Karapan Sapi as Android-Based Learning Module Material of Physics

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Abstract. The research was aimed to produce an android-assisted module feasibly for physics learning in the Newton’s Laws. The developing model used was 4-D (define, design, develop, & disseminate). In this research, the subject was students in the X grade in one of Madrasah Aliyah Negeri in the District of Banyuwangi, Province of East Java. Hence, the implementation of android-based learning module material of physics was performed by installing aplication of modules into smartphone using android operating system. As the result, the result of this research was that the development of android-based learning module material of physics was feasible used in the physics learning in Senior High School. According to the assessment result conducted by materials expert, the mean of each aspect was 4.36 (four point thirty-six), including highly feasible category. Based on the assessment of media expert, thus, concerning on technologi-based learning, the mean of each aspect was 4.47 (four point fourty-seven), and it included into highly feasible category. While, according to the assessment of learning expert, the mean of each aspect was 4.39 (four point thirty-nine), including as highly feasible category. Further, limited trial test conducted to 10 students was chosen by sampling and the percentage result showed 4.55, including in highly feasible category.

Keyword: Karapan Sapi; Android; Material of physics.

1. Introduction
A demand of education concept in the 21st Century is a learning process using computer technology or internet, called open distance learning. Studying circumstance under open distance learning enables teachers and students away each other, in different time and location, and not having direct face-to-face learning process. The physics learning drafted in the 2013 curriculum framework is mastering concept and principle, having skills to develop knowledge and self-confidence as study preparation to continue in higher education, and developing science and technology [1]. Hence, after conducting physics learning, students hopefully can develop themselves in way of thinking.

The internet and technology advancement within smartphone have been acknowledged by public. Likewise, the development of smartphone’s technology also affects various innovations in education sphere. One of its influences in education is exploration of information and technology-based learning media. Implementation of such technology form, thus, as learning media is an innovation in learning process enabling more flexible and innovative learning process, instead of teacher-oriented learning, and it promotes student centered or autonomous learners [2]. Specifically, the utilization of information and technology has significant role in not only solving limitation of study’s hour in...
classroom, but also coping any issue of student’s absent in classroom because of certain reasons. By information and technology-assisted learning, it can commence undoubtedly wheresoever [3]. Students, then, having failure are those having lack active participation in information and technology [4].

One of the most common information and technology’s roles used by public is Android-based smartphone’s operating system. Android is one of the most frequently information and technology used by school aged teenager [5]. Further, android is an operating system for Linux-based mobile device covering operating system, middleware, and application [6]. Android is Linux-based operating system used in cellular phone [7]. For its utilization, android as learning media has a varied of advantages, such as 1) Efficient, which users can access from elsewhere on learning content including quiz, journal, games, and so forth; 2) Collaborative, meaning that learning process can be performed at once on real-time basis; 3) Book’s utilization can be replaced by RAM, where learning materials can be managed and synchronized; 4) It has practical design-based mobile; 5) Learning becomes more fun and entertaining. In addition, some benefits of using mobile device as learning media are as follows: 1) Comfort, which users can use easily and cheaply and it can establish autonomous learning, and 2) in accordance with learning demand, which is updating information from various forms of information and technology rapidly [8]. Mobile-based learning using interesting and creative application enables students using flexible learning process, no boundary of time and space [9].

In learning process, learning media has significant role in learning activity. The use of media in learning process comprises of text books, module, students’ work sheet, and other printed media. Learning using module in its activity would be effective compared with conventional teaching method [10]. Module is a set of independent learning activity and learning method based on skills and knowledge development in discreet unit [11]. Other advantage that can be obtained, on the other hand, contrastingly, the shortage of printed media, such as 1) difficulty in displaying any motion in media’s page; 2) time-consuming printing process; 3) bore some; 4) rarely improving affective skill; and 5) printed easily broken [12]. This shortage of module, postulated by Arsyad, can be recovered by modification, namely android. Learning system utilizing module has been well-implemented in either foreign or Indonesia. Overall, it has diverse characteristics, but the purpose is similar, which is growing independency of students in learning activity. Students’ independency in learning is minimally improved. Typically, most of learning process was dominated by teacher, so that students had limited access to gain information because of dependency on their teacher. However, it is not a huge mistake if applying this such traditional method, but good learning ideally is students centered learning [13]. Moreover, unavailable module in learning process results students only hears and note down. Indeed, it also engages students to be passive in learning process or teacher centered learning [14].

