

Development Blended Web Mobile Learning

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2 Development Blended Web Mobile Learning Model on COVID-19 Pandemic

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Abstract – Educational Design Research (EDR) focuses on producing a Blended Web Mobile Learning (BWML) to increase the students' HOTS of senior high school. The BWML model in each phase is supported by using the MoLearn application (web and mobile version). The results indicate that the BWML model is proven to be valid, practical and effective in improving HOTS of senior high school students. Research implication such as: (1) The BWML model can be used as an alternative to digital-based learning, (2) The BWML model can be a reference for developing a hybrid learning model in COVID-19 pandemic, (3) The research result can be used as empirical data that web and mobile integration in learning has proven successful.

Keywords –BWML, higher order thinking skills, learning model, MoLearn.

1. Introduction

COVID-19 pandemic has caused a lot of chaos in the world. In addition, COVID-19 has had an effect in various lines of life, including education.

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The need for innovation in the field of education, especially innovative learning models that can be effective and efficient in improving students' higher-order thinking skills.

The higher order thinking skills (HOTS) have proven to be one of the main needs that students must have [1], [2]. Recent research results in the last three years indicate the importance of HOTS [3], [4], [5]. In addition, research also varies with HOTS including assessment [6], [7], [8], curriculum [9], media [10], and learning [11], [12]. The results of these studies confirm that HOTS need to be trained and owned by students [13], [14], [15].

In fact, the student's HOTS of senior high school before being given the treatment were still not optimal. Preliminary studies were found in several senior high schools (private and state) in East Java, Indonesia. In general, the HOTS of students were still not optimal. This result is supported by the HOTS category national exam questions; students have not yet got the maximum. In addition, the optimization of digital learning media has not been seen evenly. The results of interviews with students indicated that they wanted to learn by optimizing digital learning media so that they did not get bored of learning in class.

Alternative solutions that already exist for improving student's HOTS are the Problem Based Learning (PBL) model [16], [17], [18] and blended learning [19], [20], [21]. The main advantages of PBL and blended learning are contextual problems and IoTs-based, making it easy to train and improve HOTS. However, in general there is no one that integrates PBL and blended learning models based on digital media to improve students' HOTS. Therefore, the researchers developed the BWML model.

The BWML model is a hybrid-based learning that combined PBL and blended learning with the MoLearn application. MoLearn application can be accessed in web and mobile version (see Figure 2. and 3.). The BWML is specially designed to improve the student's HOTS of senior high school. The BWML model is developed using EDR (education

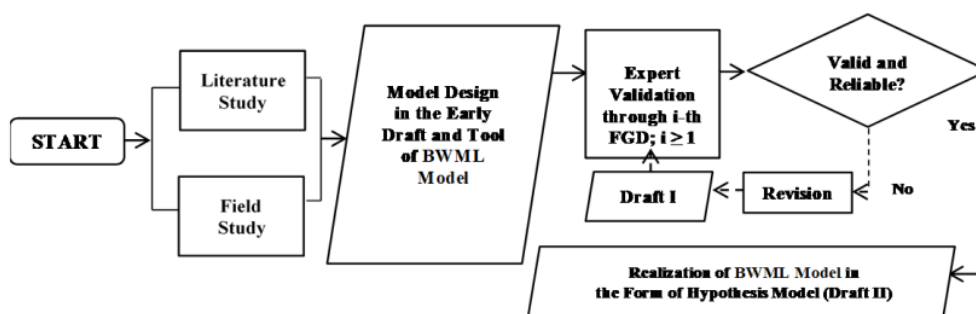
design research) which is supported by empirical studies and learning theories, including social construction theory, cognitive theory, dual coding theory, behavioural learning theory, digital literacy and multi representation.

2. Research Method

This study is Educational Design Research (EDR) on innovative learning. Through the assessment of three experts (professors), the results that have been declared valid and reliable include:

(1) Learning Media (Syllabus, lesson plan, student worksheet, and student books); (2) Research instruments (Practical observation sheet and HOTS assessment sheet); (3) MoLearn, web version; and (4) MoLearn, mobile version. The development is carried out in two core stages (details in Figure 1) adapted from [22], [23], namely: (1) preliminary study and development of the BWML model; (2) limited and large-scale trial of the BWML model.

