

# Development of Comics Work and Energy Assisted Android Based on Indigenous in Wonogiri

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## ABSTRACT

This research aims to determine the feasibility of an comics work and energy assisted android based on indigenous in Wonogiri. This research used the model of development 4D (define, design, development, and disseminate). This research was conducted a validation instrument assessment by the instrument validator. The assessment instrument will be used to assess the feasibility of comic products and lesson plans (RPP) by expert validators, practitioners and peers review. The product readability assessment is carried out by students through the response questionnaire. The results of instrument validation by the validator are included in the very good category. Evaluation of expert and practitioner validators on products and lesson plans is included in the very good category. Students' response to the comics developed is good. Based on these results, the comic products developed are feasible for use in learning physics, work materials and energy.

**Keywords:** Comics assisted android, Work and Energy, Indigenous, Wonogiri.

## 1. INTRODUCTION

There are still many teachers who have not developed innovative learning media that interests students. Teachers tend to use conventional media such as blackboards, or instant media in the form of picture, posters, and chart [1]. Based on these, the right media needed for learning.

Physics learning can be connected with culture, life, and people's lifestyle [2]. Learning modern physics without examples in daily life, causes students to become bored [3]. It is very important to connect the concepts of physics with the events of everyday phenomena and cultures that are around so that students will better understand the concepts of physics [4] [5]. Western countries and developing countries have tried to include local culture in the curriculum in order to meet their own ideological and cultural goals [6]. Based on this, it is necessary to link the physics concepts that will be learned with indigenous knowledge, local culture, and the potential that exists in the community around students.

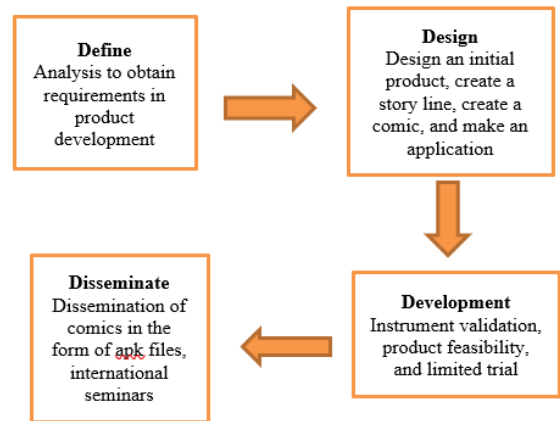
The selection of indigenous people should be adjusted to the culture around the students. The teacher must be selective in determining the indigenous that will be used. MLMs based on indigenous knowledge are feasible to use because they significantly improve students' abilities in physics learning [7] Indigenous knowledge can be included in subject of physical such as thermal physics, mechanics, and electricity [8]. One of the physics materials that get a low percentage of answering correctly in the analysis of the 2014-2019 national final examination is Work and Energy. Indigenous knowledge related to the material in the Wonogiri region is the tourism object of Waduk Gajah Mungkur. The concept of work can be observed from the phenomenon of ships in reservoirs moving if given the force, a fisherman who pulls the ship. When the reservoir door is opened then the water will come out and gush into the Bengawan Solo River, from this event the concept of potential energy can be observed. Reservoir water that flows and leads to the turbines is also used to drive generators and produce electricity, this shows the concept of energy change.

Teachers need media in learning. The right media to display representations in verbal form, diagrams, pictures, graphs that are visually appealing and can be linked to indigenous knowledge to be more easily understood by students is comics [9]. Comics have many advantages including complex interactions between images and text dialogs, which provide the potential to convey material well and motivate student involvement effectively [10]. Comics not only contain material but also ordinary conversations between characters to avoid boredom, flexibility, and characters are not always human [11]. Comics can also develop students' character [12]. Students are more interested in learning physics through comics than learning through media that only contains writing [13]. Characters in comics can raise open questions to readers, so that students will practice understanding the concept [14]. The training with comic media is also supported by the presence of images that can illustrate abstract concepts into concrete [15] so that it clarifies the dialogue that is being read. This explains that, in addition to comics being used as a means of entertainment, relevant comics are used as a medium for learning physics. The aspects concerned are the material, language, appearance, and presentation effect on learning strategies. In this study, making comics refers to aspects of language, writing, pictures, and story content [16]. This aspect will be used as an aspect of the comic's feasibility assessment by the validator.

Smartphones are an important part of the learning process in the modern school era [17]. Based on preliminary observations at school, most students use Android-based smartphones at school. The distribution of comics not only with paper, but also can use the internet can even be combined with digital technology including Android [18]. Comic media based on indigenous knowledge assisted with android can improve mathematical representation and creative thinking of students in learning physics [19]. Based on android-assisted comics have the potential to be developed into physics learning media on work and energy. Supported by developments in technology and the internet, it is now easier to develop applications without learning about coding. One of the websites providing android application development is [www.kodular.io](http://www.kodular.io).

