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SARIPUDIN, AS'ARI DJOHAR & DEDI ROHENDI

Typical OER (Open Educational Resources) Development Model for Prospective Vocational High School Teachers in Indonesia

ABSTRACT: *Access to a quality learning materials in the era of ICT (Information and Communication Technology) is increasingly massive, so it can solve problems such as imbalances in the quality of educational materials and access to the intended materials. Every country in the world strives to provide wide-open access through the use of web-based applications to facilitate and provide support to the population on the needs of teaching materials according to their needs. Distance learning can be one of the alternative solutions done easily by utilizing ICT infrastructure. In Indonesia, research on OER (Open Educational Resources) in the field of vocational education has not been widely carried out, more research has been conducted only on aspects of the application of OER in higher education in general. The purpose of this research is how to develop a typical OER development model for prospective vocational high school teachers in LPTK (Lembaga Pendidikan Tenaga Kependidikan or Education Institute for Education Personnel)'s University based in an effort to improve their quality and competence. This research method uses DBR (Design-Based Research). Through a series of tests, it can be seen that the model developed has been able to improve student competence in achieving learning outcomes, through the implementation of pre-test and post-test at each practice session carried out. The results show that the average of the consensus from the experts for all aspects of the model that has been developed is 88.8%. This shows that the typical OER development model in this study is very feasible to be implemented widely.*

KEY WORDS: *Information Technology; Educational Technology; Open Educational Resources; Design-Based Research.*

INTRODUCTION

The development of distance learning, e-learning, and LOs (Learning Objects), along with the development of new technologies in the field of

About the Authors: **Saripudin, M.T.** is a Student at the Technological and Vocational Education Study Program of SPs UPI (School of Postgraduate, Indonesia University of Education), Jalan Dr. Setiabudhi No.229 Bandung 40154, West Java, Indonesia. **Pof. Dr. As'ari Djohar** and **Dr. Dedi Rohendi** are the Lecturers at the Technological and Vocational Education Study Program of SPs UPI in Bandung, West Java, Indonesia. E-mail address at: saripudin@upi.edu, asaridjohar@upi.edu, and dedir@upi.edu

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ICT (Information and Communication Technology), have encouraged efforts to provide equal access to educational facilities for all (Arimoto, Barroca & Barbosa, 2016; and Otero *et al.,* 2018). In terms of providing quality and reusable learning material for everyone without the need for permission to be adopted has encouraged movements that demand openness and freedom of learning resource materials, the result is in the form of new concepts and technologies in the concept of OER (Open Educational Resources) or Open Learning Resources (Lawrence & Lester, 2018).

OER has become an interesting topic that is widely discussed by researchers in the world and is one source of strength for contributing to improving the quality of the education system and openness. OER are open-licensed documents and media that are useful for teaching, learning, education, assessment, and research purposes. OER included lectures, lecture materials, content modules, learning objects, journals, and various supporting tools for the delivery of learning content (UNESCO, 2011; and Zancanaro, Todesco & Ramos, 2015).

The government of Indonesia clearly states its support for this open educational resources learning in article 79 and paragraph 4 of Law Number 12 of 2012 concerning Higher Education. OER opens new opportunities for the process of producing and disseminating knowledge, while promoting an adaptive learning environment, suitable for each individual's needs. OER is essentially a licensed learning resource open in the sense that each source is intended, open for everyone to access, modify, combine and customize, and redistribute according to user needs (*cf* Hylén, 2006; D'Antoni, 2009; and Setneg RI, 2012).

Research on OER in the field of vocational education has not been done much, so far the research has more application in higher education in general, such as shown in the study results of: Marshall S. Smith & Catherine M. Casserly (2006); UNESCO [United Nations Educational, Scientific, and Cultural Organization] & CoL [Commonwealth of Learning] (2011); Eileen Scanlon (2012); Angela Murphy (2013); Gajaraj Dhanarajan & David Porter (2013); Jeremy Knox (2013); Markus Deimann & Norm Friesen (2013); Robert A. Rhoads, Jennifer Berdan & Brit Toven-lindsey (2013); Sara Hammer (2013); Ophat Kaosaiyaporn, Jaitip Na-Songkhla & Lalida Boonthong (2015); John Hilton (2016); Rosa Navarrete, Sergio Lujan-Mora & Myriam Penafiel (2016); Ilias O. Pappas, Michail N. Giannakos & Patrick Mikalef (2017); Jose Luis Martin Nunez, Edmundo Tovar Caro & Jose Ramon Hilera Gonzalez (2017); Michael Henderson, Neil Selwyn & Rachel Aston (2017); Shouhong Wang & Hai Wang (2017); Tarah K. Ikahihifo *et al*. (2017); and Yetunde A. Zaid & Adefunke O. Alabi (2020).

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The implementation of the 2013 Curriculum in the Indonesian national education system for vocational education makes teachers act as facilitators and motivators in the learning process in the classroom. The learning process should not be done haphazardly. The learning process must be planned, organized, and carried out effectively and efficiently to achieve a goal. The lack of availability and access to learning resource materials has an impact on the quality and competence of teachers, prospective teachers, and students in vocational schools. Therefore, awareness of every element involved that the availability of learning resources is a necessity (Trust & Pektas, 2018; and Engeness, 2020).

