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Shifting to Digital Education: An Analysis of Teacher Knowledge and Its Implementation of Open Educational Resources in Vocational Schools

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ABSTRACT

Open Educational Resources (OER) are more than just an expectation in the world of education. However, they are a tangible manifestation of developments in science and technology in today's modern, sophisticated world that teachers can utilize as one of the learning strategies. This research aims to analyze teachers' understanding and application of Open Education Resources (OER) implemented in vocational schools in Indonesia. This correlational study uses a survey and observational research design approach conducted on 60 teachers in 33 vocational schools, consisting of 46.7% of men and 53.3% of women. The sample was 20 – 50 years. The research results showed that the level of teacher understanding of the use of OER is in the high category, namely 93.3%. The research results also show that there is a negative and significant correlation between the level of knowledge and age, and there is a positive correlation between the level of teacher knowledge and the level of education. This research concludes that OER, a digital learning media that can be accessed generally, is helpful for teaching, learning, education, assessment, and research.

1. Introduction

The use of technology and digitalization systems in education is increasingly developing, and the concept of learning by integrating technology and digitalization experiences continuous changes all the time [1-13]. These conditions require educators to be able to adapt to rapid technological changes. Integrating technology into learning makes it possible to create a broad community according to the required field of knowledge, especially in vocational education, which has unique specifications and competencies [14].

Digital technology is one of the essential things in implementing distance learning. Distance learning is one of the methods in teaching and learning process [15-24]. The availability of quality educational materials is the primary capital for preparing students to be more skilled and have

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competencies used as a basis for global competition [25, 26]. Various platforms are used in implementing distance learning. Digitalization and technology are primary needs in implementing distance learning [27]. The openness of learning resources is one of the trends in the implementation of distance learning; this is marked by the increasing number of platforms with Open Educational Resources (OER) that provide access to high-quality educational materials related to skills development [28, 29].

The dynamic development of science is an excellent opportunity for openness in education [30]. In this context, educational openness is the key to realizing the benefits of Open Educational Resources (OER) in vocational education [30]. It was recorded that around 73.1% of published reports on OER (Open Educational Resources) were concentrated between 2010 and 2013 [31]. OER is an open licensed learning resource that can be accessed for specific research and learning development purposes [32, 33]. OER is widely used in open learning in various institutions or consortia (Wiley et al., 2014). Several studies show that using OER in learning makes it easier for educators and students to explore material from various sources according to their expertise [34, 35].

Open Educational Practice (OEP) aims to build knowledge, skills, and behaviors that support and enhance teaching and learning [36-40]. Using open educational resources (OER) presents a unique affordance for educators, as the use of OER is an invitation to adapt, personalize, and add relevance to materials that inspire and encourage deeper learning in the classroom and across institutions [41]. However, in reality, not all teachers can utilize OER in learning due to teachers' abilities, skills, and access to technology and digitalization systems that they will use in learning. Learning by integrating technology into learning at vocational schools is a challenge for teachers. This can be indicated by knowing how much teachers have utilized OER in implementing learning at the vocational school.

Discussion of OEP and OER has been well-attracted researchers. Bibliometric analysis shows the increases in the number of publications, as shown in Figures 1 and 2. Total publications for OEP and OER reach more than 8000 and 6000 documents, respectively. Bibliometric analysis is one of the effective methods for understanding research trend in many subject areas (see Table 1). Detailed information on how to use bibliometric analysis is explained elsewhere [4]. This research aims to determine the level of knowledge of teachers in vocational education regarding OER and the extent to which teachers have integrated OER in the implementation of learning.

