

Validity of the Online Learning Teaching Materials Model on the Innovation Course of Technology and Vocational Education

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As the development of Indonesian education is slower than the development of technology, there is a need for acceleration in Indonesian education. Education and technology must be combined in order to create a good balance. Thus, this provides the rationale for introduction of Problem Based Learning via network (online) medium in the Vocational Technology Education (PTK) setting. This research & development 4-D model (define, design, develop, disseminate) was conducted at PTK program in Universitas Negeri Padang. The instrument validity was validated by three experts (expert judgment) with the results of the validity of Aiken's V 0.929 and ICC reliability 0.811. The teaching material produced is valid, so it is appropriate to be used for learning in the era of the industrial revolution 4.0. Overall study findings have provided a good understanding regarding the validity of online learning teaching material models on the innovation course of technology and vocational education which can further be used in the upcoming studies.

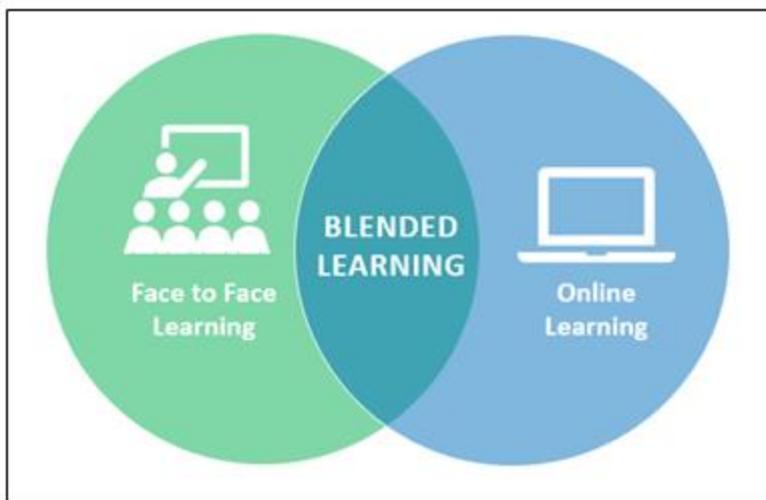
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Introduction

Technology is developing so fast and this has changed human habits. Moreover, the industrial revolution 4.0. has really helped people with technology. But this situation does not make things easy automatically, because there is also a negative side (Maulana, 2018). This situation is a shared responsibility, especially vocational education. For example, technological

developments have resulted in more than 50,000 job losses in the banking sector in Indonesia because robots have been implemented in their service systems (Franedya, 2019). Where is the role of higher education? Higher education must discuss this, research, and find solutions scientifically! In Indonesian education, the effects of Industrial Revolution (IR) 4.0 have been felt. Among them the use of web-based learning media (Sukardi, 2017), in the form of blended learning (Kose, 2010), or distance learning (Martin, 2018; Kose, 2010). Günther Schuh (2014) states that collaboration between technology and education is needed so that the progress of life continues. Saurabh et al (2018) argue that digitalisation and the development of automation quickly provide productivity, especially in the field of education such as the use of computers, 3D printing and robots (Yi Li, 2018). Carruthers (2018) states that to get good education graduates (ready to face IR4.0) students must go through a learning process that leads to technology-based learning and continuous innovation (Kautsar, 2018). The direction of blended learning is certainly the presence of learning without having to attend class, and it is projected that there will be a classless learning period with a percentage of > 80% online, only through a computer or maybe via a smartphone (Kautsar, 2018). Then what about practical learning? This was welcomed positively by Padang State University (UNP), which has begun implementing blended learning with a maximum of 50% delivery to be conducted online. Besides that, the Faculty of Engineering (FT UNP) is one of the faculties that is quick to respond, because blended learning is still not optimal as it requires a lot of meetings in the classroom and laboratory rather than online. As a subject that is highly relevant to technological development, the Vocational Technology Education (PTK) innovation course has an obligation to develop innovations in the use of technology in learning. Based on preliminary studies, many problems in learning were found starting from the suboptimal use of technology, students less actively participating and playing more on mobile phones. So, it is very suitable for new innovations specifically related to teaching materials that are in accordance with learning in the era of IR4.0. The implementation is blended learning as shown in Figure 1.