Karapan Sapi, or bull race, is one of Maduranese’ local wisdoms. It is annual competition to seize President’s cup. The final is commenced on August referring the statement of Laws No. 20 of 203 and the Government Regulation No. 19 of 2005 that physics learning can be integrated to local wisdom so that it creates brilliant and civilized people. Therefore, physics learning is necessarily integrated into local wisdom so that it can assist students to maintain local culture and aid in solving any physics issues. In the Karapan Sapi, the Newton’s Laws can be depicted as one of physics phenomena. While improving physics knowledge of students by studying through local wisdom, it also can hopefully feed students’ character values.

According to observation result to teacher s in the State Senior High School 1 (SMA N 1) Glagah and MAN Banyuwangi, they stated that for those students who could not be able to join any subject materials because of certain reason, they would miss such subject material. It shows that learning only can be done when students are presence in classroom. Further, the result of interview on 10 students in one class of sample depicts that the lack of smartphone utilization, particularly android-based operating system in learning process. According to interview result in the Madrasah Aliyah Negeri Banyuwangi, students were not allowed to use android-based smartphone during learning process. In same vein, students mostly did not use Android as learning media [15].
Most schools have provided facilities to students by printed module. Nevertheless, the result of interview derived from students in the State Senior High School 1 Glagah and MAN Banyuwangi showed that the availability of printed learning material does not help much assisting students to learn beyond classroom because it is considered impractical and non-portable learning materials. Then, the use of android-based module can support students’ independency in learning wherever and whenever they are.

Moreover, it found that physics learning had lack of relation with local wisdom, so that students had less consideration that there are many things surrounding that can be related to physics’ concept. In fact, students only know that Karapan Sapi is part of art and culture, and they do not know about science’s concept, mainly in physics. Hence, this issue becomes the basic for researcher to make research in developing android-based learning module of physics using the Karapan Sapi as its material to improve representation ability in physics learning. Through interview with physics teacher in the X grade, it was noticed that students had difficulty to represent any forces in the Newton’s Laws by diagram, whereas the Newton’s Laws are material mostly explaining on force. For developing android-based learning module material of physics, this can be drilled and conditioned or simulated by teacher in learning process. This material is chosen based on analytical task step in the 4D research procedure. Therefore, this work presents Karapan Sapi as Android-based learning module material of physics.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Research Method

In this research, method used was research and the 4D development. In detail, media that is going to be developed is android-based physics module. The research design was adopted from research and development method based on Thiagarajan.

This research was limited until feasibility test of learning media. Therefore, the research used steps simplification of the 4D, comprising of (1) Defining Step, (2) Planning Step, and (3) Developing Step. In the defining step, it included front-end analytical step, analysis of student, task analysis, and formulation of learning objective. Planning step comprised of three steps, which were setting up benchmarking test, media selection in accordance with the purpose, and format selection. Developing step was aimed to result revised physics module based on expert’s inputs. Lastly, the step of feasibility test consisted of two steps, which were (a) feasibility test of module by expert followed by revision edition and (b) trial test limited to actual students.

The research was conducted in the District of Banyuwangi, Province of East Java, Indonesia. Then, the subject was 90 students of the X grade in the Madrasah Aliyah Negeri Banyuwangi. The object of this research was feasibility of Android-based Physics Module from several aspects of physics, technology (information and technology-based media), learning, and test result of small group by 10 students. Target of this research development, then, was the main discussion of the Newton’s Laws.