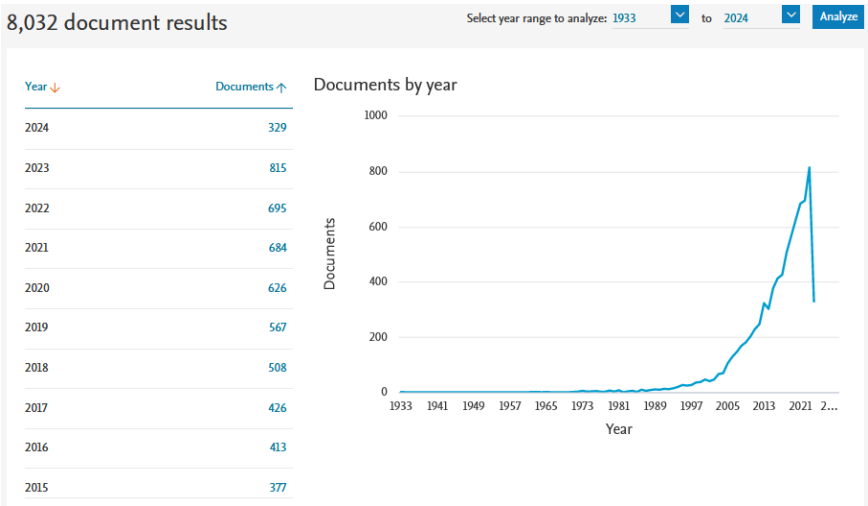

Fig. 1. Scopus database results for OEP, taken in May 2024

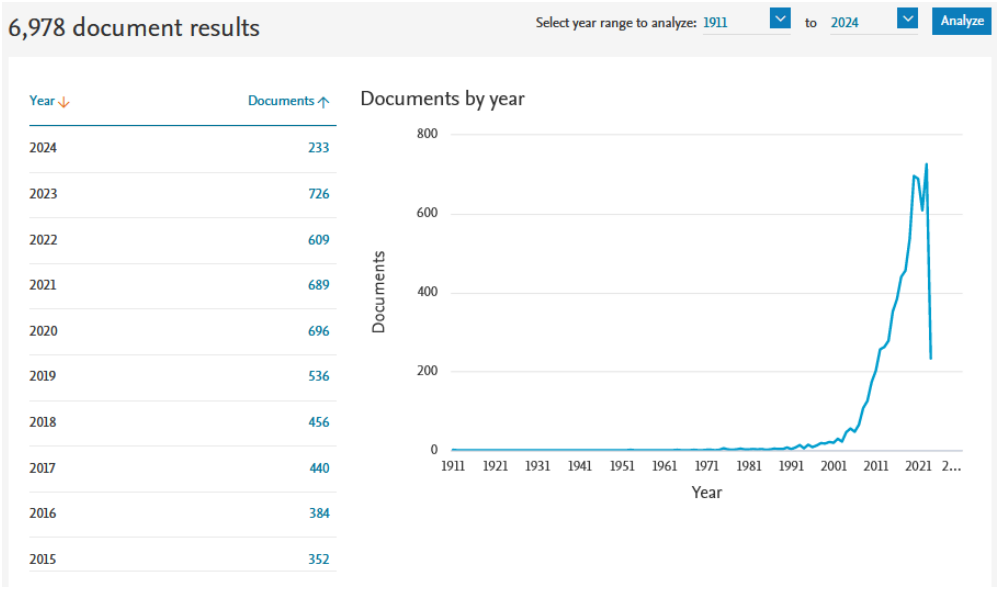

Fig. 2. Scopus database results for OER, taken in May 2024

Table 1
Previous studies on bibliometric analysis (published in 2023-2024)

No	Author(s)	Topic	Reference
1	Utama et al. (2023)	Progressing from bibliometric analysis to a comprehensive model of sustainable production-inventory with multi-material, quality deterioration, and probabilistic demand.	[42]
2	Sahidin et al. (2023)	In-vitro and in-silico research using bibliometric analysis to investigate the phytochemical profile and biological activity of peanut (Arachis hypogaea L.) stem ethylacetate extract.	[43]
3	Hamidah et al. (2023)	Biomass-based supercapacitors electrodes for electrical energy storage systems activated using chemical activation method: A literature review and bibliometric analysis	[44]
4	Arianingrum et al. (2023)	Antiangiogenesis activity of Indonesian local black garlic (Allium Sativum 'Solo): Experiments and bibliometric analysis	[45]
5	Rahmat et al. (2023)	Characteristics of tamarind seed biochar at different pyrolysis temperatures as waste management strategy: experiments and bibliometric analysis	[46]
6	Abduh et al. (2023)	The compleat lextutor application tool for academic and technological lexical learning: Review and bibliometric approach	[47]
7	Juhanaini et al. (2023)	How eyes and brain see color: Definition of color, literature review with bibliometric analysis, and inquiry learning strategy for teaching color changes to student with mild intelligence barriers	[48]
8	Mardina et al. (2024)	Corncob-derived sulfonated magnetic solid catalyst synthesis as heterogeneous catalyst in the esterification of waste cooking oil and bibliometric analysis	[49]
9	Solihah et al. (2024)	Prototype of greenhouse effect for improving problem-solving skills in science, technology, engineering, and mathematics (STEM)-education for sustainable development (ESD): Literature review, bibliometric, and experiment	[50]
10	Yang et al. (2024)	Spatial visualization ability assessment for analyzing differences and exploring influencing factors: Literature review with bibliometrics and experiment.	[51]

