Advances in Social Science, Education and Humanities Research, volume 397
3rd International Conference on Learning Innovation and Quality Education (ICLIQE 2019)

The Development of Education Game Learning Training Module Based on Information Technology in Industrial Revolution 4.0 for Teachers in MI Al Asy'ari Jombang

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Abstract: Industrial Revolution Era 4.0 is the fourth world era where information technology has become the basis in human life. Although we are in the era of 4.0 revolution, there are still many problems related to the lack of learning innovations that utilize information technology skills. This is also experienced by one of the schools in Jombang, namely MI Al Asy'ari. As a result of that, the training of information technology Mastery needs to be held. One of which is in making interesting Educational Games based on information technology skills. Learning games which centered on active participants, can be used as innovative and fun elements in the learning experience (Silberman, 2014). Meanwhile, it is necessary to have a training module as a learning means to make the participants easier to learnthe IT-based educational game. This research is a developmental research that aims to produce an IT-based educational game learning training module for teachers at MI Al Asy'ari Jombang. This research uses the Borg & Gall model which refers to the seven steps taken by (Widyaningrum, Sarwanto, & Karyanto, 2013). Those are 1) research and data collection, 2) Planning, 3) product draft development, 4) initial field trials, 5) revising the results of trials (optional), 6) major field trials, and 7) revisions to operational products (optional). The research instrument used was a validation sheet, questionnaire, and the results of the training participants' posttest. The validity results of the two validators showed the percentage of each assessment as many as 80% for the format, and 88.74% for the contents of the module, and 86.2% for the language used in the training module. The results of practicality in the initial and main field trials are seen from the results of the participants responses. It is shown in each assessmentas many as 96.05% and 94.41%. The effectiveness results in the initial and main field trials were seen from the results of the trainees' posttest. The effectiveness results showed that the percentage of participants who met the completeness criteria classically was 83.3% and 92.3%. Thus, the IT-based educational game learning training module that has been developed can be declared feasible to be used as a means to facilitate the trainees because it fulfill valid, practical, and effective criteria.

Keywords: *training module, development, educational game, information technology*

INTRODUCTION

Our country has now entered the fourth world revolution 4.0 era. The term industry 4.0 was born from the idea of the fourth industrial revolution. Industry 4.0 is a new interdisciplinary field combining cyber-physical systems, the internet of things and sevices and smart factories (Lavanya, Shylaja, & Santhosh, 2017). There are five major challenges to be faced. Those are knowledge, technology, economic, social and political aspects. Industry 4.0 is strategic initiative recently introduced by the German government (Rojko, 2017). The 4.0 industrial revolution made information technology as the basis of human life. The use of unlimited computing and data is influenced by the development of the internet and digital technology, which are still the backbone of the movement and connectivity of humans and machines, causing everything to be unlimited. (Xu, David, & Kim, 2018) said the speed and measure of the changes coming about by the fourth industrial revolution are not to be ignored. These changes will bring about shifts in power, shift in wealth, and knowledge. Only in being knowledgeable about these changes and

the speed in which this is occurring can we ensure that advances in knowledge ang technology reach all and benefit all.

The era of the industrial revolution 4.0, often also called the era of disruption, is an era in which massive changes occur in all areas of life as a result of modern technology, no exception on these changes which also occur in the field of education. Education is a very important aspect to prepare the generation in facing the challenges of the disruption era. One of the effects of this era is that many educational units have implemented digital technology in teaching, which is able to penetrate classroom walls, school boundaries, and even the State. One of the challenges that must be faced in life change in this era of disruption is the improvement in the quality of human resources who are able to compete in the global era. For this reason, educational institutions in Indonesia must be able to provide a set of plans, preparations and arrangements regarding the objectives, content, and learning materials, as well as the methods used as guidelines in organizing learning activities to achieve certain educational goals.

Indonesia needs good preparation to face the industrial revolution 4.0, especially the world of education. Improving the quality of learning is very necessary for the realization of educational goals as expected. The magnitude of the influence of the industrial revolution era 4.0 makes educational institutions competing to prepare themselves to face the challenges. However, it turns out that not a few educational institutions that have not fully optimally made preparations to welcome the 4.0 revolution era. One of the schools that has been randomly selected is MI Al Asy'ari Hard. This school is located in Keras, Disek, Jombang, East Java. Based on interviews with several teachers at MI Al Asy'ari Keras Jombang, it is obtained that teachers in managing teaching and learning activities are still very rarely integrate with information technology skills. One reason is because of the lack of mastery of information technology skills.