The development of Distance Education or PJJ (*Pendidikan Jarak Jauh*), E-learning, and LOs (Learning Objects), along with the development of new technologies in the field of communication, have encouraged efforts in provide facilities for equal access to education for all. Especially, in terms of providing quality learning materials that everyone can reuse without requiring permission to be adopted, it has encouraged a movement that demands openness and freedom to learning resource materials; the result is in the form of new concepts and technology in the form of OER (Open Educational Resources) or Open Learning Sources. OER has become an interesting topic discussed by many researchers in the world; and it is a source of strength for contributing to the improvement of the quality of education systems and openness (Zancanaro, Todesco & Ramos, 2015; Arimoto, Barroca & Barbosa, 2016; Pannen *et al.*, 2016; and Lawrence & Lester, 2018).

OER is an openly licensed document and media that is useful for teaching, learning, education, assessment, and research purposes. OER has not been tested in many academic programs at universities, so it is an opportunity to enrich research on the implementation of OER in universities in Indonesia. The potential for OER is expected to contribute to the process of increasing the productivity and quality of students and teachers in Indonesia, especially prospective vocational school teachers. It is generally known that vocational schools with curriculum content require students to do more practice than theory, so they need more money than another public school model (Wang & Wang, 2017; and Tlili *et al.,* 2019).

The results of preliminary research regarding how much student's literacy is towards OER-based materials, at the preliminary study results measuring the Electrical Engineering Education Students' understanding of OER and its benefits (Saripudin *et al.,* 2019) can describe the level of understanding and awareness of OER and IPR (Intellectual Property Rights). See figure 1.

The survey results in the study, eighty point two percent (80.02%)

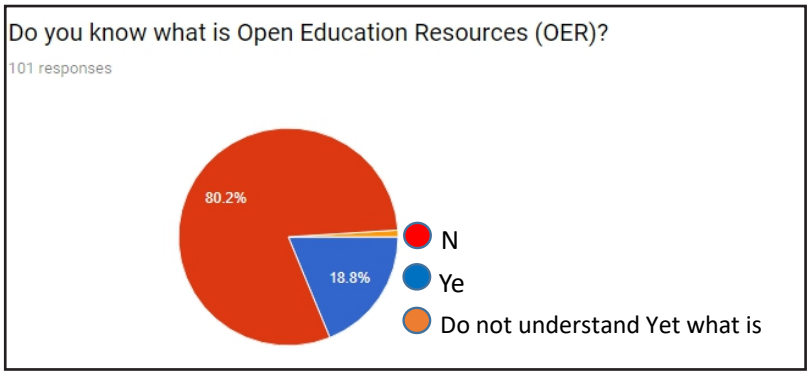

Figure 1:
Level of Participant Knowledge of OERs
(Source: Saripudin *et al.*, 2019)

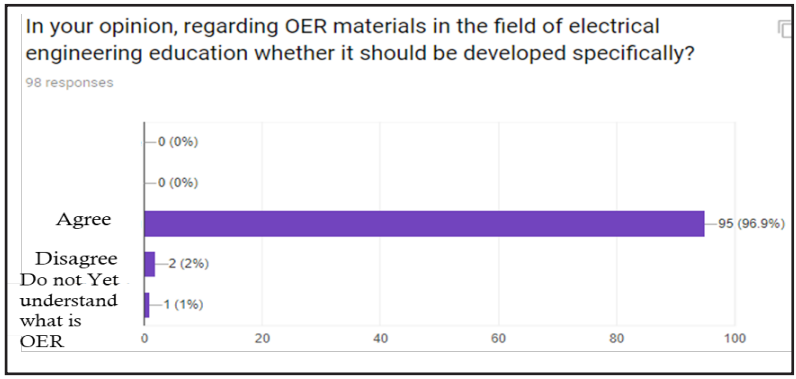

Figure 2:
Participant Opinion Regarding OER Materials Development

considered themselves to have poor knowledge of OER (Open Educational Resources) and IPR (Intellectual Property Rights). What is interesting is that ninety-five percent of the respondents agree, if the OER material in the field of electronic engineering education is developed specifically. See figure 2.

What was surprising and actually not realy surprising was that when students were asked about the legality of the LMR (Learning Material Resources) they used, it turned out that eighty-four point nine percent 84.9% were pirated. See figure 3.

