# Development of Blended Learning Based on Web and Augmented Reality

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*Abstract*—In this 4.0 revolution era - the cyber physical, internet of thing, big data and cloud computing- everyone will face disruptive era. A university as a producer of educated human resources should be able to produce a high quality graduates. One of the solutions to reach the goal is by using augmented reality and web-based blended learning. Augmented Reality technology is believed to have contribution in changing and being a future trend for learning. This study is a research and development study with ADDIE model involving 30 respondents and aimed at developing a blended learning model which based on web and augmented reality in a learning process. The data were taken by using interview, observation and questionnaire. This study was the initial (analysis) step of the study and was done by identifying the needs of the learning. The questionnaire data were analyzed by using Rasch Model. The results of the study show that the respondents agree on the development of the augmented reality blended learning since it contributes in giving freedom of time for learning, increasing the students' discipline, honesty and responsibility. In addition, the use of augmented reality can increase the student's technological literacy and help them in understanding a learning concept easily. In short, it can be concluded that the augmented reality and web-based blended learning can be continued to the next step.

*Keywords—blended learning; augmanted reality*

## I. INTRODUCTION

Nowadays, we are encountering an industrial revolution era 4.0, namely the Cyber Physical Era, the Internet of Thing, Big Data, and Cloud Computing. The result is an era of disruption. This era possess several characteristics including Volatility, which is a rapid and massive change with difficult pattern to guess. Uncertainty, Quick changes that cause uncertainty. Complexity, there is a complex relationship between the factors causing the change. Ambiguity, lack of clarity about the direction of change that causes ambiguity. The industrial revolution 4.0 has an impact on the world of education in the 21st century. 21st century education has four characteristics, namely creative, innovative, collaboration and communication. The learning process in the disruption era includes self-directed, multisource, life-long learning and ICT based. Higher education is the producer of educated resources and guarantees so that each graduate has qualification ability in accordance with the IQF standards in order to be able to compete in this era

of globalization [1]. The Industrial Revolution era requires new literacy in addition to old literacy (reading, writing and mathematics), namely data literacy, technology literacy, and human literacy. Data literacy is used for managing large data streams. Meanwhile, technology literacy is used to find out how machines work, technology applications, and human literacy so that humans function properly with an environment that includes humanism, communication and design [2]. Therefore, to be ready and produce competitive graduates resources in this era, a comprehensive blend of cognitive abilities, lifelong learning, general education, new literacy are needed.

Blended learning is a learning solution in revolution era 4.0. Blended learning is a combination of online-based learning with face-to-face learning in class [3]. Blended learning is a method that combines face-to-face learning in class with online learning [4]. Blended learning is a combination of physical learning in the classroom with the virtual environment [5]. This shows that blended learning based learning is a combination of old literacy and new literacy (human literacy, technology literacy and data). Currently there are 6 blended learning models, namely: face to face driver, rotation model, flex, online lab, self-blend, online driver. The benefits of blended learning is more effective than just learning face to face or just learning online [6]. Blended learning can improve learning outcomes, Blended learning can be an appropriate way to extend learning time so that students can achieve standards of readiness in college and the world of work. Blended learning can enable students to obtain digital literacy and online learning skills. Blended learning can be used as an appropriate way to cover up learning that cannot be attended face-to-face. Blended learning can make the task more attractive and flexible. Blended learning can make it easier to monitor student progress.
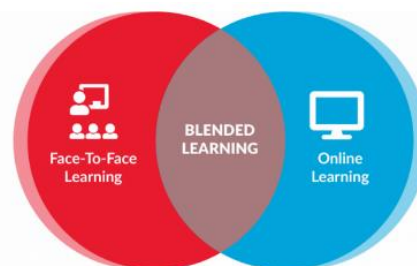


Fig. 1. Model blended learning.

One of the models and platform blended learning used in the world are khan academy, Moodle [4]. The University of Bengkulu as a state university that has a mission to become a world-class university in 2025 has had the framework with the latest changes since 2016. Therefore, it has a good carrying capacity to implement this learning. From the data obtained from the LPTIK University of Bengkulu, there are a total of 1575 registered users. However, from the data of active lecturer users who teach at the University of Bengkulu, there are still very few lecturers who use this facility not more than 10%. So that this learning model needs to be developed at the University of Bengkulu. An innovation will be followed if the user feels the benefits of the innovation, the user will follow an innovation if it is influenced by a key person or a person who has a strong influence [7]. With the big number of programs being implemented, the number of students is large what results on many classes, but with limited lecturer resources, limited hours, the application of blended learning model is one of the right alternatives.