Efforts are needed to overcome the problems faced by teachers in these schools. One of those is efforts to increase teachers' insights about various learning innovations that are integrated with information technology skills. Teachers need to decide which games could be appropriate to specific learning outcomes and importantly, how they could use games to manifest specific learning outcomes (Jenson & Hébert, 2017). Game studies as well as the cognitive understanding and application-level knowledge of the field are more effective in learning and in student achievements in terms of retention (Bakan & Bakan, 2018). On balance, results indicate that games and/or simulations have a positive impact on learning goals. The researchers identify three learning outcomes when integrating games into the learning process: Cognitive, behavioral, and affective (Vlachopoulos & Makri, 2017). (Henriksen & Mehta, 2016) said that creativity is one of the most important and desirable qualities of thinking for success in the 21st century. The solution offered in dealing with this problem is to provide training with the theme of GeMa BakTi Learning Training (Interesting Educational Game Based on Information Technology Skills). Training and development activities are a crucial exercise in any organizational set-up (Boadu, etc. 2014). Thus as a Media to Promote the Importance of Welcoming the Industrial Revolution 4.0. The obstacle faced by the training program for teachers at MI Al Asy’ari is that there is no training module. A learning module is a self-contained, formally structured learning experience with acoherent and explicit set of learning outcomes and assessment criteria (Rufii, 2015). The module material consists of introduction, learning activities, summary, formative test, and formative test answer key. The functions of the training modules include, (1) overcoming the weaknesses of the traditional teaching system, (2) increasing motivation to learn, (3) increasing the creativity of the trainer in preparing individual learning, (4) realizing the principle of continuous progress, and (5) realizing concentrated

learning. Itis necessary to make a training module because there are many benefits and functions of the training module. Those training can help participants to achieve the training objectives. As the result, this research will develop an information technology-based educational game learning training module to add the teachers' concept at MI Al Asy'ari with various information that later can be practiced in teaching and learning activities in class

METHOD

Research Method

This research is Research and Development (R&D). The development model used in this study is the Borg & Gall development model which refers to the seven steps taken by (Widyaningrum et al., 2013). Those are 1) research and data collection, 2) planning, 3) product draft development, 4) initial field trials, 5) revising the results of trials (if needed)., 6) main field trials and 7) revisions to operational products (if needed). The research product is a learning training module to make an information technology-based educational game

Research Subjects

The research subjects in the main field trial were the teachers in MI Al Asy'ari Keras Jombang, which the total number is approximately 26 teachers, while the sample of this study in the initial field trial consisted of 6 people.

Data Collection Techniques and Data Analysis

Data collection techniques used in the study in the context of testing the training module consisted of validation sheets, questionnaire sheets, and the results of the pretest and posttest. Data analysis method used in this research is descriptive analysis. Data analysis in this study was reviewed from the validity aspects of two validators who were experts in their fields. They are the practicality of the participant's questionnaire responsesand the effectiveness of the posttest results. The data analysis included:

a. Validation Result of Data Analysis

The validator scores the assessment on each validation sheet of the training module which consists of three categories; they are the format, content, and language used in the training module. The data evaluation of the results in this study uses a Likert scale (Sugiyono, 2015). On each validation sheet, the validator assess his assessment which consists of 5 categories, namely: definitely not good (value 1), poorly good (value 2), good enough (value 3), good (value 4) and strongly good (value 5). The validator also give suggestions and comments. The assessment results are analyzed by considering suggestions and comments from the validator. Then, they calculate the validation of all validators using the following formula:

$$\text{Percentage} = \frac{\sum Validator's\ Answer}{\sum The\ Highest\ Score\ of\ Validators} \times 100\%$$

To calculate the average of validation, it is formulated as follow:

$$RTT = \frac{\sum Overall\ Result\ of\ Rating\ Aspect}{\sum Rated\ Aspect}$$

After that, match the average percentage of validity with table 1 (Riduwan, 2011):

Table 1. The Criteria of Validity Percentage

No.	Range Value	Explanation
1	$\geq 81{,}5 - 100$	Strongly Valid
2	$\geq 62{,}5 - 81{,}5$	Valid
3	$\geq 43{,}5 - 62{,}5$	Poorly Valid
4	$\geq 25 - 43{,}5$	Not Valid

b. Data Response Analysis

Practicality Analysis is carried out to determine the practicality of training modules developed. The instrument used for practicality analysis was in the form of Likert scale questionnaire with 5 rating scales according to Sugiyono (2015). To calculate the value of each indicator from all questionnaires, the formula used in the calculation to obtain the following percentages:

$$\text{Response Percentage} = \frac{\sum Respondent's\ Answer}{\sum The\ High\ Score\ of\ Respondents} \times 100\%$$

After calculating the percentage, match it with the percentage criteria from Riduwan (2011).