The availability of OER (Open Educational Resources) is a solution to help teachers, prospective teachers, and students with the problem of the availability of teaching materials and learning resources, because it can

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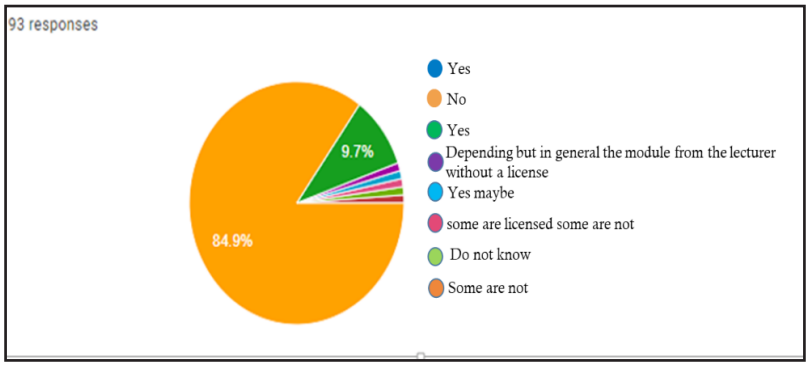

Figure 3:
Legality of Learning Material Sources

save costs and time in getting quality learning resource materials; everyone involved in the educational process at a vocational high school can actively be involved; materials can be modified, distributed, and reused according to their individual needs, so that through the OER scheme the concept of education for everyone can be easily achieved (Hilton III *et al.*, 2014).

The spread of OER along with the rapid development of ICT (Information and Communication Technology), with the support of web 2.0 technology, is made easier especially through the use of opecourseware applications that are increasingly developing with more advanced concepts with the MOC (Massive Online Course) concept. This has further increased the achievement of equality in gaining access to teaching materials, especially OER-based materials (Saripudin, 2015; Saripudin *et al.*, 2019 and 2020; and Tlili *et al.*, 2020).

Through the use of increasingly advanced web technology, the implementation process of using MOC can be used to integrate the distribution of OER-based learning materials. OER materials or materials that have been used can be stored into the OER repository portal, so that they can be easily searched and recalled if needed again or needed by other parties with various purposes in accordance with the subject of the needy party study (Goyanes, Bermudez & Docampo, 2018; Saripudin *et al.*, 2019; and Al-Imarah, Shields & Kamm, 2020). See figure 4.

By applying the concepts in figure 4, both students and professors can be connected to carry out the learning process both synchronous and asynchronous to increase learning outcome. The aim of this research is to develop a typical OER (Open Educational Resources) development model for prospective vocational school teachers in Indonesia. In this study, a case study was conducted on prospective vocational high school

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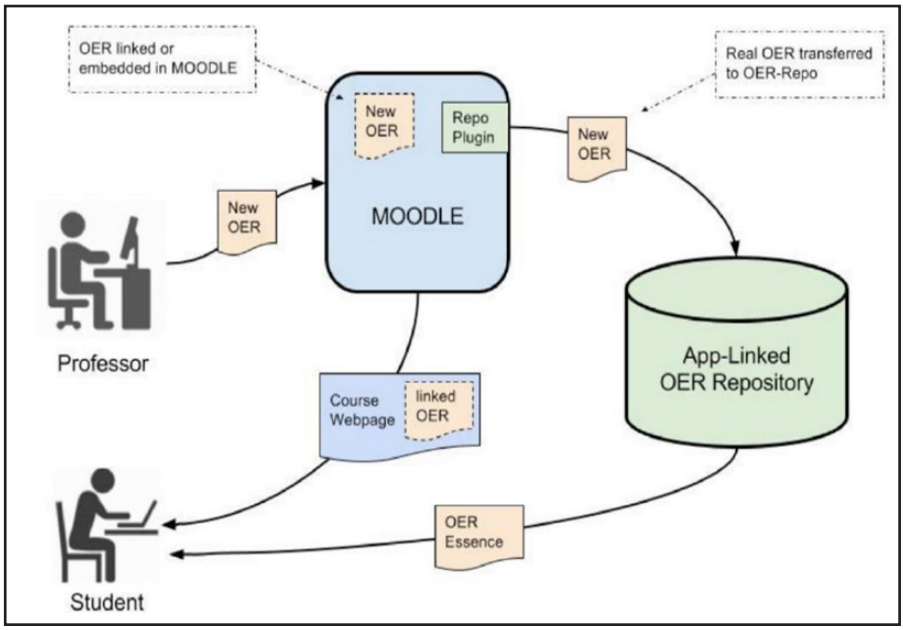

Figure 4:
Application-Linked OER Reopsitory
(Source: Vicente Goyanes, Anxo Sanchez Bermudez & Domingo Docampo, 2018).

teachers in West Java, who were currently studying at one of the largest LPTK (*Lembaga Pendidikan Tenaga Kependidikan* or Education Institute for Education Personnel)-based university in Indonesia (*cf* Dixon & Hondo, 2014; Saripudin, 2015; and Saripudin *et al.*, 2019 and 2020).

The research method used in this study is the DBR (Design-Based Research) method. In this context, Feng Wang & Michael J. Hannafin (2005) defined DBR as:

> *A systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings and leading to contextually-sensitive design principles and theories* (Wang & Hannafin, 2005:6-7).

So, DBR (Design-Based Research) is not so much an approach as it is a series of approaches, with the intent of producing new theories, artefacts, and practices that account for and potentially impact learning and teaching in naturalistic setting (Barab & Squire, 2004; Herrington *et al.,* 2007; and Nieveen & Flomer, 2013).

