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The Distributions of Vocational High School Teachers' Advanced Digital Competence (ADC)

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Abstract: Digital competence is one of the significant skills to be possessed by the teachers as the impact of rapid technology development in many aspects such as economy, education, health, and environment. Various digital competence measurements and frameworks had been developed to ensure that someone has an advance digital skill and one of those is DigComp 2.1 by European Commission. Many previous studies had been studied about teachers' digital competence levels influenced by some factors such as age, gender, working period, and educational background. However, it is infrequently analysed that the advance digital competence (ADC) of Vocational High School (VHS) teachers is differentiated by engineering field and non-engineering field, area or region and its school quality. Moreover, this study aimed: (a) to show the ADC level analysis between VHS teachers in engineering and non-engineering school, (b) to delineate the ADC level of VHS teachers based on the islands where the school is located, and (c) to represent the impact of school quality towards the VHS teachers' ADC level. The data was analysed using a quantitative approach with a descriptive statistics method. Additionally, the instruments of the survey to collect the data were adapted from the DigCompEdu framework in part of advanced level and measured using Likert scale. The participants of this study were 392 respondents but, it was classified and divided into some fields based on VHS fields, islands and school accreditation. The result of this study expounded that VHS teachers in the engineering field have higher scores at the ADC level even though there are some ADC components that should be upgraded by the VHS teachers in both fields. Meanwhile, islands and school accreditation had no significant impact yet showed the opposite result.

Keywords: Advanced Digital Competence (ADC), Vocational High School (VHS), digital skills

1. Introduction

The shift of conventional to digital is being a concern in decades. Digitalization had been spread out through all aspects of life starting from the economy, health, education, and environment since 1990s and contributed as a major strength of a country (Edet & Ekpoh, 2019; Milenkova & Manov, 2019; Zhao et al., 2021). Since the fact that the COVID-19 affected almost the whole world, the teachers had been challenged by the situation to deliver and integrate the teaching process through online using digital media (Damşa et al., 2021; Jimoh et al., 2020; Muktiarni et al., 2021).

Genuinely, distance learning has been cultured for decades ago (Zhao et al., 2021). Nevertheless, it is still uncommon for the teachers to fully conduct the teaching in a distance surprisingly by the escalation of COVID-19. The teachers of elementary to higher education was adapted by the inconvenient of distance learning since not all the teachers are proficient enough in using digital tools because of some factors such as age, gender, educational background, school facilities, and years of teaching; yet some of the studies claimed that age and gender did not

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significantly affect the digital competence (Asan, 2003; Çam & Kiyici, 2017; Emosda & Annisa, 2020; Saripudin et al., 2021; Yildiz, 2020). Teacher readiness in schooling digitally also challenged by their digital competence. Some previous studies measuring the teachers' level of digital literacy explicated that teachers' digital competences are predominantly in intermediate level (Astuti et al., 2021; Lucas et al., 2021; Zhao et al., 2021). Derived from the DigComp framework, there are 3 levels of digital competence which could be mastered gradually. The level starting from A-foundation, B-Intermediate, and C-Advanced. Foundation level is a basic level for understanding and aware of the new technologies but limited in how to operate it. Intermediate level means that someone could operate the new technologies well. Then, Advanced level describe someone's ability to upgrade their digital competence by creating product or frequently being aware of their digital competence needs (Ferrari et al., 2013).

Digital competence can be termed as digital literacy, digital skills, and digital ability (Zhao et al., 2021). Based on the framework constructed by the European Commission, the digital competence contains some elements such as information, communication, content creation, safety, and problem solving (Ferrari et al., 2013). Information literacy in digital competence means that the individual could analyze the information through digital and also filter the information which usually retrieved from some internet source. The information literacy competences that should be mastered by the individual are browsing, searching and information filtering, and citing information through the internet source. Secondly, the communication literacy in digital competence includes technology interaction, content sharing, online engagement through social media, collaboration, etc. Related to the content, (Ferrari et al., 2013) continued to mention that content creation is sharply important as one of the digital competence. In content creation literacy, there are four different points that should be learned or even mastered. Those are content development, content integration and elaboration, copyright and licenses, and programming. In the content creation analysis, the individual is required to produce a content starting from preparing the content to producing the final content product. In producing the content, the individual could use many media creator such as video editor, photo editor, application, online quiz, or other interactive media. The upcoming competence in digital competence is digital security. In mastering digital security, the individual should understand about device, digital identity, and data protection. The protection could use antivirus. The last competence which included in the DigCompEdu framework is problem solving. In problem solving skill, the individual requires to solve the digital problem while there is an error in technical problem, technology updating, technology innovation and creation.

