American Journal of Engineering Research (AJER)
e-ISSN: 2320-0847 p-ISSN : 2320-0936
Volume-5, Issue-10, pp-223-229
www.ajer.org
Research Paper Open Access

Development of an android-based physics e-book to ease students' physics learning And its influence on their learning achievement

Tamman Firdaus Muqarrobin, Heru Kuswanto
Physics Education, Postgraduates Program, Universitas Negeri Yogyakarta, Indonesia

ABSTRACT: *The objective of the research concerned here was to determine (1) the fitness of an Android-based physics e-book learning media as product of research and development, (2) the difference in learning achievement between learners using the Android-based physics e-book learning media and those using the learning media frequently used at school, (3) the difference in obtained learning ease between learners using the Android-based physics e-book learning media and those using the learning media from their school, and (4) the influence of learning ease on learning achievement. The Android-based learning media was developed by using the software Adobe Flash Professional CS 6 with Action Script 3. The media produced was tested at a state senior high school, SMA Negeri 1, Ngrambe, Ngawi, Indonesia, with the involvement of forty-eight of the students there as research subjects. The research data were collected by means of questionnaires and written tests. The data were analyzed by using Levene's homogeneity test, Kolmogorov-Smirnov normality test, and a comparison test in the form of an independent samples t-test with a level of significance of 0.95. The research results indicate that (1) the Android-based physics e-book learning media is declared fit for use, (2) there is significant difference in learning achievement between a class using the said learning media and a class using the learning media usually used at school, (3) there is no significant difference in learners' response to the learning ease that they get when using the Android-based physics e-book learning media compared to that when using the learning media from the school, and (4) learning ease does not fully influence learners' learning achievement.*

Keywords: *learning media, Android-based physics e-book, learning ease, learning achievement*

I. INTRODUCTION

A teaching-learning activity is an activity that demands the occurrence of a change in the person of the learner concerned. In essence, learning implies the presence of a change occurring within one's self after one does a certain activity (Faturrohman & Sutikno, 2007: 6; Hergenhahn & Olson, 2012: 8; Schunk, 2012: 5). With learning so defined, a learning activity always emphasizes the occurrence of a behavioral change as the result of the learning process conducted.

A learning activity is said to be successfully conducted when it could improve the ability of the learner intended after participating in the said learning activity. Sudjana (2009: 3) opines that the result of students' learning is essentially a change in behavior as the learning outcome in a broader sense covering the cognitive, affective, and psychomotor domains. Though the change differs in scale from individual to individual but in a teaching-learning activity, the change should occur within the learner's person. According to Mulyasa (2008: 100), many factors could exert influence in a learning interaction and they consist of both internal factors coming from within individuals and external factors coming from the environment. The factors influence each other and make one unit becoming the basis of the learner's learning result.

1.1 Research Problem

According to Slavin (1991) and Usman (2003), the forces appearing from within the learner's self and urging him or her to do something in line with a wish of his or hers are interest and motivation. The internal factors related to learner interest and motivation in attending a learning activity are natural driving forces for learners. It is here that the teacher role is hoped to be able to encourage and arouse the interest and motivation of the learner in attending the learning activity so that the learner is able to attain maximum learning achievement.

One of the most accepted ways to do that is optimizing external factors to make them become stimuli in order that the learner's internal factors could come out. A variety of methods could be applied by a teacher

to arouse the learner's learning interest and motivation. Frases, Malone, and Neale (1989) opine that, in the learning atmosphere, a change fulfilling students' hopes could influence their learning achievement. Therefore, the teacher's role here requires him or her to be always active in making efforts to bring about a new atmosphere in the classroom in order that learner interest and motivation remain maintained.

It would be very good to apply the use of various media in the classroom, in view of the consideration that different learners have their own respective learning styles. Duckett and Marilyn (2005: 11) opine that learning style is related to the learner's way and approach in conducting a learning activity. Whether the learner does it by reading, by viewing a video, or by simultaneously reading a book and listening to music, it is all done by the learner in accordance with the interest that he or she has. The teacher could not force the learner to change the learning style that he or she possesses. The teacher's role in the learning activity conducted is merely to present and provide the learner with what the learner needs in learning.

In relation with learning style, Duckett and Marilyn (2005: 11) classify learning styles into three types, namely, visual, auditory, and kinesthetic. To meet the needs of these learning styles, media that could simultaneously accommodate the three learning styles had better be developed. In practice, however, different media have their own respective strengths and weaknesses. Very rarely is there any occasion in which the needs of all the three learning styles could simultaneously be perfectly accommodated by one single media during a learning activity.