DBR – similar approaches have been termed design research, development research, and others – has recently received considerable

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attention by researchers in education as an emerging framework that can guide better educational research. DBR can address some of the deficiencies of other research methods in investigating the role of tools and techniques in the classroom (Brown, 1992; Cobb *et al.*, 2003; Akker *et al.*, 2006; and Amiel & Reeves, 2008).

The figure 5 shows an illustration of how the DBR approach in educational technology research. Based on the description above, the researchers will examine on how the typical OER (Open Educational Resources) development model for prospective vocational school teachers who are currently studying at the University of LPTK (*Lembaga Pendidikan Tenaga Kependidikan* or Education Institute for Education Personnel)-based in Indonesia (*cf* Akker *et al.*, 2006; Reeves, 2006; Amiel & Reeves, 2008; Saripudin, 2015; and Saripudin *et al.*, 2019 and 2020).

METHOD

The research method used in this study is the DBR (Design-Based Research) as shown in figure 5. And then, the Authors will elaborate pertaining: Respondents, Instruments, Procedures, and Data Analysis as following here:

Respondents. The research respondents chosen in this study were 25 students of the Department of Electrical Engineering Education Study Program or JPTE (*Jurusan Pendidikan Teknik Elektro*) at the UPI (*Universitas Pendidikan Indonesia* or Indonesia University of Education). The selected students are students at UPI, a university which is one of the oldest LPTKs (*Lembaga Pendidikan Tenaga Kependidikan* or Education Institute for Education Personnel) in Indonesia, where in the curriculum it makes an education is the core of the abilities and competencies of its graduates.

The place where the research was carried out was in Bandung, West Java, because it was considered to be representative of student respondents in Indonesia. Another consideration made was that the UPI could represent 11 LPTKs in Indonesia.

Subjects in this study were selected through snowball sampling with selection based on criteria. This selection method is used, because the researchers find it difficult to obtain a list of students who can represent the criteria for being prospective vocational school teacher students at the LPTK colleges. This happens because there is no guarantee that the student will become a vocational teacher when they graduates, apart from the above. There is no guarantee either from the campus as an *Alma Mater* in taking their education or from the government. Snowball sampling is considered, especially valuable in qualitative research where access to participants is limited.

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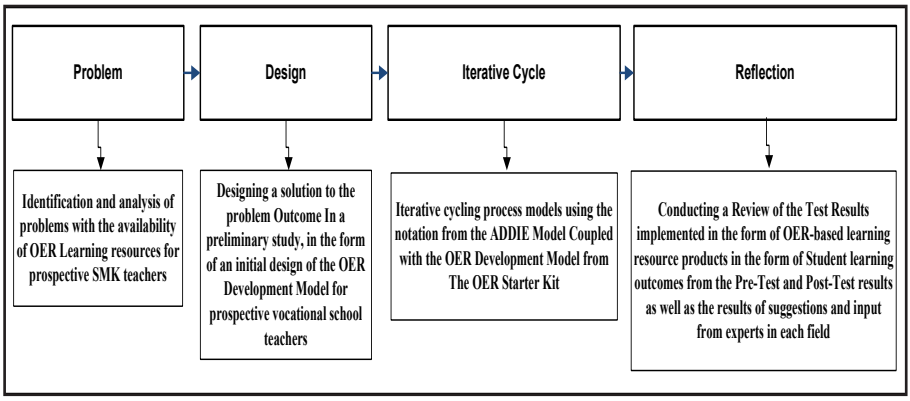

Figure 5:
OER Research Design Development Model with DBR Approach
(Source: T.C. Reeves, 2006:59)

***Instruments*.** The development of instruments for the assessment aspects of this study was adapted from the "Attributes of Instructional Materials" (McAlpine & Weston, 1994; and Murniasih *et al.*, 2020). Drafted instruments in accordance with the classification of data types, data collection instruments in this study were divided into several categories, including:

The first category is an instruments for capturing and exploring various things related to testing the validity of models developed from experts in their fields, for examples: Expert Test Instruments Against Model Validity; Expert Test Instruments Against Model Support Devices; Learning Effects Test Instrument; and Test Instrument for Subject's Perception of the Model.

The second category is the instrument used to collect and extract data related to instructional effects testing; and

The third category is an instrument that aims to capture and explore data related to the perceptions of research subjects towards the development result model both in terms of instructional and appearance.

***Procedures*.** In selecting participants, firstly, the researchers developed three main criteria to consider each student, potential participant, eligible or not to participate in this study, for example, students have taken at least 4 semesters; they have not submit Digital Engineering subject; and they are students of the Electrical Engineering Education Department. This criterion was determined according to research seeking to gain an understanding of OER (Open Educational Resources) in Indonesian LPTK (*Lembaga Pendidikan Tenaga Kependidikan* or Education Institute

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Table 1:
The OER Development Model Method for Prospective Vocational High School Teachers

Development Activities	Development Method/Model
Preliminary studies.	Surveys, literature, observations, problem analysis, and analysis of current conditions.
Development of a hypothetical model.	Integration of The OER Starter Kit, with the ADDIE learning design model.
Initial test.	Expert judgment with the Delphi technique.
Main field trials.	Experiment, survey.
Operational field trials.	Experiment, survey.

for Education Personnel) universities after the government issued Law Number 12 of 2012 concerning Higher Education and implemented the 2013 Curriculum, in which the role of the teacher is more of a facilitator (Setneg RI, 2012).