In terms of digitalization in teaching, all the teachers from any school levels are required to upgrade their digital competence especially for vocational high school teachers that they are required to master a specific competence based on their fields. The teachers' digital competence is not a seasonal competence but, digital competence is a continuous skill that should be improved. The continuance of teachers' ability in improving their digital competence could be bolstered up by technostress, school support, and their own self-efficacy (Chou & Chou, 2021). Previous studies mentioned that teachers were still lack of some components in digital such as identifying and assessing information, understanding the use of technology, preparing for the teaching activities using digital tools, and securing the personal information in digital media (Saripudin et al., 2020; Tomczyk, 2019). On the other side, vocational schoolteachers must meet market demands for digital media learning. These pressures on teachers have emerged with the digital era. Teachers no longer provide instructional resources to traditional learning platforms since it lowers student engagement and motivation. To be digitally literate, teachers must build digital technologies. Digital technology's challenge is to transform Indonesians' lives and help them access knowledge and do daily tasks. Not everyone has access. Remote, low-educated people find it challenging to get digital information (Saripudin et al., 2021). The essential of digital competence in the era of society 5.0 leads to the concern of how to assess the digital competence using a predefined framework. There are frameworks constructed by many organizations such as European Commission, National Institute of Educational Technologies and Teacher Training (INTEF) in Spain, United Nations Educational, Scientific and Cultural Organization (UNESCO), and The General Office of the Central Committee of the Chinese Communist Party and the General Office of the State Council (Carretero et al., 2019; INTEF, 2017; UNESCO, 2018; Yan & Yang, 2021). Those developed frameworks of digital competence are DigComp 2.1, Common Digital Competence Framework for Teachers (CDCFT), Education Informatization 2.0, and Teacher Digital Competence (TDC), etc. However, the most commonly used and famous framework to measure the teacher's digital competence is DigComp by the European Commission (Cattaneo et al., 2022).

A lot of prior studies has been researched about the teachers' digital competence level starting from the primary education to higher education level. The studies commonly analyzed teachers' digital literacy level divided by its age, gender or years of working. Nevertheless, none of the previous studies examined the teachers' digital competence grouped by its field of subject (engineering and non-engineering), area or region, and school quality. In as much of the previous studies analyzed the digital competence level in the higher education (Liu et al., 2020). Meanwhile, the discussion about the VHS teachers' digital competence is still scarce. Therefore, this study is interested to specifically encounter the advanced digital competence of the Vocational High School (VHS) teachers who should teach in a specific subject related to work and industrial skill. Drew on the Vocational Directorate General of Vocational Education, the strengthening of digital skill in facing digital revolution is urgent since Indonesia is still left behind other ASEAN countries in *Network Readiness Index* (Vokasi, 2020). In the favor of uplifting the Indonesian VHS teachers' teaching quality, the government had been started to strengthen some of the digitalization aspects such as enhancing

Massive Open Online Course (MOOC) and blended learning system, preparing the vocational students and teachers with digital marketing and culturizing the use of e-book.

To sum up, this study would like to analyze the Advanced Digital Competence of VHS teachers using the most common and famous framework from DigComp developed by European commission (Cattaneo et al., 2022; Zhao et al., 2021). Ultimately, this author was aimed to:

- Analyze the different level of VHS teachers' digital competence differentiated by the engineering and non-engineering field;
- Describe the VHS teachers' ADC in Indonesia differentiated by the islands; and
- Show the influence of school quality towards VHS teachers' ADC.

The researcher then generated some research questions of this study as:

RQ1: How is the disparity level of advanced digital competence (ADC) between VHS Teacher in engineering and non engineering field?

RQ2: How are differences of VHS teachers' ADC in different islands?

RQ3: Does school quality has a significant influence on VHS teachers' ADC?

2. Methodology

In this study section, we represent the method from setting up the sample, procedure of data collection, instrument and data analysis process to define our research questions.

2.1 Sample and Procedure of Data Collection

This study used quantitative design with descriptive statistics method. The data were collected through self-administered online survey using Google Form in May 2021. The questionnaire was distributed to the VHS teachers in Indonesia who joined an online seminar conducted by PT Rumah Publikasi Indonesia about scientific writing papers strategy for Indonesian VHS Teacher. The participants of this questionnaire were 392 VHS teachers.

However, the researcher purposed to classify the data into some fields such as engineering and non-engineering VHS teachers, VHS teachers based on different islands, and school quality. The engineering field of VHS teacher was defined as the teacher who teach a specific subject in vocational high school such as electricity engineering, computer and network engineering, electricity control system, etc. Otherwise, the non-engineering field was classified as teacher who teach non-engineering field subject such as fashion design, accounting, office management, culinary art, etc. It specifically excludes the general subject such as mathematics, physics, biology, chemistry, etc. The final classification of technology and non-technology fields generated 155 VHS teachers in the engineering field and 45 VHS teachers in non-engineering field. On the other side, there are 320 VHS teachers for Java Island, 7 for Borneo, 13 for Sulawesi, 37 for Sumatra, and 14 for Nusa-Bali Island. Built upon the school quality data, we got 308 VHS teachers in school with an A accreditation, 68 teachers from B accreditation, 8 from C accreditation and 8 from unaccredited school. The distributions of the sample were shown in the table 1.