Table 1 (Continue)
Previous studies on bibliometric analysis (published in 2023-2024)

No	Author(s)	Topic	Reference
11	Angraini et al. (2024)	Augmented reality for cultivating computational thinking skills in mathematics completed with literature review, bibliometrics, and experiments for students	[52]
12	Nurramadhani et al. (2024)	Low-carbon food consumption for solving climate change mitigation: Literature review with bibliometric and simple calculation application for cultivating sustainability consciousness in facing sustainable development goals (SDGs).	[53]
13	Imaniyati et al. (2024)	Neuroscience intervention for implementing digital transformation and organizational health completed with literature review, bibliometrics, and experiments	[54]
14	Amida et al. (2024)	Phylogenetic analysis of Bengkulu citrus based on DNA sequencing enhanced chemistry students' system thinking skills: Literature review with bibliometrics and experiments	[55]
15	Kadir et al. (2024)	The ship's propeller rotation threshold for coral reef ecosystems based on sediment rate indicators: Literature review with bibliometric analysis and experiments	[56]
16	Shafiq et al. (2024)	Empowering engineering female students to improve retention and progression: A program evaluation study completed with bibliometric analysis	[57]
17	Shidiq (2023)	Bibliometric analysis of nano metal-organic frameworks synthesis research in medical science using VOSviewer	[58]
18	Nandiyanto et al. (2024)	Research trends from the scopus database using keyword water hyacinth and ecosystem: A bibliometric literature review.	[59]
19	Lizama et al. (2024)	Use of blockchain technology for the exchange and secure transmission of medical images in the cloud: Systematic review with bibliometric analysis	[60]
20	Al Husaeni et al. (2024a)	Chatbot artificial intelligence as educational tools in science and engineering education: A literature review and bibliometric mapping analysis with its advantages and disadvantages	[61]
21	Laita et al. (2024)	How technology can change educational research? Definition, factors for improving quality of education and computational bibliometric analysis	[62]
22	Al Husaeni & Nandiyanto (2023)	Bibliometric analysis of high school keyword using VOSviewer indexed by google scholar	[63]
23	Zafrullah & Ramadhani	The use of mobile learning in schools as a learning media: Bibliometric analysis	[64]
24	Kongsaenkham & Chano (2024)	Bibliometric analysis using VOSviewer with Publish or Perish of role-play in the teaching and learning	[65]
25	Farokhah & Abidin (2024)	Global research trends of mathematics literacy in elementary school: A bibliometric analysis	[66]
26	Al Husaeni & Munir (2023)	Literature review and bibliometric mapping analysis: Philosophy of science and technology education	[67]
27	Pramanik & Rahmanita (2023)	Strengthening the role of local community in developing countries through community-based tourism from education perspective: Bibliometric analysis	[69]
28	Rasuman et al. (2024)	Trends and networks in education for sustainable development (ESD): A bibliometric analysis using vosviewer	[70]
29	Tungtawee & Chano (2024)	Bibliometric analysis using VOSviewer with Publish or Perish of curriculum evaluation using the CIPP model	[71]
30	Muktiarni et al. (2023)	Bibliometric computational mapping analysis of trend metaverse in education using vosviewer	[72]

2. Methodology

This research uses descriptive correlation research methods by conducting observations and surveys. This research provides an overview and study of the Open Educational Resources phenomenon and An Analysis of Teacher Knowledge and Its Implementation in Vocational Schools in Indonesia, as well as testing the relationship between several variables. This research focuses on describing and providing a correlation analysis regarding teachers' understanding of OER and the types of OER implemented by teachers in schools. Apart from that, this research also provides an overview of the implementation of OER in vocational schools in Indonesia.

2.1 Sampling and Population

The subjects of this research consisted of 60 teachers in 33 vocational schools in Indonesia, 28 men and 32 women, with the sample age range of 20 – 50 years. The sampling technique used is convenience sampling because sampling is based on the availability of elements and the ease of obtaining them. The sample who was willing to be involved in this research filled out the information concern as proof of willingness to be involved voluntarily as participants in this research.

2.2 Instrument and Data Collection

The instrument used was a questionnaire regarding aspects of the use of Open Educational Resources in Learning by teachers at Vocational schools. This instrument consists of four parts, namely:

2.2.1 Demographic data

Demographic data is basic data about the participants involved in this research, consisting of age, gender, school origin, study program, level of education, and length of time teaching at school.

2.2.2 Aspects of teacher knowledge regarding the use of open educational resources in learning at vocational schools

The knowledge aspect in question is the knowledge aspect stated by the teacher based on the questions provided as shown in Table 2 below.