**2. METHODS**

This research is a development research with 4D model. Development research is carried out with reference to Thiagarajan, Semmel and Semmel (1974) in the 4-D model. There are four stages in the development of the 4-D model: define, design, develop, and disseminate. The study was conducted in March 2020. The research subjects were grade X students in SMA N 2 Wonogiri, the number of students was 72 people.



**Figure 1.** The stages of developing the 4D models

Validation of assessment instruments is carried out by expert judgment. The instrument validation analysis uses the Aiken V formula.

$$V = \frac{\sum s}{[n(c - 1)]}$$

The scores obtained were then converted into four categories by comparing the values of Aiken V with the quality categories shown in Table 1.

**Table 1. Instrument categories.**

Range of Scores	Categories
0.2 < V ≤ 0.4	Less
0.4 < V ≤ 0.6	Enough
0.6 < V ≤ 0.8	Good
0.8 < V ≤ 1	Very good

The feasibility assessment on products, media and lesson plans (RPP) was carried out by 3 people by experts, 3 practitioners, and 2 peer review. Students make an assessment using a questionnaire to responses the use of media that are developed and learning. The product feasibility assessment is done by converting it into the criteria as in table 2.

**Table 2. Assessment category**

Range of Scores	Categories
$\bar{X} \geq Xi + 1.8 Sbi$	Very good
$Xi + 0.6 Sbi < \bar{X} \leq Xi + 1.8 Sbi$	Good
$Xi - 0.6 Sbi < \bar{X} \leq Xi + 0.6 Sbi$	Enough
$Xi - 1.8 Sbi < \bar{X} \leq Xi + 0.6 Sbi$	less
$\bar{X} \geq Xi - 1.8 Sbi$	Very less

### 3. RESULT AND DISCUSSION

#### 3.1. Result of the Define Stage

The development of comics works and energy based on indigenous in Wonogiri starts from the definition stage. The definition stage is to find out the general requirements in developing comics. This stage is carried out pre-research analysis, concept analysis, student analysis and task analysis. this stage produces a matrix that is used as a reference in making comic storyboards. At this stage, choosing an appropriate character based on the story. At this stage, instrument validation standards, feasibility assessment standards, and determining media specifications are made.

**Table 3.** Results of analysis of comic development needs

Needs	Result
Media that can be used on Android	Android based comic media on work material, kinetic energy, potential energy, mechanical energy
Based on the 2013 revised physics curriculum material	conservation laws.
Media according to student development	Android comics contain videos, worksheets, and comics Indigenous integrated comic phenomenon of Waduk Gajah Mungkur

#### 3.2. Result of the Design Stage

The design stage produces a media development storyboard, story line, android comic application, RPP, instrument validation sheet, product assessment sheet. All products are made based on criteria from the defining stage. Android comics contain introductions, instructions for use, apperception videos, comics, worksheets, and developer profiles. The preliminary feature contains learning indicators and learning objectives. The video feature contains apperception videos that are used to motivate students at the beginning of learning. Worksheets are used as a medium for student discussion in learning.

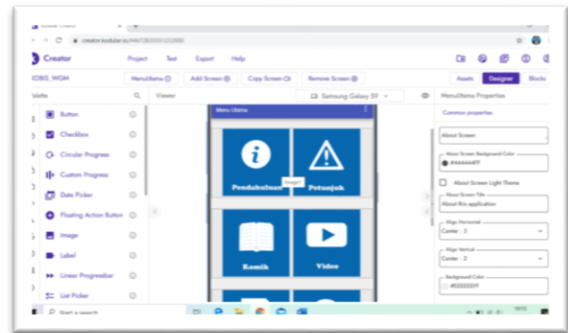
The comic tells about an adventure trip in the Waduk Gajah Mungkur, a phenomenon that is there that is to be connected with work and energy content. The concept of work can be seen in the phenomenon of fishermen who

attract and encourage ships. The concept of kinetic energy can be seen in the phenomenon of moving ships, vehicle of a walking rabbit train. The concept of potential energy can be observed in the slide game on Waterboom. The conservation kinetic energy law concept can be observed in the phenomenon of reservoir water flowing out into the Bengawan Solo River and water sliding into generators on a hydropower plant.

#### 3.3. The Development Product

In this research an android-assisted comic media is developed for learning physics in work and energy materials. Material contained in the media is work, potential energy, kinetic energy and conservation of mechanical energy. The content is delivered simply and attractively through android-assisted comic media. The content is related to the phenomenon in one of the indigenous groups in Wonogiri, namely the Waduk Gajah Mungkur. Comics can realize abstract concepts into concrete examples in everyday life [20]. In this study, the selection of the Waduk Gajah Mungkur as a study material in learning because it is one of the famous places that is close to students in Wonogiri and the phenomena are suitable with the material.