Figure 1. Blended learning model (Martynmills, 2018)





For facilitating the student's learning, effective teaching and learning activities are quite essential (Anderson, Liam, Garrison, & Archer, 2001; Azevedo & Cromley, 2004; Ebner, Lienhardt, Rohs, & Meyer, 2010; Kearsley & Shneiderman, 1998). However, the conventional way of teaching in the classrooms and through textbooks is to be considered as an older way of knowledge discrimination. The reason is that technological advancement has gradually taken over the traditional ways of learning and teaching. The method of online learning or e-learning is widely accepted in contemporary times for several reasons. Both online learning and e-learning are used interchangeably, however, online learning indicates the learning which takes place over internet and e-learning refers to the utilisation of various resources and electronic media in any learning process (Anderson, 2008; Moore, Dickson-Deane, & Galyen, 2011). Among several differing learning approaches, online learning provides a flexibility in different means to both the students and the teachers. The internet is widely used as a digital repository of the teaching materials from which students can get access to reasonable learning materials. Meanwhile, one of the key debates in the literature of online learning is how much students benefit from the online learning process and related materials.

Various authors have provided their view about the concept of e-learning. For example, it is narrated as technological based learning where the learning materials are delivered through some computer network to those who are known as remote learners (Anderson, 2008; McGreal & Elliott, 2008). The term is widely used to refer to learning process which occurs outside the classroom setting and has significant output from students as well as instructors. In both developed and developing economies, e-learning is widely used. For instance, in their study Kwache (2007) explained that both classroom and online learning programs are adopted in different universities of Nigeria and such programs have made it possible for different students have access to university degrees. However, they have not examined the reliability and legality of those degrees which are received through online learning classes.

In the present literature, it is observed that schools and other educational institutions are primarily using information technologies with the core intention to expand access for students along with improving the quality of teaching material as well as cost reduction (Appana, 2008). Various districts and states in the world economy have shifted towards online learning techniques due to the recent pandemic. Meanwhile, it is also observed that some educational institutions are also working towards ending the summer programs while providing the instructions and quality material to students via the internet (Cochrane, 2019; Owston, 1997).

Additionally, the perception of the students towards online learning and related materials is also a major concern. In their research findings, Van der Scheer, Bijlsma and Glas (2019) have examined the validity and reliability of student's perception about the teaching quality in primary education. For further investigation, an online survey was created with the ratings



criteria. Three lessons of 39 teachers were recorded based on the ratings of 4 criteria. It is believed that the scale of student perception is quite reliable. However, high correlation was found between similar contents while no clear pattern for this correlation was observed.

Some authors believe that enrolment in online courses has been increasing since last decade (Alverson, Schwartz, & Shultz, 2019; Kucuk & Richardson, 2019). This increasing trend has provided a need for course evaluation tools which are specifically developed for online classes and courses. Meanwhile, some teachers have also shown their concern for the traditional course evaluations and their inadequacy while providing them with a useful feedback for the improvement of teaching methods. During the last decade, researchers like Chang and Fisher (2003) have provided their argument that more and more academics are adopting the challenge for using the web-based sources of learning for the delivery of higher education tools. Various web-sources have confirmed this fact, that it is a routine matter for universities to provide some online course facility. However, web is observed as a significant factor working as a change agent where universities are reviewing their strategic plan.

Various benefits for online learning have been identified. For example, it is observed that online learning contains an effectiveness in teaching the students, can be used for the professional development of the students and teachers as well, is very cost effective comparatively to the physical classroom environment, has the possibility of providing a world-class educational level to the students etc. However, some authors believe that online learning classes can work more for the provision of some quality education. For this reason, the role of online learning resources is very important which are also entitled as virtual sources for teaching the students. Such online resources cover the online educational environment like the HTML documents, lecture notes, assignments or similar other materials. In addition, resources also include any other digital material used for supporting the student's learning that is delivered through multiple delivery models. Furthermore, digital learning contents indicate the material and tools available online to the learners.

In an online learning environment, the attitudes of the students are very important to address. Korkmaz (2012) has examined student's attitude toward online cooperative learning. He specifies that online learning is an important issue which needs to be examined on an adequate basis. However, in the existing literature very few scales are provided covering the dimension of online cooperative learning for checking the reliability and validity. The key purpose of his study was to explore the attitude scale in order to specify student's attitude towards online cooperative learning. For addressing the study objective, the authors collected a sample of 599 students as first applicants and 242 of those are under the title of second applicants. Both exploratory and confirmatory factor analyses, correlation, corrected correlations and discrimination of the items were observed. For examining the reliability of the scale, internal



consistence and stability levels were also calculated. It is observed that both positive and negative attitudes from the students toward online learning exist.

