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Competency of Vocational Education Teachers in the Society Era 5.0

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Abstract

Pada saat sekarang ini penguasaan kompetensi di era masyarakat 5.0 bagi guru dan siswa seiring dengan perkembangan ilmu pengetahuan dan teknologi di bidang pendidikan kejuruan masih kurang memuaskan dan jauh dari kata memuaskan. Penelitian ini bertujuan untuk menganalisis sejauh mana kesiapan kompetensi guru di era masyarakat 5.0. Penelitian ini menggunakan desain penelitian survei dengan total keterlibatan 340 responden yang terdiri dari guru pendidikan kejuruan. Metode angket digunakan untuk mengukur seluruh kompetensi di era masyarakat 5.0 dengan instrumen angket skala 4 Likert. Data dianalisis secara deskriptif berdasarkan rata-rata dan persentase masing-masing kompetensi, serta dianalisis menggunakan uji t sampel independen dan uji post hoc Dunnett. Hasil penelitian mengungkapkan bahwa semua kompetensi di era society 5.0 pada guru tinggi dan tidak berbeda secara signifikan dalam cakupan semua karakteristik responden. Kemudian pendidikan vokasi sebagai lembaga pengembangan sumber daya manusia memiliki peran penting dalam mentransformasi pembelajaran berbasis masyarakat 5.0 untuk menjawab tantangan yang ada di era tersebut.

Keywords: *Kompetensi; Guru Sekolah Kejuruan; Era Masyarakat 5.0.*

Abstract

Mastery of competence in the era of society 5.0 for teachers and students along with the development of science and technology in vocational education is still far from satisfactory. This study aims to analyze how far the readiness of teacher competencies is in the era of society 5.0. This study uses a survey research design with a total involvement of 340 respondents from vocational education teachers. The questionnaire method was used to measure all competencies in the era of society 5.0 with a 4-Likert scale questionnaire instrument. Data were analyzed descriptively based on the average and percentage of each competency, and also analyzed using the independent sample t-test and post hoc Dunnett test. The results of the study revealed that all competencies in the era of society 5.0 in teachers were high and did not differ significantly in the coverage of all characteristics of the respondents. Vocational education as a human resource development institution has an important role in transforming learning based on the society 5.0 era to respond to the challenges that exist in that era.

Keywords: Competency; Vocational Teachers; Society Era 5.0.

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1. INTRODUCTION

Society 5.0 is a concept initiated by the Japanese government. The concept of society 5.0 is not only limited to manufacturing factors but also solves social problems with the help of the integration of physical and virtual spaces to create a human-centered and technology-based society (Hermawan et al., 2020; Skobelev & Borovik, 2017). The era of society 5.0 is a continuation of the industrial revolution 4.0 era which emphasizes the human side in solving social problems including education by integrating virtual and reality. The concept was adopted by the Japanese government to anticipate fluctuation and disruption due to the industrial revolution 4.0 which gave rise to various innovations in the industrial world, causing complex and ambiguous uncertainty (Hermawan et al., 2020; Umro, 2020). Society 5.0 is a kind of bond between the changes taking place in technology, digital, and information, and focusing its activities on the concept of sustainable community development. In other words, the vision of Society 5.0 requires us to think about two types of

relationships: the relationship between technology and society and the technology-mediated relationship between the individual and society (Deguchi et al., 2018; Sułkowski et al., 2021). Society 5.0 can be considered as an answer to the demands of a human/human-cantered paradigm of society, starting from the reorganization (structural, organizational, managerial, knowledge-based, philosophical, and cultural) of the production process to then produce positive implications, in a business and innovation perspective (Carayannis et al., 2021; Carayannis, Christodoulou, et al., 2022; Carayannis, Dezi, et al., 2022; Carayannis & Morawska-Jancelewicz, 2022). This anticipation arises from the fear of the invasion of the industrial revolution 4.0 which continues to erode the values of human character that Japan has so far held. The era of disruption and VUCA (volatility, uncertainty, complexity, and ambiguity) make them have to build concepts that highlight the human side of the technological devices they make (Hermawan et al., 2020; Yoshino et al., 2020).