Table 2
Aspects of teacher knowledge regarding the use of open educational resources in learning at vocational schools

No	Statement
1	What do you know about Open Educational Resources? a. Open Educational Resources are open learning resources (open licensed documents and media) that can be accessed by anyone. b. Open Educational Resources are learning resources that can be accessed via the website. c. Open Educational Resources is an online learning application. d. Open Educational Resources is a learning medium that uses the internet network. e. Open Educational Resources is distance learning that utilizes technology. f. I'm not aware of Open Educational Resources.

Table 3
Aspects of teacher knowledge regarding the use of open educational resources in learning at vocational schools

2	What type of Open Educational Resources do you use when implementing online learning? a. Search Engines b. Creative Commons (CC) c. Video Search Tool d. Search Tool for images e. Textbooks f. OER Database g. Open course h. Learning Management System

2.2.3 Aspects of learning preparation using open educational resources in learning at vocational schools

The learning preparation aspect includes teacher statements that represent their activities in preparing learning using OER. This learning aspect is expressed in 4 rating scales, namely 1 (Strongly Disagree), 2 (Disagree), 3 (Agree), and 4 (Strongly Agree) as in Table 4 below.

Table 4
Aspects of learning preparation using Open Educational Resources in learning at vocational schools

No	Statements	Answer			
		1	2	3	4
1	I always appreciate learners for their variety without making them different in terms of beliefs, ethnicity, traditions, places of origin, and genders				
2	I always understand learners' characteristics from the physical, moral, social, cultural, emotional, and intellectual aspects.				
	Educational Foundation Insights:				
3	I have to have a mastery of learning theories and principles of learning in their education environments.				
	Curriculum Development:				
4	I have to develop a curriculum relating to its courses/field of development in the field of my responsibility.				
	Learning Design of Learning:				
5	I have to hold an educating principles of learning design.				
6	I always have to set a comprehensive learning design to support activities carried out in a class, a laboratory, and in practices				
7	I am always searching for learning resources from various media and platforms on the internet				
8	I always do an update of materials, structures, concepts, and thinking patterns of scientific thoughts supporting the subject under my responsibility to teach				
9	I always develop learning materials under my responsibility to teach creatively and innovatively				

2.2.4 Implementation of the use of open educational resources in learning in vocational schools

The implementation of the use of OER by teachers in vocational schools is described in several categories of questions, namely regarding the use of search engines, Creative Commons, video search tools, image search tools, textbooks, OER databases, open courses, and Learning Management Systems. The implementation categories can be seen in Table 5 below. The data collection process was carried out by surveying by distributing instruments via Google Forms to 200 vocational teachers in Indonesia. Participants are allowed to fill out and return the survey within 1 month. After the specified time, 60 participants filled out and returned the instrument and met the criteria as participants in this research which was then processed using statistical analysis.

Table 5
Implementation of the use of open educational resources in learning at vocational schools

No	Open Educational Resources Category	URL	Yes	No
1	Search Engine	http://www.google.com/		
		http://www.yahoo.com/		
		http://www.bing.com/		
		http://www.lycos.com/		
2	Creative Commons (CC)	http://search.creativecommons/		
		http://www.curriki.org/		
		https://www.oercommons.org/		
3	Video Search Tool	http://www.youtube.com/		
		http://www.vimeo.com/		
		http://archive.org/details/mov		
		http://www.ted.com/		
		http://cc.aljazeera.net/		
4	Search Tool for images	http://www.google.com/adva		
		http://www.pixabay.com/		
		http://openclipart.org/		
5	Textbook	http://openstaxcollege.org/		
		http://projects.siyavula.com/		
		http://www.ck12.org/		
		http://www.boundless.com/		
		https://open.bccampus.ca/find-open-textbooks/		
		https://chem.libretexts.org/		
		http://open.umn.edu/opentextbooks/		
6	OER Database	https://www.bibb.de/en/35852.php		
		http://oasis.col.org/		
		https://moodle.gprc.ab.ca/		
		http://doer.col.org/		
		https://www.khanacademy.org/		
		https://www.merlot.org/merlot/index.htm		
		http://phet.colorado.edu/		
7	Open course	http://oeru.org/		
		http://www.coursera.org/		
		http://www.futurelearn.com/		
		http://online.stanford.edu/cou		
		http://e-tesda.gov.ph/		
8	Learning Management System	http://www.schoology.com/		
		http://www.myhaikuclass.com/		
		http://www.coursesites.com/		
		http://www.edmodo.com/		

2.3 Data Analysis

Analysis of this research data uses descriptive statistical analysis, Frequencies, and Pearson Correlation. Data analysis used SPSS version 25 with a significance level of 0.05.

