

The Effects of Electronic Modules in Constructivist Blended Learning Approaches to Improve Learning Independence

Komang Anik Sugiani^a, I Nyoman Sudana Degeng^b, Punaji Setyosari^c, Sulton^d, ^aState University of Malang, ^{b,c,d}Polytechnic Ganesha Guru, Email: anikkomang4@gmail.com, nyoman.sudana.d.fip@um.ac.id, setyosari.fip@um.ac.id, sulton.fip@um.ac.id

This research aimed to produce the development of an electronic module for one semester in which the feasibility and advantages had been tested to improve learning independence. The type of research is Research and Development (R & D), using the Elaboration model. The steps of Development are 1) objective analysis and study field characteristics, 2) analysis of learning resources, 3) analysing the characteristics of learners; 4) establishing the learning objectives and content of learning; 5) establishing a strategy for organizing learning content; 6) establishing the delivery strategy of learning content; 7) establishing a learning management strategy, and 8) the development of a learning outcomes measurement procedure. Validation prototype modules include 1) expert evaluation; 2) one to one evaluation; 3) small group evaluation, and 4) field trial. Instruments used in the data collection are the questionnaire and test learning independence. Based on the results of data collection, the average percentage of respondents to the products developed was over 80%. The results of this study indicate that the electronic module is very significant to improving learning outcomes.

Key words: *Electronic Modules, learning materials, E-learning, Blended Learning.*



Introduction

The use of media and learning resources are a part of the components that affect learning. Teaching material needs to be adapted to the learning conditions and the learning strategies that are used by the learner. The utilization of modules to support empowerment and learning is not only to improve the effectiveness and quality of learning, but more importantly, it is to improve the mastery of the material for both teachers and learners.

The current learning model begins to evolve along with the rapid development of technology and information such as the Constructivist Blended Learning Approach (CBLA) as a learning model that combines traditional learning and online learning with a constructivist approach. CBLA learning excellence according to Hasibunan (2006: 4) is (1) Active learners, (2) Learners contrasting their knowledge, (3) Subjective, dynamic and expanding, (4) Processing and understanding of information, (5) The learner has his own learning. The CBLA model requires learners to be active so they can build knowledge with subjective, dynamic and developing learning processes. Then they can process and understand the information, so that learners can develop their own learning. Ruffi (2015) in his research explained that the use of constructivist theory and learning modules is a must in the learning process. The use of learning modules help to build and construct knowledge.

Based on the results of the preliminary observation in the college, it was found that several factors that were caused by the process and the learning outcomes had not been optimal. Firstly, the unavailability of the module and learning materials that are relevant and appropriate to the characteristics of learners is an obstacle that is faced. The existing learning materials are only in the form of textbooks, therefore learners often have difficulties in understanding the content of the readings. The dominant textbooks used present information but they have minimal training and test activities. The material in the textbooks is presented in a way that tends to be rigid and not focused on the level of development of learners. Secondly, learners feel they have learned when they have completed a lecture assignment given by the learner on campus. The work of the lecture task tends to be based on the material taught. As students do not yet understand the nature of what is being taught and how to learn, the learners tend to learn better when they are completing a task that is assigned to them.

Third, learners are still considered as the sole source of learning. When learners practice procedures and suffered constraints, the learners tend to ask for assistance. Learners do not have the initiative to seek and find their own solutions to the problems encountered.

Fourth, the learners acquire a touchless innovation in creating learning. The existence of some deficiencies in the learning process are considered as necessary to provide a solution to these

problems. According to the results of the observation, the solution offered was to develop an electronic module in blended learning.

The electronic module allows the learning process to accomplish the achievement of "complex skills" that are needed in the global era, while allowing the existence of student-centred learning (Mills, 2006:3). Fullik (2004:72) mentioned some potential that can be developed from a source of online learning in the process of learning, namely (1) drawing on web-based material to be used by students both within and outside lesson time, (2) teachers modifying and adapting web-based resources for use with their students, and (3) teachers using the Internet to support their professional needs. According to research results Juuti, et al (2002) found that science-based online learning resources still must be followed by a communication face-to-face model informally with the learners to obtain optimal results.