Table 1 - Sample distribution

Category	Group	Total
VHS Fields	Engineering field of VHS	155
	Non-engineering field of VHS	45
Islands	Java	320
	Borneo	7
	Sulawesi	13
	Sumatra	37
	Nusa-Bali	14
School Accreditation	A	308
	B	68
	C	8
	Unaccredited	8

2.2 Self-Assessment Instrument

The instrument used Likert scale from 1-4 represented as not proficient (1), less proficient (2), proficient (3) and very proficient (4). The instruments were adapted from the European Commission framework of Digital Literacy for Educators (DigCompEdu). The instruments were validated by using validity test of product moment correlation and the results of all the instruments were valid. The author checked its reliability using Cronbach Alpha test and the result was 0.97 that the instruments were also reliable (> 0.70). These scale were adapted from the Likert scale theory which measure someone's ability in a competency using psychometrics tools especially in social science research (Joshi et al., 2015). Since it was adapted, it was then adjusted with the needs of the researcher's assessment. Not proficient was defined if someone only could use but do not understand how to create, filter or even upgrade the digital tools with their own ability. On the other hand, less proficient means that teacher understand how to utilize the digital tools but less creating, filtering or even upgrading the ability and less in the sub-competence of digital competence such as communication, collaboration, problem solving, etc. Furthermore, proficient level means that the teachers are aware the digital development and knowing how to operate it well. Lastly, the very proficient level is defined as someone who could be aware of new technologies, good in all competences and upgrade their ability of understanding the digital tools.

The questionnaire was referred to the digital competence frameworks of DigComp which has five highlighted competence areas such as information, communication, content creation, safety and problem solving (Ferrari et al., 2013). all the sections of the self-administered are enclosed to be 29 questions in the survey and slightly represented in the table 2.

Table 2 - Components of advanced digital sub-competence

No.	Descriptions
1.	Using a variety of search strategies in searching for information and surfing through internet
2.	Filtering and monitoring the information received
3.	Knowing the shared-content quality information
4.	Engaging in the utilization of various online communication tools such as (email, chat, instant messaging, blogs, group chats).
5.	Applying aspects of online ethics in various digital communication spaces and contexts.
6.	Adapting the way of communicating for different audiences
7.	Vigorously sharing knowledge on various online community platforms.
8.	Actively participating in online communities
9.	Frequently and confidently using multiple digital collaboration tools and means to collaborate with others in sharing knowledge and content.
10.	constantly protecting digital reputation by filtering any information that will be disseminated.
11.	Producing digital content in a variety of formats, platforms, and environments.
12.	Using various digital multimedia tools.
13.	Merging existing content items for content development
14.	Producing code with various programming languages in creating digital content.
15.	Knowing the different types of licenses for information and resources used in creating content.
16.	Immediately acting when digital devices are under threat
17.	Changing the default privacy settings in online services to improve privacy protection
18.	Able to change the default privacy settings in online services to improve privacy protection
19.	Having skills in securing data.
20.	Using secured technology in managing data.
21.	Balancing online data storage and offline data storage.
22.	Having knowledge about the impact of technology on daily life, online consumption, and the environment.
23.	Solving different problems in the use of digital technology.
24.	Making the right decisions by choosing tools, devices and service applications for unfamiliar tasks.
25.	Having the ability to solve conceptual problems by utilizing digital technology and tools
26.	Understand how to operate new digital equipment
27.	Critically evaluating the benefits and drawbacks of a new digital device.
28.	Proactively collaborating to create new innovative works.
29.	Upgrading digital competency needs.

2.3 Data Analysis

Overall, the data analysis process covered 1) descriptive statistics process to interpret the level of advanced digital competence between VHS teacher in and non-engineering field (RQ1), 2) to portray the distribution of VHS teachers' ADC level based on the island location (RQ2), and 3) to show the influence of school quality towards VHS teachers ADC level (RQ3). In the sub- sections, the researcher would like to show the analytical phases of the data analysis process.

Phase 1

Firstly, the researcher used the filtered data to be analysed using descriptive statistics. Since the data used a Likert scale that resulted a nominal data, it could be measured the hierarchy or ranking of a data from low to high but not being an absolute measurement (Fisher & Marshall, 2009). The data was divided into two sheets, engineering and non-engineering field, in a Ms. excel file and we summed up the total value of each participant. Afterwards, all the total value was being analysed using data analysis tool in Ms. Excel called descriptive analysis tool. The result was visualized in table 4. Meanwhile, we did not use all the descriptive statistics results to answer the problems so that we merely used mean and standard deviation to determine the result as mean and standard deviation are sufficiently sensitive for the changes (Ferreira, 2020).

Phase 2

The second and third phase are quite similar with the first phase. Nevertheless, the data was separated by the classification of islands and school quality. In the context of islands, the researcher divided the data into five categories of some islands such as Java, Borneo, Sulawesi, Sumatra, and Nusa-Bali. Here the researcher did not include all the data from all islands as there were no participants coming from another islands. Furthermore, the school quality is based on its accreditation so that the school accreditation was divided into four categories included as A, B, C, and unaccredited. The researcher would also use descriptive statistics to summarize the percentage of the data from the collected information.

3. Result

The current study was purposed to know and compare the level of ADC between engineering and non-engineering field of VHS teacher, island's location, and school quality in Indonesia by using descriptive statistics for measuring the average result of the variable. As the previous result of data analysis, the researcher concluded the result as further information for answering the three research questions. By means of statistical results, the researcher was elucidated the first problem about the disparity level between engineering and non-engineering field VHS teacher, then delineated the VHS teachers' ADC level based on the islands location, and lastly furnished the result with a description of VHS teachers' ADC level based on school quality.

