The validity of M-Learning based physics teaching materials to improve student learning access in the digital age

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Abstract. The development of high-quality m-learning based physics teaching materials, needs validity from some experts, so that the product developed can be implemented in physics learning in senior high school. This research has purpose to test the validity of M-Learning based physics teaching materials to improve student learning access in the digital age. The type of this research is Research and Development. The development model used is the development procedure of Thiagarajan (4-D model) includes define, design, develop and disseminate. The assessment instrument used was in the form of a questionnaire consisting of three components, that are content, construct, and language. Based on the result of the study, the result of the feasibility test by expert lecturers and teachers obtained the feasibility of the product with a valid predicate so that it can be used as a source of senior high school physics learning.

1. Introduction
Science and technology are two inseparable things. The development od technology is influenced towards the science development. With the increasingly sophisticated technology, it will be easier for scientists to conduct experiments. In addition, information and technology media also function as a means of delivering the latest discoveries in the world of science. Therefore, it should integrate technology in science learning.

In conducting learning activities, every teachers is charged to always prepare everything that can improve learners interest and motivation in learning. To support the formation of learner skills, teachers must be able to develop teaching materials. Teaching materials are important components in the learning process of Science. Teaching materials are part of learning tools which are learning resources that support the learning process. According to Andi Prastowo Teaching materials are all forms of material used to help the teachers/ instructors in conducting learning [1]. Teaching material is one material that can help students to learn. The teaching materials available must be teaching materials that can optimize students in forming their own knowledge.

Wardoyo stated that all concepts obtained by each student is result of construction process and reality that is formed is interpretation result of each student [2]. So, from this statement it can be concluded that knowledge must be built or formed by students themselves. Therefore, so that knowledge can be formed by students themselves, the teaching materials available can optimize students in forming their own knowledge. So, teaching materials can help educators in conveying learning and help students in understanding subject matter so that learning objectives can be achieved.
The availability of adequate teaching materials in schools greatly determines the success of the teaching and learning process in school [3].

From the result of observation conducted in State Senior High School 1 Sungai Penuh it is obtained that teaching material that often used has not utilized the developed technology, but still use printed teaching materials, such as student worksheets and printed books.

The development of technology such as telecommunication devices and mobile devices is currently very rapid. Many teachers and students have used mobile phones as a communication tool, to send messages, receive calls, even though with mobile phones students can access lessons. So that there is mobile learning (m-learning) as one of the learning media alternatives. By using mobile devices (cellphone), then the m-Learning program is more easy to be reached and utilized. That argument is supported by Purbasari (2013) who stated that one alternative learning supplement that can provide opportunities for students to learn on their own which is done anywhere and anytime [4].

M-Learning allows students to conduct activities in the form of learning material, direction, and learning information wherever and whenever, unlimited space and time. M-Learning can solve the limitations of time allocation for certain materials. M-Learning also can train students to learn independently from various provided sources. This is in line with argument of Yuniati (2011) who stated that it improved student attention towards learning material [5].

Based on the description stated above, the researcher makes an alternative teaching material using mobile devices that can present more interesting physics learning by utilizing information technology. The aim is to overcome the difficulties of student learning in understanding physical materials and can improve student access to the digital age.

Furthermore, the teaching material prepared must be in good quality and have valid, practical and effective criteria. In KBBI it is stated that valid means according to what should be, valid and valid. Encyclopedia of Educational Evaluation in Arikunto (2013) stated that “a test is valid if it measures what it purpose to measure” or meaning that a test is said to be valid is the test is measuring what is being measured [6]. Next, Yusuf (2005) explains that validity is pointed to its appropriateness, significance and usefulness of conclusions made based on the instrument's score. The higher the validity of an instrument, the better the level of meaningfulness and usefulness [7]. Therefore, an instrument is said to be valid if the instrument measures something that is to be measured. According to Arifin (2014) explains the types of validation that are surface validity, content validity, construct validity and language validity [8].

2. Method

The subject of this research was m-learning based Physic teaching materials. This study uses 4D model (Four D Models), proposed by Thiagarajan (1974) which consists of four stages, that are the definition (define) consists of curriculum analysis, concept analysis and student analysis, design, development, dan dissemination [9].

The instrument used to collect data in this study was the Validation Instrument Validation Sheet based on m-learning teaching materials. The validation sheet for teaching materials based on m-learning is compiled based on guidelines for the development of teaching materials which are modified from the guidelines for the development of teaching materials by the Ministry of National Education 2008 [10].

Validity was in development stage. In this stage, validation was conducted by some experts. This expert validation was conducted by expert in field of education and physic, includes 2 physic leactures, 1 language lecturer, and 1 multimedia teacher. The validators name can be seen in Table 1.

| No | Validators               | Name Codes | Academic Officials                                           |
|----|-------------------------|------------|-------------------------------------------------------------|
| 1  | Petri Reni Sasmita, M.Pd| PR         | Physics Lecturer at STKIP M Sungai Penuh                   |
The data analysis technique used was descriptive analysis that illustrates the validity of m-learning-based teaching materials. Validity analysis using the formula Aiken’s V viz:

\[ V = \frac{\sum s}{n(c-lo)} \]  

(1)

Description:
- \( s = r - lo \)  
- \( lo = \) The lowest validity scoring  
- \( c = \) The highest validity scoring  
- \( r = \) Number given by an assessor  
- \( n = \) Number of assessors \(^{[1]}\)

The validity category of interactive multimedia modules based on the final values obtained can be seen in Table 2.

| No | Validators | Name Codes | Academic Officials |
|----|------------|------------|--------------------|
| 2  | Enny Zarvianty, M.Si | EZ         | Physics Lecturer at STKIP M Sungai Penuh |
| 3  | Nidde Puspita, M.Pd  | NP         | Lecturer of Indonesian Language at STKIP M Sungai Penuh |
| 4  | Alpian, S.Kom      | AL         | Multimedia Teacher at State Vocational High School 5 Kerinci |

Table 2. Product Validity Category

| Achievement Level | Category |
|-------------------|----------|
| ≥ 0,6             | Valid    |
| < 0,6             | Invalid  |

(Azwar: 2015)

2.1 Validation of Validation Instrument Sheet

To obtain instrument collection of valid data, then an assessment of the validation instrument is conducted. The validation sheet assessment was conducted by 3 validators, that are STKIP M Sungai Penuh lecturer. Before the assessment, the validator provides advice on the instrument that will be tested.