VUCA is a rapid, unpredictable, and uncontrollable change of order because it has multiple effects. Society 5.0 has the concept of big data technology collected by the Internet of things (IoT) transformed by Artificial Intelligence (AI) into something that will be dedicated to improving capabilities human (Özdemir & Hekim, 2018). Society 5.0 requires human resources with new competencies that are much different from previous ones (Umro, 2020; Wagiran et al., 2019). The era of society 5.0 will change the entire social order in various fields. In the field of education, this change must be supported by the strengthening of competencies that must be mastered by teachers. The competencies needed by teachers in the era of society 5.0 are social competencies that are adaptive and able to transform values in managing themselves and all the potential contained in them. And the most important thing that must be prepared to face the era of society 5.0 is competence that can solve problems with a humanistic approach (Carayannis, Christodoulou, et al., 2022; Hermawan et al., 2020). In carrying out learning activities, vocational education teachers must specifically complete students with work experience and work knowledge, work attitudes, and work skills as real work experience, to facilitate the transition of graduates from school to the world of work (Flynn et al., 2016; Grollmann, 2008).

Previous studies state that vocational school graduates need new skills that are different from the previous era (Made Sudana et al., 2019). This has implications for vocational education teachers to adapt to complexity and change. It is in line with another previous study that states teachers are not the only component of the vocational education system, but they play an important role as active facilitators of the system, with a direct influence on educational processes and educational outcomes (Metzler & Woessmann, 2012). Therefore, teachers must have adaptive and transformative social potential to manage themselves and all the potential they contain for a balanced and sustainable well-being life (Kintamani DH, 2011; Purnama & Dwikurnaningsih, 2021). The role of teachers in the era of society 5.0 is not only transferring knowledge but more emphasizing character education in the form of character, morals, ethics, and exemplary, because if it is only related to the transfer of knowledge then technology can be replaced (Hermawan et al., 2020; Wagiran et al., 2019). With the birth of society 5.0, it is expected to be able to create technology in the field of education that does not change the role of teachers in teaching moral and exemplary education to students. This study was conducted to analyze how far the readiness of teacher competence in the era of society 5.0 is. In addition, we also tested the interrelationships between variables, making it possible to come up with recommendations for increasing competence that include predetermined variables.

2. METHODS

This survey uses a design developed (Rea & Parker, 2014), with a total involvement of 340 respondents. The data used in this study uses primary data sourced from data collected by distributing online questionnaires. The population of this research is vocational education teachers in Indonesia. Due to the unknown population, the sample was taken using a simple random sampling technique. Sampling results were obtained from a research sample of 340 vocational education teachers spread across 11 provinces in Indonesia. Then considering the difficulty of obtaining a complete and ideal number of samples, most of the samples obtained were from vocational education in Yogyakarta. The general characteristics of respondents in this study will clearly be described in Table 1.

Table 1. Distribution of Respondent Data

Category	Public School		Private School	
	F	%	F	%
Male	84	24.71	112	32.94
Female	62	18.24	82	24.12
DIY	82	24.12	60	17.65
Jawa Tengah	14	4.12	102	30.00
Jawa Timur	6	1.76	8	2.35
Jawa Barat	4	1.18	2	0.59
DKI Jakarta	6	1.76	2	0.59
Lampung	2	0.59	20	5.88
Kalimantan Selatan	16	4.71	0	0.00
Kalimantan Timur	2	0.59	0	0.00
Kalimantan Barat	2	0.59	0	0.00
NTB	10	2.94	0	0.00
NTT	2	0.59	0	0.00

An assessment instrument that has been designed and developed by several experts and previous research (Astuti et al., 2021; Mutohhari et al., 2021; Trilling, B., & Fadel, 2009). The instrument was transliterated into Indonesian, making it easier for research subjects to understand each item in the instrument, and presented through one of the electronic survey platforms, namely Google Form. The instrument used is a 4 Likert scale questionnaire with answer choices strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD). Testing the questionnaire data using the product moment validity test, where if the p-value is below 0.050 with a significance of 5% it is declared valid, and a reliability test where a variable is said to have high reliability if it has a value of $r > 0.8$. The test results show that the p-value on the product-moment correlation coefficient is below 0.050 for all items, so all items are declared valid. Likewise, the value of the resulting reliability coefficient is also above 0.800, so it is included in the reliable category. Thus, the instrument is declared feasible to use. Meanwhile, the following is a grid of instruments used to measure the competence of vocational education teachers in the era of society 5.0 which is shown in Table 2.