After the criteria have been determined, the researchers look for potential participants to the faculty of technology and vocational education. The development model of learning materials or resources in this study uses a combination technique between two different types of models, namely the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) instrcutional design model (Chang, 2006; Patricia, Rocio & Elizabeth, 2010; Breault, 2012; Dick, 2013; Lee & Jang, 2014; Aldoobie, 2015; Wibawa, 2017; and Trust & Pektas, 2018), combined with the open source learning development model from the OER Starter Kit by Abbey Elder from Iowa State University and William Meinke from the University of Hawaii (Meinke, 2018; and Elder, 2019).

The table 1 describes the stages of the research procedure carried out.

The model development phase consists of: (1) *Analysis*, in the form of a preliminary study consisting of a needs assessment and literature study; (2) *Model Design*, in the form of a stage design/syntax model, activity design for vocational school teacher candidates at each stage of the model, and model design from the developed model; and (3) *Model Development*, in the form of determining the stages of the model and details of the activities for each stage.

Model Development, model validity testing is carried out by experts or expert judgments who are competent in the field of instructional design, covering content and IT (Information Technology) aspects, and model testing. Meanwhile, the testing phase for the effectiveness of the model consists of a limited model implementation stage and an evaluation stage of the implementation results.

Testing is one part of the model development procedure, this stage plays

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an important role in the process of determining the validity and quality of the model being developed. In accordance with the illustration of the development procedure in the picture above, the model trial in this study was carried out in several stages, namely the test from the experts (expert judgment), the main field test or limited field test, and the operational field test or expanded field test.

The stages carried out by the Delphi Technique include: (1) Identification of problems through needs analysis; (2) Prioritization in this type and model development; (3) Determination of program objectives; and (4) Determining the solution to solve the problem.

The Delphi technique procedure is carried out in the following order: (1) Determine the goals to be achieved from the product made; (2) Preparation of a questionnaire or questionnaire; (3) Determination of experts as samples; (4) Sending questionnaires to respondents or experts; (5) Review of the questionnaire returned by the expert; (6) Invite experts to clarify answers; and (7) Drawing conclusions based on the results of expert consensus (*cf* Yousuf, 2007; and Soenarto & Rahmawati, 2019).

***Data Analysis*.** The data from the model implementation trial were analyzed using the percentage technique for the validity of the model and the subject's perception, while the impact of learning was analyzed using the mean difference test score.

Firstly, *Model Validity Analysis.* Analysis of the model validity of the model that has been developed is intended to test: (1) the accuracy of the materials and design of OER or Open Educational Resources-based learning materials by experts; (2) product quality in the form of output from the developed model; (3) achievement of the expected goals; (4) revise the product in the form of output from the developed model before general use; and (5) testing the feasibility and suitability of the product in the form of output in the form of teaching materials and supporting devices from the model developed as a learning resource.

Secondly, *Learning Impact Analysis.* Testing the learning effect of a model that has been developed in the form of open learning materials or sources is carried out by testing the difference between learning achievement before taking lessons and learning achievement after participating in or implementing learning or technically conducting a difference test between pre-test and post-test using techniques t-test. After the difference test is carried out, if the results show that there is a significant difference between the pre-test and post-test scores, the next stage is plotting the average score of both at each learning session to see data in the form of how the students' learning outcomes tend to be during the following sessions. Lesson session takes place.

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However, if the difference test results do not show a significant difference between the pre-test and post-test mean scores, the process of plotting the values of both is not carried out. By using the graphic analysis process, a data description will be obtained that can reflect or display the trend in how the pre-test and post-test average values are presented at each session or learning stages from the stages that have the highest, medium and lowest influence on the achievement of results learn from students as research subjects.

Thirdly, *Analysis of Subject Perceptions of Learning.* To determine how the subject's perceptions of the instructional aspects and the presentation of the product in the form of outputs from the developed models, used descriptive narrative analysis with a percentage. Each statement item in the perception questionnaire has a score with a value range of 1 to 5.

The determination of the perception tendency is done by using percentage techniques using a formula such as equation below:

$$P = \frac{(n_1 x1) + (n_2 x2) + (n_3 x3) + (n_4 x4) + (n_5 x5)}{Nx5} x100\%$$

The explanation for the formula in equation is that P shows the percentage of perception: n1, n2, n3, n4, n5 respectively the number of choices for STS (*Sangat Tidak Setuju* or Strongly Disagree), TS (*Tidak Setuju* or Disagree), R (*Ragu-ragu* or Doubtful), S (*Setuju* or Agree), and SS (*Sangat Setuju* or Strongly Agree); and N indicates the total number of questionnaire items.

