Development of e-Handout materials physics based android for improvement learning outcomes senior high school student

I M Astra, D Susanti and A Novriansyah
Universitas Negeri Jakarta, Rawamangun Muka, Jakarta Timur 13220, Indonesia

*imadeastra@unj.ac.id

Abstract. This study aims to develop a product of teaching materials e-Handout based physics android equipped audio visual for improve learning outcomes high school students of class XI semester I. Research conducted in Media Development Laboratory Department of Physics State University of Jakarta. This research uses Research and Development (R & D) method with Dick & Carey model modified by Atwi Suparman into Instructional Development Model (MPI). Product feasibility test is done to material expert and media expert, obtained by percentage of material expert 81,67% with excellent interpretation and media expert 93,13% with very good interpretation. The product test was conducted to physics teacher and 32 students, got percentage by physics teacher 89,48% and by 87,37% for all components with 86,88% for content fulfilment component, 88,75% For component of presentation, 87,88% for easy to see component, 86,75% for interesting component, 87,19% for useful and useful component, 87,50% for well-structured component and 86,67% for effective and efficient component. The effectiveness test using the gain test obtained a result of 0.65, which indicates an increase in knowledge with moderate interpretation. Based on the results of validation and testing, the development of e-physics-based android-based e-physics teaching materials equipped with audio visual for high school students of class XI semester I can be categorized as appropriate for use as companion teaching materials and can improvement learning outcomes students.

1. Introduction
The development of information technology in the 20th century affects on improving the quality of learning. The use of technology and media in learning can form a learning atmosphere where students can actively participate. Learning media to be the liaison between teachers and students, thanks to the media students are no longer limited to the boundaries of the classroom. Students can learn in various places such as via internet or smartphone (smartphone) them. The operating system on the smartphone allows educational applications to make the students have self-supporting materials so that learners no longer rely on educators as the only source of learning. Learning that is combined with technology will create mobile learning that will give a lot of access for learners to study. M-learning has been begun an important role in education. The existence of m-learning and wireless devices is a reality. Freedom for students to learn and get information makes m-learning be a favorite [1].

Handouts are very concise learning materials. This teaching material comes from several literatures relevant to the basic competencies and subject matter taught to the learners. This instructional material is given to learners to facilitate them while following the learning process. Thus, this instructional material is certainly not an expensive resource, but economical and practical [2]. By using this, it is expected that learner can study well.
1.1. Development of physics e-Handout

1.1.1. Development of e-Handout teaching materials. The development of teaching materials is the process of selecting, adapting, and making instructional materials based on specific framework references. Self-study materials are developed when in the implementation of instructional activities learners learn independently without depending on the presence of educators [3,4]. Teaching materials are all materials (information, tools, and text) containing learning materials, methods, limitations, and how to evaluate the competencies that will be mastered learners are designed systematically and used in the learning process. e-Handouts are teaching materials provided by educators to students using electronic or computer systems containing resume material taken from the relevant literature and in accordance with the basic competencies that must be mastered by students in order to facilitate the learning process [5].

1.1.2. Android-based application development. With the operating system paired on a mobile phone, the use of mobile phones is no longer just for phones and short messages; however, mobile phones can be used to listen to music, watch videos, record images or videos, access the internet, edit photos, play games, and many more. All that can be done because the operating system installed third-party applications (third party application) [6]. Android is an operating system or a linux-based mobile device used for mobile phones, such as smartphones (Smartphones) and tablet computers and then acquired by Google. This operating system is open source so that programmers can create applications easily [7]. To develop android based e-Handout, the author uses android studio software. Android studio is a software used by application developers to create applications that can be incorporated into Google play store.

1.1.3. Learning outcomes. Learning outcomes are statements of what is expected that the student will be able to do as a result of learning activity [8], learning outcomes are an explicit description of what a learner should know understand and be able to do as a result of learning [9]. Learning outcomes and the experience that was gained, there are 3 domain of the ministry of PT. PGN promised to supply cognitive: mental skills the (knowledge), affective: growth intrust a servant with one feelings persons of very emotional areas (attitude persons of very self), psychomotor: manual persons of very physical skills the (skills the) krathwoh. Upon and above the gaff [10]. In this research of study result of the only focused on the sacred printing cognitive course covering remember, understanding, applying, analysing, evaluating and creating, remember with materials Elasticity, fluids, rotational kinematics, rotational dynamics, temperature and heat, the ideal gas law and kinetic theory, thermodynamics [11].

