

# DEVELOPMENT OF ANDROID-BASED PHYSICS TEACHING MATERIALS USING MIND MAP METHOD WITH BRAIN BASED LEARNING APPROACH ON ELASTICITY MATERIALS

Iktivaiyatul Mawadah<sup>1</sup>, Nyai suminten<sup>2\*</sup>, Feli Cianda Adrin Burhendi<sup>3</sup>

<sup>1,2</sup>*Physics Education Study Program, Universitas Muhammadiyah Prof. DR. HAMKA,  
Indonesia*

<sup>2</sup>[suminten@uhamka.ac.id](mailto:suminten@uhamka.ac.id)  
Telp. 082116508661

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**ABSTRACT**

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This study aims to develop teaching materials using an android-based mind map method with a brain-based learning approach in high school physics learning. The research method used is 4D development research (Define, Design, Develop, Disseminate). The stages are needs analysis, designing and developing teaching materials using the mind map method into an android application, validation tests by expert lecturers and physics teachers on media and materials, small, and large-scale tests for students. The conclusion of this study states that the development of android-based teaching materials with the mind map method on elasticity material is said to be good with a percentage of 79%.

**Keywords:** brain-based learning, mind map

## INTRODUCTION

The Ministry of Education and Culture began updating the curriculum in Indonesia in 2013. Its implementation became mandatory in the 2014 - 2015 Academic Year. This new curriculum contains student-centered learning so that students are trained to be independent and try to find solutions to problems found in the learning process. The learning process must of course be made interesting so that students are challenged to find existing problems and solve them. The teacher acts as a facilitator who can utilize various kinds of technology as a tool in the learning process. In this era, technology is growing rapidly and has been widely applied in various fields, one of which is in the field of education, technology can be used as an intermediary media that makes it easier for students in the learning process. Technology in education can be devoted to 3 important things, namely

creating, using, and managing. These three things are the most important part of the function of educational technology, namely as a learning facility, and physics learning is no exception.

Physics is a science that discusses the process of occurrence of phenomena in the universe. Learning related to physical phenomena is quite difficult to present in class directly on the object. So that not a few students do not master the material and solve problems in learning physics in class. These obstacles can come from various aspects, one of which is the teaching materials used by students. Teaching materials play an important role in the learning process and teaching materials that are considered to be used to support learning are teaching materials with a mind mapping model where mind mapping is a method that aims to make it easier to remember and understand learning materials. On this side, opportunities were found to develop teaching materials with a

mind map model. This teaching material can be used as a physics learning resource that can be used anywhere at any time. In addition, the benefits of this teaching material are that students can more easily remember and understand the material in the learning process because it is based on a brain-based learning approach, especially elasticity material.

Then as a State-of the art research with the title "Development of Brain-based Learning Tools to Improve Student Learning Outcomes", based on the results of this study, the learning tools developed were valid, practical, and effectively used to improve student learning outcomes [1]. Further research with the title "Development of Mind Map Based Teaching Materials on Invertebrate Materials for Middle School Class VII", the results of this study indicate that the level of response to teaching materials is at a very good level. Based on the results of these responses, it can be said that the teaching materials developed make it easier for students to understand the material so that students can learn independently [2]. Research with the title "The Effect of Mind Mapping Through Brain-Based Learning on Student Learning Outcomes on Chemical Bonds in Class X MIA SMA Negeri 1 Marawola". The results of this study state that the brain-based learning model applied to learning makes students smarter in thinking. Brain based learning using the mind mapping method has a more positive effect on student learning outcomes for class X MIA. This is indicated by the value of  $t_{count}$  is greater than  $t_{table}$  [3].

The novelty in this research and development is the Development of Android-Based Physics Materials Using the Mind Map Method with a Brain Based Learning Approach on Elasticity Materials.

## EXPERIMENTAL METHOD

Based on the formulation of the problem, this study aims to determine the process of developing teaching materials with a mind map model based on a brain-based learning approach on elasticity

material and to determine the feasibility and quality of teaching material products with a mind map model based on a brain based learning approach in high school physics learning on elasticity material.

