CHAPTER III
RESEARCH METHOD

3.1   Research Design

The design of this research employed several research models to answer each research question, such as Systematic Literature Review (SLR) and bibliometrics analysis to give preliminary overviews, then also using a descriptive quantitative for analyzing the collected data.

The systematic literature reviews and bibliometrics analysis were carried out to find a research pattern relevant to the digital competence of vocational high school teachers. Systematics literature review and bibliometrics data could be gathered from several reliable databases such as Scopus, Web of Science (WoS), PubMed, etc. Additionally, this search employed the Scopus database to get reliable data for systematic literature review and bibliometrics analysis. A systematic review of the literature is a way to evaluate and analyze all of the available research that is pertinent to a specific research question, topic area, or phenomenon that is of interest to the researcher. Systematic literature reviews are conducted with the intention of delivering an unbiased analysis of a particular area of research by employing a process that is reliable, stringent, and capable of being audited (Barbara Kitchenham & Charters, 2007). Moreover, the study of bibliometrics is becoming an increasingly common and respected approach to the investigation and evaluation of significant amounts of scientific data. It makes it possible for us to dissect the subtle changes that have taken place over the course of a certain field's history while also providing light on the developing aspects of that field (Donthu et al., 2021).

Furthermore, the author would also apply descriptive quantitative to measure the teachers' advanced digital competence. Utilizing questionnaires allowed for the collection of both qualitative and quantitative data (Creswell, J. W., & Poth, 2007). Statements from teachers about their views on their advanced digital competence, how they integrate their teaching digitally in the classroom, and how they could evaluate their use of digital equipment effectively are all matters in this research. The

use of questionnaires allowed for the collection of statements made by the teachers regarding the way teachers encourage the students to use or introduce to digital media, interactions between teachers and digital tools, and the result of their advanced digital competence.

3.2 Participant

The selection of the participants was considered by prior studies, which stated that vocational high schools, especially engineering teachers, had higher requirements and competence of digital competence (Gunadi et al., 2020). The participants of this research were mainly vocational high school teachers in Indonesia, especially the teachers who teach the specific subject of the vocational engineering field. It means that the authors eliminated the data of teachers who teach general subjects and non-engineering subjects such as English, Indonesian language, Civics, culinary, social welfare, and fashion since it is not included in the specific subject of vocational engineering field. In this study, the author compiled 155 VHS teachers as respondents.

Table 2.3 Demographic distribution

Variables		Percentage (%)
Gender	Man	44%
	Woman	56%
Years of working	1-5 Years	27.30%
	6-10 Years	15.31%
	11-15 Years	24.23%
	16-20 Years	19.39%
	>20 Years	13.78%
Field of subject	Technical	70.92%
	Non-Technical	29.08%

3.3 Research Instrument

In this study, a questionnaire was used; the construction of the questionnaire was based on the digital competence framework by the European Commission that were extracted through its components of advanced digital competence (Ferrari et al., 2013). These criteria and sub-criteria have been bundled together in a survey research set that includes a set of question item that is assisted by Google forms. Table 3.1 provides illustrations of some of the items.

Sherly Rahmawati, 2022
THE IDENTIFICATION OF VOCATIONAL HIGH SCHOOL TEACHERS' ADVANCED DIGITAL COMPETENCE: OVERVIEW AND ANALYSIS
Universitas Pendidikan Indonesia|repository.upi.edu|perpustakaan.upi.edu

15

On the instrument, a scale ranging from 1 to 4 known as the Likert scale represented not proficient (1), less proficient (2), proficient (3), and very proficient (4). (4). The instruments are an adaptation of the framework that was developed by the European Commission. The instruments were validated by employing a validity test that was based on the product moment correlation, and all of the instruments produced results that were reliable. The author used the Cronbach Alpha test to evaluate the reliability of the instruments, and the result of 0.97 indicated that the instruments were also reliable (> 0.70). The theory behind the likert scale, which is used to measure a person's ability in a certain competency using psychometric tools, is what served as the basis for this scale's adaptation (Joshi et al., 2015). Because it was adapted, it was then modified to accommodate the requirements of the researcher's assessment. Someone is considered not proficient if they only have the ability to use digital tools, but they do not understand how to create, filter, or even upgrade the tools using their own capabilities. On the other hand, being less proficient indicates that a teacher understands how to use the digital tools, but has less capability in terms of creating, filtering, or even upgrading their abilities, as well as having less capability in the sub-competences of digital competence, such as communication, collaboration, problem solving, etc. In addition, having a proficient level indicates that the educators are aware of the advancements in digital technology and are able to successfully operate it. Lastly, the very proficient level is defined as someone who is able to be aware of new technologies, is good in all competences, and can upgrade their ability to understand digital tools.

