership challenges of vocational high school principals in the industrial revolution era 4.0 were relevant to the indicator items that researchers presented and could be elaborated as follows ([Daryono et al., 2020](#); [Nurtanto et al., 2020](#)): (a) diversification and job creation by 81.90% were categorized high, (b) the ease of socio-cultural regulation of 84.11% which is categorized high, (c) a trusted workforce of 86.13% which is categorized very high, (d) leadership and vision of 81.43% which is categorized high, (e) productivity and practice professionals at 82.86% categorized high, (f) support, management, and operations 83.1% categorized high, (g) learning and teaching amounting to 81.59% categorized high, (h) assessment and evaluation 80,28% were categorized high, (i) problems, legal, social and ethics were 82.60% categorized high. From the results of data analysis, it is found that the challenges of leadership in vocational high school principals in the 21<sup>st</sup>-century learning are relevant to the indicator items that researchers present and can be described as follows: (a) life and work skills of 83.24% which are categorized high, (b) learning and innovation skills of 83.95% which are categorized high, (c) technology and information media skills of 85.87% which are categorized very high.

From the analysis of the data, it was found that the leadership solution of the vocational high school principals in the industrial revolution era 4.0 was in accordance/relevant to the indicator items that the researchers presented and could be



described as follows (Hartoyo et al., 2018; Lim & Lee, 2019; Yunos, 2019): (a) oriented to individual performance in the world of work by 84.82% which was categorized according to, (b) special justification on real needs in the field of 83.71% which is categorized accordingly, (c) curriculum focus on psychomotor, affective, and cognitive aspects of 85.45% which is categorized very suitable, (d) training, assistance and evaluation to educators to realize responsive, reliable and adaptive educators. as much as 84.43% are categorized accordingly, (e) benchmarks of success are not only limited to schools by 81.43% which are categorized accordingly, (f) sensitivity to the development of the world of work by 86.11% which is categorized very appropriate, (g) require adequate facilities and infrastructure of 83.71% which are categorized accordingly. From the analysis of the data it was found that the leading solutions of vocational high school principals in 21<sup>st</sup>-century learning were very appropriate/relevant to the indicator items that the researchers presented and could be described as follows: (a) the suitability of curriculum implementation and education policy in vocational high school by 83.81% categorized appropriate, (b) readiness of human resources in the utilization of ICT by 83.75% which is categorized accordingly, (c) readiness of HR in optimizing the abilities and character of students by 86.19% which is categorized very suitable, (d) readiness of facilities and infrastructure of 85.24% which is categorized as very appropriate.

There is a significant influence between the principals' entrepreneurial competence on principals' leadership solutions in the 4.0 industrial revolution era and 21<sup>st</sup>-century learning. This is evidenced by the correlation coefficient  $r_{\text{value}} 0.661 > r_{\text{table}} 0.344$  while the determinant coefficient or the magnitude of the contribution of the influence of principals' entrepreneurial competence towards Principal's leadership solution is 0.374 or 37.4% and the equation  $Y^{\wedge} = 53.116 + 0.606 X_1$  is obtained. There is a significant influence between the challenges of principals' leadership to principals' leadership solutions in the industrial revolution era 4.0 and 21<sup>st</sup>-century learning. This is evidenced by the calculated correlation coefficient of 0.898  $> r_{\text{table}}$  of 0.344 while the determinant coefficient or the magnitude of the contribution of the influence of the principal's leadership challenges to solutions the principal's leadership in the industrial revolution era 4.0 and 21<sup>st</sup>-century learning was 0.806 or 80.6% and the  $Y^{\wedge} = 4.58 + 0.763 X_2$  was obtained.

It is in line with previous study related to the leadership of school principals state that the principal as a leader must be able to formulate and implement the school's vision and mission, moving his subordinates to be willing to carry out the tasks that are their responsibility with high commitment (González-Falcón et al. 2020; Sanchez et al. 2020; and Stein et al.2016). Furthermore, they can make decisions on each step in the activities and obstacles faced by the school (Khanal et al., 2020; Zheng et al., 2017). It is also reinforce by other previous study that state the principal's duties include providing motivation, guidance, and direction to teachers/staff in carrying out their duties (Okamoto et al., 2020; Sopa et al., 2020; Suparman et al., 2019)

Hopefully with this research, it is hoped that principals can lead schools by improving and guaranteeing school services because of the challenges that arise in the era of the industrial revolution 4.0 and 21st-century learning. Principals are expected to be able to find indicators of problem-solving solutions from professional performance and leadership challenges as a form of leadership solutions in the era of the industrial revolution 4.0 and 21st-century learning as stated in this study. The limitations of this study are the instrument only consists of 2 aspects, namely the challenges of principals' leadership in 21<sup>st</sup>-century learning and the era of the industrial revolution 4.0. Then the research subjects were still limited which only included principals, vice principals, heads of departments and teachers in only two school, namely SMKN 2 Yogyakarta and SMKN 1 Sedayu.

#### 4. CONCLUSION

Based on the conclusions from the results of the research conducted above, there is an influence of entrepreneurial competence and leadership challenges on the principal's leadership solution in the era of the industrial revolution 4.0 and 21st-century learning. Each variable shows a positive and significant effect. Therefore, the higher the entrepreneurial competence and the challenges of the principal's leadership, the higher the level of the principal's leadership solution in the era of the industrial revolution 4.0 and 21st-century learning. Principals are expected to better prepare themselves to improve services in schools based on the five existing competencies as a form of performance in order to be able to face the development of the use of technology in the era of the industrial revolution 4.0 and 21st-century learning.

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