The needs analysis was carried out in 3 schools, namely SMAN 75 Jakarta, SMAN 92 Jakarta, and SMA Muhammadiyah 1 Jakarta. Furthermore, small-scale tests were conducted at SMA Tanjung Priok, and large-scale tests were carried out in 3 schools, namely SMA Yapenda, SMAN 75 Jakarta, SMA Muhammadiyah 1 Jakarta. The product specifications that are expected by researchers in general are that teaching materials with the mind map model have good quality values in their use and teaching materials with the mind map model can be accepted and get a positive response from users. In addition, technically the specifications that the researcher wants are teaching materials with a mind map model providing material that is packaged in easy language and combined with pictures that are arranged sequentially and the background of teaching materials with a mind map model on a white background.

The research method used in this research is the research and development method. According to Sugiono in Sigit research and development is used to produce a certain product and test its effectiveness [4]. So, it can be said that research and development methods are research conducted to produce a product that has been developed to be better and more effective to use. The research procedure is through the definition stage, the design stage, the development stage, and the deployment stage. The technique of collecting data is through a questionnaire equipped with data collection instruments (validation sheets of material experts and media experts. Furthermore, data analysis is carried out, the data obtained are in the form of qualitative and quantitative data. Qualitative data in the form of comments and suggestions will be analyzed descriptively qualitatively by making it as the basis for product revision, while quantitative data obtained from the validation assessment

of experts, teachers, and students were measured in all aspects using a Likert scale.

**RESULT AND DISCUSSION**

The results of this study are described in accordance with the stages of the 4D development research model which aims to develop teaching materials for brain-based learning android mind map models. This development model consists of 4 stages, namely Define, Design, Develop, and Disseminate. Following are the results of the discussion of each stage in this research:

1. Defining Stage. The purpose of this stage is to define the initial step in developing teaching materials, namely by conducting needs analysis and qualitative descriptive observations. The needs analysis was carried out in 3 schools, namely SMAN 75, SMAN 92, and SMA Muhammadiyah 1 Jakarta. At SMAN 75, the results of the analysis were then followed up as a basis for developing brain-based learning android mind map model teaching materials. Through needs analysis, the results obtained have been analyzed so that they can be seen in Table 1 below:

**Table 1.** Needs Analysis

No	Evaluation	Result
1	The use of smartphones in learning	80%
2	Teaching materials used by Teachers	36,8%
3	Learning process by following how the brain works	44,8%
4	Approval for the development of mind map model teaching materials on BBL-based android	61,7%

From this data, the researchers took the initiative to develop teaching materials on Android with this brain-based learning mind map model.

2. Design Stage. At this stage, the media design is carried out as a container for the teaching materials that are developed. This media is compiled using

a mind map model with a brain-based learning approach, namely:

- a. Presentation of motivation when opening the application that guides students' emotions to build a positive and fun atmosphere.
- b. Preparation of mind maps with material sources provided or can be explored from other sources according to their respective pleasures.
- c. Students will be asked to write down the most important things from the material related to real events that are presented in several parts of the mind map framework.
- d. Mind maps can be shared in the form of photos to a group of friends so that there are comments and suggestions so that students can accept the opinions of others.
- e. New ideas will exist when students receive input from other friends.
- f. Students can make mind maps with their own creativity and will have their own characteristics.
- g. Input from other friends will be a challenge for students in making a better mind map.
- h. With the characteristics of each student's mind map, mind maps can be printed and displayed on the classroom wall magazine as a form of appreciation for the work that has been made. This application is called Think Me, made with Unity software because it can present interesting animations and displays on learning applications.

The initial part of the application contains a logo and motivation to start learning with enthusiasm, then there is a login tab as data from students who want to use the application. Furthermore, in the home section there are several menus including brain thinking, do the task, maker information and instructions for use. The application is combined with background sound so that students do not feel bored when using it. The section on the menu

generally functions the same as a book, there is material consisting of KI and KD then questions for evaluation. The difference is that the material is developed with a place for students to make mind maps so that they can recall the material previously studied in their respective ways.