1.2 Learning Media

Learning media, as means of transferring a message to learners, employ, among others, animation. Animation is beneficial in learning media for indicating objects related to ideas, explaining concepts that are difficult to understand, explaining abstract concepts by making them concrete with animation, and showing procedural steps clearly (Munir, 2012: 318; Abdullah, Zakaria, & Halim, 2012; Surjono, 2015; Dalal, 2014). That claim is strengthened by several research results indicating the occurrence of improvement in learners' cognitive ability when learning, by means of several animations, conceptual understanding requiring visual presentation or appearance. Research by Dalacosta, Paparrigopulou, Palyvos, & Spyrellis (2009) report findings that "… use of animated cartoons significantly increases the young students' knowledge and understanding of specific science concepts, which are normally difficult to comprehend and often cause misconceptions to them". According to Arsyad & Sujaini (2004), the grades obtained by learners using instructional programs with animation addition undergo a significant improvement compared to the grades obtained by them before using the programs. From results of research by Setiawan, Isnaeni, Budijantoro, & Marianti (2015), it is concluded that interactive digital multimedia effectively improve students' activities and achievement in learning the excretion system. It has become the basis for the need to develop an electronically-based media with content combining text and animation or simulation.

One of the electronic gadgets that could be turned into a learning media is the smartphone. In Indonesia, according to data presented by the site identified as http://statcounter.com from July 2014 to August 2015, people's use of the Android-based smartphone has reached the figure of 67.77%. There has now been an increasing functional shift in the use of the smartphone, which has changed from being initially a sophisticated communication instrument into being a game-playing instrument that highly attracts the interest of school-age children. There is still minimum smartphone use in the learning process because of teachers' lack of understanding concerning how to develop their use of the various features that could be utilized in the smartphone.

The use of the smartphone as learning media during the teaching-learning activity could be classified as mobile-based learning. Mobile-based learning *(*or just mobile learning*)* is the learning activity using a smartphone, personal digital assistant (PDAs), laptop, or any other device which has the nature of being mobile in conducting the transfer of science and knowledge (Traxler, 2007; Sampson & Zervas, 2012: 166; Pachler, Bachmair, & Cook, 2010: 7). Mobile learning as an educational activity makes sense only when the technology in use is fully mobile and when the users of the technology are also mobile while they learn (El-Hussein, & Cronje, 2010).

The utilization of the smartphone as learning media has the purpose of helping learners by making it easier for them to learn. Pritchard (2009: 42) opines that each individual will adopt an approach to learning with which they are most comfortable and in doing so leave behind the approaches with which they are less comfortable. Therefore, it is not impossible that when learners feel uncomfortable in learning in the classroom, they could then decide to do the learning activity outside the classroom in an atmosphere that makes themselves comfortable.

II. LEARNING ACTIVITY ANYTIME AND ANYWHERE

Eckhardt, Urhahne, Conrad, & Harms (2013) opine that in order that doing learning activity anytime and anywhere could take place, rightness and suitability of choice are required in developing the learning

media that would be used. Therefore, Fahad (2009) opines that the media that would be used as the learner's companion in the learning activity to be conducted anytime and anywhere should be able to have the nature of improving communication and enriching students' learning experiences in their open and distance learning.

The utilization of the learning media used to give learners ease in learning anytime and anywhere should be right on target. Therefore, what is the most important in developing media is that the media could help learners understand concepts and obtain information at the time they learn by using only the media resulting from the effort of development (Yahya, Ahmad, & Jalil, 2010). As media used to ease learners learn anytime and anywhere, its learning material needs to be complete and able to help learners understand the material content easily. It is in line with an opinion expressed by Smaldino, Lowther, & Russel (2011: 72), namely, that the media should (1) provide concrete reference for ideas, (2) make abstract ideas concrete, (3) motivate learners, (4) direct attention, (5) repeat information in a different format, (6) recall previous learning, and (7) lessen learning effort. Therefore, the development of a learning media as means of making it easier for learners to learn should not only focus on ease in operation but also consider the point of material completeness in order that learners could attain maximum learning achievement.