3. Results and Discussion

3.1 Demographic Analysis

The participant demographics analyzed in this paper are age, gender, school origin, study program, education level, and length of time teaching at school. The results of descriptive data analysis using frequencies are in figures 1 – 6 below. Figure 1 and 2 show the data on the age and sex distribution of the respondents**.**

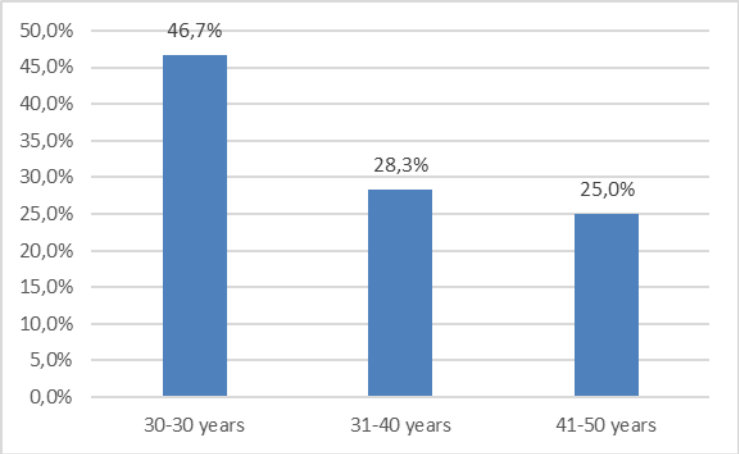

Fig. 1. Age distribution of respondents

Surveys were collected from 60 teachers spread across several vocational education schools. Figure 1 shows data on the age distribution of respondents; less than half of them, 28 (46.7%) teachers aged 30-30 years, a small portion 17 (28.3%) teachers aged 31-40 years, and the remaining majority, 15 (25%) teachers aged 41-50 years. Based on the results of descriptive data analysis using frequencies, it is known that the dominant ages of teachers who are participants are between 20-30 years old, namely 28 people, 17 people are between 31-40 years and 15 people are between 41-50 years. Based on this data, teachers aged between 20-30 years were more likely to participate in this research, which illustrates that this age range is quite productive. In this age range, it is considered productive and more proficient in understanding scientific concepts and technological developments, such as open educational resources. Based on the Global Education Monitoring Report (Technology in Education) 2023, young people adapt more quickly to technology. In line with the opinion of Palupi (2017) [73], in their research, they stated that the age of 21-40 years (early adulthood) is the age when the ability to practice all the intellectual potential, talents, interests, knowledge, and skills that have been acquired is explored. In other words, at this age stage, each individual is very productive [73].

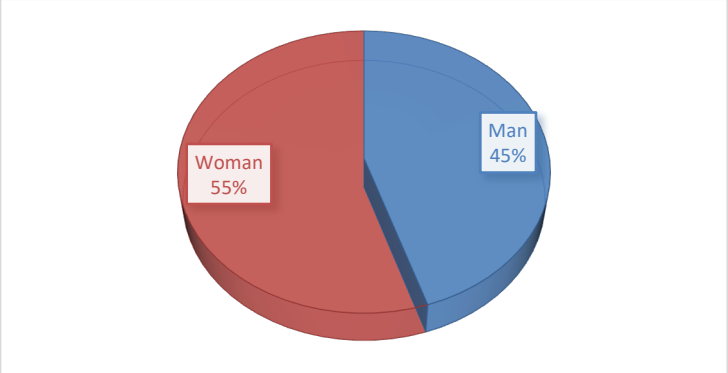

Fig. 2. Gender distribution of respondents

Figure 2 shows data on the gender distribution of respondents; 32 (53.3%) female teachers and the remaining 28 (46.7%) male teachers were involved in this research. The number of participants based on gender is relatively balanced between men and women. Data on teachers based on gender in Indonesia can be seen from the Basic Data of the Ministry of Education, Culture, Research, and Technology, showing that vocational school teachers are predominantly female. According to the 2023 survey results, the gender distribution data for vocational school teachers is dominated by women. The distribution of vocational school teachers based on gender is the largest; 179,302 (45%) are female, and the remaining 146,445 (55%) are male. Figure 3 and 4 show the data on the school background and study program background distribution of the respondents.