Lastly, fourth, *Analysis of Subject Perceptions of the System.* The analysis of the subject's perception of the system from the developed model is intended to determine the subject's perception of the system aspects that have been developed, the percentage of views and aspects of the system components of the developed model, using a narrative descriptive analysis with a percentage.

FINDINGS AND DISCUSSION

Results. This research has produced a model, in the form of an OER (Open Educational Resources)-based educational resource development model for use in LPTK (*Lembaga Pendidikan Tenaga Kependidikan* or Education Institute for Education Personnel)-based university, especially for Electrical Engineering Education students who are prospective teachers at SMK (*Sekolah Menengah Kejuruan* or Vocational Secondary School) in developing OER-based materials. See figure 6.

The average percentage concencus from the experts is 83.3%. From

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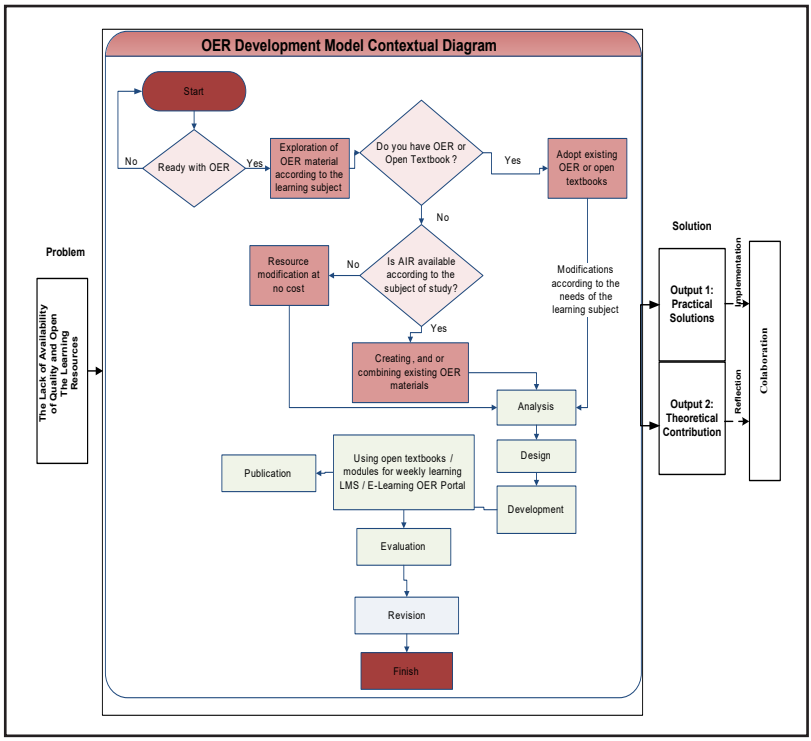

Figure 6:
OER Development Model Contextual Diagram

the chart 1, it can be concluded that the experts agree that the output of the developed model is equipped with adequate learning tools, easy to understand, easy to implement, and can help smooth how to implement the model. See again chart 1.

Based on the chart 2, it can be seen that the average of the consensus from the experts for all aspects of the model that has been developed is 88.8%. This shows that according to the experts, typical OER (Open Educational Resources) development model for Prospective Vocational High School Teachers in this study is very feasible to be implemented widely. See again chart 2 and table 2.

From table 2, it can be seen that the results of the study indicate that the use of the developed model and its outcomes can increase the competence of subjects. Based on the data from the results of the analysis above, it can be concluded that the use of OER (Open Educational Resources)-based OLM (Open Learning Materials) was developed based on the LRDM (Learning Resource Development Model) that has been developed and applied to each of them during digital engineering practice activities,

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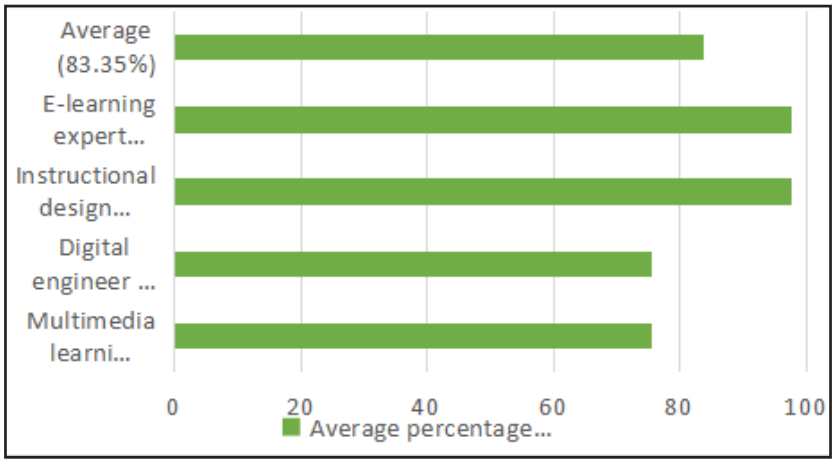