III. METHODOLOGY

3.1 Method

The development of a physics e-book learning media discussed here used the research and development (R&D) method developed by Borg & Gall (1989: 783-795) with ten stages of development. The developmental research concerned here referred to the ten developmental stages but its execution went as far as only the eighth stage, namely, that of conducting a test of goodness of fit with a broader reach of subjects. The eight stages in the research were those of (1) gathering information, (2) constructing the initial design, (3) developing the initial product, (4) getting experts' validation, (5) conducting product revision based on experts' suggestions and comments concerning both the material and the media, (6) conducting initial product testing, (7) conducting product revision based on comments and suggestions from users as end user, and (8) conducting final product testing.

3.2 Design of Product Testing

The product testing was conducted at SMAN (*Sekolah Menengah Atas Negeri* 'State Senior High School') 1, Ngrambe, Ngawi, Indonesia, with the involvement of forty-eight learners divided into two groups, namely, the class using the Android-based e-book as the experimental group and the class using the teaching media available at school as the control group. The research design was the posttest only control group design as presented in Table 1.

Table 1. Posttest Only Control Group Design

Group	Treatment	Posttest
Experimental	X_1	T_2
Control	X_2	T_2

3.3 Population

The research subjects for the product testing were divided into two groups, namely, those for, respectively, (1) the empirical validation testing to learn the goodness of fit of the initial e-book product and (2) the final product testing. The product testing for the empirical validation of the goodness of fit of the initial e-book product was conducted at SMA Negeri 7, Yogyakarta, with the involvement of thirty students of the school. The final e-book product testing was conducted, as previously mentioned, at SMA Negeri 1, Ngrambe, Ngawi, with the involvement of forty-eight students of the school divided into two classes to be, respectively, the experimental and control groups (also known as the experimental and control classes here).

3.4 Data Collecting Technique and Instruments

The research data were collected by means of instruments that had been developed for that purpose. The instruments used were a questionnaire and a cognitive test.

3.4.1 Questionnaire: The questionnaire was used to evaluate the physics e-book learning media. The number of the questionnaire items was not the same for different aspects evaluated. The items for the evaluation of the goodness of fit of media appearance and software technology were thirty-five in number and those for the evaluation of the goodness of fit of media material were fifteen in number. Meanwhile, the items for the evaluation of learning ease were thirteen in number. The scoring scale used for each item had a score range from 1 to 4. Because the number of items for the different evaluated aspects was not the same, the ideal score criteria for each aspect would also differ.

3.4. 2 Cognitive Test Instrument: The items of the cognitive test instrument used were multiple-choice items with reasons. In the test instrument, there were twenty-three items that had been developed in accordance with the grid for the subject matter of geometric optics. The test instrument was used at learning session end as

means of posttest. The item criteria used to evaluate students' cognitive domain began at Level C1 and ended at Level C5.

IV. TESTS ANd RESULTS

4.1 Tests

The data analysis technique used in developing the Android-based e-book conformed to analysis needs and used as basis the form of the data obtained by using the instrument at hand.

Table 2. Ideal Score Criteria

No.	Score Criteria	Category
1	$\overline{X} > \overline{X}i+1{,}5\ SB_i$	Very Good
2	$\overline{X}i+0{,}5\ SB_i < \overline{X} \leq \overline{X}i+1{,}5\ SB_i$	Good
3	$\overline{X}i - 0{,}5\ SB_i < \overline{X} \leq \overline{X}i+0{,}5\ SB_i$	Fair
4	$\overline{X}i - 1{,}5\ SB_i < \overline{X} \leq \overline{X}i - 0{,}5\ SB_i$	Poor
5	$\overline{X}i \leq \overline{X}i - 1{,}5\ SB_i$	Very Poor

Legend: $\overline{X}$ = score from validator

4.1.1 Validity: Validation was done by means of a non-test instrument requesting judgments from two experts, five practitioners, two teachers, the thirty learners involved in the initial product testing, and the forty-eight learners involved in the final product testing. To determine the goodness of fit of the product being developed in the research, five categories for comparison developed by Azwar (2014) as presented in Table 2 were used. The determination of the goodness of fit referred to the highest ideal score, the lowest ideal score, the ideal mean, and the ideal standard deviation.

4.1.2 Inferential Statistics Test: This test was used to measure any normality, homogeneity, and significant difference between the experimental and control classes. The inferential statistics test wholly made use of the aid of the IBM program of SPSS 20. The criteria for areas of acceptance were as shown in Table 3.