Table 2. The Criteria of Response Percentage

No.	Range Value	Explanation
1	$\geq 81{,}5 - 100$	Strongly Good
2	$\geq 62{,}5 - 81{,}5$	Good
3	$\geq 43{,}5 - 62{,}5$	Poorly Good
4	$\geq 25 - 43{,}5$	Not Good

c. Posttest Result Analysis

The instrument used for the effectiveness analysis was the posttest results test. Participants are asked to complete the training if they have reached the Minimum Completeness Criteria (KKM) that have been set at ≥ 80. Calculation of the percentage of classical completeness according to Riduwan (2011) is as follows:

$$\text{Classical Percentage} = \frac{Completed\ Number\ of\ Participant}{Total\ Number\ of\ Participant} \times 100\%$$

The results of this trial will be used as a basis for revising the training modules to produce a good final module that can be tested on the main field, which is the teachers at MI Al Asy'ari. The training module is said to be good if the training module has met the valid criteria of the validator and tested to meet the practicality criteria (seen from the positive participant's response to the training module), and also meet the effectiveness criteria from classical completeness based on the posttest score

RESULTS AND DISCUSSION

Results

The result of module training development of educational game based on IT is as follow :

1. Validation Result

The assessment module is assessed by two competent validators, according to their fields. The validation sheet used in the module validation process has the same evaluation aspects. The first material module contains 21st Century Learning material, the second material contains wondershare quiz creator, and the third material contains Powerpoint material with Macro visual basic. The following are the results of validation by two validators. presented in Table 1 as follows.

Table 3. Recapitulation of Module Validation Data

No.	DESCRIPTION	ASSESSMENT					
		V1	V2	Total	Maximal Score	%	Exp.
1	FORMAT	8	8	16	20	80%	Valid
2	CONTENT	18,2	17,3	35,5	40	88,75%	Strongly Valid
3	LANGUAGE	31,7	28,7	60,4	70	86,28%	Strongly Valid
	Average					85,01%	Strongly Valid

The results of these two expert validations show that the training modules are classified as very valid criteria to be used as training support. In addition, the validators also provide comments and suggestions on the validation sheet. Here are some suggestions given:

Table 4. Results of the Training Module Revision

Material	Before Revision	After Revision	Reason of Revision
1	The display of gnomio application is not accompanied with material	The display of gnomio application is accompanied with material	To make the participants easy to understand the purpose and objectives of the material presented
	The result of online test should be displayed in the module	The result of online test is displayed in the module	
2	The quiz exercises for each type in the program should be given each example	The quiz exercises for each type in the program have been given each example	To make participants can understand more easily when applying the wondershare quiz creator program using each type of question that has been provided
3	The background display on learning media should be colorful and the blend of images should be more soft and elegant	The background display on learning media has been improved by using colorful images and the blend of images has been more soft and elegant	To make module become more interesting and the participants can understand easily.
	The game layout needs to be made as attractive as possible	The game layout has been made as attractive as possible	

2. The Results of Participant Response Questionnaire

The results of participant response questionnaire consisted of the results of theresponse questionnaire in the initial and main field trials. The results of the participant response questionnaire in the initial field trials can be seen in Table 3 below.

Table 5. The results of the participant response questionnaire in the initial field

No.	Rated Aspects	ASSESSMENT			
		Total	Maximal Score	%	Exp.
1	Participants' responses to the training presenters	228	240	95%	Strongly Good
2	Participants' responses to the training	314	330	95,15%	Strongly Good
3	Participants' responses to the module facility	147	150	98%	Strongly Good
	Average			96,05%	Strongly Good

The results of the participant response questionnaire in this initial field trial obtained an average percentage of 96.05% with a strongly good category. Next is the results of the participant response questionnaire in the main field trials which can be seen in Table 4 below.

Table 6. The results of the participant response questionnaire in the main field

No.	Rated Aspects	ASSESSMENT			
		Total	Maximal Score	%	Exp.
1	Participants' responses to the training presenters	1049	1120	93,66%	Strongly Good
2	Participants' responses to the training	1463	1540	95%	Strongly Good
3	Participants' responses to the module facility	662	700	94,57%	Strongly Good
	Average			94,41%	Strongly Good

The results of the participant response questionnaire in this main field trial obtained an average percentage of 94.41% with a strongly good category

3. The Posttest Results of Training

Student learning test results consist of the results of student learning tests on initial field trials and main field trials. The results of student learning tests in the initial field trials were known from the 6 participants who took the test. In total, 5 participants (83.3%) were completed and 1 (16.7%) incomplete students were obtained.

