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DEVELOPING BLENDED POE$_2$WE-BASED DIGITAL LEARNING INNOVATION IN INDUSTRIAL REVOLUTION 4.0 ERA

Nana[1]
[1]Physics Education Department, Faculty of Teacher Training and Education, Universitas Siliwangi

Corresponding author: nana@unsil.ac.id

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ABSTRACT

Developing digital learning innovation with the employment of Blended POE2WE model aims (1) to access knowledge without time and space limitation, (2) to establish internet-based communication, (3) to make learning easier and more enjoyable, and (4) to create more interactive and innovative learning process. The method was literature study. Electronic Data Processing was used to manipulate data into more useful information. Digital learning and POE$_2$WE were simultaneously utilized and blended or so-called the blended POE$_2$WE. This blended POE$_2$WEsynthesizes face-to-face learning and online-based learning into an integrated learning in order to create a high, efficient, and attractive impact. It facilitates classroom-based learning with electronic formats (e-learning). The result shows that blended POE$_2$WE allows student to get a real time and interactive learning. Teacher and students can interact at anytime and anywhere related to teaching and learning process, discussion, assignment, assessment, evaluation, and achievement. Moreover, paper-based is changed into digital-based. Nevertheless, the blended POE$_2$WE model learning must be provided by a high-internet access and devices to access it.

INTRODUCTION

Along with the development of information and communication technology (ICT), information and knowledge become easier to be accessed without any limitation of distance, places, spaces, and time. This implies that human life is certainly inseparable from technology. Technology is basically a process to get added value from a certain product. It influences and changes human, so technology illiterate results in the lack of getting information and opportunities. In a consequence, ICT has an important and tangible role in the information society or knowledge society era.

The development of ICT is reflected by, one of them, computer. Computer is ICT-based device utilized to process the data into useful information by processing and displaying information. Processing data with computer is known as electronic data processing (EDP). By the existence of computer, all aspects of human life gradually become computerized-based.

In education, computerized-based learning is indicated by e-learning. E-learning is often related to computer and internet. It is derived from 'e' referring to 'electronic' and 'learning'. It is defined as a learning system using electronic devices as learning media (Rahmasari & Rismiati, 2013:27). This system is expected to replace conventional learning methods and material and to add new learning methods and strategies.

The implementation of e-learning is arguably able to overcome students' passiveness(Sadiman, Rahardjo, Haryono, & Harjito, 2006). E-learning is useful to increase students' interaction, provide learning sources, increase student, teacher and educational institution qualities, create interaction without limitation, and access information from online media.

Besides, the implementation of POE_2WE model in Physics learning reveals its effectiveness in increasing students' achievement (Nana, Sajidan, Akhyar, & Rochsatiningsih, 2014). However, learning process is still conducted in conventional way and seems out of date. In a consequence, the combination between e-learning and POE_2WE model can update and renew POE_2WE model especially in dealing with the industrial revolution 4.0 era. This combination is contributed as blended learning or so-called the blended POE_2WE.

METHODS

This study deployed library research method by reviewing literatures related to POE_2WE model (Kearney, 2004; Kearney & Young, 2007; Nana, 2014, 2016; Nana et al., 2014; Permatasari, 2011; Rahayu, Widodo, & Sudirman, 2013; Samosir, 2010; Supriyati, 2012) and Blended learning (Bersin, 2004; Purwaningsih & Pujianto, 2009; Thorne, 2003). POE_2WE model was previously developed by Nana, Sajidan, Akhyar, & Rochsatiningsih (2014) from POEW model (Samosir, 2010) and Physics learning with constructivist approach (Duffy & Jonassen, 1992). It was then developed to be the Blended Learning model by proposing learning innovation of digital-based POE_2WE model.

RESULTS AND DISCUSSION

POE$_2$WE Model

Prediction, Observation, Explanation, Elaboration, Write dan Evaluation (POE$_2$WE) learning model was developed to know students' understanding on a certain concept. It builds knowledge by predicting solutions, conducting experiments to prove prediction, explaining results orally or written, compiling examples of its application in daily life, writing discussion results and evaluation about students' understanding orally and written (Nana et al., 2014).