Table 3 - Teacher's ADC in each component

No.	Field	Descriptions	Mean	Mode	Std. Deviation
1	Engineering field	Using a variety of search strategies in searching for information and surfing through internet	3.27	3	0.668
	Non-engineering field		3	3	0.603
2	Engineering field	Filtering and monitoring the information received	3.23	3	0.670
	Non-engineering field		2.91	3	0.733
3	Engineering field	Knowing the shared-content quality information	3.15	3	0.713
	Non-engineering field		2.93	3	0.688
4	Engineering field	Engaging in the utilization of various online communication tools such as (email, chat, instant messaging, blogs, group chats).	3.37	3	0.684
	Non-engineering field		3.09	3	0.688
5	Engineering field	Applying aspects of online ethics in various digital communication spaces and contexts.	3.30	3	0.656
	Non-engineering field		3.09	3	0.596
6	Engineering field	Adapting the way of communicating for different audiences	3.15	3	0.662
	Non-engineering field		3.09	3	0.668
7	Engineering field	Vigorously sharing knowledge on various online community platforms	2.87	3	0.718
	Non-engineering field		3.09	2	0.668
8	Engineering field	Actively participating in online communities	2.97	2	0.742
	Non engineering field		2.64	3	0.773

9	Engineering field	Frequently and confidently using multiple digital collaboration tools and means to collaborate with others in sharing knowledge and content.	2.94	3	0.700
	Non engineering field		2.71	3	0.661
10	Engineering field	constantly protecting digital reputation by filtering any information that will be disseminated.	3.20	3	0.649
	Non-engineering field		2.64	3	0.743
11	Engineering field	Producing digital content in a variety of formats, platforms and environments.	2.72	3	0.779
	Non-engineering field		2.96	2	0.737
12	Engineering field	Using various digital multimedia tools.	3.03	3	0.693
	Non-engineering field		2.33	3	0.853
13	Engineering field	Merging existing content items for content development	2.72	3	0.717
	Non-engineering field		2.67	2	0.739
14	Engineering field	Producing code with various programming languages in creating digital content.	2.32	3	0.874
	Non-engineering field		2.42	2	0.783
15	Engineering field	Knowing the different types of licenses for information and resources used in creating content.	2.54	3	0.766
	Non-engineering field		1.93	2	0.863
16	Engineering field	Immediately taking action when digital devices are under threat	2.74	3	0.790
	Non-engineering field		2.16	2	0.796
17	Engineering field	Changing the default privacy settings in online services to improve privacy protection	2.83	3	0.771
	Non-engineering field		2.29	2	0.869
18	Engineering field	Able to change the default privacy settings in online services to improve privacy protection	2.43	3	0.822
	Non-engineering field		2.51	2	0.815
19	Engineering field	Having skills in securing data.	2.62	3	0.767
	Non-engineering field		2.16	2	0.852
20	Engineering field	Using secured technology in managing data.	2.83	3	0.731
	Non-engineering field		2.38	2	0.912
21	Engineering field	Balancing online data storage and offline datastorage.	2.97	3	0.702
	Non-engineering field		2.56	2	0.841
22	Engineering field	Having knowledge about the impact of technology on daily life, online consumption and the environment	3.17	3	0.633
	Non-engineering field		2.69	3	0.701
23	Engineering field	Solving different problems in the use of digital technology.	2.87	3	0.681
	Non-engineering field		2.87	2	0.757
24	Engineering field	Making the right decisions by choosing tools, devices and service applications for unfamiliar tasks.	2.90	3	0.652
	Non-engineering field		2.40	2	0.809
25	Engineering field	Having the ability to solve conceptual problems by utilizing digital technology and tools	2.86	3	0.659
	Non-engineering field		2.51	2	0.695
26	Engineering field	Understand how to operate new digital equipment	2.90	3	0.652
	Non-engineering field		2.44	2	0.841
27	Engineering field	Critically evaluating the benefits and drawbacksof a new digital device.	2.72	3	0.726
	Non-engineering field		2.47	2	0.786
28	Engineering field	Proactively collaborating to create new innovative works.	2.59	3	0.736
	Non-engineering field		2.33	2	0.798
29	Engineering field	Upgrading digital competency needs.	2.95	3	0.710
	Non-engineering field		2.40	3	0.809

The result in table 4 was to explain and answer the first research question. Secondly, the following phase was determining the total average of each component to measure the teacher's mastery in advanced digital competence starting from the least, highest and the competent that is mastered by both VHS teacher in different field. Practically, the phase was completely the same with the first phase that we counted using descriptive statistics tool. However, in this point, we summed up the distribution of each component from 1 to 29 to know obviously the result. The results are explained in the table 4.