3. Development or Development Stage At this stage the application and material are revised and developed according to input from physics experts and teachers. Then the application was tested on a small scale at SMA Tanjung Priok and of course the input obtained was used as a reference for the next revision. Then the final stage is a large-scale trial in 2 schools, namely SMA Yapenda and SMA Muhammadiyah 1 Jakarta. After being declared valid or feasible based on the assessment given through a validation questionnaire, the application is ready to be distributed. The following revisions have been made, which can be seen in Figure 1 below:



**Figure 1.** Product Development

4. Dissemination or Disseminate Stage. This stage is the end of the 4D research flow, namely when the use of the application has been tested on a larger scale and is declared feasible. The application will be given to the physics teacher and can be distributed via g-mail with the permission of the researcher.

Characteristics of respondents are students majoring in science who have

received elasticity material. The process carried out when the teaching materials have been completed is to test the validation of materials and media to expert lecturers and physics teachers. The selected expert lecturers are experts

in their fields. While the physics teacher selected is a teacher who has teaching experience. Furthermore, small-scale tests and large-scale tests were carried out. The feasibility of teaching materials can be seen in Table 2 below:

**Table 2.** Material Validation Quantitative Data on Each Indicator

<i>Formats</i>	Completeness of Content	90%	Very worth
<i>Content Eligibility</i>	a. Material content	80%	Worth
	b. Learning	86,6%	Very worth
<i>Language</i>	a. Content clarity	85%	Worth
	b. Language compatibility	90%	Very worth
<i>Presentment</i>	a. Content neatness	86,7%	Very worth
	b. Interaction	80%	Worth
<i>Average Assessment of Each Aspect</i>		86,03%	Very worth

Based on Table 2, the average value of each indicator is 86.03%. So that it illustrates that the material in the development of teaching materials is considered very feasible. In addition, qualitative data validation of this material is the comments and suggestions obtained from the two assessors. The conclusions from the comments and suggestions of the assessors are that they are good but there are some improvements, including similarities and adding pictures to the sub material. The images added are series and parallel circuits as well as elasticity graphs.

Meanwhile, for quantitative data, the average result for each aspect is 75.02%. Based on this, the teaching materials developed are included in the category of good enough or decent enough. The level of practicality of the media through questionnaires and large-scale and small-scale tests shows that teaching materials are suitable for use with a value of 84.98% in good predicate. Then qualitative data was obtained and analyzed so that it could be concluded that the students felt that the teaching materials developed were good.

The teaching materials for the mind map model based on brain-based learning have previously gone through

the research phase according to the 4D (Define, Design, Develop, Disseminate) step procedure, starting with the definition of teaching materials until the distribution of teaching materials in the form of applications to physics teachers around. This teaching material was developed with a mind map model that can be made on Android. The application, called Think Me, can be downloaded via g-drive which has been distributed by researchers. The teaching materials developed have also gone through the testing phase, namely the feasibility test and expert validation test. The expert validation process is carried out to determine the quality and feasibility of the products that have been developed. Validation is carried out by lecturers and physics teachers, both for materials and media. The assessment of each lecturer and teacher is based on the instrument given. The instrument made consists of several different assessment criteria between material and media experts.

The following shows the results of the assessments from lecturers and teachers on the material and media on each criterion.



technological developments in the industrial era 4.0 which greatly influences education in Indonesia, where education in era 4.0 is characterized by the use of digital in the learning process in schools [6]. Furthermore, the selection of the main map method is also considered appropriate because it can increase students' creativity, this is in line with the research results of Zulfia *et.al*.