Table 3. Criteria for Acceptance of Decisions by Inferential Statistics Test

No	Type of Statistics Test	Decision
1	Kolmogorov–Smirnov Normality Test	H_0 is accepted if the value of .sig SPSS > 0.05 H_a is accepted if the value of .sig SPSS < 0,05
2	Levene's Homogeneity Test	H_0 is accepted if the value of .sig SPSS > 0.05 H_a is accepted if the value of .sig SPSS < 0.05
3	Independent Samples T-Test	H_0 is accepted if the value of .sig SPSS > 0.05 H_a is accepted if the value of .sig SPSS < 0.05
4	Simple Linear Regression Test	H_0 is accepted if the value of .sig SPSS > 0.05 H_a is accepted if the value of .sig SPSS < 0.05

4.2 Results

The evaluation results given are presented from the database representing the evaluation related to the product development conducted from beginning to end. The exposition concerning the results of the testing of the goodness of fit and the functionality testing is elaborated as follows.

4.2.1 Evaluation of the Material Aspect of the Media: The evaluation concerning the aspect of material of the media was of the goodness of fit of the material found in the physics e-book application. The overall result of the evaluation done by a material expert and two physics teachers was in the form of the overall score of 159. By referring to the highest ideal score, the lowest ideal score, the ideal mean, and the ideal standard deviation related to the three scorers of fifteen items, the evaluation obtained fell into the category of being very good.

4.2.2 Evaluation of the Appearance and Software Technology Aspect of the Media: The evaluation concerning the aspect of appearance and software technology of the media was done by a media expert and five media practitioners. The overall score obtained in the evaluation was 587. With reference to the highest ideal score, the lowest ideal score, the ideal mean, and the ideal standard deviation related to thirty-five items, the physics *e-book* media belonged to the category of being good.

4.2.3 Learners' Response to the Product of Media Development: Data of learners' response were obtained from the filling in of the questionnaire distributed after the learning activity using the physics e-book and the posttest held afterward were finished. The data were compared with those obtained from the class not using the physics e-book media. The response from the learners in the experimental class indicated their attraction to or interest in the physics e-book media as product of the development. It was reinforced by the score of 2910 obtained for the aspect of appearance from learners as respondents numbering thirty and items numbering thirty-five. Those results indicated that the media was good in category.

***4.2.4 Independent Samples Test for Learning Ease*:** This test was used to find out which media could help learners learn anytime and anywhere. Table 4 contains the results of a comparative test in which scores obtained from questionnaires given to learners and taken back after being filled in were compared. The test decisions referred to the value of Sig. (2-tailed).

Table 4. Independent Samples Test for Learning Ease

		T-Test for Equality of Means	
		T	Sig. (2-tailed)
Learning Ease	Equal Variances Assumed	0.953	0.346
	Equal Variances Not Assumed	0.953	0.346

The decision-making was done with the following criteria as basis:

H_0 : There is no significant difference in learning ease.

H_a : There is significant difference in learning ease

H_0 would be accepted if the value of Sig. (2-tailed) > 0.05. From the data resulting from the analysis it was known that the value of Sig. (2-tailed) > 0.05. It indicated that H_0 was accepted and H_a was rejected, which meant that there was no significant difference in learning ease between the experimental class using the Android-based e-book learning media and the control class using the learning media usually used by the school.

However, in view of the mean scores of the two data batches as in Table 5, the mean score of the experimental class was higher. So, though the two media were considered able to ease learners' learning, there were more learners in the experimental class who agreed that the physics e-book learning media eased learners' learning.

Table 5. Mean Scores Compared

	Group Category	Mean Score
Learning Ease	Experimental Class	38.17
	Control Class	36.88

4.2.5 Independent Samples T-Test Posttest: This test was used to know the functionality of the learning media in optimizing learners' learning achievement. The test results could be seen in Table 5.

Table 5. Independent Samples T-Test Posttest

		Levene's Test for Equality of Variances		T-Test for Equality of Means	
		F	Sig.	T	Sig. (2-tailed)
Score	Equal variances assumed	1.149	0.289	5.180	0.00
	Equal variances not assumed			5.180	0.00

From the analysis results, it was known that the significance value of the Levene test conducted > 0.05, which indicated that the data were homogenous so that the decision to conduct a two-tailed test of significance could be carried out with the following basis:

H_0 : There is no significant difference in learning achievement between the experimental class and the control class

H_a : There is significant difference in learning achievement between the experimental class and the control class

H_0 would be accepted when the value of Sig. (2-tailed) > 0.05. From the results of analysis it was known that the value of Sig. (2-tailed) was smaller than 0.05 ($p < 0.05$), indicating that H_0 was rejected and H_a was accepted. It in turn meant that there was difference in learning achievement between the experimental class using the Android-based physics e-book learning media and the control class using the learning media commonly used at the school, as expressed by the learners' posttest scores.