Data collection technique used was questionnaire. Questionnaire used in the research was aimed to know feasibility of such product developed. Specifically, questionnaire for experts used Likert scale comprising of 5 alternative answers adjusted with rubric. The collection instrument of feasibility data by experts was assessment sheet for material expert covering following aspects of (1) learning and (2) material. While, the assessment sheet for media expert included (1) audio visual and (2) engineered software, and the assessment sheet for learning expert was (1) module format, (2) material, and (3) exercises and assessment. In addition, response questionnaire or opinion of students on android-based physics module comprised of (1) content, (2) language, and (3) format.

Feasibility measurement of android-based physics module obtained using assessment sheet by experts, further, was used as input for refinement and analysed using equation 1. Later, analysis result of questionnaire on students’ response as small group trial was analysed using equation 1.
\[
\bar{X} = \frac{X}{n}
\]  

Where, \( \bar{X} \) is total of rate score, \( \sum X \) is total of points score, and \( n \) is total of points.

Rate score gained from each aspect was calculated, hence it became total of rate score from each aspect. Next step was compared the value of rate score with quality category in line with normal curve by [16] explained in Table 1.

**Table 1. Category of feasibility score.**

| No | Interval                                      | Grade | Category  |
|----|-----------------------------------------------|-------|-----------|
| 1  | \( X > Y_i + 1.80 \ Sbi \)                   | A     | Very Good |
| 2  | \( Y_i + 0.6 \ Sbi \leq X < Y_i + 1.8 \ Sbi \) | B     | Good      |
| 3  | \( Y_i - 0.6 \ Sbi \leq X < Y_i + 0.6 \ Sbi \) | C     | Enough    |
| 4  | \( Y_i - 1.8 \ Sbi \leq X < Y_i - 0.6 \ Sbi \) | D     | Less      |
| 5  | \( X \leq Y_i - 1.8 \ Sbi \)                 | E     | Poor      |

Where:

- \( X \): Score obtained
- \( Y_i \) (mean of ideal score): \( \frac{1}{2} \) (ideally maximal score + ideally minimal score)
- Ideally standard deviation (Sbi): \( \frac{1}{6} \) (ideally minimal score – minimal score)
- Ideally maximal score: \( \sum \) point criteria x higher score
- Ideally lower score: \( \sum \) point criteria x lower score

### 3. Results and Discussion

One way to improve study motivation and learning outcome is directly engaging technology in learning media. Learning using information and technology-based media enables learning process done whatsoever and whenever [17]. In line with defining step, the development of android-based physics module is adjusted with the 2013 curriculum. Next process, it is planning step. In this step, the development of android-based physics module is by designing flowchart and story board. The display of visual component existing in the android-based physics module comprises of: (1) Front page, containing the logo of Yogyakarta State University, product’s name, start icon, module code, information button, and exit button. (2) Menu page covering introduction, competency, the Karapan Sapi, materials, evaluation, answer keys, and glossary. In detail, the front and menu page of android-based physics module can be seen in Figures 2 and 3.

**Figure 2.** The front page of Android-based Physics Module  
**Figure 3.** The menu page of android-based physics module
The Front Page contains learning guidelines using android-based physics modules, covering introduction, study’s time, and learning hints. The page of the *Karapan Sapi* includes history and outline of the *Karapan Sapi* as local wisdom. Further, it adds with video of the *Karapan Sapi*. Next, the introduction page includes competency expected from students after learning using android-based physics module. Accordingly, in the material page, it contains material going to be learnt through android-based physics module, which is the 1st Newton’s Laws, 2nd Newton’s Laws, 3rd Newton’s Laws, and Friction force. In each material, there is virtual lab enabling students understanding those material easily. This virtual lab is adjusted with the *Karapan Sapi* as local wisdom. Additionally, still in the material page, it is also completed with students’ discussion sheet. This sheet must be downloaded using internet connection. The material of the Newton’s Laws in the android-based physics module can be shown in Figures 4 and 5 as follows.