Chart 1:
Average of the Percentage of the Concensus from the Experts

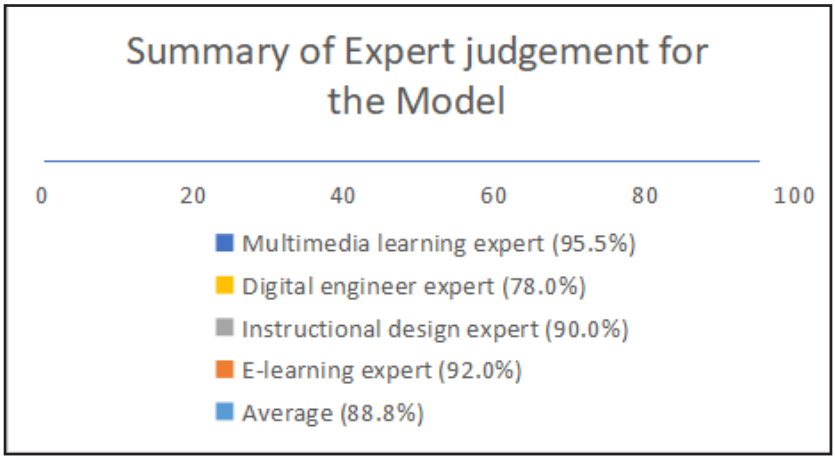

Chart 2:
Summary of the Experts Judgement for the Model

proven to have a positive impact in the form of an increase in the learning achievement of students who practice participants, where there was a significant increase in scores of 11.46 points between the results of the pre test and post test.

Discussion. The purpose of this research is to produce models and the prototype products that are developed based on the results of the development model in the form of OER (Open Educational Resources), which are typical for vocational high school teacher candidates in an

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Table 2:
Learning Impact Analysis Using OER Materials Development Results
Using the t-test Number of Subjects of 24 People

Practice Session	Variable	Average	Standard Deviation	Difference Average	t	p	Significance of the Difference
I	Post-test 1	70.26	20.0	15.60	3.900	0.001	Significance
	Pre-test 1	52.55	24.800				(p<0.05)
II	Post-test 2	60.80	12.705	10.20	3.500	0.002	Significance
	Pre-test 2	48.58	12.676				(p<0.05)
III	Post-test 3	76.55	13.500	11.00	2.645	0.019	Significance
	Pre-test 3	66.60	18.404				(p<0.05)
IV	Post-test 4	72.08	12.504	4.22	2.005	0.047	Significance
	Pre-test 4	67.92	13.181				(p<0.05)
V	Post-test 5	54.80	15.606	9.15	2.402	0.035	Significance
	Pre-test 5	45.67	18.805				(p<0.05)
VI	Post-test 6	46.50	13.270	9.18	3.900	0.001	Significance
	Pre-test 6	39.33	10.072				(p<0.05)
VII	Post-test 7	72.41	25.459	18.50	3.330	0.004	Significance
	Pre-test 7	51.83	15.591				(p<0.05)
VII	Post-test 8	65.50	16.706	10.20	2.200	0.034	Significance
	Pre-test 8	55.25	16.670				(p<0.05)
Average	Post-test	64.74	9.376	11.46	8.857	0.000	Significance
	Pre-test	53.28	8.158				(p<0.05)

effort to improve their quality and competence. The main purpose of data analysis is to carry out validity, testing, and revision of the model and its output. The output of this research is the production of models and examples of OER teaching materials that are complete and ready to be implemented so that they can be used as a reference for developing OER-based teaching materials with various subjects.

To test the initial model that has been developed, apart from testing through assessment instruments by involving experts, learning resource materials have also been developed with the 5R (Reuse, Retain, Revise, Remix, and Redistribute) concept according to the OER principle. These materials are the output of the model as a medium to test the effectiveness of the model and are tested to students in the form of pre-test and post-test, which are carried out before and after practical activities are carried out independently and guided.

The research that has been carried out so far has succeeded in answering

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the research objectives mentioned at the beginning of this paper, so a detailed explanation of each answer to the research question that has been answered is as follows.

One of the research questions is how the typical Open Source Learning or SPT (*Sumber Pembelajaran Terbuka*) development model for vocational teacher candidates in an effort to improve their quality and competence. Based on the results of the development of the model that has been carried out as described in the Hypothetical Model figure 6, the typical Open Source Learning or OER development process stages for prospective vocational school teachers in Indonesia consist of identification in the form of key questions to measure the OER knowledge and skills of those who are interested in developing OER.

The second stage is measuring the readiness of OER teachers/content creators in the OER project. At this stage is the stage of determining whether to proceed at the next stage or repeating the previous stage, because it requires special knowledge and skills that prospective teachers must possess in developing OER open source learning material.

The next stage, third, is the process of exploring the material available in the subject according to the needs and the teaching objectives required are the steps that are quite clear, so that it can be easily followed by prospective SMK (*Sekolah Menengah Kejuruan* or Vocational Secondary School)'s teachers.

The fourth stage modifies or changes the available openly published OER textbooks or sources.