Sherly Rahmawati, 2022
THE IDENTIFICATION OF VOCATIONAL HIGH SCHOOL TEACHERS' ADVANCED DIGITAL COMPETENCE: OVERVIEW AND ANALYSIS
Universitas Pendidikan Indonesia|repository.upi.edu|perpustakaan.upi.edu

16

Table 3.1 Digital Competence Survey Instruments (Ferrari et al., 2013)

No.	Descriptions
1.	Employing a number of different search methodologies while looking for information and navigating through the internet
2.	Managing and examining the quality of the information that has been received
3.	Having knowledge of the quality of the content that is shared
4.	Participating in the use of a variety of online communication tools such as (email, chat, instant messaging, blogs, group chats).
5.	Putting different aspects of online ethics into practice in a variety of different digital communication spaces and settings.
6.	Modifying one's mode of communication in order to cater to a variety of different audiences
7.	assiduously disseminating information across a variety of online community platforms.
8.	Involving in Online Communities
9.	Using multiple digital collaboration tools and methods on a regular basis and with complete self-assurance in order to work together with other people to share information and content.
10.	Protecting one's online reputation at all times by screening any information that will be shared.
11.	Creating digital content in a wide variety of file formats, operating systems, and other environments.
12.	Utilizing digital multimedia tools.
13.	Combining content for development
14.	Coding digital content with various programming languages.
15.	Understanding content creation licenses.
16.	Protecting digital devices immediately
17.	Modifying the privacy settings that are pre-set in online services in order to better protect users' personal information
18.	Capable of altering the privacy settings that are used by default in online services, thereby improving privacy protection
19.	A proficiency in data security techniques.
20.	When it comes to handling sensitive information, we use only the most secure methods.
21.	Maintaining a healthy balance between online and offline data storage.
22.	Understanding the effects of technology on everyday living, online use, and the environment.
23.	Utilizing digital technology to solve various issues.
24.	Choosing the appropriate tools, technologies, and service applications for unknown jobs while making sound decisions.
25.	Utilizing digital technologies and techniques to tackle conceptual issues.
26.	Learn how to operate the latest digital equipment
27.	Evaluating the advantages and disadvantages of a new digital device.
28.	Collaborating proactively to produce new innovative works.
29.	Increasing need for digital competence.

3.4 Research Procedure

The procedure of this research delineates the research stages especially for the research design factually. The following paragraph shows the details of the procedures. The first stage of this research starts from ensuring the problem statements by using the literature analysis. The systematic literature analysis helps the author to find the overview of the problem relevant to the research topic from various prior findings (Barbara Kitchenham & Charters, 2007). Here is the following eligibility criteria of systematic literature review:

Table 3.2 Eligibility Criteria of SLR Data

The inclusion criteria:
• The articles are related to the VHS Teachers' digital competence;
• The articles use English as its language;
• The articles are not a pre-proof type of paper; and
• The articles are published in a journal;

The exclusion criteria:
• The articles are not related to the VHS Teachers' digital competence;
• The articles do not use English as its language;
• The articles are a pre-proof type of paper; and
• The articles are not published in a journal;

Furthermore, this study also applied the keywords' construction for the bibliometrics study as follows:

(TITLE-ABS-KEY ("Digital literac*" OR "digital skill*" OR "digital abilit*" OR "digital competenc*") AND TITLE-ABS-KEY ("vocational high school*" OR "secondary vocational school*" OR "vocational*" OR "engineering edu*" OR "technical edu*" OR tvet OR vet OR "career technical education (CTE)") AND TITLE-ABS-KEY (teacher* OR educator*)) = **238 Documents**

The data from the Scopus database will be refined using Openrefine software and then analyzed using VOSviewer analysis. The next stage of the research is problem identification, in order that the author could be more focused on the researched problem, limitation is provided by arranging research problems for tightening the results. The third stage begins from composing theoretical background to show the aim of the research focus. The theoretical backgrounds showed in this research are digital competence, advanced digital competence and digital competence for educators.