How far the difference in learning achievement was between the experimental class and the control class could be seen in Table 6. As seen in the table, the mean score of the experimental class was greater in comparison with the mean score of the control class. It indicated that the class using the physics e-book learning media had better learning achievement.

Table 6. Posttest Mean Score

	Group Category	Mean Score
Score	Experimental Class	37.71
	Control Class	28.29

***4.2.6 Simple Linear Regression Test*:** This test was used to know whether learning ease was a factor influencing learning achievement or not. The regression testing was based on the data showing learners' response to their use of the Android-based physics e-book learning media and the data resulting from their posttest. The initial assumption was that when learners obtained more ease in learning, their learning achievement would also be increasingly better. More clearly, the initial hypothesis could be understood as follows:

H_o = There is no influence from the learning ease obtained by learners on their learning achievement after using the Android-based physics e-book learning media.

H_a = There is influence from the learning ease obtained by learners on their learning achievement after using the Android-based physics e-book learning media.

The statement of H_o would be accepted when the value of Sig. > 0.05. Table 7 is the result of the simple linear regression test with the aid of the SPSS program.

Table 7. Simple Linear Regression Test

Model	F	T	Sig.
Learning Ease	0.137	0.369	0.713

From Table 7 it is known that $F_{obtained}$ is smaller in value than F_{table}, whose value is 4.06 at the degree of freedom (*df*) of 1 and 3.20 at the degree of freedom (*df*) of 2. Calculation results also indicate that $t_{obtained}$ is smaller in value than t_{table}, whose value range is 2.937 – 2.971 at the significance level of 0.05. From the column of Sig. it is known that the value of significance > 0.05, which indicates that H_o is accepted so that it is concluded that there is no influence from the learning ease obtained by learners on their learning achievement after using the Android-based physics e-book learning media. Results of the simple linear regression test indicate that learning ease does not become the main factor aiding learners in attaining good learning achievement.

4.2.7 Results of Final Product Development: The results of the final development of the physics e-book learning media product could be seen, among others, in the following figures, Figure 1, Figure 2, and Figure 3.

Figure 1. Appearance of Media Opening

Figure 2. Appearance of Main Menu

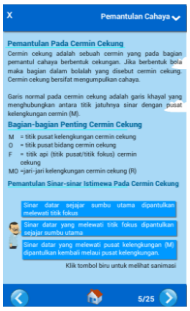

Figure 3. Appearance of Material

V. CONCLUSION

With the results of the Android-based physics learning media research and development as basis, it could be concluded that (1) the product of development in the form of the Android-based physics e-book

learning media about geometric optics is declared to be fit for use as learning media to help learners learn and attain good learning achievement in relation with the academic subject of Physics at the level of SMA, (2) the research results indicate that there is difference in learning achievement attained between learners using the Android-based e-book learning media and those using the learning media frequently used at school, (3) the research results indicate that there is no significant difference in learner response to the learning ease obtained by learners using the Android-based physics e-book learning media compared to the learners using the learning media from the school, meaning that the two learning media could equally help learners in learning, but the test results based on mean score comparison indicate that learners lean more to choosing the Android-based physics e-book learning media as learning media that could make it easier for them to learn, and (4) the research results indicate that the learning ease obtained by learners after using the Android-based physics e-book learning media does not fully influence their learning achievement.

ACKNOWLEDGEMENTS

This research is part of the Graduate Grant from the Ministry of Research, Technology and Higher Education of the Republic of Indonesia with the contract number: 15/H. Pascasarjana/UN.34.21/2016.