Modules that are developed must comply with the characteristics of the learners, given the rapid development of technology, so then the modules developed are electronic. An electronic module is a tool or a means of learning material, methods, limitations, and how to evaluate systematically designed and attractive the expected competencies, in accordance with the level of its complexity in Electronics (part of e-learning). The electronic module is one of the computer-aided media inside there is a picture animation of a symbol. The electronic module is a type of computer-based learning media. The computer can accommodate the plodding learner receive lessons because it can give a more effective climate in a way that is more individual, never forgotten, and very patient in carrying out the instructions as the desired program used (Arsyad, 2013; Ramkumar and G. Rajini, 2018).

As argued by Santyasa (2009), the advantages gained from learning with the application of electronic modules are as follows: 1) an increase in the motivation of the learners, because every time they do the lesson tasks, they are clearly defined and in accordance with the students abilities; 2) after the evaluation, teachers and learners know accurately, about which module the learners have succeeded on and on the parts of the module where they have not succeeded; 3) learners achieve results according to their ability; 4) the lesson material is more evenly distributed in one semester; and 5) the education is more efficient, because the subject matter is arranged according to the students' academic level.

The advantages of this are practical electronic modules that can be accessed through a computer, tablet, and so on, that are equipped with audio-video tutorials, job sheets, and evaluations. If the learners are connected to the internet network then they can address the source reference as directly accessible. Electronic modules are equipped with a variety of buttons, e.g. its function to switch on the music that is already in the electronic module or to open it to the next page.



Perinpasingam, et.al (2014) in his research, explained that the module supports learning so that learning can be more interactive, the module also became a viable alternative solution developed for learning, so as to improve learning outcomes. Riana, et. al (2016) in his research, explained that the learning module is very feasible and effectively developed to improve learning outcomes. Sri et. Al (2014) in his research explained that the development of the electronic module in the learning process by integrating local wisdom is effectively developed in entrepreneurship learning.

Daniel, et. al (2015) in his research suggests that the modules are effectively used in E-learning. The use of modules is very interesting for learners in the learning process. Budi and Citrawati (2017) argued that the question-based inquiry module (QBIM) is effectively developed to facilitate science learning in order to improve the mastery of biology concepts, science process skills, and the learner's thinking abilities. Chong, et. al(2005) in his research suggests that E-modules with a multimedia approach help learners to better understand the content of learning. This e-module is very effectively developed as an alternative teaching method that can help Pneumatic learning.

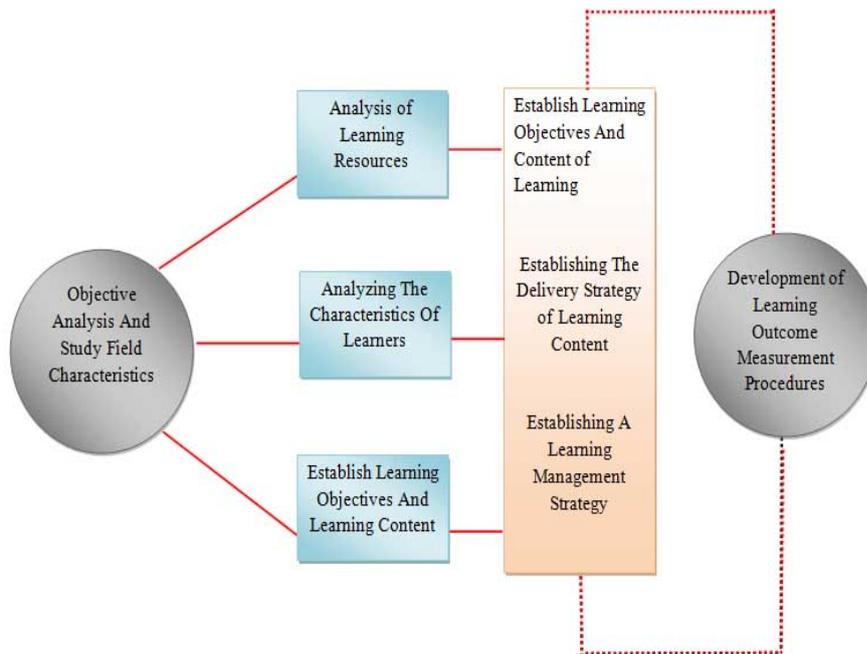
Mberia (2011) in his research explained that there is a need to use electronic modules in learning or training, this will help in the development of communication competence by providing information about the various forms of communication for proper use in learning. Salve & Opina (2014) in their research explained that when effective online modules are used in the learning process, learners feel more satisfied using the online modules of learning compared to using traditional conventional methods. Naval (2014) in his research suggests that in the effective modules used in learning physics, the modules can help the understanding of the concept of learners in the learning process, and the development of the module can help teachers in the learning process.