After all the references were gathered, the following stage is designing the instrument or questionnaire utilized by the author in this research as a measurement. The variable measurement is fundamental for research since it is the stage of gaining the significant results accurately and trustworthy. After the questionnaire is validated, it will be distributed to participants. After the data is collected, the next stage is data analysis. Data analysis using descriptive quantitative. The data processing process

Sherly Rahmawati, 2022
THE IDENTIFICATION OF VOCATIONAL HIGH SCHOOL TEACHERS' ADVANCED DIGITAL COMPETENCE: OVERVIEW AND ANALYSIS
Universitas Pendidikan Indonesia|repository.upi.edu|perpustakaan.upi.edu

18

produces a finding that can be used as information material to the reader. The results of this study are in the form of overview and information or descriptions of the digital competence needed for teachers and the vocational high school teachers' digital competence. The last process in this research is report writing. Writing that is not published or disseminated will be of little use in the development of science and does not have high practical value. Therefore, the obligation for researcher is to complete a series of scientific activities in the form of a written scientific report that can be accounted for.

Analyzing which competencies are most acquired by the teachers in vocational high school since there are various concentration in vocational education, a descriptive quantitative is needed. Therefore, this study will also apply quantitative method analysis to answer this problem. Descriptive statistics are used to offer an organized summary of data by giving an explanation of the connection between the variables that comprise a sample or population. The objective of descriptive statistics is to provide an organized overview of data. When doing research, the very first step that is required to be finished is the evaluation of the reliability and validity of the questionnaire, in addition to the computation of the descriptive statistics. The types of variables that make up descriptive statistics are nominal, ordinal, interval, and ratio variables, and the measures that make up descriptive statistics are frequency, central tendency, dispersion or variation, and position. Since descriptive statistics condense large amounts of data into a more concise summary, they make it possible for decision-makers in conducting research to analyze the data (Franzese & Iuliano, 2018).

3.5   Data Analysis

The data analysis employed overview analysis using Systematic Literature Review (SLR) and bibliometrics analysis and quantitative analysis applying statistic descriptive. The statistics descriptive method could be applied after the overview literature for the digital competence was made. In general, the process of analyzing the data consisted of the following steps: 1) providing an overview of the general

teachers' digital competence based on the bibliometrics analysis; 2) presenting a current review of the VHS teachers' digital competence distribution based on literature review (RQ2); and 3) using descriptive statistical analysis to define the level of advanced digital skill among VHS engineering teachers (RQ3). The researcher hopes to demonstrate, in the subsequent sections, the various analytical stages that comprise the process of data analysis.

1. In the first and second stage, the author will use systematic literature review to answer the research questions. Bibliometrics analysis will be used to find the research trends quantitatively based on the Scopus database. In this stage, the author will use three software for processing, analyzing, and visualizing the data such as Openrefine, VosViewers, Tableau Public and R Programming.

2. Following the completion of the survey, the data that was gathered was examined by the researcher using descriptive statistics. Due to the fact that the data were collected using a Likert scale, which produced nominal data, it was possible to quantify the hierarchy or ranking of a data set from low to high, despite the fact that this was not an absolute measurement (Fisher & Marshall, 2009). The information was organized in a Microsoft Excel file according to the technical discipline it came from, and the author computed the aggregate worth of each participant. Following that, the entirety of the total value was assessed utilizing a data analysis tool contained within Microsoft Excel known as the descriptive analysis tool. In the meantime, we did not use all of the descriptive statistical outcomes to analyze the questions, so we essentially used the mean and the standard deviation to determine the result. Given that the mean and the standard deviation are sensitive enough to changes in the data, we determined that these two statistics were sufficient to determine the outcome (Ferreira, 2020).