Kim, Wang, and Ketenci (2020) have conceptualised the learning leadership from the context of an online discussion. For this purpose, they have proposed the leader identification method or LIM. Their study has used mixed data to evidence the utility of the LIM and overall three types of leaders were identified. It is believed that such identified leaders in an online learning environment are demonstrating more transformational leadership with higher levels of engagement. Li and Tsai (2017) have used the time spent for accessing the learning materials in an online environment in order to classify different clusters of students. Overall, the authors have identified three clusters which are entitled as consistent, less and slightintensive use students in an online environment. It is believed that students entitled as less demonstrated are less motivated and have lower learning performance. Whereas consistent and slight intensive spent the same time period and have almost the same final examination score. However, those who are consistent had a higher level of motivation and homework scores than slide intensive students.

The effectiveness of online learning is an ongoing phenomenon. Based on his research findings, Immagic, (2011) believed that online learning courses are a good platform for the student to learn with some new ideas. Those students who took all or some of their course through online learning are in a position to perform in a better way. However, those who take the same course through a traditional learning environment have shown average performance. Furthermore, it is also believed that collaborative or instructive directed learning improves the effectiveness for online instructions. Meanwhile, different results were observed for different studies where online learning did not affect the student's learning outcome. Additionally, based on the experimental and quasi-experimental studies, online learning practices have provided some interesting facts. For example, factors like online quizzes and videos do not appear to influence the amount that students learn during their online classes. Furthermore, when a group of students are learning through online sources, support mechanisms like guiding questions have a significant influence on the students learning and interaction as well.

Theory

The Materials of Teaching

The materials of teaching is a collection of information containing experiences, competencies and knowledge arranged systematically so that it can be understood and learned by students, such as pictures, job sheets, books, audios and others (Lewis, 2018). The concept is that good teaching materials are valid and able to help students get information that should be obtained (Prastowo, Andi, 2011; Shi et al., 2019). In addition, teaching material are also known as instructional materials which include both animate and inanimate objects along with both

human and non-human resources. Such resources are used by the teachers or course instructors for achieving the desired learning objectives. Meanwhile, instructional materials cover printed books, handouts, study guides and manuals, while other materials include audios, visuals, audio-visual and electronics interactives like computers and other similar devices.

Problem Based Learning (PBL)

PBL is a problem-oriented learning model to foster students' critical thinking skills and how to solve problems (problems solving skill). The core PBL characteristics are: 1) learning starts from problems, 2) the existence of study groups, 3) student oriented, 4) the role of the teacher is as a guide, 5) time is provided for independent learning. (P.B Smits, 2003; H.G Schmidt, 2009). PBL can be implemented in any learning situation and can further be utilised in any semester program. Both in lab and class usage of PBL models are observed in the existing literature. Meanwhile, any type of subject area can be adapted to PBL with a reasonable level of creativity. However, there are some characteristics of good PBL problems that transcend fields which covers that the problem should motivate the students to make some reasonable decisions and that the problem must motivate the students to get a deeper level of understanding about the concepts. Meanwhile, the implication of the PBL model can also be expanded to a group project where the students are going to work in a group, and together they can solve the problem too.