The electronic module is very helpful in the learning process, it is as expressed in a study conducted by the Alias (2012), that found that learners have difficulty in understanding the concept of physics, this is due to the lack of learning materials that are in accordance with the characteristics of the learners. Alias (2012) reveals that the technology-based learning modules and learning style of learners when using the ISMANmodel is very effective when used in the learning process, improving learning outcomes. Sudarwati (2013) in his research explains that the module is integrated very effectively to improve motivation in the learning process, so learners were able to build their knowledge. Thus, electronic modules need to be developed to overcome the problems in learning to improve learning outcomes.

Method Research

The development of this electronic module using the Elaboration model.

Figure 1. Elaboration Model



Product testing in research-development includes: 1) trial design; 2) test subjects; 3) data type; 4) data collection instruments; and 5) data analysis techniques. The trials were conducted in several stages namely: a) expert evaluation; b) one to one evaluation; c) small group evaluation; and d) a field trial. Product trials are reviewed by: 1) content experts, media experts, and design experts; 2) One on one evaluation that consists of three learners, consisting of one person who has a high learning achievement, one who has a moderate achievement, and one who has low achievement; 3) Small group evaluations consisting of nine learners, consisting of three people with high learning achievements, three moderate performers, and three low achievers; and 4) field trials that were sampled by one class of 30 learners.

The instruments used to collect data in this experiment are the use of research questionnaires and the results of the study. The questionnaire was used to collect the results of the review experts' evaluation, the one on one evaluation, the small groups' evaluation, and the field trial. The results of the test were used to collect the learners' learning outcomes both before and after the use of the electronic module on the field trial.

This research uses three methods of data analysis, namely: 1) qualitative descriptive analysis, 2) quantitative descriptive analysis, and 3) inferential statistical analysis. Qualitative descriptive analysis is used to process trial data from experts, one to one evaluation, small groups' evaluation and the field trial, while the quantitative descriptive analysis is used to process the data that was obtained from questionnaires in the form of descriptive percentages.

Inferential statistics of the t-test were used to analyse the differences in the pre-test and post-test scores that were obtained during field trials. Data that is processed in the field test is data of the pre-test and post-test results. The pre-test is given to the learners before using an electronic module and the post-test is given to the learners after the learners used the electronic module. The research hypothesis was tested by a t-test (paired samples t-test). The conditions are as follows: 1) if the probability is > 0.05 then H_0 is accepted, and 2) if the probability is < 0.05 then H_0 is rejected.

Finding and Discussion

The results of this research are in the form of electronic modules. The innovative aspect of the learning materials is an electronic module which can be read via smartphones, laptops, and computers. This electronic module can also be referred to as digital books. Expert review results state that the developed electronic module is appropriate. Expert test results responded well with a percentage of 81%. The one to one evaluation had a result of 89% and is located on good qualification.

Table 1: One to One Evaluation Data

Number	Respondents	Score	Score (%)	Qualification
1	R1	579	81,32	Good
2	R2	657	92,27	Very Good
3	R3	665	93,39	Very Good
	Average	1901	89	Good

A small group evaluation results of 91.92% lies in very good qualifications.