The data collected were analyzed using descriptive statistics based on the average and percentage of each competency, to describe the percentage of vocational education teacher competency attainment in the era of society 5.0. The interpretation criteria by comparing the average score with the category refer to Mardapi's opinion as shown in Table 3.

Table 2. Grid of Research Instrument

Teacher Competency	Code	Indicators	Item
Complex problem solving	C1	The quality of the problem	3
		Complexity of ways	4
		Solution analysis skills	3
Critical thinking	C2	Effective reasoning	2
		Systemic thinking	2
		Complex assessment	2
		Quality of decision making	2
Creativity	C3	Creative thinking	4
		Creative in collaborating	4
		Implementing innovation	2
Collaboration	C4	Collaborative work responsibilities	1
		Efficiency of use	2
		Effectiveness of use	2
Communication	C5	Clarity of verbal articulation	1
		Effectiveness in listening	1
		Clarity of purpose of communicating	1
		The use of ICT in communicating	1
		Flexible compromises	1
Technological Competencies	C6	Technological Awareness	1
		Technological literacy	1
		Technological capability	1
		Technological creativity	1
		Technological criticism	1
Career life skills	C7	Flexibility and adaptability	1
		Initiative and self-direction	1
		Social and cross-cultural skills	1
		Productivity and accountability	1
		Leadership and responsibility	1

Table 3. Criteria for Average Results

Formula	Interval score			Category
	C1, C3	C2	C4, C5, C6, C7	
$Mi + 1{,}5\ SDi \leq M \leq Mi + 3{,}0\ SDi$	32.5–40.0	26.0-32.0	16.25–20.0	Very High
$Mi + 0\ SDi \leq M \leq Mi + 1{,}5\ SDi$	25.0–32.5	20.0-26.0	12.5–16.25	High
$Mi - 1{,}5\ SDi \leq M \leq Mi + 0\ SDi$	17.5–25.0	14.0-20.0	8.75–12.5	Low
$Mi - 3{,}0\ SDi \leq M \leq Mi - 1{,}5\ SDi$	10.0–17.5	8.0-14.0	5.0–8.75	Very Low

In addition, the data were also analyzed using a post-hoc t-test to test the differences in the level of competence between societies 5.0. Finally, product moment correlation analysis was also adopted to test the relationship between variables, thus giving rise to new recommendations related to their relationship.

3. RESULTS AND DISCUSSION

Result

The competence of vocational education teachers in facing the era of society 5.0 is high. The level of teacher competence in each indicator is more than 50%. A descriptive analysis of vocational education teacher competency data in the era of society 5.0 is presented in Table 4.

Table 4. Competency of Vocational Education Teachers in the Social Era 5.0

Teacher Competency	Item	Mean	Percentage	Median	Mode	Stv. Dev	Min	Max	Category
Complex problem solving	10	31.05	77.62%	30	30	4.323	13	40	High
Critical thinking	8	23.99	74.98%	24	24	3.321	8	32	High
Creativity	10	30.50	76.25%	30	30	4.234	19	40	High
Collaboration	5	15.61	78.07%	15	15	2.038	10	20	High
Communication	5	15.54	77.71%	15	15	1.981	10	20	High
Technological Competencies	5	15.62	78.10%	15	15	2.217	10	20	High
Career life skills	5	15.35	76.75%	15	15	2.074	10	20	High

Based on Table 4, information is obtained that the competence of vocational education teachers in facing the era of society 5.0 is included in the "high" category for all skill indicators. The results of the acquisition of vocational education teacher competency readiness in the era of society 5.0 in Indonesia are: 1) complex problem-solving competence with a percentage of 77.62% in the high category; 2) critical thinking competence with a percentage of 74.98% is in the high category; 3) creativity competence with a percentage of 76, 25% is in the high category; 4) collaboration competence with a percentage of 78.07% is in the high category; 5) communication competence with a percentage of 77.71% is in the high category; 6) technological competencies with a percentage of 78.10% are in the high category; and 7) career life skills competence with a percentage of 76.75% in the high category. To find out the difference between each indicator, a post hoc test data analysis was performed using the Tukey method. A comparison of the competency levels of vocational education teachers in the era of society 5.0 is shown in Table 5.