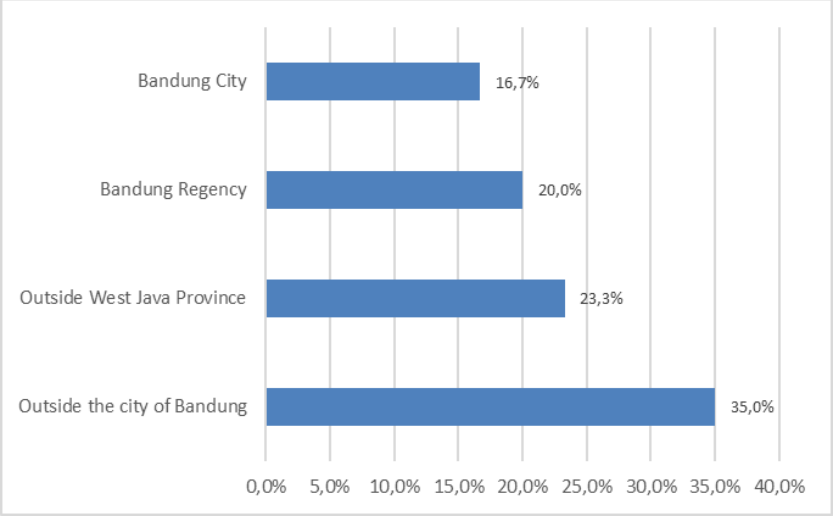

Fig. 3. Participants school background

Figure 3 shows data on the distribution of respondent schools, 21 (35%) teachers come from outside the city of Bandung, 14 (23.3%) come from outside West Java Province, 12 (20%) come from Bandung Regency, 10 (16.7%) came from Bandung City. The remaining 3 (5%) came from Cimahi City. Based on this data, it can be seen that the dominant participants came from schools in West Java, while the rest were from other provinces in Indonesia. Primary Data from the Ministry of Education, Culture, Research, and Technology shows that teachers predominantly come from West Java Province. Following the results of the 2023 survey, data on the distribution of vocational school teachers is dominated by West Java Province. Based on Basic Data from the Ministry of Education, Culture, Research, and Technology, in 2023, the most significant number of vocational school

teachers will come from the province of Java, namely 55,788 (17%) of the 325,747 vocational school teachers spread across Indonesia.

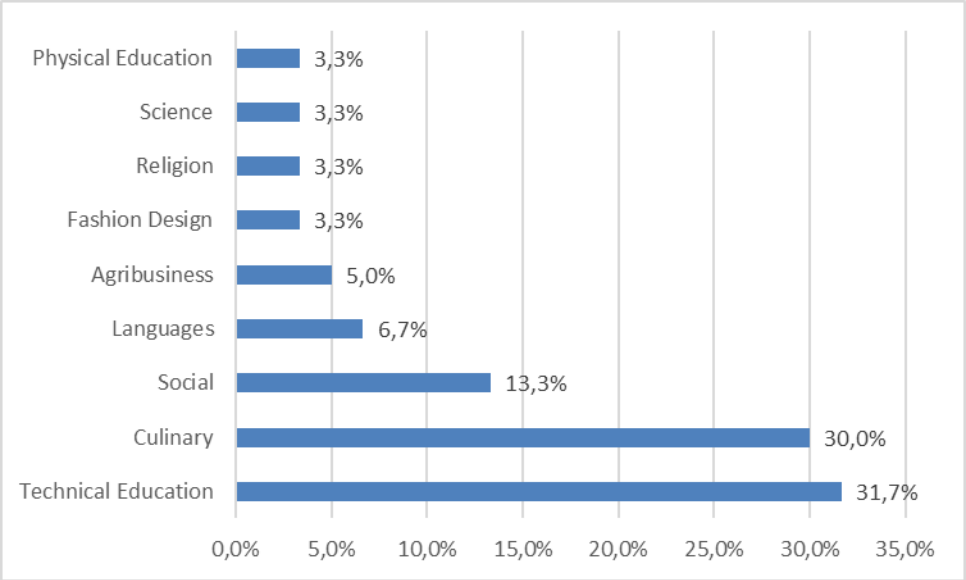

Fig. 4. Participants School Background

Figure 4 shows that in participants program study background, the educational background of the teachers who participated in this research were 19 (31,7%) in technical education, 18 (30%) in culinary, 8 (13,3%) in social, 4 (6,7%) languages, 3 (5%) in agribusiness, 2 (3,3%) in fashion design, religion, science, and Physical Education. Figure 5 and 6 show the data on the level of education and teaching background distribution of the respondents.