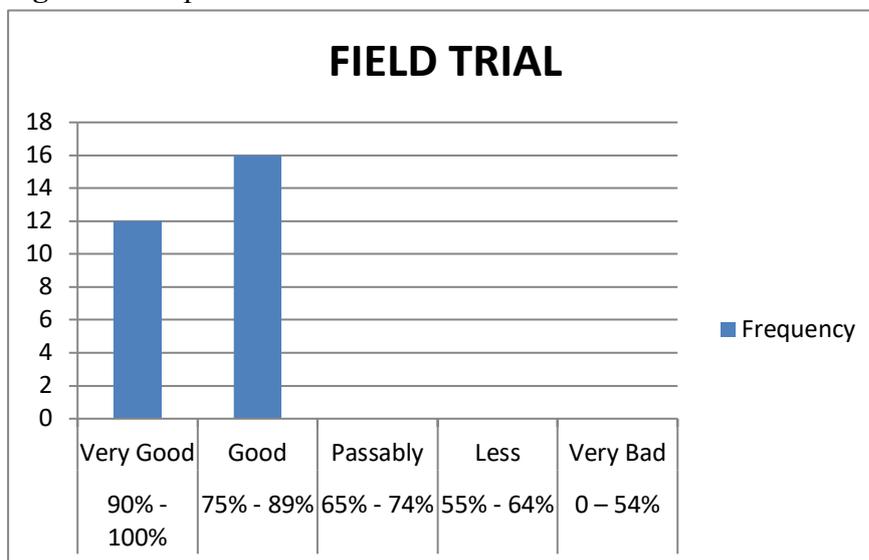
Table 2: Small Group Evaluation Data

Number	Respondents	Score	Score(%)	Qualification
1	R1	626	87,9	Good
2	R2	627	88.06	Good
3	R3	578	84	Good
4	R4	704	98.8	Very Good
5	R5	681	95,6	Very Good
6	R6	685	96,2	Very Good

Number	Respondents	Score	Score(%)	Qualification
7	R7	653	91,7	Very Good
8	R8	652	91,5	Very Good
9	R9	666	93,5	Very Good
	Average		91,92	Very Good

The result of the evaluation from the field trial showed that 42.85% of respondents (13 people) gave very good responses, 57.15% of respondents (17 persons) gave good responses, and 0% of respondents gave passable, less and very bad responses.

Figure 2. Graph of Field Test Results



Field trial results of 87.41% are in the good qualification range. Tests on requirements data distribution of research results in the form of pre-test and post-test scores should be done first before testing the hypothesis using the t-test. The prerequisite analysis test includes the data normality test and the homogeneity test. It is known that the normality of the data tested using Kolmogorov-Smirnov has a significance level of 0.200 for the pre-test and 0.07 for the post-test values. Both pre-test and post-test values are greater than $\alpha = 0.05$, so H_0 is accepted and has a mean value of pre-test and post-test is normally distributed. Based on the homogeneity the test results had a significance level of $0.208 > 0.05$, so H_0 accepted and it means the variation of each sample is the same (homogeneous). Both the pre-test and post-test value data is normal and homogeneously distributed, so the next analysis will be done using a t-test.

Table 3: Paired Samples T-Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test – Post-test	-4,657141	6,96780	1,31679	-49,27326	-43,86960	-35,367	27	0,001

Based on the results of the paired samples t-test, indicating that the significance value obtained is $0.001 < 0.05$ so that H_0 is rejected and H_1 is accepted. This means there are significant differences in the learning outcomes between learners before learning with electronic modules and after learning with electronic modules. Thus the electronic module is very effective to improve learning outcomes.

Discussion

Product development is the electronic module by using the development elaboration model: 1) the analysis of the objectives and characteristics of the area of study; 2) the analysis of learning resources; 3) the analysis of the characteristics of learners; 4) setting the learning objectives and the content that is learnt; 5) setting out a strategy of organizing the learning content; 6) set the contents of the delivery of learning strategies; 7) sets out the learning management strategies; and 8) the measurement procedure in the development of learning outcomes. The electronic module is very effective when used as the learning materials in blended learning. According to the research results by Juuti, et al (2002), science-based online learning resources still must be followed by a communication model of face-to-face learning with the learners informally to obtain optimal results.

The advantages of this electronic module are: 1) an increase in the motivation of the learners, because every time they do the lesson the tasks are clearly defined and in accordance with the students abilities; 2) after the evaluation, the teachers and learners can identify which module the learners have succeeded in and the module sections where they have not been successful; 3) the learners achieve results according to their ability; 4) the lesson material is more evenly distributed in one semester; and 5) the level of education is more efficient because the subject matter is arranged according to the academic level, and 6) it is practically accessible through the electronic media of computers, tablets and etc., such as a job sheet, video audio tutorial, and an evaluation. Simple use one of which can be directly opened via swf and if you want to go to the destination page, the page can be directly clicked. If the learners are connected to the internet network then direct reference source addresses can be accessed. Electronic modules

are equipped with various buttons, e.g. functions to turn on the music that is already in the electronic module or to open to the next page.