I. PRELIMINARY STUDY AND DEVELOPMENT OF BWML MODEL



II. LIMITED AND LARGE-SCALE TRIAL OF BWML MODEL

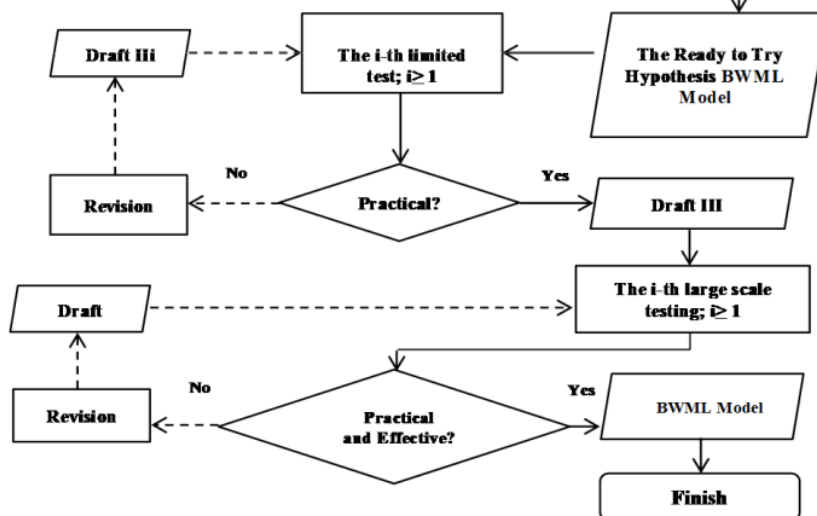


Figure 1. The EDR stages of the BWML model

The effectiveness data (HOTS) were analyzed using inferential statistics and N-gain. Indicator of HOTS are Analyzing (C3), Evaluating (C5), and Creating (C6) [22], [23]. The syntax of the BWML model, such as:

- Phase I; Orientation based on IoTs and Big Data, focus on C4 and C5
- Phase II; Investigation, focus on C4, C5, and C6

- Phase III; Analyzing, focus on C4, C5, and C6
- Phase IV; Presenting, focus on C4, C5, and C6
- Phase V; Evaluating, focus on C5

The core of the BWML model implementation has a percentage of 10% (classroom, course, and reading) on phase I, 70% (on the job experience) on phase IV, and 20% (mentoring and coaching) on phase V to maximize the increase of students' HOTS [22], [23].

3. Results and Discussions

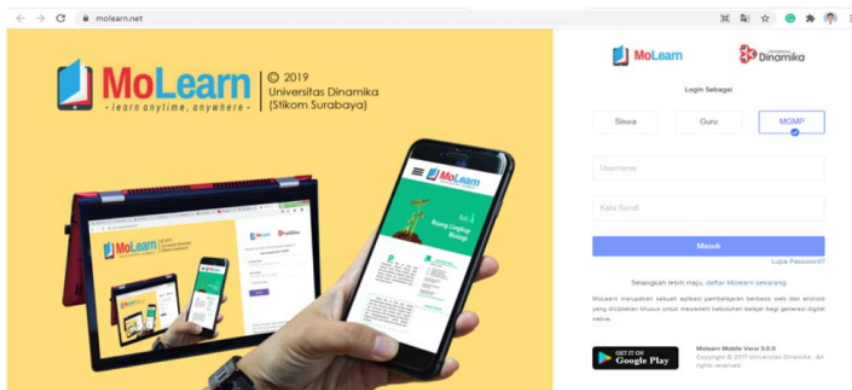
3.1. BWML Model Validity

The BWML model has been developed and validated by three experts (Professor). In general, the validation results show that the BWML model is valid and reliable to be used to increase the student's HOTS of senior high school.

These results are used as a reference for continuing the second and third stages of the BWML model development.