Table 4 - Descriptive statistics analysis

Digital competence of VHS teacher in non-engineering field		Digital competence of VHS teacher in engineering field	
Mean	75.06667	Mean	84.14839
Standard error	2.625323	Standard error	1.215312
Median	74	Median	85
Mode	68	Mode	85
Standard Deviation	17.61121	Standard Deviation	15.13051
Sample variance	310.1545	Sample variance	228.9324
Kurtosis	0.096226	Kurtosis	1.472244
Skewness	0.477994	Skewness	-0.40949
Range	74	Range	87
Minimum	42	Minimum	29
Maximum	116	Maximum	116
sum	3378	sum	13043
Count	45	Count	155
Largest (1)	116	Largest (1)	116
Smallest (1)	42	Smallest (1)	29
Confidence level (95.0%)	2.290992	Confidence level (95.0%)	2.400834

3.1 The Disparity ADC Level Between VHS Teacher in Engineering and Non-Engineering Field

The established data analysis described that both VHS teacher in engineering and non-engineering field has slightly different level. It could be mentioned in the table 5. the total average of VHS teachers in engineering school is 84.14 which could be said as the advanced level of digital competence. Meanwhile, the VHS teachers ADC in non-engineering field school have lower result of 75.06. However, 75.06 could still be defined as advanced level but has some parts of component should be improved and developed. Based on the table, there is a negative skewness result in the engineering field caused by one datum which has the weakest proficiency level with only 29 in total. It detected to be the minimum total from the engineering field.

Table 5 - Disparity Level Between VHS Teacher in Engineering and Non-Engineering Field

Field of Study	Teachers' total	Average Result
Engineering Field	155	84.14
Non-Engineering Field	54	75.06

Furthermore, the digital competence requires a lot of components to be mastered by the teacher especially them who teach in vocational school and teach a specific subject requiring high digital competence for integrating the learning process into an engaging classroom (Saripudin et al., 2020). However, by all the components existed in the ADC level, there are some of the components should be improved by the teachers such as Producing code with various programming languages in creating digital content, changing the default privacy settings in online services to improve privacy protection, knowing the different types of licenses for information and resources used in creating content, and critically evaluating the benefits and drawbacks of a new digital device. The visualization of the least and highest ADC components mastered by the teacher is portrayed in the table 6.

Table 6 - Lowest and highest score of digital competence components

The Lowest and Highest Score from Both Fields		
Teacher's Field	**Competence**	**Score**
VHS Teacher in Engineering Field	*Producing code with various programming languages in creating digital content.*	2.32
	Engaging in the utilization of various online communication tools such as (e-mail, chat, instant messaging, blogs, group chats).	3.36
VHS Teacher in Non-engineering field	*Producing code with various programming languages in creating digital content.*	1.93
	Engaging in the utilization of various online communication tools such as (e-mail, chat, instant messaging, blogs, group chats).	3.08

According to the table 6, the teacher possessed a good level in ADC but, they still have a lack mastery in some components especially producing code in a programming language. Moreover, both fields, technology and non-technology, do not possess and master this component. The value of engineering field is 2.32 and 1.93 for the VHS teachers of non-engineering field. It means that their skill especially in programming languages supposed to be trained and upgraded. Meanwhile, the highest score of the component possessed by the non-engineering field school is consisted of three components with the same score as 3.09. Those components included as engaging in in the utilization of various communication tools, applying aspects of online ethics in various digital communication, and adapting the way of communicating for different audiences. However, even though the VHS teachers from non-engineering field had been mastered three components described as the highest score result but, the score of those components possessed by the VHS teacher in engineering school were still higher with more than 3.09.

3.2 The ADC of Vocational High School (VHS) Teachers Divided by Islands

Based on the survey conducted by the Indonesian Internet Providers Association (APJII) in 2017, the internet users in Java Island are the highest in percentage at approximately 58,08%. Meanwhile, the islands outside Java have lower percentage of internet users such as Kalimantan/Borneo (7,97 %), Sulawesi (6,73%), Sumatra (19, 09%), Bali-Nusa (5,63%) (APJII Indonesia, 2019). Nonetheless, the low internet user's percentage does not mean that their digital competence is in below average. Gleaned from this study, the researcher provided that the Advanced Digital Competence (ADC) of VHS teachers in Indonesia had been high.

Table 7 - ADC of VHS teachers in Indonesia

Islands	Average	Std. Deviation	Percentage
Java	81.27	16.08	21%
Borneo	68	26.70	21%
Sulawesi	80.3	15.86	21%
Sumatra	83.37	15.33	20%
Nusa Tenggara and Bali	82.85	14.55	17%

The table unexpectedly represented that the ADC of VHS teachers in Sumatra gained the highest average score with the total 83.37. Meanwhile, Borneo gained the lowest score, and the distance of Borneo average score is quite far from another average result. Furthermore, the average score between Java, Nusa Tenggara and Bali, Sulawesi, and Sumatra is quite similar in around 80. To sum up, the island of where the school is located had no effect on VHS teachers ADC level since the result is quite similar. The average data was presented in percentage result in the table 7.

3.3 The School Quality Impact Towards Teachers Advanced Digital Competence (ADC)

In education, quality assurance is accomplished through the accreditation process, which is a systematic and integrated activity undertaken by an educational unit, its practitioners, local and national governments, and the community with the goal of improving the nations' intelligence through education. This is accomplished through a thorough examination of the school's performance in accordance with the National Education Standard, which compared the school's current state to the eight criteria established. Therefore, School quality could be seen from its accreditation since accreditation could describe the school development and performance. The function of accreditation is to show the school performance, accountability and quality that one of the school qualities is shown by the development of technology for learning in its school (Awaludin, 2017).