Making comics begins with drawing manuals on a drawing book with a pencil and ballpoint, then edited and colored through the Coreldraw 8 application. After making the comic is complete, the next stage is making the comic application with the help of the android application creation service provider site “*kodular.io*”.



**Figure 1.** Application creation view

The result of making this application is apk file extension that can be installed directly on an Android smartphone. After the comic media is finished, the product will be assessed by the validator.



Figure 2. Instructions and feature in the comics

Instruction for reading comics according to the numbers in the column. This aims to make it easier for students to read comics. Figure 2 shows the comic menu display consisting of 7 episodes. Students can choose episodes according to the material to be studied.

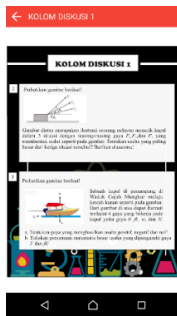


Figure 3. Feature “worksheet”



Figure 4. Feature “komik”

Worksheets are used as a media for discussion between students. The worksheet raises problems according to the material to be studied. Students conduct discussions to find solutions to problems. This worksheet will make students active in learning. Figure 4 displays the dialogue in the comic. Dialogue is adjusted to the age level of students, so students will not be bored. Dialogue is inserted with humor that will make it comfortable for students to read.

3.4. The Validation Result of the Comic Media

Before the appraisal instrument is used, an appraisal instrument is validated by the expert.

Table 4. Validation instrument assessment results.

Instrument	Score	Category
RPP	1	Very good
Product Assessments by Validator	1	Very good
Student Response Questionnaire	1	Very good

Table 4 shows validation of the RPP assessment instruments, media products and student questionnaire responses obtained a score of 1 so that it can be concluded in the very good or valid category used. The assessment instruments are ready to be used by expert validators and practitioners. The results of the feasibility assessment of work and energy media are shown in Table 5.

Table 5. Media feasibility assessment.

Instrument	Score	Category
Quality of content	3.6	Very good
Language	3.7	Very good
Design	3.5	Very good
Visual Display	3.7	Very good
Implementation of comics	3.9	Very good

Table 5 shows the results of the feasibility assessment of Comics Work and Energy assisted android based on indigenous in Wonogiri. The results show that the evaluation in the criteria is very good, so that the comic product is ready to be used at a later stage. These criteria are compatibility with learning material, compatibility with learning objectives, c compatibility with learning models, compatibility with indigenous phenomena in Waduk Gajah Mungkur, communicative language, good story line, good image quality, complete application features, complete writing quality good, good video quality, practicality of Android-based media, and media effectiveness. After evaluating by the validator, revisions are made according to the suggestions and comments of the validator.

Table 6. Feasibility assessment of lesson plan

Instrument	Score	Category
Complete RPP identity	3.8	Very good
Formulation of learning indicators	4	Very good
Formulation of learning objectives	4	Very good
Selection of study material	3.8	Very good
Selection of learning models	3.8	Very good
Learning scenario	3.8	Very good
Selection of learning media	3.8	Very good

Assessment of learning outcomes	3.8	Very good
Language	3.4	Very good

Table 6, the results of the assessment of the feasibility of the RPP will be used in the product test. The results show that RPP is feasible to use because it is in the very good category.

### 3.5. Result of Limited Trial

At the product test stage on students, students look enthusiastic and more motivated in learning. Group discussion is more active with the discussion column feature on the media, which contains problems that must be solved in groups. Responses by students to media and learning are presented in Table 7.

**Table 7. Results of analysis of student responses.**

Aspect	Score	Category
Perceived ease of use	3,12	Good
Perceived benefits	3,12	Good
Product usage	3,08	Good
Use of media in learning	3,10	Good
Average	3,11	Good

Table 7 shows students' responses to the media and learning used. Based on the assessment of responses to the criteria obtained an average score of 3.11 in good categories. The good category shows students are interested and the media used, so that this media has the potential to be used in learning the physics of Work and Energy material. This is supported by comic stories that are easily understood by students, and observed phenomena that are familiar to students.

The use of language is adapted to age levels, and provides a humorous effect on the story will make students not bored in reading comics. This is according to research [3] states that comics are made according to the target age and there is a humorous effect to avoid boredom. The features used are made friendly so it is easy to use. This is an advantage of Android with the Open Sorce system, features on Android can be made according to your wishes and needs [21]. Based on this, the research on the development of comics work and energy is successful and suitable for use in field tests. The next step is product revision based on the findings of the limited test. Revision is used to improve the quality of media, so that it is better and feasible using in actual learning.

## 4. CONCLUSION

Based on the findings and discussion, it was concluded that: the comic media of business and energy based on Android based on indigenous in Wonogiri received very good categories by experts, practitioners,

and peers review. Students give positive responses to the media and learning using work comics and energy, this is indicated by getting responses in good categories.

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