POE$_2$WE learning model treats students as a subject of learning process. Students actively find a concept through observation and experiment directly, not through memorizing materials from the book and teacher explanation. This model also allows students to be active in learning process and gives them opportunities to construct their knowledge, to observe phenomena, to communicate their idea and to write discussion results. As a consequence, students increasingly master and understand the concept resulting in the increase of students' achievement(Nana, 2014, 2016; Nana et al., 2014; Permatasari, 2011; Rahayu et al., 2013; Samosir, 2010).

POE$_2$WE learning model was developed from POEW learning and Physics learning model with constructivist approach. It is summarized in the following table:

Table 1. Syntax of the development of POE$_2$WE Model

No.	POEW Syntax (Samosir, 2010)	Syntax of Learning Model with Constructivist Approach (Duffy & Jonassen, 1992)	POE$_2$WE Model (Nana et al., 2014)
1.	(*Prediction*) is to make predictions or initial assessments	(*Engagement*) or introduction is to make questions, to explore students' initial knowledge.	(*Prediction)* is to make a predition. It is identical between *prediction* in POEW and *engagement* in the constructivist approach.
2.	(*Observation*) is to conduct research or observation.	(*Exploration*) is to test predictions, to conduct observation and to record observation result.	(*Observation*) is to conduct observation. It is identical between *observation* in PEOW and *exploration* in the constructivist approach.
3.	(*Explanation*) is to give an explanation.	(*Explanation*) is to explain a concept with students' own language.	(*Explanation*) is to explain. It is identical between *explanation* in PEOW and in the constructivist approach.
4.	*(Write*) is to make a conclusion.	(*Elaboration*) is the application of the concept in daily life.	(*Elaboration*) is the application of the concept in daily life. It is developed from *elaboration* in the constructivist approach.
5.		(*Evaluation*) is to evaluate knowledge, skill, and	(*Write*) is to write the result of discussion as a conclusion. It

		change in students' thinking process.	is developed from *write* in POEW.
6.			(*Evaluation*) is is to evaluate knowledge, skill, and change in students' thinking process. It is developed from *evaluation* in the constructivist approach.

Adapted from Duffy & Jonassen (1992); Nana et al. (2014); Samosir (2010)

The phases of POE_2WE learning model are described as the followings.

a) Prediction
In this phase, students make predictions or initial assessments on a certain problem. The problem is obtained from questions and pictures related to learning materials in Students' Workbook (*LKS*)/ students' book before students make predictions. This phase is derived from *prediction* of POEW model and *engagement* of constructivist approach. In this phase, teachers ask questions to encourage students make predictions or temporary answers from the proposed problem.

b) Observation
The observation phase is to prove predictions. Students are encouraged to conduct an experiment related to the problem proposed or found. They then observe what happens and test those predictions.

c) Explanation
In this phase, students give an explanation on the experimental result conducted. It is conducted through a discussion group member. Each group then present their discussion result in front of the class. If their predictions are represented in the experiment, teacher guides students to summarize and gives an explanation to reinforce the experiment result. Meanwhile, if their predictions are not reflected in the experiment, teacher helps students to find out an explanation on why their predictions are not proven.

d) Elaboration
In this phase, students make an example or apply the concept in daily life. Teacher encourage students to apply a new concept in a new situation so they have more understanding the concept taught.

e) Write
This phase is to conduct communication written, reflect students' knowledge and ideas. This phase helps students to express their knowledge and ideas (Wisniowska, 1996 in Yamin & Ansari, 2012). Students write the result of discussion and answer questions provided in students' workbook. Besides, they also make a conclusion and report of the experiment. This phase is developed from *think-talk-write* model.

f) Evaluation
This phase evaluates knowledge, skills, and changes of students' thinking process. Students are evaluated in terms of material given orally and in written.

These phases are then elaborated into learning activity as the following table.