The development of this product takes time and processes that are long enough to allow for errors and deficiencies in some parts. To optimize the product that is developed, it needs to be improved through expert review and product testing, consisting of a one to one evaluation, small group evaluations, and a field trial. From the experts there are several suggestions on the developed product, namely: (1) Expert evaluation results of things that need to be improved including: (a) Case (physical design), and (b) Back cover CD case (typography) adjusted to the theme (title). (2) The results of the one to one evaluation, small group evaluation and field trials of things need to be improved, among others: (a) If possible the narrative can be made to be more interesting, (b) Cover the effort according to the subject, and (c) sample in the form of a video added in each material. Research conducted by Alias (2012) found that electronic modules facilitate understanding the concepts of learners because it is arranged systematically and developed according to the characteristics of learners to improve motivation and learning outcomes.

There are four factors that lead to an excellent qualification in the one to one evaluation, small group evaluation, and the field trial. First, the exposure of the module contents is clear. This clarity indication appears at the exposure of materials using the simple language according to the level of development of learners. Secondly, the technical quality, especially the aspect of the display is considered attractive. Third, a clear presentation of material can make learners interested to learn the electronic module. Fourth, the content of the learning content is studied systematically and easily understood, this can make students interested to learn. Based on these factors, electronic modules are effectively used and can significantly improve learning outcomes. Daniel, et. al (2015) in their research suggests that the module is very effectively used in E-learning. The use of modules is very interesting learners in the learning process.

The weakness of this product is a product of the resolution that cannot be changed according to the screen of the computer used by the users. The solution is used by investigators is the grant of a black background which covers the entire screen with all kinds of computers and the user needs to have the recommended software, adobe flash player or if the person already has this program they need to keep updating the latest adobe flash player. The common people are expected to have other users who will understand the electronic module, so that the layman can have a better understanding about the existing material in products that have been developed.

Researchers realized that a quality product requires many supporting factors to be more optimal. Many things appear in field research was carried out at the moment, it is increasingly optimizing the product developed. From various things, the researchers hope this development can be useful and can be developed further.



Conclusion

The research design used is the Degeng model development. This steps of Development is: 1) an objective analysis and study field characteristics, 2) the analysis of learning resources, 3) analysing the characteristics of learners; 4) establishing learning objectives and the content of learning; 5) establishing a strategy for organizing learning content; 6) establishing the delivery strategy of learning content; 7) establishing a learning management strategy, and 8) development of learning outcome measurement procedure. This electronic module is categorised as it has been through several test eligibility. The results of the research and development of electronic modules are very effectively used to improve learning results. This is apparent from the presence of the difference in the scores of the pre-test and post-test's prior to and after using this electronic module in the learning process. The results of this study, a teacher motivation to practice the presentation of messages with various modalities of learning so as to improve retention and knowledge transfer by learners.

Acknowledgments

Acknowledgments are directed to LPDP, Kemenristekdikti, BUDI DN, State University of Malang.