2. Method

The research method of this study is Research and Development, a method which develops a product then examines its effectiveness [12]. The development of this study uses an approach system model designed by Walter Dick and Lou Carey [13]. Afterwards, Atwi Suparman modifies Dick and Carey’s model to Model Pengembangan Instruksional (MPI) which is written in an instructional modern design book. The stages of MPI are: a. Identifying the Instructional Requirements and Writing the Purpose of General Instructional (TIU) b. Doing the Instructional Analysis. c. Identifying the Students’ Primary Behavior and Characteristics. d. Writing the Purpose of Specific Instructional. e. Arranging the Assessment of Learning Outcomes. f. Arranging the Instructional Strategy. g. Developing the Instructional Material. h. Arranging the Design and Conducting the Formative Evaluation. i. Instructional System. j. The Implementation, Summative Evaluation, and Diffusion Innovative.
3. Results

3.1. Test of material expert and media expert validation

Product validation test is done by giving assessment instrument in the form of questionnaire to the validator. In the questionnaire, there were 29 items for material experts and 54 point statements for media experts assessed using a Likert scale of 1-5. Components assessed by the material expert's validator include aspects of material content, presentation, language. The data of validation test of material experts and media experts are presented in table 1 and table 2.

| Component | Result suitable test Percentage (%) | Interpretation |
|-----------|-------------------------------------|----------------|
| Content   | 80,00                               | Good           |
| Presentation | 85,00                            | Very good      |
| Language  | 80,00                               | Good           |
| Average   | 81,67                               | Very good      |

Based on the Likert scale interpretation, the result of the percentage of the overall aspect achievement on the material validation test of 81.67% indicates that the developed e-Handout Physics XI is considered excellent to be used as a companion teaching material.

For criteria of component media that are considered among others are easy to see, interesting, simple, useful and useful, well structured, effective and efficient. According to table 2, it can be seen that most of component have very good interpretation and only one component get good interpretation.

| Component               | Feasibility suitable test Percentage (%) | Interpretation |
|-------------------------|------------------------------------------|----------------|
| Easy to see             | 88,57                                    | Very good      |
| Interesting             | 80,00                                    | Good           |
| Simple                  | 100,00                                   | Very good      |
| Useful and Helpful      | 100,00                                   | Very good      |
| Accurate                | 93,33                                    | Very good      |
| Well Arranged           | 90,00                                    | Very good      |

Figure 1. Experimental material validation test results.

Table 1. Experimental material validation test results.

Table 2. Expert media validation test results.
Figure 2. Expert media validation.

Based on Likert scale interpretation, the result of percentage of overall aspect achievement on material validation test of 93.13% shows that e-Handout of Physics XI developed is considered very good to be used as companion teaching material.

3.2. Trial products to teachers and learners

Based on the validation and validator suggestions, the product is revised before it is tested to the learner. The product test is done by giving the instrument of assessment in the form of questionnaires to high school physics teacher and 32 students of SMA XI class of MIPA program. In the questionnaire to the physics teacher there were 27 points of statement and 24 points of statement to learners who were assessed using a Likert scale 1-5 covering aspects of content feasibility, presentation, view ability, interest, useful and useful, useful and useful, well construct, effective and Efficient. Data product trial results are presented in tables 3 and 4.

| Component                  | Feasibility suitable test | Percentage (%) | Interpretation |
|----------------------------|---------------------------|----------------|----------------|
| Feasibility of Content     | Very good                 | 93,33          |                |
| Presentation               | Very good                 | 84,00          |                |
| Easy to see                | Very good                 | 96,00          |                |
| Interesting                | Very good                 | 88,00          |                |
| Useful and Helpful         | Very good                 | 80,00          |                |
| Well Arranged              | Very good                 | 85,00          |                |
| Effective and Efficient    | Very good                 | 100,00         |                |
| Average                    | Very good                 | 89,48          |                |
Figure 3. Trial results to physics teacher.