Website is an application that is built using a web programming language (html, java) and can be accessed by users online or offline through network technology. The use of web-based technology for education has been done a lot. For example ruanguru.com, quipper.com and others. Ruangguru.com combines web-based, interactive video online learning models. Ruangguru.com users now almost reach 8 million users. This shows that the trend of digital literacy and technology is increasing. So that it might happen in the next few years conventional tutoring will begin to diminish. . To access a website, a browser is needed to see the interface that you want to present. At present, students are already very familiar with the use of technology so as to bring about changes in classroom learning. Almost all students now have mobile technology devices. Interactive use of technology can improve student attitudes [8]. In the Industrial Revolution 4.0 Augmented Reality or abbreviated as (AR) is a part that will not be separated from future education. AR technology is believed to change and become an increasing trend in future learning [9]. Augmented Reality is an interactive form of technology that combines virtual technology with the real world. Augmented Reality is a combination of 3D projects into the real environment [10]. With AR technology we can realize 2D images into 3D so that they look realistic. Some of the reasons for using AR technology is that using AR in learning can help explain abstract concepts or cannot clearly present in learning, AR technology can be accessed through any gadget device at any time.



Fig. 2. Augmented Reality in education.

It is seen from Figure 2 that through using AR technology, 2D images can be projected into 3D / 4D objects so that makes learning more interesting. Based on the literature study, research on blended learning models using web-based frameworks is quite a lot, but research on web-based blended learning models combined with augmented reality technology is still very limited. Based on this explanation, the title of this research will be about the development of web-based and augmented reality blended learning model.

## II. EXPERIMENTAL METHOD

The current research uses Research and Development (R & D) model. RnD research is a research that is used to produce a particular product. In addition, it is used to test the effectiveness of the product so that it can function widely, it is necessary to conduct a research to test the effectiveness of the product [11]. The development model used is ADDIE model, it was developed by Dick and Carry. ADDIE stages include Analysis, Design, Development, Implementation and Evaluation [12]. This research will use the web platform and Augmented Reality. This research is an initial research so it is limited to the analysis phase. This stage of analysis includes pre-planning activities, identifying products that are in line with the goals of students, learning objectives, identifying learning materials, identifying learning environments and delivery strategies in learning [12]. At this stage data collection techniques are used in the form of questionnaires with 30 respondent using purposive sampling technique to study the need for developing blended learning models based on web and augmented reality and whether blended learning models can help overcome learning problems. In addition, environmental observations were conducted to find out whether the blended learning model supports the facilities to be implemented. The data processing techniques used for the analysis of questionnaire items used Rasch models by implementing the Winstep application. The results obtained later will be analyzed and the question of "whether the data shows that the development of web-based and Augmented Reality blended learning models can proceed to the next stage or not" will be answered.

## III. RESULT AND DISCUSSION

With blended learning, some learning problems can overcome including limited time. The existence of technology literacy helps facilitate the learning process. Interactive learning using augmented reality can help in understanding abstract concepts of learning. Based on data from interviews conducted at the LPTIK Unit, it was found that the blended learning model is web-based and augmented reality could be applied to be implemented because the existing facilities and infrastructure were adequate. In stage A (analysis) a limited trial was used to find out the response about web-based and augmented reality blended learning models. From the reliability test on the questionnaire used, shows that the questionnaire has a reality greater than 0.80. This shows that the questionnaire used has a high level of reliability or is very reliable [13]. Then the item questionnaire item in the analysis uses the Rasch model using the Winstep program. The results of the map variable data are shown in the Figure 3 below.

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--------------------------------------------------------------------
| Person     30 INPUT    30 MEASURED          INFIT       OUTFIT    |
|            TOTAL  COUNT  MEASURE  REALSE   IMNSQ ZSTD  OMNSQ  ZSTD |
| MEAN       49.4   14.7    2.25     .70      .96   -.1    .90   -.2 |
| P.SD       5.2     .7     1.74     .15      .53   1.3    .61   1.2 |
| REAL RMSE  .72 TRUE SD  1.59 SEPARATION 2.21 Person RELIABILITY .83|
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**Reliability Statistics²**

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .833 | .838 | 15 |

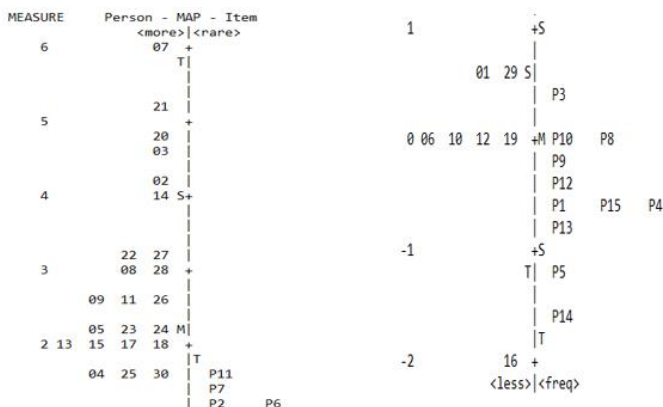Fig. 3.  Data reliability Winstep[1], Spss[2].