![Figure 4](https://drive.google.com/file/d/1wq8yQ89h2t07.png) **Figure 4.** The material page of the Newton’s Laws  

![Figure 5](https://drive.google.com/file/d/1wq8yQ89h2t07.png) **Figure 5.** Virtual lab on the Newton’s Laws on the *Karapan Sapi*

In the Evaluation Page, it contains exercises, related to the Newton’s Laws concept and equipped with its answer keys in following page. While in the reference and glossary page, there are several references used in designing the android-based learning module material of physics.

Subsequently, the following step in developing android-based physics module was feasibility test. This test was performed by three experts, comprising of media, learning, and teacher of physics. In addition, a small group trial was conducted based on analysis result of assessment on some students concerning on android-based physics module. This feasibility test comprises of several aspects, which are learning and material. It was done by material expert, three physics teacher, and five peers review. Below is the result of the test, as seen in Table 2.

| Feasibility | Aspect   | Value | Category  |
|-------------|----------|-------|-----------|
| Material    | Learning | 4.27  | Very Good |
| Material    | Material | 4.44  | Very Good |
From above table, the feasibility test from material aspect earns its mean of 4.36, which, according to Table 1, android-based physics module has fulfilled highly feasible category.

Then, the feasibility test from technology covers operating program, navigation, display and illustration quality, and engineered software. This test was performed by technology expert, three teachers, and five peers review. As result, it gained mean of 4.47 from all aspects, which according to Table 1 android-based physics module has satisfied highly feasible category from media aspect. Following, in the Table 3, is the result of feasibility test.

| Technology-based media | Value | Category |
|------------------------|-------|----------|
| Operating Program      | 4.52  | Highly feasible |
| Navigation             | 4.55  | Highly feasible |
| Display Quality        | 4.37  | Highly feasible |
| Illustration Quality   | 4.44  | Highly feasible |
| Engineered Software    | 4.48  | Highly feasible |
| Mean                   | 4.47  | Highly feasible |

After that, learning expert, three teachers, and five peers review assessed feasibility of android-based physics module as learning media. The result can be seen in following Table 4.

| Learning Media | Value | Category |
|----------------|-------|----------|
| Module Format  | 4.40  | Highly feasible |
| Material       | 4.40  | Highly feasible |
| Exercises and assessment | 4.37 | Highly feasible |
| Mean           | 4.39  | Highly feasible |

From above, Table 4 depicts that the mean of feasibility test in android-based physics module as learning media is 4.39, which according to score category in the Table 1, android-based physics module is categorized highly feasible. In following step, empirical test of android-based physics module was tested to 10 students in the Madrasah Aliyah Negeri Banyuwangi. The result can be seen from Table 5 as following.

| Aspects               | Value | Category |
|-----------------------|-------|----------|
| Module Format         | 4.40  | Highly feasible |
| Material              | 4.40  | Highly feasible |
| Exercises and assessment | 4.37 | Highly feasible |
| Mean                  | 4.39  | Highly feasible |

Table 5 depicts that the result of small group trial is obtained 4.39 of rate score. From this rate score, it means that learning media developed has satisfied highly feasible criteria.

4. Conclusion and Future Work
As conclusion, based on data of research findings and discussion explained in previous chapter, it can be concluded that the validity of creation of android-based module materials of physics was at Very Good level. This validation result can be seen that the accuracy of material conducted by material expert, teacher, and peer review showed Very Good by average value of 4.36. Then, the validation reviewed visually by media expert, teacher, and peer review obtained highly feasible
category by average value of 4.47. In addition, the validation of android-based module material of physics as learning media conducted by learning expert, teacher, and peer review earned highly feasible category by average value of 4.39. As a suggestion, for further research it is expected that the material used can be developed i.e. other physics subject from other local wisdom as well other technology platforms [18-20].