As for the results of the main field trial test, there are 24 participants (92.3%)who complete the test out of 26 participants and other 2 (7.69%) is not complete the test. The classical learning completeness in main field trials is 92.3%. From the results of this classical

completeness, the training module can be declared as effective because it has reached the classical completeness criteria set in the training at MI Al Asy'ari which is ≥80%.

Table 7. The Posttest Results of Initial and Main Field Trial

Explanation	Initial Field Trial	Main Field Trial
The average of posttest result	88,6	90,8
The amount of participant who cannot complete the test	1 out of 6	2 out of 26
The percentage of participants who complete the test	83,3%	92,3%
The completeness of classical learning	completed	completed

Discussion

Based on the interviews with the school principals of MI al Asy'ari Jombang, it is stated that teachers rarely make learning innovations in the teaching and learning process.They also rarely use Information Technology because of their lack of understanding of information technology skills. Some teachers at the school also stated that they needed training on IT-based learning innovations so students remained focused and not bored during the teaching and learning process from beginning to end. The results of these interviews and preliminary observations conclude that training needs to be held in making new learning innovations in which researchers provide solutions to create IT-based educational games. One of the main advantages of educational games is the visualization of real problems (Vitianingsih, 2016). Learning games which focused on active participants, can be used as innovative and fun elements in the learning experience. This strategy is not only used to make students happy but also used as a means to reach the goal (Siberman, 2014). Rodliyah, et al (2018) added that students can gain real and meaningful learning experiences while playing so they can help them to construct concepts in a fun way. The role of technology is not only seen in the lives of adults, but also how good technology can play a role in the lives of children, especially in the field of education (Hartono, Purnomo, Kurdhi, & Firdiana, 2016). The concept of "module" is strictly linked to the idea of a flexible language curriculum, which should provide all those concerned with education (primaly learners and teachers, but also parents and administrators, as well as society at large) with a framework to establish clear and realistic language learning objectives. Modules are increasingly being used in many countries as a way of organizing a language curriculum (Sejpal, 2013). This training module has many functions, one of which is to facilitate the participants in achieving their goals.

The planning phase includes preparing the structural framework of the training modules, determining the systematic development of training modules and designing training modules to be able to achieve the training objectives. The module material consists of introduction, learning activities, summary, formative test, and formative test answer key. In preparing the structural framework, the researcher analyzes the material that will be provided during the training, determines display design, determines formative tests and designs concepts. The training module material is in the form of educational games that use some existing software, including 21st century learning that are Moodle, Quiz creator, and PPT with Visual Basic.

The development phase produced a draft of a training module with three materials namely Moodle, Quiz creator, and PPT with Visual Basic through the pre-research stage. It meansto

validate the product into two expert validators. The results of the validation are used as a draft and then edited so that the next stage can be carried out;which is the initial field trial phase in small groups.