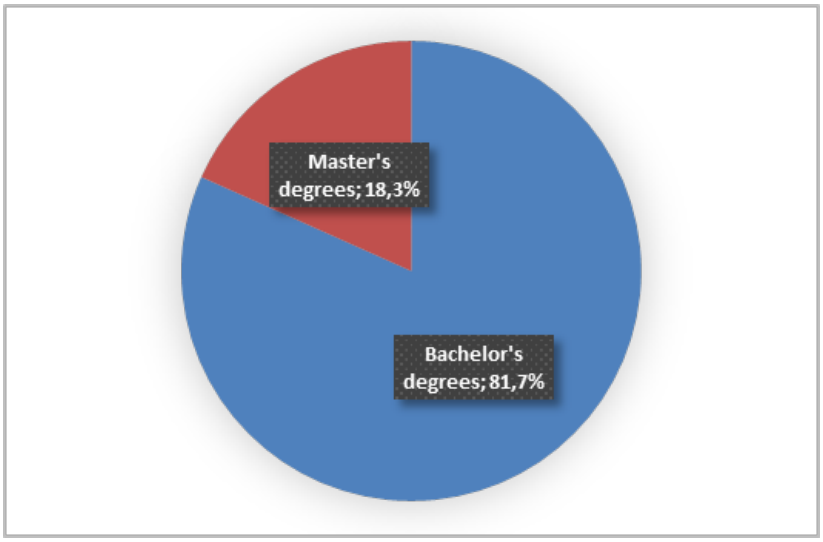

Fig. 5. Participants teaching background

Figure 5 shows data on the educational background of respondents, less than half of the respondents 49 (81.7%) teachers came with Bachelor's degrees, and the rest of the respondents 11 (18.3%) teachers came with Master's degrees.

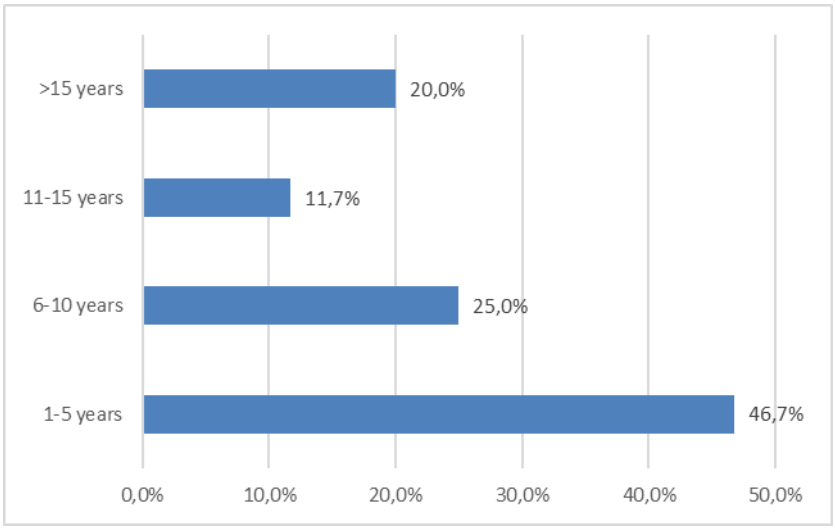

Fig. 6. Participants teaching background

Figure 6 shows data on the distribution of respondents' teaching background, 28 (46.7%) teachers have taught for 1-5 years, 15 (25%) teachers have taught for 6-10 years, 10 (16.7%) teachers have taught >15 years, and the remaining 7 (11.7%) teachers have been teaching for 11-15 years. Based on this data, it can be concluded that the participant teaching background of vocational school teachers is 1-5 years of teaching.

3.2 Analysis of Bivariate Correlation

The level of knowledge with age and level of education can be seen from the results of data analysis. The results of correlation analysis to determine the relationship between knowledge age and level of education can be seen in Table 4.

Table 4
Correlation of OER knowledge level with age and education level

Correlations

		Knowledge_ OER	Age	Education Level
Knowledge_OER	Pearson Correlation	1	-.125	.275*
	Sig. (2-tailed)		.043	.034
	N	60	60	60

Based on the results in Table 4 of correlation data analysis using Pearson Correlation with a significant level of 0.05, it was found that there was a significant relationship between the level of teacher knowledge and age and level of education. The research results show a negative and significant correlation between the level of knowledge and age (r = -125, p = 0.043). This means that the higher the teacher's age, the lower the level of knowledge. The research results also show a positive correlation between the level of teacher knowledge and the level of education (r = 275, p = 0.034), meaning that the higher the level of education, the higher the level of teacher knowledge.