By the reason of the school quality, the researcher wanted to highlight the impact of school quality based on accreditation towards teachers' advanced digital competence. The result oppositely summarized that the school quality had not influenced the VHS teachers' ADC. It showed that the highest ADC average was gained by the VHS teachers in unaccredited school with around 90.62. Meanwhile, the VHS teachers in an A-accredited school had the lowest score of ADC level. The outcome portrayed in table 8.

Table 8 - VHS teachers' ADC based on school quality

Total data	Accreditation	Avg. Score	Percentage
308	A	80.74	24%
68	B	81.45	24%
8	C	88.37	26%
8	Unaccredited	90.62	26%

Accreditation of schools is frequently used to assess a school's capacity to conduct educational activities. A higher school accreditation score indicates that the school's quality assurance in conducting the learning process meets the government's criteria. However, the results indicate that this state had no effect on teachers' digital competence. Since the teacher from an unaccredited school has the highest score, and the teacher from an A-accredited school has the lowest score. This means that school accreditation has no bearing on a teacher's ability to use digital tools, but rather on the teacher's experience with those digital tools in the classroom.

4. Discussion

In this study, the researcher had completely highlighted, some expected and unexpected, and brought up the analysis in VHS digital competence differentiated by the fields of engineering and non-engineering, islands, and school quality.

4.1 The Disparity ADC Level Between VHS Teacher in Engineering and Non-Engineering Field

According to (Cattaneo et al., 2022), the digital competence of the teachers could be influenced by the number of works they have, but that factor has not been separated and differentiated based on the teacher's specific and general subject. However, in this study, the researcher was interested to analyse another factor influenced teachers' digital competence of school subject differentiated by engineering and non-engineering field. It is related to the previous exploration, the studies stated that teachers in vocational education could be divided into two or more subjects. Lastly, there was a further separation between teacher who teach a general knowledge and specific knowledge (Berger & D'Ascoli, 2012). Conversely, there were the differentiating types based on the teachers' subject by vocational subjects, general-culture subjects or vocational baccalaureate courses (VPETO, 2021). In those studies, the teachers with different subject did not show a significant difference in digital competence. It was in line with a slight difference between the teachers in engineering and non-engineering field found in this study. This small distinction could be happened as the teachers teach different subjects which need different media to be applied in their teaching and learning process. By means of the fields divided by the researcher, it proved that the specific subject could slightly influence the teachers' digital competence. The engineering VHS teacher has possessed higher ADC instead of the VHS teacher in non-engineering field school. However, their ADC difference is not extremely significant and the VHS teacher from non-engineering field has gained high ADC based on the DigComp 2.1 framework.

4.2 The ADC of Vocational High School (VHS) Teachers Divided by Islands

At the second point of this study, the author examined the teachers' digital competence based on the digital divide of each island in Indonesia. Technology in digital grows rapidly starting from the developed country to developing country (Kalolo, 2019). Otherwise, the spread of digital development divided again inside the country since there is a territory division. Mentioning about the digital development in a smaller region than a country, it has been known that Indonesia has six big islands namely Java, Kalimantan, Sumatra, Bali-Nusa, and Papua. Digital technology gap among the island region in Indonesia is still unequal based on the internet access survey from APJII in 2019 (APJII Indonesia, 2019). The growth or development of technology is usually fast in the Java Island since Java is the island where the capital city is located. Nevertheless, that statement is contrasted to this study result, the analysis proved that the digital divide of VHS teachers in the developed island and remote island is not different and even it is almost equal. Contrary with the engineering and non-engineering field, the average score of VHS teachers' ADC level in different islands had quite competitive and summarized that the teachers' advanced digital competence in Indonesia has been in high level. It is contrast with the prior study which stated that the digital literacy in urban area was low (Mulyaningsih et al., 2020). However, the contrast of the result might be happened because the different subject or area; since the subject of this study was the teacher and the prior study was focused on the citizens. The disparity of the result could also happen because of the education of the teacher that might be different with the general citizen. It means that the improvement of teachers' digital competence in advanced level was good.

Contrary with the engineering and non-engineering field, the average score of VHS teachers' ADC level in different islands had quite competitive and summarized that the teachers' digital competence in Indonesia has been in high level. It could be seen that surprisingly there were three islands having high result such as Java, Sumatra and Bali-Nusa with the total score was 21% out of 100%. Those result was closely the same with the result of VHS teachers' digital rate in Sulawesi with the total score was 20%. However, the disparity of teachers' digital competence based on the islands is still exist by the result of Kalimantan Island with only 17% out of 100%.