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References

[1] Kendikbud. “Peraturan Menteri Pendidikan dan Kebudayaan Nomor 21. Tahun 2016, tentang Standar Isi Pendidikan,” (2016).
[2] Dekhane, S. Xu, X.,., and Tsoi, Mai Yin., “Mobile App Development to Increase Student Engagement and Problem Solving Skill,” Journal of Information Systems Education, 24 (4), 209-208.
[3] Darmayanti, T., Setiani, M. Y., and Oetojo, B., “E-Learning Pada Pendidikan Jarak Jauh: Konsep Yang Mengubah Metode Pembelajaran Di perguruan Tinggi Di Indonesia,” Jurnal Pendidikan Terbuka dan Jarak Jauh : 8(2). (2007).
[4] Davies, J. and Graff, M., “Performance in eLearning: Online participation and student grades,” British Journal of Education Technology, 36(4), 657–663. DOI: 10.1111/bjet.1467-8355.2005.00542.x. (2005).
[5] Hanafi, H. and Samsudin, K., “Mobile learning environment system (mles): the case of android-based learning application on undergraduates learning,” International Journal of Advanced Computer Science and Application, 3(3), 1-5. (2012).
[6] Safaat, N., “Pemrograman Aplikasi mobile smartphone dan tablet PC berbasis android Informatika,” Bandung, 2012.
[7] Yohan J. W., “Google Android-Sistem Operasi Ponsel Masa Depan,” Yogyakarta: Andi. 2010.
[8] Deitel, P., Deitel, H., Deitel, A., and Morgano, M., “Android for Programmers: An App-Driven Approach,” St. Petersburg: Piter, 2012.
[9] Martono, K. and Nurhayati, O. “Implementation Of Android Based Mobile Learning Application As A Flexible Learning Media,” International Journal of Computer Science (IJCSI): 11(3). (2014).
[10] Ali, R. et al. “Effectiveness of modular teaching in biology at secondary level”, Asian Social Science, 6 (9), (2010)
[11] Sejpal, K., “Modular Method of teaching,” International Journal for Research in Education. 2(2). (2013).
[12] Arsyad, A., “Media Pembelajaran,” Jakarta: Raja Grafindo Persada, 2011.
[13] Rufii, R., “Developing Module on Constructivist Learning Strategies to Promote Students’ Independence and performance,” International Journal of Education. 7(1). (2015).
[14] Parmin and Peniati, E., “Pengembangan Modul Mata Kuliah Strategi Belajar Mengajar IPA Berbasis Hasil Penelitian Pembelajaran,” Jurnal Pendidikan IPA Indonesia. 18(2). (2012).
[15] Woodcock, B., Middleton, A., and Nortcliffe, A., “Considering The Smartphone Learner: An Investigation Into Student Interest In The Use Of Personal Technology To Enhance Their Learning,” Student Engagement And Experience Journal, 1(1), 1-15. (2012).
[16] Widoyoeko, E. P., “Evaluasi program pembelajaran: Panduan praktis bagi pendidik dan calon pendidik,” Yogyakarta: Pustaka Pelajar. 2009
[17] Stoller-Schall, D., “Mobile Learning Beyond Tablets And Smartphones: How Mobile And Networked Devices” Enable New Mobile Learning Scenarios. 2015.
[18] Darmayanti, T., Setiani, M. Y., and Oetojo, B., “E-Learning Pada Pendidikan Jarak Jauh: Konsep Yang Mengubah Metode Pembelajaran Di perguruan Tinggi Di Indonesia,” Jurnal Pendidikan Terbuka dan Jarak Jauh : 8(2). (2007).
[19] Tutty, J.I., “Effects of Self-Regulatory Status and Practice Type on Students Performance in The Mobile Learning Environment,” Journal of Educational Technology, 17-21(2014).
[20] Darcey, L., and Conder, Sh., “Android Application Development in 24 Hours”, Sams Teach Yourself. New York: Sams Publishing, 2012.