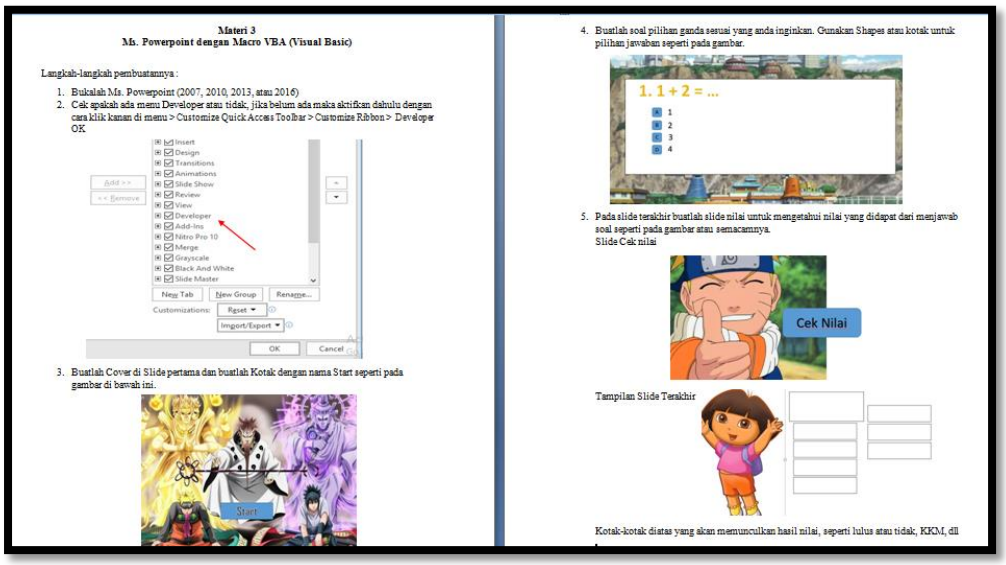

Figure 1. The Example of Training Module Content that has been developed

In this study, module assessments are seen based on 3 categories including format, content, and language. There are two indicators for the Format category assessed: (1) a clear numbering system, (2) The display and images in the module have a tensile force. Other is the 4 indicators for the content category assessed: (1) The truth of the content material, (2) The suitability of the Module with the theme of training, (3) The suitability of the task with the order of the material, and (4) Questions or commands are easily understood by participants . Whereas, there are 7 indicators of the language category assessed: (1) The use of grammar according to improved spelling, (2) Conformity of sentences with the level of thinking and reading ability according to the age of the participant, (3) Encouraging interest in learning, (4) Simplicity of structure sentences, (5) Sentences do not contain multiple meanings, (6) Clarity of instructions and direction, and (7) Communicative nature of the language used. The validity results of the two validators indicate the percentage of each rating, as of 80% for the format which means valid, 88.74% for the contents of the module which means strongly valid, and 86.2% which means strongly valid for the language used in the training module. In addition, at this stage of development, a slight revision was made based on some suggestions from the validators.

The revised training module after receiving suggestions from the validators was then the trial is carried out on a small group. This aims are to find out the deficiencies as well as to what extent the preparations have been made in order to minimize errors when the main field trials take place. At the end of the trial, a small group of 6 participants was conducted. Researchers obtained the results of participant responses to training presenters, implementation of training, and training facilities including training modules in the very good category that is equal to 96.05%. As for the results of the posttest, of the 6 participants, there was one participant whose value was below the completeness criterion of 67. Even so, the training module could be declared effective because it had reached the classical completeness criteria set at the training at MI Al Asy'ari which is ≥80% of 83.3%.

Figure 2. Initial Field Trial of the IT-Based Educational Game Learning Training Module

After testing a small group and making a few revisions based on the suggestions of the participants, the training modules are ready to be used in the main field trials, which are the teachers at MI Al Asy'ari Keras Jombang. Similar to the initial field trial, the researcher obtained positive results from the participant toward the trainee, the implementation of the training, and the training facilities including the training modules which were in the very good category at 94.41%. As for the results of the posttest, of the 26 participants, there were two participants whose grades were below the completeness criteria of 65. Even so, classically the training module could be declared effective because it had reached the classical completeness criteria set at the training at MI Al Asy'ari which is ≥80% which in the amount of 92.3%. As for the incompleteness of the participants who took part in the posttest both in the initial and main field trials, this was due to inaccuracy in reading the questions so that there were questions that were missed and not being answered. For example, in the posttest questions number 1 to 3, here the researcher ask the participant to give each example. However, the participants only explained their definition and theory. Thus can reduce the points. On the other hand, there are some numbers that are incomplete explanation.

Based on Validity Analysis, the Practical Analysis that is seen from the responses of the participants, and effectiveness analysis seen from the posttest results can be concluded that the training module is appropriate to be used as a supporting tool in training IT-based educational game learning in the Revolutionary Era 4.0.

CONCLUSIONS

1. Training Modules that have been developed are valid, practical and effective. The validity results from the two validators showed the percentage of each assessment which is 80% for the format, 88.74% for the contents of the module, and 86.2% for the language used in the training module. The results of practicality in the initial and main field trials are seen from the results of the responses of the participants which showed the percentage of each assessment which are 96.05% and 94.41%. The effectiveness results in the initial and main field trials were seen from the results of the trainees' posttest. The effectiveness results showed that the percentage of participants who met the completeness criteria classically was 83.3% and 92.3%.

2. This developed training module is urgently needed for learning trainees in making IT-based educational games in MI Al Asy'ari Jombang in order to facilitate achieving the training objectives.

ACKNOWLEDGMENTS

Special thanks especially to the Republic of Indonesia Ministry of Research, Technology and Higher Education, Rector of Hasyim Asy'ari University Tebuireng Jombang, LPPM Hasyim Asy'ari University, and those who have helped in completing this research. Hopefully, the results of this study are useful and make a positive contribution, especially in the world of education.

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