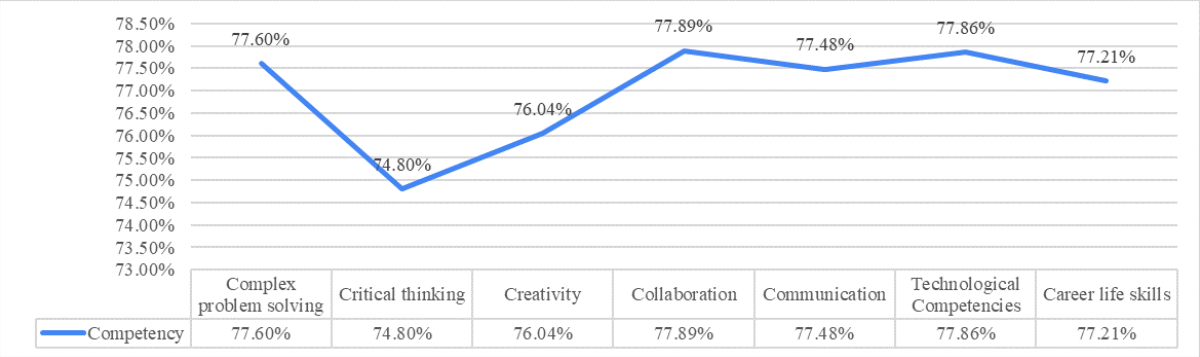
Table 5. Tukey Post Hoc Test Result on Teacher Competence

C	C	Mean. Diff	Sig	C	C	Mean. Diff	Sig
C1	C2	0.1034	0.021	C4	C5	0.0165	0.999
	C3	0.0535	0.633		C6	0.0012	1.000
	C4	-0.0206	0.995		C7	0.0271	0.980
	C5	-0.0041	1.000	C5	C1	0.0041	1.000
	C6	-0.0194	0.977		C2	0.1075	0.014
	C7	0.0065	1.000		C3	0.0576	0.546
C2	C1	-0.1034	0.021		C4	-0.0165	0.999
	C3	-0.0499	0.708		C6	-0.0153	0.999
	C4	-0.124	0.002		C7	0.0106	1.000
	C5	-0.1075	0.014	C6	C1	0.0194	0.997
	C6	-0.1228	0.002		C2	0.1228	0.002
	C7	-0.0969	0.040		C3	0.0729	0.253

C	C	Mean. Diff	Sig	C	C	Mean. Diff	Sig
C3	C1	-0.0535	0.633		C4	-0.0012	1.000
	C2	0.0499	0.708		C5	0.0153	0.999
	C4	-0.0741	0.236		C7	0.0259	0.984
	C5	-0.0576	0.546	C7	C1	-0.0065	1.000
	C6	-0.0729	0.253		C2	0.0969	0.040
	C7	-0.0471	0.762		C3	0.471	0.762
C4	C1	0.0206	0.995		C4	-0.0271	0.980
	C2	0.124	0.002		C5	-0.0106	1.000
	C3	0.0741	0.236		C6	-0.0259	0.984

Based on Table 5, a significance value below 0.05 indicates that there is a significant difference between indicators, while a significance value above 0.05 indicates that there is no significant difference between indicators. Competency of vocational education teachers in the society era 5.0 is seen in Figure 1.

Figure 1. Competency of vocational education teachers in the social era 5.0



The results of the analysis of the relationship between the variables of community competence 5.0 are shown in Table 6.

Table 6. Relationship Between Competency Variables Society 5.0

Correl action	C1	C2	C3	C4	C5	C6	C7
C1	-	0.826***	0.661***	0.261***	0.566***	0.704***	0.254***
C2	0.826***	-	0.284***	0.482***	0.196**	0.583***	0.361***
C3	0.661***	0.284***	-	0.571***	0.118*	0.466***	0.612***
C4	0.261***	0.482***	0.571***	-	0.418***	0.525***	0.413***
C5	0.566***	0.196**	0.118*	0.418***	-	0.494***	0.407***
C6	0.704***	0.583***	0.466***	0.525***	0.494***	-	0.804***
C7	0.254***	0.361***	0.612***	0.413***	0.407***	0.804***	-

Base on Table 6 shows that the teacher presents the value of the correlation coefficient and p-value with a significance level of 5%. The results of the analysis show that community competencies 5.0 which include complex problem solving, critical thinking,

creativity, collaboration, communication, digital literacy, and career life skills are significantly correlated. The value of the correlation coefficient is comparable to the r table for a sample of 300, besides that, it is also followed by a p-value below 0.050, so it is stated that all competencies have a significant relationship.