Table 2. Learning Activity of POE_2WE Learning Model

Phases	Teacher's Activities	Students' Activities
Prediction	- Explaining learning goal - Asking questions to students - Recording predictions and reasons proposed by students	- Paying attention to teacher's explanation - Predicting answers of the questions proposed by teacher - Discussing the result of predictions
Observation	- Encouraging students to work together - Giving students' workbook - Overseeing the experiment conducted by students	- Creating a group work - Conducting the experiment - Obtaining the data of experimental result - Conducting group discussion - Concluding the result of experiment.
Explanation	- Encouraging students to explain the result of experiment - Asking student for presenting the result experiment - Clarifying the result of experiment - Explaining a new concept or definition	- Expressing their idea on the result of experiment - Expressing their idea on a new opinion - Responding other group presentations - Accepting a new concept from teacher.
Elaboration	- Giving problems related to the application of concept. - Encouraging student to apply a new concept in a new situation.	- Applying a new concept in a new situation or daily life.
Write	- Giving an opportunity to students to write discussion result and conclusion.	- Writing explanation and conclusion from teacher and group discussion.
Evaluation	- Asking for questions for assessing the process - Assessing students' knowledge - Giving feedback to students' answers	- Answering questions based on the data - Demonstrating skills in the concept mastery.

1.1. Blended Learning

The term of *blended learning* refers to the combination of different learning environments. This combination can combine asynchronous and synchronous(Yamagata-Lynch, 2000), face to face and distance learning(Moebs & Weibelzahl, 2006). This blended learning allows teacher to use variation of methods between traditional (face-to-face) and modern (online) (Akkoyunlu & Soylu, 2006) integrated (Moebs & Weibelzahl, 2006). Besides, media in terms of technologies, activities, and types of events can also be combined in the blended learning in order to create a successful learning process(Bersin, 2004). It indicates that blended learning is

a traditional learning supplemented with other electronic formats. These formats may refer to e-learning. Hence, blended learning aims to synthesize face-to-face and online-based learning to become an integrated combination so that create a high, efficient, and interesting impacts.

The concept of combination as proposed in blended learning makes learning more meaningful. This concept is generally needed when the distance learning is not absolutely needed but students need additional lessons. The followings are reflected the right time to use blended learning:

- Teaching and learning process is not only conducted by face-to-face, but also utilizes internet.
- There is a need to ease and fast non-stop communication process between teacher and students.
- Students and teacher are positioned as learners.
- The process of learning velocity is needed.

Since the concept of blended learning involves e-learning, this is along with the development of ICT. Moreover, ICT is gradually advantaged once the revolution industrial 4.0 begins. This accommodates all aspects of human life to be computerized and digitalized with the high speed of access. Hence, blended learning is absolutely appropriate to be implemented in this era.

1.2. Blended POE2WE

The framework of blended POE2WE is constructed on some theories. Blended POE2WE combines three types of interaction, including teacher, content, and social interactions.

a. The first type of interaction is reflected by teachers as facilitators of the active learning and face-to-face interaction in a social setting. However, teachers are the only ones who design and maintain learning phases as well as select appropriate media before doing interaction with students. Teacher then use e-learning to conduct distance learning, collect assignment, and do online communication. Students can discuss one another or with teachers at the same time as interpersonal communication is created and feedback is obtained.
b. The second type of interaction, a content interaction, bridge cognitive interaction with concept and skill containing in learning module. This module is provided with usage guidelines and mind-mapping in each topic so that learning goals are clearly described.
c. The last type of interaction, social interaction, refers to students' ability to perceive themselves as a positive interdependent community. This interaction is taken place in all learning process because doing assignment demands mutual work. This interaction dimension is shared to group member who build mutual knowledge through giving responses one another (Aviv, 2000).

1.3. Implementing Blended POE$_2$WE

As proposed above, blended learning is face-to-face learning supplemented with e-learning. Face-to-face learning with POE$_2$WE model can traditionally be conducted as proposed by (Nana et al., 2014). In this learning process, e-learning is provided as a supplementary media. It is reflected by web-based e-learning, allowing a real time and

interactive learning information. It can be accessed through www.alearning.unsil.ac.id as the following figure.