The next validation activity was conducted in different time (based on validators availability) This activity is conducted to discuss with the validator about the improvement that have been made. Then the validator evaluated the results of the revised learning instrument sheet. the results of the validators assessment of the m-learning based teaching instrument validation instrument evaluation sheet were 0.94, which means it was in the valid category because the value of \( V > 0.6 \). Thus, this validation instrument can be used to validate the learning devices that have been designed.

2.2 Validity of Practicality Instrument Sheets

The results of the validation of the practicality sheet instrument of m-learning based teaching materials can be seen in Table 3.

Table 3. Results of the Practicality Instrument Assessment Sheet

| No | Learning Instruments                  | The Average (V) | Category |
|----|--------------------------------------|-----------------|----------|
| 1  | Teaching Materials (Teacher’s Responses) | 0.89            | Valid    |
| 2  | Teaching Materials (Students’ Responses) | 0.85            | Valid    |
From Table 3 it can be seen that the validators assessment result of the instrument practice instrument assessment sheet (teacher response) 0.89 and teaching material (student response) 0.85. All instruments are in the valid category. Thus, this practicality instrument can be used to see whether or not a learning device has been designed.

3. Result and discussion
The results of the design of teaching materials at the design stage are tested for validity. The purpose of the development phase is to develop m-learning based teaching material that is valid in learning. This validation was conducted by four experts consisting of 3 STKIP M Sungai Penuh lecturers and 1 multimedia teacher at State Senior High School 1 Sungai Penuh.

3.1. Initial Stage of Validation
At this stage, the data obtained with valid category, but there are still some suggestions that need to be added. The suggestions from the validator can be seen in Table 4.

Table 4. Summary of Validator Suggestions

| Validators’ Suggestion                                      | Revision Results                                      |
|-------------------------------------------------------------|-------------------------------------------------------|
| 1. Fix the interaction between teaching materials and the users | 1. The interaction between the teaching materials and the users has been fixed |
| 2. Add more example questions                               | 2. Example questions have been added into each chapter. |
| 3. Fix the writing contrast                                 | 3. The writing contrast has been fixed                 |
| 4. Add picture illustration at each beginning of the chapter| 4. Picture illustration has been added into each chapter. |

3.2. Final Stage of Validation
Validation is conducted to find out whether the teaching material provided is valid for trial or not. Validation is conducted by validator who provides assessment by filling out the validation sheet. The validator consists of 3 experts and 1 practitioner. Validation is complete when the validator stated that the material developed is valid. The validation results provided by expert validators are 0.88 with a valid category, and the validation results provided by practitioners are 0.92 with a valid category. Thus the m-learning based physics teaching material has been tested in classroom learning.

4. Conclusion
Based on the research results described above, it can be concluded that M-Learning based physics teaching materials to improve student learning access in the digital age obtained validation results that are in the valid category. This means that M-Learning Based Physics Teaching Materials can be used in the learning process.

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References
[1] Prastowo, Andi. 2011. Creative Guide to Making Innovative Teaching Materials. Yogyakarta: Diva Press
[2] Wardoyo, Sigit M. 2013. *Constructivism Learning*. Bandung. Alfabeta.

[3] Hufri, et.al. 2018. *Validation Analysis of Physics Teaching Materials Based on Contextual Throught Inquiry to Increase Student’s Science Literacy*. The 2018 International Conference on Research and Learning of Physics. Department of Physics, Padang State University, Indonesia. IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012133. doi:10.1088/1742-6596/1185/1/012133

[4] Purbasari, Rohmi Julia. 2013. *Android Application Development as a Mathematics Learning Media on Three Dimensional Material for Class X Senior High School Students*. Online Journal of Malang State University Vol. 1. No. 4. (Online). Provided at: http://jurnal-online.um.ac.id/data/artikel. Accessed on July 20, 2019

[5] Yuniati, Lukita. 2011. Development of Doppler Effect Learning Media As Aid in Fun Physic Learning. *JP2F*. Vol. 2. No. 2. (Online). http://id.portalgaruda.org. Accessed on December 6, 2018

[6] Arikunto, Suharsimi. 2013. *Basics of Educational Evaluation*. Jakarta : Bumi Aksara.

[7] Yusuf, Muri. 2005. *Education Evaluation*. Padang : Padang State University.

[8] Zainal, Arifin. 2014. *Learning Evaluation*. Bandung : Remaja Rosdakarya.

[9] Thiagrajan. 1974. *Instructional Development For Training Teachers Of Exceptional Children*. Idinna: Indinna University Bloomington

[10] Ministry of National Education. 2008. *Teaching Material Development Guide*. Jakarta: Directorate of Middle School Development

[11] Azwar, S. 2015. *Reliability and Validity*. 4th Edition. Yogyakarta : Pustaka Pelajar.