Discussions

Competency Readiness of Vocational High School Teachers in Facing Society 5.0

The percentage of technological competencies readiness is at the highest level of other competencies, namely 78.10%. Currently, the technological competencies of teachers can be said to have increased in line with COVID-19 with online distance learning, which requires teachers to learn and master these competencies (de Vore & Pilain, 2022; Sadaf & Johnson, 2017). A thorough understanding of digital technology can also help support problem-solving in learning. The teacher's role as a learning facilitator must be able to guide students and become a role model for students, aiming to increase the maturity of the digital skills of vocational education students. The more mature the level of digital technology competence possessed by vocational education teachers, the better the learning process for forming students' digital competencies (Astuti et al., 2021; Lawrence & Tar, 2018; Riyanto et al., 2020).

Vocational education must educate and train teachers in-depth and thoroughly in digital technology by providing training to vocational education teachers on how to properly teach digital technology and mature digital technology to students (Astuti et al., 2021; Kivunja, 2013; Prasasti et al., 2019). In addition, vocational education teachers need to align digital facilities and infrastructure to support digital competency-based learning (Devi et al., 2020; Van Hong & Do Van Dung, 2019). Currently, digital transformation is very much needed in the world of vocational education. Digital transformation means development, in the sense of integrating not only machines and IT infrastructure but also people. This requires reinventing the organization its vision and strategy, organizational structure, processes, capabilities, and culture. Artificial intelligence can be both an enabler and a threat to organizations so organizations must find a way to successfully manage their transition toward the desired future (Carayannis & Morawska-Jancelewicz, 2022). In the future, information-based technology innovations such as IoT, AI, and robotics are expected to generate new added value, but this is one of the biggest challenges that must be faced (Carayannis & Morawska-Jancelewicz, 2022). Digital transformation attempts to measure the extent to which organizations can benefit from the use of information technology (IT), but is also seen as an evolutionary process in which IT becomes a fundamental element of everyday life, influencing all dimensions involving both people and organizations themselves (Rodríguez-Abitia & Bribiesca-Correa, 2021).

Critical thinking gets the lowest percentage gain with a percentage of 74.98%. Critical thinking is one of the competencies that teachers must have in the era of society 5.0 as an important reference for completing complex work. The basic idea is that critical thinking is about: 1) being skeptical of absolute claims to knowledge, from the belief that there are many different ways of looking at problems and issues, both in science and in society; 2) being able to consider different perspectives, and (c) ultimately being able to decide what to do or believe (Dekker, 2020; Mutohhari et al., 2021). This can help other educators to design educational environments that foster critical thinking effectively. Applying critical thinking skills in doing work can increase benefits and get high results. In addition, critical thinking skills can help in problem-solving-oriented activities. In this study, critical thinking is the competency with the lowest average score of other competencies. Based on the statement items on the research instrument, it is known that teachers have problems in learning management literacy which is oriented to the use of inductive and deductive reasoning. In

this context, teachers need training and guidance to get the most out of competency-based learning management (Mutohhari et al., 2021; Sholihah & Lastariwati, 2020).

Comparison competency levels of vocational education teachers in the era of society 5.0.

The first significance value below 0.05 is found in the difference between complex problem-solving and critical thinking competencies with a significance value of 0.021. This shows that the readiness for complex problem-solving competencies is significantly different from critical thinking. This means that the readiness of vocational education teachers in this competency is not evenly distributed. Solving complex problems is an important aspect that must be fully understood by teachers. Problem-solving ability is an important basis for vocational education teachers to deal with teaching activities (Greiff et al., 2013; Hussin et al., 2018). Distractions in work, competence, and technology require problem-solving skills to solve job problems. A person cannot be separated from the problems of everyday life which are increasingly complex, so problem-solving skills are needed to solve these problems (Iñiguez-Berrozpe & Boeren, 2020; Mutohhari et al., 2021).