Open Education Resources (OER) is a term for open learning resources. The meaning of open learning resources here is documents and media with an open license that anyone can access and use anywhere and at any time. These learning resources are not limited to being used for learning and teaching only but as research and reference sources that can be accessed for free on the Internet [41, 42]. Open Education Resources is an open learning resource that can be accessed effectively,

affordably, and sustainably. As a learning resource, Open Education Resources can be accessed with an open and unrestricted license, and education and students can use them easily without having to pay licensing fees. Education and students can use Open Education Resources learning resources according to their needs and requirements [75]. Open Education Resources is more than just textbooks, modules, multimedia resources, learning videos, etc. Curriculum and Learning Plans can be published under an open license and continue developing according to the open project context. Open Education Resources as learning resources can be created and developed openly and collaboratively [76]. Open Education Resources as learning resources in open education have standard tools, such as learning resources and open platforms, that allow them to be edited collaboratively easily [77]. The learning house, one of the Open Education Resources platforms, contains learning materials that can be used by education in implementing the learning process. This portal can also be accessed by learning resources students; this portal can be accessed anywhere, both in the school area and outside the school. The advantage of the platform is that it has many features, various features provided, namely books in digital form and open learning resources in digital form; this is a learning resource for learning references if you cannot buy physical books or become additional references besides the physical books you already have.

The integration of Open Education Resources significantly influences the online learning process; students can access material and interact with educators using the available platforms [74]. One of the platforms used for the online lecture process that can be used globally is iTunes University, an application that can be downloaded and used specifically for lectures globally. This application can make getting material from various sources worldwide easier and more accessible. Apart from iTunes University, one of the open learning platforms is Slideshare. This open learning resource is in the form of a website that contains information sources for various materials and various documents to add learning resources that can be used by education and students. Another open learning platform used in the learning process is YouTube; as one of the open educational resource platforms, many schools and universities in various countries have integrated YouTube. YouTube has an attractive appearance compared to text or digital books. YouTube has visuals that are easier to understand, and the visuals can be more explicit with audio, which can explain and clarify the presented material. YouTube as a learning source continues to develop according to current learning and curriculum.

Open Education Resources as an open learning resource has five principles: retain, reuse, revise, remix, and redistribution [78]. Retain relates to the right to create, own, and control copies of content; for example, someone can access, download, reproduce, store, and manage. Reuse relates to reuse, namely the right to use content in various ways (for example, using content in class, in study groups, on official websites, and in videos). Revise relates to the right to adapt, modify, or change the content (one example of using OER is translating content into another language). Remix relates to the right to combine original or revised content with other material to create something new (for example, incorporating content into a mashup, a mixture of content or elements from various official websites). Redistribution relates to the right to share copies of original content and revisions made or merge owned files with other files [79].

Open Education Resources as an open learning resource has advantages and disadvantages. The advantages of Open Educational Resources as a learning resource are that they are free, have continuous access, you can choose according to your wishes, and the materials are easy to access. The lack of Open Educational Resources as a learning resource requires hardware, software, human resources, and practice in the process of teaching and learning activities, as well as the lack of maximum language mastery, which is an obstacle to the ability to access and obtain knowledge of digital information. Open education resources in digital learning are used to examine the use of technology more profoundly and comprehensively so that educators and students must be

professionals in using technology. For example, an educator who will teach using open learning resources must first understand and master the skills in using technology before using them. So that when using open learning resources in the learning process, educators can maximize their use. Open Education Resources can provide solutions when students experience difficulties in the learning process; by using open learning resources in digital form, students can learn anytime and anywhere without being limited by space and time [80]. Open learning resources in vocational education are not limited to conceptual understanding. However, open learning resources can be used to guide students in understanding more deeply the competencies according to their area of expertise [80]. The limitations of classroom learning mean that students do not understand concepts and theories; therefore, the existence of open learning resources provides a solution for students to master the material according to their respective skill competencies [29, 81]. This study add new ideas and information regarding open and digital education [82-90].

4. Conclusions

Open education resources, such as learning resources that anyone can access openly, are a form of digitalization in learning. Open education resources as a learning resource have the aim of improving the quality of education and making the learning process easier. The use of open educational resources depends on educational and student competency. The better the level of understanding and competency in using technology, the easier and more accessible it will be. This research analyzes teachers' understanding of open education resources and the extent to which teachers use open education resources in the learning process. The research results show that the level of teacher understanding of the use of OER is in the high category, and various types of Educational Resources used by teachers during the learning process start from search engines, Creative Commons, video search tools, and image disbursement tools. In general, teachers understand and implement OER as a learning resource. The research also concludes that the higher the teacher's age, the lower the level of knowledge of OER, and the higher the level of education, the higher the level of teacher knowledge of OER.

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