Table 4. Trial results to students.

| Component             | Feasibility Test Results | Interpretation |
|-----------------------|--------------------------|----------------|
| Feasibility of Content| 86.88%                   | Very good      |
| Presentation          | 88.75%                   | Very good      |
| Easy to see           | 87.88%                   | Very good      |
| Interesting           | 86.75%                   | Very good      |

Figure 4. Trial results to students.
Based on the Likert scale interpretation, the percentage achievement of the overall aspects of the experiment to the teacher is 89.48% and the test for the students is 87.37%. By using the gain test calculation, there is an increase of knowledge with the average value of pre-test 44.06 and the average value of heading 79.38. The value illustrates that there is an increase in students' knowledge with a gain score of 0.65. From the results of teacher and student test shows that e-Handout Physics XI developed is considered very good to be used as a companion teaching materials. It can be concluded that the students' knowledge improvement is in the high category.

3.3. e-Handout product
Products that have passed the test and validity testing stages are then uploaded into the Google Play Store under the name e-Handout Physics XI. Here's a look at the products that have been developed.
This product furnished by a map the concept of, the use of a map the concept of it will be useful for a student to lose their especially in an election and the core idea, publicly listed financial services company and the core idea and stated that the water channel and the core idea on i looked and received instruction. In the long term the a map the concept of express its strongest of learning which he means a sense of ownership, active, help students coming from poor that people may understand a, follow and figure out just what a lesson with the concept of the for the biofuel project, meanwhile according to the susan marie in the results back out of the research one of instructional national access to justice strategy paper work showing the use of a map a concept in learning activities forbid that it should have a student to lose their can explain the understanding of the related them upon an and the core idea and deal with the and the core idea the prices of other commodities [14]. This product also could be further explored with a computer, according to the back out of the research by the use of a map the concept of based computer as one of an instrument learning to promote disorder to national access to justice strategy cognitive, can make students, make of the conclusions and is the capacity to think in a critical condition [15].

4. Conclusion

Based on the results of validation by experts and the assessment of high school students to the product, it can be concluded that the teaching materials e-Handout physics-based android equipped audio visual for high school students class XI semester I can be classified in the category worthy of use as a companion teaching materials, and this product can be improve learning outcomes student high school.

References

[1] Mahizer 2009 Mobile Learning: New Era in Malaysia Jurnal Pendidikan Dasar
[2] Prastowo 2011 Panduan Kreatif membuat Bahan Ajar Inovatif (Yogyakarta: DIVA Press)
[3] Nunan D 1991 Language Teaching Methodology (New York: Prentice Hall)
[4] Suparman A 2004 Desain Instruksional (Jakarta: Pusat Penerbitan Universitas Terbuka)
[5] Depdiknas 2008 Pengembangan Bahan Ajar (Jakarta: Depdiknas)
[6] Juju 2009 Fun with Symbian (Jakarta: PT Elex Media Komputindo)
[7] Enterprise J 2010 Step by Step: Ponsel Android (Jakarta: PT Elex Media Komputindo)
[8] Jenkins A and Unwin D 2000 How to write learning outcomes [online] retrieved from www.ncgia.ucsb.edu/education/curricula/giscc/units/format/outcomes.html
[9] Bingham J 1999 Guide to Developing Learning Outcomes (Sheffield: Sheffield Hallam University)
[10] Anderson L W, Krathwohl D R, Airasian P W, Cruikshank K A, Mayer R E, Pintrich P R, Raths J, and Wittrock M C 2001 A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives (New York: Longman)
[11] Halliday D, Resnick R, and Krane K, 2002 Physics (New York: Jhon Willey &sons INC)
[12] Sugiyono 2013 Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D (Bandung: Alfabeta).
[13] Gall M D, Gall J P, and Borg W L 2003 Educational Research (USA: Pearson Education, Inc)
[14] Pia A B, Blasco-Tamarit E, and Munoz-Portero 2011 Different Applications of Concept maps in Higher Education Journal of Industrial Engineering and Management 4
[15] Dabbagh N 2014 Journal of computing in teacher Education