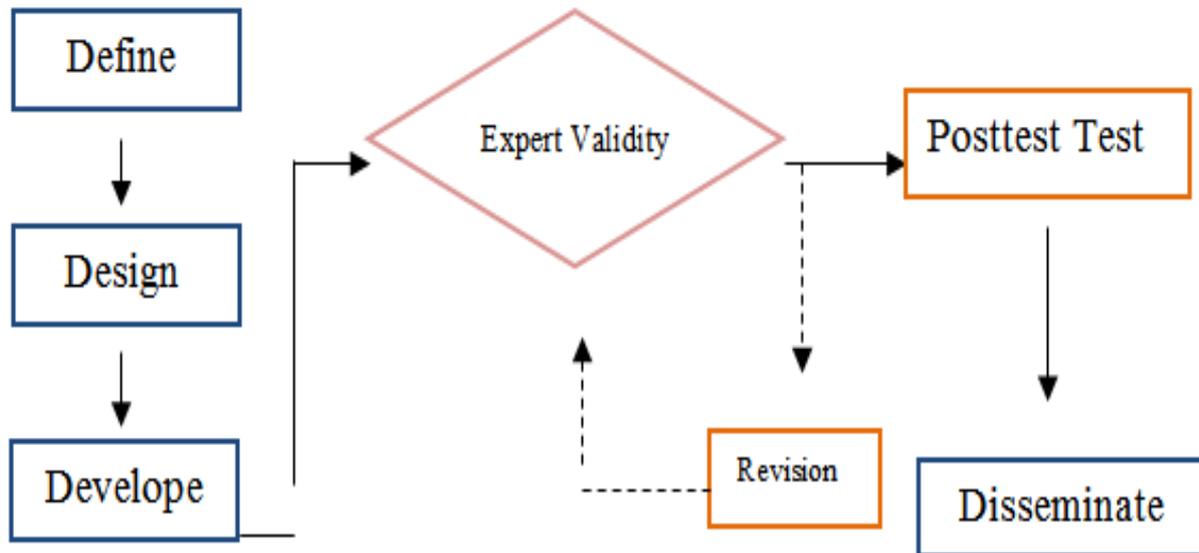
Online Learning in Network

Learning by using computer or in network is modern learning today. Some experts call it CNBL (Computer network based learning), learning by using internet/computer/technology (Ahmed Tlili, 2015). The function of CNBL in learning is as a supplement (Hughes, 2002). But with blended learning, the presence of CNBL has substantially increased its role, especially in the ease of access to teaching materials (Minhong Wang, 2018). The online learning network is something like a community of practice with a feedback mechanism to reasonably support learning over the internet. The community members supporting this system of online learning provide aid in the form of supporting the teaching mechanism at the online level along with the development of new courses or programs.

Research Method

This research is research & development (R&D) by developing teaching materials using the 4-D model (Four D model; define, design, develop, and disseminate) (Trianto, 2009, p. 189). Figure 2 illustrates the flow of teaching material development in this study. The first factor is entitled as “Define” which leads towards the “Design and finally to the “Develop” factor. The next stage in the 4-D research model covers the expert validity along with the post-test, revision and disseminate factors.

Figure 2. 4-D Research Model Flow



Validity & Reliability

Validity is the accuracy of the instrument in measuring the objectives to be measured. Measuring instruments are said to be valid if the measurement function is appropriate and precisely measures what is measured. Likewise, teaching materials will be declared valid if measured by a tool that is able to measure the teaching materials. In this case, teaching materials are validated using inter-rater or variance analysis techniques based on the inter-rater reliability index (Intraclass Correlation Coefficient or ICC). The product is declared reliable if the reliability coefficient is at least 0.7 (Mardapi, 2012; Sukardi M, 2017). The content validity test is done using Aiken V with a number from 0 to 1.00. The results of the validity analysis done by the expert content validity coefficient technique are 0.929 and the expert inter-assessor reliability (ICC) is 0.811. This means that the development of teaching materials is valid and reliable used by lecturers in PTK innovation courses.

Table 1: Results of the Aiken V Expert Teachers' Innovation Material Validity Validity and ICC Expert Reliability

Item	Coefficient	Classification
Validity of Aiken's V	0,929	Valid
Reliability ICC	0,811	Reliable

Results and Discussion

Modern learning requires graduates who are dynamic and ready to develop independently in the community. Some characteristics of modern learning outputs are that graduates have the ability to think critically, are able to solve problems, and are innovative and creative. It is appropriate to use the problem-based learning model to answer this situation. Then, the final outcome is to bring new innovation. Seeing this, the PTK innovation course which incidentally is an important part of educational innovation sees this as an important matter, making these problem-based teaching materials declared valid by experts with very good grades. This teaching material also presents complete and comprehensive material, as well as implicative examples related to innovation in learning. This learning is considered good because the examples given are related to reality and sharpen students' critical thinking. Then, this teaching material is considered appropriate and very appropriate in answering the challenges of learning in the era of IR 4.0 oriented problem solving.

Conclusion:

Online learning is an emerging phenomenon in the recent time due to various reasons. However, the validity of the online learning material is not widely observed in the existing body of literature. This study has provided an empirical outcome for checking the validity of an online learning environment along with the Innovation Course of technology and vocational education. The overall study findings have provided a good literature for the consideration in present and proposed future studies regarding the validity of teaching material in an online learning environment. However, some of the key points of the study based on the overall theoretical and empirical debate are as follows:

- Teaching material developed is valid through expert judgment very well.
- This teaching material is able to present comprehensive material along with implicative examples related to innovation in learning.
- This teaching material makes it easy for lecturers to provide concrete examples of learning in honing students' critical thinking.
- The use of PBL learning models in the PTK innovation teaching materials is very appropriate because it is in line with the demands of learning in the era of IR 4.0 which is oriented to problem solving.

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