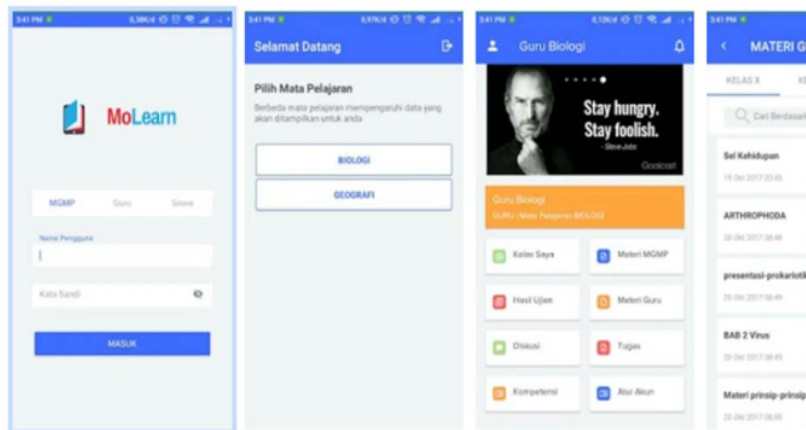
3.2. BWML Model Practically

Observers are optimized to see the practicality of the BWML model syntax. In addition, there are two MoLearn applications that have been developed by researchers in implementing the BWML model as shown in Figure 2. and Figure 3.



(Source <https://www.molearn.net/>)

Figure 2. MoLearn in web version (Intellectual Property Rights by Authors)



(Source: <https://play.google.com/store/apps/details?id=edu.stikom.molearn&hl=in>)

Figure 3. MoLearn in mobile version (Intellectual Property Rights by Authors)

Each class has three observers to follow and assess the BWML model implementation. Each observer uses a valid and reliable instrument to observe the implementation of the BWML model. The results of the BWML model practicality in increasing student HOTS are presented in Table 1.

Table 1. BWML model practically

School		Practicality of BWML Model		
		Criteria	Validity	Reliability
BWML Model (Experiment Group)	State Senior High School I	Good	Valid	Reliable
	State Senior High School II	Good	Valid	Reliable

3.3. BWML Model Effectiveness

The students were given a pre-test; the learning was then carried out with a post-test. The analysis results are presented in Table 2. Table 2 shows that the results of the BWML model implementation are applied in two state senior high schools. In addition, there are two control classes that use learning based on the current curriculum in Indonesia.

The first result, the results of different tests using the Wilcoxon test model showed a significant difference in the results of the pre-test and the post-test. The second result, HOTS N-gain value in the class using the BWML model is better (moderate) than the control class (low). Third, there is consistency of HOTS N-gain scores in both groups, which also proves that the BWML model can consistently increase the students' HOTS of senior high school.

Table 2. Wilcoxon test, N-gain score, and Mann-Whitney U on HOTS results

Group		N	Wilcoxon test	N-gain	Mann-Whitney U
BWML Model (Experiment Group)	State Senior High School I	35	Significant	Moderate	Significant
	State Senior High School II	35	Significant	Moderate	
Learning based on Current Curriculum in Indonesia (Control Group)	State Senior High School I	35	Significant	Low	Significant
	State Senior High School II	32	Significant	Low	

$\alpha = 5\%$

3.4. Research Implication

- 6 The BWML model can be used as an alternative to digital-based learning. Digital learning supports solutions in the COVID-19 pandemic [24], [25], [26]. Including the need for innovation in education during the COVID-19 pandemic [27], [28], [29].
- The BWML model can be a reference for developing a hybrid learning model.
- Web and Mobile integration in learning is something that is still rare in Indonesia. This means that the BWML can contribute to hybrid learning innovation in Indonesia.
- For research in developed countries, the results of this study can be used as empirical data that the integration of web and mobile in learning has been proven to be successful even though in terms of resources it is not like developed countries.
- For researchers in developing countries, the results of this study can be used as motivation and generally used in improving the quality of learning, especially in increasing the students' HOTS of senior high school.

4. Conclusion

The focus of the BWML model is to increase the students' HOTS of senior high school. The BWML model in each phase is carried out and supported by using the MoLearn application. The results of this study indicate that the BWML model is proven to be valid, practical and effective in improving the students' HOTS of senior high school. The limitations of this research are still applied to

Biology and Geography subjects. Further research can be carried out: (1) the BWML model can be developed in other subjects; (2) the BWML model can be developed for elementary, junior high school and Higher Education levels; (3) The BWML model can be customized to be fully online based.

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