The fifth stage combines, this is done if OER is not found in accordance with the objectives and needs in the field.

The sixth stage is looking for OER resources at no cost or modifying OER resources at no cost.

The seventh stage is the core stage of how the process of developing OER-based teaching materials adopts a development model. With ADDIE instructional design, which consists of Analysis, Design, Development, Implementation, and Evaluation (Chang, 2006; Patricia, Rocio & Elizabeth, 2010; Breault, 2012; Dick, 2013; Lee & Jang, 2014; Aldoobie, 2015; Wibawa, 2017; and Trust & Pektas, 2018).

The eighth stage is the publication or publication of the final OER material into various media and in various formats to facilitate the process of dissemination and utilization to parties in need.

The ninth step is the last step is formative and summative evaluation.

After the model is developed, trials are carried out in the form of compiling a set of examples of OER products in the form of teaching materials for one course and their completeness. Then, an assessment

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process is carried out by experts in each area of expertise. The measurement or assessment process involving experts is intended to obtain validation of the hypothetical model from. The designed model and its supporting devices after the assessment data by the expert are obtained then corrections are made according to the recommendations and input.

The next step is to do limited trials on a number of subjects, namely students of vocational teacher candidates to get an overview in the form of limited trial result data about the validity and quality of the model developed.

Based on the stages that have been carried out, a model and several products have been produced, for example, a development product developed based on a model in which the stages or steps of development and measurement stages are described in the form of a hypothetical model that has been proven to produce sufficient OER-based open learning sources well. This can be seen from the results of trials that have been carried out on prospective vocational school teachers and the results of validity tests and product revisions of the models that have been produced and developed and based on the results of testing the impact of learning from OER-based teaching materials that have been produced, in the form of presentations and improvements. The model output is in the form of a product output from a model that has been developed based on field trials.

In an era where ICT (Information and Communication Technology) is developing so rapidly, it is very easy for students to access the material needed to support the success of their studies. However, these conveniences are not accompanied by a level of awareness of respect for IPR (Intellectual Property Rights). This can be seen from the survey results at the stage of the data literacy analysis process and the benefits of the OER concept for vocational high school teacher candidates. The survey conducted at the beginning of the research process of this dissertation can be seen that the subject understands the importance of IPR, but the percentage level of using licensed materials by pirating is still relatively high (Ofili, 2014; and Chauhan *et al.*, 2020).

OCW (Open Course Ware) developing around the world cannot be separated from the rapid development of ICT in both developed and developing countries. OCW is one of the pillars of OER development around the world, it requires progressive strategies, especially when it comes to enriching various materials because developing countries are not far behind technologically. Except in terms of the amount of material available.

The model that has been developed and its outputs after validation and limited testing can be concluded that it is effective enough to be used

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and can increase the competence of prospective teachers in the form of increasing learning outcomes as evidenced by the results of the pres-test and post-test in the practical process, so that the model and the outcomes has been developed worthy of wide use.

The repository that has been built can store various types of OER-based material in various formats, including text, audio, and video, etc. In the future, it is hoped that everyone who has the ability to develop learning resources can contribute by saving the results of the developer, so that the contents of the repostory will be richer and more diverse with various subject matter topics. As explained in the previous section, the OER-based material development process can be carried out using various approaches using the 5R principle by utilizing the development model that has been produced in this study, either independently or in collaboration.

CONCLUSION

The model effectiveness test is carried out using the output in the form of teaching materials from the developed model that reflects the effort to solve problems that are prioritized to be resolved, and the formula has led to efforts to increase the efficiency and effectiveness of education delivery. This can be seen from the average of consensus percentage from the experts amounting to 93.8% where this figure has shown that the teaching materials of the developed model, especially based on the part of determining the program objectives, are very feasible to be implemented in other words quite effective.

This research has produced a repository that can store various OER (Open Educational Resources)-based learning resource materials in various formats so that in the future it is hoped that it will facilitate the developers of OER-based learning resource materials. This research has produced a repository that can store various OER-based learning resource materials in various formats, so that in the future it is hoped that it will facilitate the developers of OER-based learning resource materials.

Developing an OER learning resource model using a combination of several approaches, namely the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) learning design model. OER development model in the form of the OER Starterkit and Meinke William from University of Hawaii has produced a model and several outputs as a complement to support the implementation and testing process to ensure that the model developed is sufficiently feasible to use.[1]

[1]***Statement:*** The Authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the data and the paper are free of plagiarism. Authors declare the article not to be submitted, reviewed as well as published by other scholarly journals.

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On the Prospective Vocational High School Teachers in West Java, Indonesia
(Source: https://en.antaranews.com/news, 09/10/2020).

The aim of this research is to develop a typical OER (Open Educational Resources) development model for prospective vocational school teachers in Indonesia. In this study, a case study was conducted on prospective vocational high school teachers in West Java, who were currently studying at one of the largest LPTK (*Lembaga Pendidikan Tenaga Kependidikan* or Education Institute for Education Personnel)-based university in Indonesia.

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