The second significance value below 0.05 is found in the difference between critical thinking competence and collaboration skills with a significance value of 0.002. This shows that critical thinking competency readiness is significantly different from collaboration skills. The ability to collaborate in the learning process is a form of cooperation that helps and complements each other to perform certain tasks to obtain a predetermined goal (Dowell et al., 2020; Sumarno, 2019). Collaboration is an important aspect that teachers must have in carrying out learning activities to support problem-solving, and critical and creative thinking skills. To improve collaboration skills teachers, practical training in collaboration skills is needed so that it can address the needs that teachers must have (Luke & Vaughn, 2022; Trilling, B., & Fadel, 2009). Collaboration skills can be learned through a variety of methods, but are best learned socially, by collaborating directly with others, either physically, face-to-face, or virtually, through technology. The third significance value below 0.05 is found in the difference between critical thinking competencies and communication skills with a significance value of 0.014. This shows that critical thinking competence readiness is significantly different from communication skills. The world of education has always paid attention to the basics of good communication, correct speech, fluent reading, and clear writing, digital tools and the demands of our time require a much wider and deeper portfolio of personal communication skills to encourage learning (Sumarno, 2019; Trilling, B., & Fadel, 2009). Appropriate communication is an ability that teachers must have in the implementation of learning activities. The communication skills needed in the learning process are understanding, managing, and creating effective communication in various forms and contents orally, in writing, and through technology. With good communication, the learning objectives will be fully conveyed. In addition, the ability to communicate in the right way of expression can support increased creativity and critical thinking in learning (Budi et al., 2020; Epçaçan, 2019). The fourth significance value below 0.05 is found in the difference between critical thinking competence and career life skills with a significance value of 0.040. This shows that critical thinking competency readiness is significantly different from career life skills. Career life skills require teachers to be able to adapt to change and be flexible in learning activities, able to manage goals and time, work independently and become educators who can control themselves, able to interact and work effectively with diverse groups.

Relationship between Competency Variables Society 5.0

The significant influence between the variables of society 5.0 competence indicates that the seven competencies are complete competence and cannot be separated in their formation. That is, each other from the competency variables is mutually needed and mutually construct so that in growing one competency, the other six competencies are

needed. The significant influence between the competency 5.0 variants of society is caused by various important factors. Previous studies investigate the importance of the seven competencies in navigating the era of society 5.0 sequentially, namely by placing career life skills at the top (Gandasari et al., 2020). Other researchers said that career life skills are an important key to continuing to maintain and develop career life for individuals in a sustainable manner (Trilling & Fadel, 2009). In constructing career life skills, of course, a person's maturity level is needed in solving problems in various aspects and conditions. Meanwhile, the complexity of the problems that exist in life requires a person to have complex problem-solving skills. In constructing complex problem-solving, the importance of criticality and creativity in thinking to construct it (Lee et al., 2019; Tan, 2009). Thus, in forming career life skills for teachers, it is very necessary to develop critical thinking and creativity that can be provided for solving complex problems, so that career life skills can be formed automatically. Forming a critical and creative mindset is lead to effective collaboration and communication skills. The ideal intensity of collaboration and supported by an effective communication process will support one's creativity in formulating problem-solving solutions (Nonthamand & Songkhla, 2018; Rizaldi et al., 2020). In addition, an effective level of communication causes the collaboration process to run smoothly, so that it can improve complex problem-solving skills that are useful in supporting the formation of career life skills (Bravo et al., 2021; Trilling, B., & Fadel, 2009). The efficiency and effectiveness offered by digital technology as a digital source of learning and teaching are certainly very much needed for strong digital literacy (Falloon, 2020; Lankshear & Knobel, 2008). The results of this study are also consistent with previous studies that have succeeded in identifying the relationship between complex problem-solving skills, critical thinking, creativity, collaboration, communication, digital literacy, and career life skills (Rizaldi et al., 2020).

4. CONCLUSION

The competency level of vocational education teachers in welcoming the era of society 5.0 shows high results. Required skills include complex problem-solving, critical thinking, creativity, collaboration, communication, technological competencies, and career life skills. Teachers have learning management literacy oriented to the use of inductive reasoning, deductive reasoning, and verification which is still lacking than other indicators. This shows that training and learning innovations that are relevant to teacher competence in welcoming the era of society 5.0 are important to be improved through coaching by related educational institutions. Vocational education as a human resource development institution has an important role in transforming learning based on the society 5.0 era to respond to the challenges that exist in that era.

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