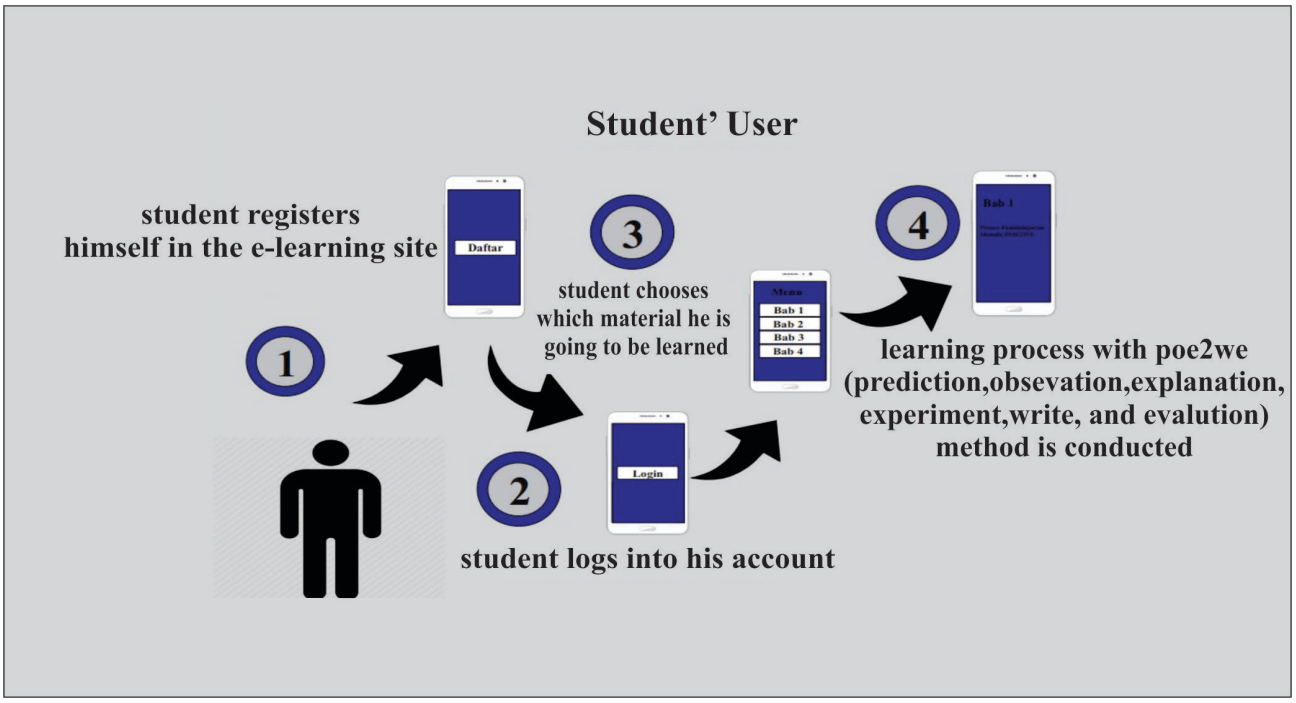

Figure 1. E-learning Site

Figure 1. above shows that there are four steps to access e-learning. They are (1) doing registration, (2) doing login, (3) choosing learning materials being learned, and (4) learning process by using POE_2WE.

Besides, blended learning is also provided by learning activities. Since face-to-face learning has been described in table 2, the following table describe activities related to e-learning.

No	Teacher	Students
1	Compiling syllabus	Accessing information and learning materials
2	Uploading learning materials	Downloading learning materials
3	Giving assignments to students	Conducting transaction of assignments
4	Getting students' assignment	Doing assignment
5	Compiling test/quiz	Doing test/quiz
6	Giving grade	Checking learning achievement
7	Monitoring students' activeness	Checking presence list
8	Processing students' grade	Checking grade
9	Interacting with students and teachers through discussion form and chat	Interacting with students and teachers through discussion form and chat

The implementation of blended POE_2WE has both positive and negative sides. The positive sides are reflected by the easy for teachers and students to interact at anytime and anywhere related to teaching and learning process, discussion, assignment, assessment, evaluation, and achievement, and the change of paper-based into digital-based. The negative side is indicated by that blended POE_2WE needs pretty huge expanses in terms of devices. Moreover, it is also less flexible in term of the need of internet access and devices to access it.

Conclusion

The development of blended learning innovation in Physics learning with POE_2WE model is categorized new. The development of this blended POE_2WE, which supplemented by e-learning, becomes the response of industrial revolution 4.0 demand. However, this learning innovation is still in the developmental stage and needs improvements in many aspects.

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