REFERENCE

- Alias, N. & Siraj, S. 2012. Design and development of physics module based on learning style and appropriate technology by employing isman instructional design model. The Turkish Online Journal of Educational Technology. 11(4).84-93. Dari www.tojet.net.
- Arsyad, A. 2013. Instructional Media. Jakarta: Rajawali Grafindo Persada.
- Budi, Andnya, I.P., & Citrawati, D.M. 2017. The Effectiveness of Question-Based Inquiry Module in Learning Biological Knowledge and Science Process Skills. International Journal Of Environmental & Science Education. 12(8).1871-1878 Dari http://www.ijese.net/makale_indir/1947.
- Chong, Soon, Lim. Jhonson., Yunos. Jailani., & Spahat., Ghazally. 2005. The Development and Evaluation of an E-Module for Pneumatics Technology. Malaysian Online Journal of Instructional Technology (MOJIT). 2 (3) 25-33. Dari <https://pdfs.semanticscholar.org/7897/58de111047f7d480595a06ee7f803637bd3e.pdf>.
- Daniel M. Getuno¹, Joel K. Kiboss², Johnson M. Changeiywo³, & Leo B. Ogola. 2015. Effects of an E-Learning Module on Students' Attitudes in an Electronics Class. Journal of Education and Practice. 6(36).80-86. Dari <https://files.eric.ed.gov/fulltext/EJ1086475.pdf>.
- Degeng, INS. 2013. Learning Sciences: Classification of Variables for the Development of Theory and Research. Bandung: KalamHidup.
- Elok N. K, Mohammad., M. M. 2017. The Effectiveness of Module Based on Discovery Learning to Increase Generic Science Skills. Journal of Education and Learning, 11 (2), 146-153. Dari <https://media.neliti.com/media/publications/74522-EN-theeffectiveness-of-module-based-on-dis.pdf>.
- Juuti, K., Lavonen J., Aksela, M. & Meisalo, V. 2009. "Adoption of ICT in Science Education: A Case Study of Communication Channels in A Teachers' Professional Development Projects". Eurasia Journal of Mathematics, Science & Technology Education, 5(2), 103-118.
- Mberia, H.K. 2011. Communication training module. International Journal of Humanities and Social Science, 1(20), 231-255. Dari http://www.ijhssnet.com/journals/Vol_1_No_20_December_2011/23.pdf
- Mills, C.S. 2006. Using the Internet for Active Teaching and Learning. Ohio: Pearson Merrill Prentice Hall.



- Nasir, J. M. I., Rizvi, A. H., & Pujeri, R.V. 2012. Skill development in multimedia based learning environment in higher education: An operational model. *International Journal of Information and Communication Technology Research*, 2(11), 820-828. Dari <https://pdfs.semanticscholar.org/0860/f2e8ebe02ad1d8732a468af699aa73a9aa88.pdf>.
- Naval, D., J. 2014. Development and Validation of Tenth Grade Physics Modules Based on Selected Least Mastered Competencies. *International Journal of Education and Research*, 2(12), 145-152. Dari <http://www.ijern.com/journal/2014/December-2014/14.pdf>
- Perinpasingam., S. T., Arumugam, Nalini., Subramaniam, S. & Mylvaganam, G. 2014. Development of a Science Module through Interactive Whiteboard. *Canadian Center of Science and Education*, 6(3), 31-38. Dari <http://dx.doi.org/10.5539/res.v6n3p31>.
- Riana T. Mangesa & Gufran, D. D. 2016. Development of Learning Module Work Competence Integrated Character Value of Electricity in Vocational High School. *International Journal of Applied Engineering Research*, 11(10) 6943-6948.
- Ramkumar, A. and G. Rajini, 2018. Personality and success level prediction of individuals using soft skills measures and its performance evaluation. *International Journal of Innovation, Creativity and Change*, 4(1): 112-131.
- Rufii. 2015. Developing Module on Constructivist Learning Strategies to Promote Students' Independence and Performance. *International Journal of Education*, 4(1), 18-28. Dari <http://www.macrothink.org/journal/index.php/ije/article/download/6675/5745/>.
- Salve, Arlene & Opina. 2014. The Development and Validation of Online Learning Modules for College English. *American International Journal of Contemporary Research*, 4(2), 89-97. Dari http://www.ajcernet.com/journals/Vol_4_No_2_February_2014/12.pdf.
- Santayasa, I W. 2012. *Innovative Learning*. Singaraja: Universitas Pendidikan Ganesha.
- Sri, Susilogati. Sumarti., Supartono, & Hidayah, Hidzyam. Diniy. 2014. Material Module Development of Colloid Orienting on Local-Advantage-Based Chemo Entrepreneurship to Improve Students' Soft Skill. *International Journal of Humanities and Management Sciences (IJHMS)*, 2(1), 42-46. Dari <http://www.isaet.org/images/extraimages/K314028.pdf>.
- Sudarwati, N. 2013. Developing an Integrated Module on Entrepreneurship to Improve Ability in Making Business Plans. *International Journal of Business, Humanities and Technology*, 3 (5), 109-135. Dari http://www.ijbhtnet.com/journals/Vol_3_No_5_May_2013/12.pdf.