REFERENCES

[1] Abdullah, N., Zakaria, E., & Halim, L. (2012). The Effect of a Thinking Strategy Approach through Visual Representation on Achievement and Conceptual Understanding in Solving Mathematical Word Problems. *Asian Social Science*, Vol. 8, No. 16; 2012.
[2] Arsyad, M.I., & Sujaini, H. (2004). Pengaruh Animasi pada Program Instruksional Pendidikan. Yogyakarta: *Seminar Nasional Aplikasi Teknologi Informasi 2004*
[3] Azwar, S. (2014). *Penyusunan Skala Psikologi*, Edisi 2. Yogyakarta: Pustaka Pelajar
[4] Borg, W.R. & Gall, M.D. (1989). *Educational Research: An Introduction, Fifth Edition*. New York: Longman.
[5] Dalacosta, K., Paparrigopulou, M.K., Palyvos, J.A., & Spyrellis, N. (2009). Multimedia Application with Animated Cartoons for Teaching Science in Elementary Education. *Computers & Education*, v52 n4 p741-748, available online at http://dx.doi.org/10.1016/j.compedu.2008.11.018
[6] Dalal, M. (2014). Impact of Multi-Media Tutorials in a Computer Science Laboratory Course – An Empirical Study. *The Electronic Journal of e-Learning, Volume 12, Issue 4, 2014*, (pp. 366-375)
[7] Duckett, I., & Marilyn. (2005). *Practical Strategies for Learning and Teaching on Vocational Programmer*. United Kingdom. Blackmoe Ltd.
[8] Eckhardt, M., Urhahne, D., Conrad, O., & Harms, U. 2010. How effective is instructional support for learning with computer simulations? *Instructional Science: An International Journal of the Learning Sciences*, Volume 41, Issue 1, pp 105–124
[9] El-Hussein, O.M.M., & Cronje, J.C. (2010). Defining Mobile Learning in the Higher Education Landscape. *Educational Technology & Society*, 13 (3), 12–21,
[10] Fahad, (2009). Students' Attitudes and Perceptions Towards the Effectiveness of Mobile Learning in King Saud University, Saudi Arabia. *The Turkish Online Journal of Educational Technology – TOJET April 2009 ISSN: 1303-6521 volume 8 Issue 2 Article* 10
[11] Fathurrohman, P dan Sutikno, M.S. (2010). *Strategi Belajar Mengajar*. Bandung: Refika Aditama.
[12] Hergenhahn, B.R. & Olson, M. H. 2012. *Theories of Learning*. Jakarta: Kencana Prenada Media Group
[13] Frases, B.J., Malone, J.A., & Neale, J.M. (1989). Assesing and improving the psychological environment of mathematics classrooms. *Journal of Research in Mathematics Education*, 20, 191-201.
[14] Mulyasa, E. (2008). *Kurikulum Berbasis Kompetensi*. Bandung: PT Remaja Rosdakarya.
[15] Munir. (2012). *Multimedia: Konsep dan Aplikasi dalam Pendidikan*. Bandung: Alfabeta
[16] Pachler, N., Bachmair, B., & Cook, J. (2010). *Mobile Learning*. New York: Springer Science Business Media.
[17] Pritchard, A. (2009). *Ways of Learning: Learning Theories and Learning Styles in the Classroom*. New York: Routledge
[18] Sampson, D.G., & Zervas, P. (2012). *Mobile Learning Management Systems in Higher Education*. IGI Global
[19] Schunk, D.H. 2012. *Learning Theories: An Educational Perspective.* Yogyakarta: Pustaka Pelajar.
[20] Setiawan, H., Isnaeni, W., Budijantoro, F.P.M.H., & Marianti, A. (2015). Implementation of Digital Learning Using Interactive Multimedia in Excretory System With Virtual Laboratory. *Research and Evaluation in Education Journal. Volume 1, Number 2, December 2015 (pages 212-224) Available online at: http://journal.uny.ac.id/index.php/reid*
[21] Slavin, R.E. (1991). *Educational Psychology: Theory Into Practice (3rd ed.).* Needham Heights,M.A.: Allyn and Bacon.
[22] Smaldino, S.E., Lowther, D.L, & Russel, J.D. (2011). *Instructional Technology & Media For Learning*. Jakarta: Kencana Prenada Media Group.
[23] Sudjana, N. (2009). *Penilaian Hasil Proses Belajar Mengajar*. Bandung: Remaja Rosdakarya
[24] Surjono, H. D. (2015). The Effects of Multimedia and Learning Style on Student Achievement in Online Electronics Course. *The Turkish Online Journal of Educational Technology*, January 2015, volume 14, issue 1
[26] Traxler, J. (2007). Defining, Discussing, and Evaluating Mobile Learning: The Moving Finger Writes and Having Writ. *The International Review of Search in Open Distributed Learning*, Vol. 8, No. 2
[27] Usman, U. (2003). *Menjadi Guru Profesional*. Bandung:Penerbit PT Remaja Rosdakarya.
[28] Yahya, S., Ahmad, E.A., & Jalil, K.A. (2010). The Definition and Characteristics of Ubiquitous Learning: A Discussion. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, 2010, Vol. 6