Fig. 4.  Variable map questionnaire item analysis.

Figure 4 above shows that the average of respondents agree that it is necessary to develop blended learning model based on web and augmented reality in learning. From the map person variable output data, it can be seen that respondent number 07 is the one who mostly agree with all the items given, while respondent number 16 is one who mostly did not approve the questionnaire items. Meanwhile, the other respondents were classified as easy to agree to the given questionnaire items. From the output data of the map item variable, it can be seen that questionnaire item number 11 is the most difficult to be approved. The mentioned questionnaire item is about using a blended learning model to increase self-confidence. Whereas,

for questionnaire items based on variable  map data, the items that are most easily approved are items number 14, 5, 13, 1, 14 and 4. This item includes respondents' responses about web-based and augmented reality of blended learning that can provide freedom in accessing material anytime. From 30 respondent show that 58,82% respondent strongly agree and 41,18% agree.  Learning through blended learning model based on web and augmented reality can help foster a disciplined, honest and responsible attitude. From 30 respondent show that 50% respondent strongly agree, 44,12 agree and 5,88% disagree. This is in line with the research that found out that learning through blended learning based on web and augmented reality which is presented with interactive content technology makes it easy to understand the concept of learning [8]. Based on theory an innovation can be easily spread if there are perceived benefits [10].

## IV. CONCLUSION

From the results of this preliminary study, it can be concluded that the development of blended learning models based on web and augmented reality can help students to be freer in accessing material at any time. Learning through blended learning based on web and augmented reality can help foster a disciplined, honest and responsible attitude. Learning through blended learning based on web and augmented reality which is presented with interactive technology content can facilitate students in understanding the concept of learning. Therefore, it is necessary to continue the next ADDIE research phase.

## REFERENCES

[1] P. Nurwardani, R.R. Tutupoho, E. Mulyono, S.W. Nugroho, E. Endrotomo, S. Arifin, and L. Djajanto, Panduan penyusunan kurikulum. Jakarta: Kementrian Riset, Teknologi dan Pendidikan Tinggi Direktorat Jenderal Pembelajaran dan Kemahasiswaan Direktorat Pembelajaran, 2016.

[2] J.E. Aoun, Robot Proof "higher education in the age of artificial intelegence". Mitpress.mit.edu, 2017.

[3] J. Fitzpatrick, Planning guide for onlne and blended learning. Michigan: The Michigan virtual university [Online]. Retrieved form : https://michiganvirtual.org/wp-content/uploads/2017/03/PlanningGuide-2012.pdf, 2011.

[4] C. Wilson, 6 blended learning model and platform [Online]. Retrieved from: https://www.teachthought.com/learning/6-blended-learning-models-platforms/, 2018.

[5] A. Hamila and Mohamed-amin, Implementation of Blended Learning in Higher Learning Institutions: A Review of the Literature. Faculty of Education, National University of Malaysia, Bangi, Selangor, Malaysia, 2016.

[6] S. Dwi, E. Budiningsih, and E. Risdianto, Model Blended Learning Berbasis Moodle. Jakarta Barat: Halaman moeka, 2018.

[7] H. A. Tanye, "Perceived Attributes of Innovation: Perceived Security as an Additional Attribute to Roger's Diffusion of Innovation Theory,"

http://ijmmu.com editor@ijmmu.com ISSN 2364-5369 vol. 3, no. 6, pp. 6-11, 2016.

[8] J.K. Eastman, R. Iyer, and K.L. Eastman, "Interactive Technology In The Classroom: An Exploratory Look At Its Use And Effectiveness," Contemporary Issues In Education Research – Third Quarter, vol. 2, no. 3, 2009.

[9] J. Bacca, S. Baldiris, R. Fabregat, S. Graf, and K. Kinshuk, "Augmented Reality Trends in Education: A Systematic Review of Research and Applications," Educational Technology & Society, vol. 17, no. 4, pp. 133–149, 2014.

[10] F. Lenurra and D. Pratiwi, "Penerapan teknologi augmented reality sebagai media promosi apartemen dengan metode markerless," Seminar Nasional Cendekiawan ke 3, 2017.

[11] S. Sugiyono, Metode Penelitian Pendidikan (pendekatan kuantitatif, kulaitatif, dan R&D). Bandung: Alfabeta press, 2016.

[12] E. Multyatiningsih, Metode Penelitian Bidang Terapan Bidang Pendidikan. Bandung: Alfabeta, 2014.

[13] S. Arikunto, Prosedur Penelitian "Suatu Pendekatan Pratktik". Jakarta: Rineka Cipta, 2013.