4.3 The School Quality Impact Towards Teachers Advanced Digital Competence (ADC)

In the last research point, the author examined the gap between VHS teachers' digital competence grouped by its school quality. In this case, school quality could be defined by its accreditation which has been covered all aspects such as the school facilities, teaching and learning, adapted curriculum, rules and achievement of the schools, etc. Unexpectedly, the result of this analysis was out of the prediction. The author expected that the VHS teachers' ADC was better or higher that the VHS teachers who teach in a lower school accreditation. However, the VHS teachers' ADC in the unaccredited vocational high school was higher and even the highest among all the results with the total score was 90.62 out of 100. Furthermore, the lowest score was coming from the vocational high school which has the best school accreditation, A. This anomaly could be mentioned as the unexpected result. This differences and unexpected result might be coming from the prior studies which stated that the teachers' digital competence was affected by their age, gender, digital confidence, information literacy or even the years of working (Benali et al., 2018; Guillén-Gámez et al., 2020; Gündüzalp, 2021; Lucas et al., 2021; Potyrała & Tomczyk, 2021; Saikkonen & Kaarakainen, 2021; Saripudin et al., 2019). It could be summed up that the VHS teachers' ADC based on school accreditation had no significant influence on VHS teachers' ADC. This result could also happen because of some disparities in the data collected by the author which made the data result was contrast. Based on the previous result, even though the result of teachers' digital competence is incredibly high, but if the teachers' digital activities is low which means that the teachers or people do not commonly or frequently utilize the digital tools; it will gradually decrease someone's digital competence (Quaicoe & Pata, 2020) . Afterall, the most influences of teachers' digital competence come from the individuals itself, and the experience or the exposure to the use of digital tools and components in their daily digital activities.

Of all the result obtained, there are still lack of component possessed by the VHS teacher in engineering and non-engineering field. Referring to (Astuti et al., 2021; Saripudin et al., 2019, 2020), the vocational teachers' ability in integrating learning media using ICT is still low though it is one of the essential components in digital competence. It is evidently proven that the component of producing code in creating digital content is still not sufficient. It is aligned with the prior study which mentioned that teachers' competence in digital was lack of creating content and problem solving (Fraile et al., 2018). Meanwhile, since the teacher faced the distance learning during COVID-19, it made them feeling more interested to continue their ability in using online media for teaching that it was aligned with the previous study of teachers' interest and future continuance in using digital tools (Chou & Chou, 2021). On the other sides, along with the high school quality, school should concern about the teachers' skill in mastering digital competence and the VHS teachers. It also written in this study that the VHS teacher's highest component in ADC is in communication and collaboration through digital tools. After all, the VHS teachers in all fields are required to upgrade their skill in solving the problems in the use of digital tools.

5. Conclusion

To conclude, the quantitative descriptive had been used to know the value of VHS teachers' ADC based on engineering and non-engineering field. This study found that the VHS teachers in engineering and non-engineering field are sufficient in mastering the digital competence especially in Advanced Digital Competence (ADC). Nevertheless, the VHS teachers in both fields should be trained in the competence of 1) Producing code with various programming languages in creating digital content and 2) Solving different problems in the use of digital technology. Overall, the study concluded that the VHS teacher's digital competence had been in the advanced level but, the VHS teachers should be trained for special digital competence based on the subject taught and especially upgraded their ability to integrate those digital competence into teaching-learning process for further continuance in digital learning. However, this research weakness is on the data that might be unequal since the disparity between one data to another data was too high such as the data of the teachers based on its islands and school accreditation. The counted scale was also expected to have bias in the result since the author did not converse the Likert scale to the exact value. The study was then conducted using available samples, which might not allow for a fair comparison of sample sizes in each category. As a result, it may not be as representative of those groups with a small number of participants. Finally, the study suggests to do deeper research using digital competence assessment test so that we could know the real digital competence of a teacher that is not only based on their self-perception and self-administered test.

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References

APJII Indonesia. (2019). Penetrasi & Perilaku Pengguna Internet Indonesia [Indonesian internet penetration and characteristics]. *Apjii*, 39. Retrieved Feb 2021 from https://apjii.or.id/survei2018s/download/TK5oJYBSyd8iqHA2eCh4FsGELm3ubj

Asan, A. (2003). Computer Technology Awareness by Elementary School Teachers: A Case Study from Turkey. *Journal of Information Technology Education: Research*, *2*, 153–164.

Astuti, M., Arifin, Z., Mutohhari, F., & Nurtanto, M. (2021). Competency of Digital Technology: The Maturity Levels of Teachers and Students in Vocational Education in Indonesia. *Journal of Education Technology*, *5*(2), 254–262.

Benali, M., Kaddouri, M., & Azzimani, T. (2018). Digital competence of Moroccan teachers of English. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, *14*(2), 99–120. http://tpack.org/

Çam, E., & Kiyici, M. (2017). Perceptions of Prospective Teachers on Digital Literacy. *Malaysian Online Journal of Educational Technology*, *5*(4), 29–44.

Carretero, S., Vuorikari, R., & Punie, Y. (2019). The Digital Competence Framework for Citizens. In *European Union Joint Research Centre*. Retrieved March 2021 from https://op.europa.eu/en/publication-detail/-/publication/3c5e7879-308f-11e7-9412-01aa75ed71a1/language-en

Cattaneo, A. A. P., Antonietti, C., & Rauseo, M. (2022). How digitalised are vocational teachers? Assessing digital competence in vocational education and looking at its underlying factors. *Computers and Education*, *176*(October 2021), 104358.

Chou, H. L., & Chou, C. (2021). A multigroup analysis of factors underlying teachers' technostress and their continuance intention toward online teaching. *Computers and Education*, *175*(March), 104335.