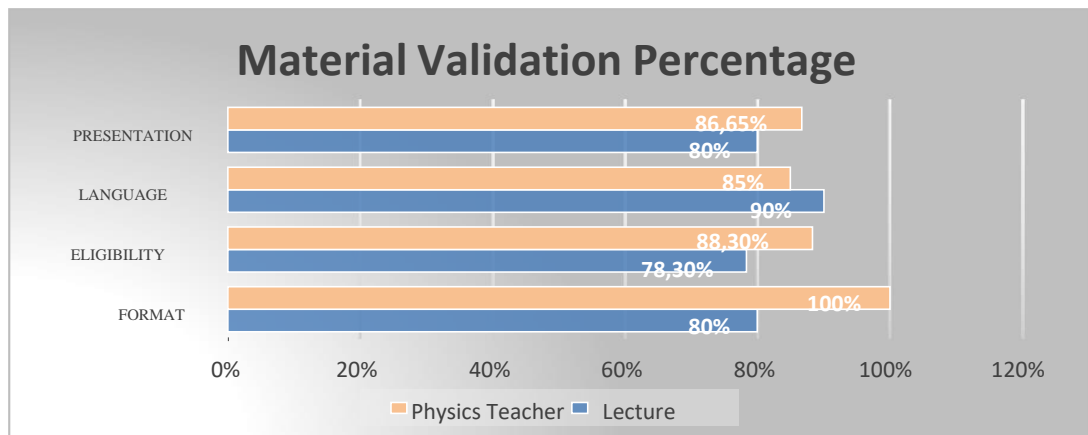


Figure 2. Material Validation Percentage

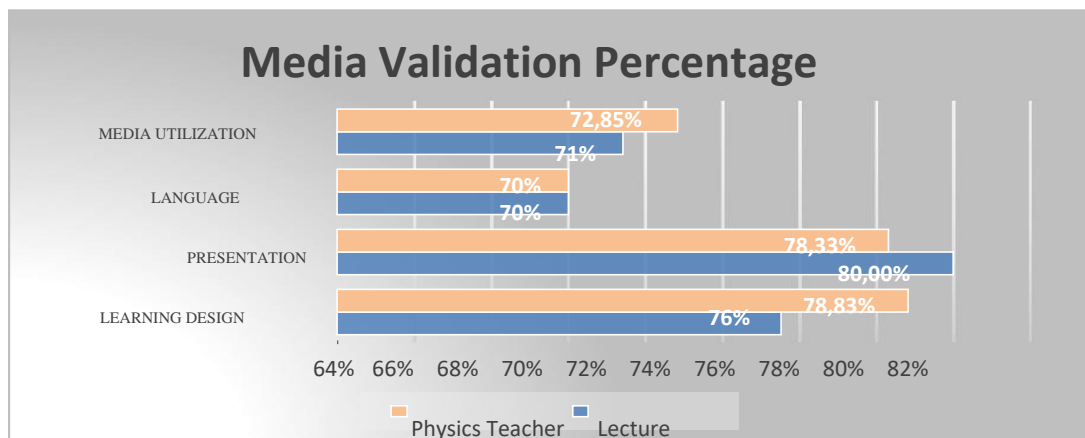


Figure 3. Media Validation Percentage

The researcher uses a 4D model (define, design, develop, disseminate) which is a development research model developed by Thiagarajan in 1974 in Kristanti Dian where the stages of this 4D model are broadly defined, planning (design), developing, and disseminate [5].

Researchers make updates to Android-based physics teaching materials as an optimal effort to take advantage of technological developments, this is in line with Sunarto's opinion in Mitha which states that these innovations are in line with

The results show that the mind mapping method can increase students' creativity [7].

In line with this, according to Tony Buzman in Rahayu states that a mind map can also be said as a brilliant route map for a person's memory, leading him to organize facts and thoughts into how the brain works naturally or in the sense of being able to remember and recall old information more easily. and more reliable than using traditional note-taking techniques [8]. Furthermore, the brain base learning (BBL) approach is very effective in learning as in the opinion of Caine et al in Sukoco Heru explaining that BBL has 12 main principles,

namely: (1) learning involves psychological aspects; (2) the brain/mind is social; (3) looking for something meaningful is an The results show that the mind mapping method can increase students' creativity [7].

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### SUMMARY

This research is in accordance with the researcher's objectives, namely the process of developing android-based teaching materials using the mind map method with a brain-based learning approach carried out in accordance with the 4D research stages. The final result of this research is a mind map model teaching material in the form of an android application that contains learning based on a brain based learning approach on elasticity material. Then according to other objectives, teaching materials were declared feasible through material and media expert

validation, getting 80.52% results with good predicates. The practicality of the media through the student response questionnaire got 76% results on a large-scale test with a good predicate. So that this teaching material is said to be feasible based on the students' responses.

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