Damşa, C., Langford, M., Uehara, D., & Scherer, R. (2021). Teachers' agency and online education in times of crisis. *Computers in Human Behavior*, *121*(March).

Edet, A. O., & Ekpoh, U. (2019). *Technology Education and national development : problems and prospect*. *January 2007*.

Emosda, E., & Annisa, V. (2020). Digital Literacy Skills on the Generation of Digital Immigrants. *Proceeding of International Conference on …*, *November*, 5–6.

Ferrari, A., Punie, Y., & Bre, B. N. (2013). *DIGCOMP : A Framework for Developing and Understanding Digital Competence in Europe* . https://doi.org/10.2788/52966

Ferreira, Á. R. S. (2020). The importance of descriptive analysis. *Revista Do Colegio Brasileiro de Cirurgioes*, *47*, 1.

Fraile, M. N., Peñalva-Vélez, A., & Lacambra, A. M. M. (2018). Development of digital competence in secondary education teachers' training. *Education Sciences*, *8*(3).

Guillén-Gámez, F. D., Mayorga-Fernández, M. ªJ, & Álvarez-García, F. J. (2020). A Study on the Actual Use of Digital Competence in the Practicum of Education Degree. *Technology, Knowledge and Learning*, *25*(3), 667–684.

Gündüzalp, S. (2021). 21 st Century Skills for Sustainable Education: Prediction Level of Teachers' Information Literacy Skills on Their Digital Literacy Skills . *Discourse and Communication for Sustainable Edu.*, *12*(1), 85–101.

INTEF. (2017). *Digital Docente*. https://aprende.intef.es/sites/default/files/2018-05/2017_1020_Marco-Común-de-Competencia-Digital-Docente.pdf

Jimoh, B., Oviawe, J., Ariyo, S., & Anorue, H. C. (2020). *Building E-Teaching Capacity of Tvet Lecturers To Cushion the Effects of Covid-19 and Other Future Pandemics on Tertiary Education System of Low*. *November*.

Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert Scale: Explored and Explained. *British Journal of Applied Science & Technology*, *7*(4), 396–403.

Law, N., Woo, D., de la Torre, J., & Wong, G. (2018). A Global Framework of Reference on Digital Literacy. *UNESCO Institute for Statistics*, *51*, 146.

Liu, Z. J., Tretyakova, N., Fedorov, V., & Kharakhordina, M. (2020). Digital literacy and digital didactics as the basis for new learning models development. *International Journal of Emerging Technologies in Learning*, *15*(14), 4–18.

Lucas, M., Bem-Haja, P., Siddiq, F., Moreira, A., & Redecker, C. (2021). The relation between in-service teachers' digital competence and personal and contextual factors: What matters most? *Computers and Edu.*, *160*(October 2020).

Milenkova, V., & Manov, B. (2019). Mobile learning and the formation of digital literacy in a knowledge society. *Proceedings of the 15th International Conference on Mobile Learning 2019, ML 2019*, 96–102.

Muktiarni, M., Ana, A., Dwiyanti, V., Sari, A. R., & Mupita, J. (2021). Digital platform trends in vocational education during the covid-19 pandemic. *Journal of Technical Education and Training*, *13*(3), 180–189.

Potyrała, K., & Tomczyk, Ł. (2021). Teachers in the lifelong learning process: examples of digital literacy. *Journal of Education for Teaching*, *47*(2), 255–273.

Quaicoe, J. S., & Pata, K. (2020). Teachers' digital literacy and digital activity as digital divide components among basic schools in Ghana. *Education and Information Technologies*.

Saikkonen, L., & Kaarakainen, M. T. (2021). Multivariate analysis of teachers' digital information skills - The importance of available resources. *Computers and Education*, *168*(July 2020), 104206.

Saripudin et al. (2021). *DIGITAL LITERACY SKILLS OF VOCATIONAL SCHOOL TEACHERS*. *16*(1), 666–680.

Saripudin, S., Sumarto, S., Juanda, E. ., Abdullah, A. G., Ana, A., & Ariyanti, T. (2019). *Digital Literacy Qualitative Analysis in Vocational Teachers*. 262–270.

Saripudin, S., Sumarto, S., Juanda, E. A., Abdullah, A. G., & Ana, A. (2020). Vocational school teachers' perceptions of e-learning during covid-19. *Journal of Engineering Education Transformations*, *34*(Special Issue), 7–13.

Tomczyk, Ł. (2019). What Do Teachers Know About Digital Safety? *Computers in the Schools*, *36*(3), 167–187.

Vokasi, D. P. (2020). Rencana Strategis Direktorat Jenderal Pendidikan Vokasi Tahun 2020-2024. *Direktorat Jenderal Pendidikan Vokasi*, 1.

Yan, S., & Yang, Y. (2021). Education Informatization 2.0 in China: Motivation, Framework, and Vision. *ECNU Review of Education*, *4*(2), 410–428.

Yildiz, E. P. (2020). Opinions of academicians on digital literacy: A phenomenology study. *Cypriot Journal of Educational Sciences*, *15*(3), 469–478.

Zhao, Y., Pinto Llorente, A. M., & Sánchez Gómez, M. C. (2021). Digital competence in higher education research: A systematic literature review. *Computers and Education*, *168*(August 2020).