

# Design of Interactive Multimedia with Contextual Approach to Improve Mathematical Economic Problem Solving Ability

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## ABSTRACT

The turning point of developing education is when the world of education succeeds in continuously creating the nation's future generations who have their own characteristics and expertises after the education. Therefore in formal schools, students need to improve their problem-solving skills. This research employs research and development model which includes modified 4-D design, that is defining, designing, developing and producing final media in the form of interactive multimedia with contextual approach. The pretest-post test control group design was used, hence the experimental class and control class were given a test before and after the treatment. The research was conducted at State SHS 9 Semarang. One class of grade X semester II was taken for trial, whereas the experiment class and control class class were grade X semester I.

**Keywords:** *interactive multimedia, contextual approach, problem solving skills*

## 1. INTRODUCTION

The turning point of developing education is when the world of education succeeds in continuously creating the nation's future generations who have their own characteristics and expertises after the education. To study various sciences that emphasize on logical reasoning and establish student attitudes and skills in the application of mathematics (Dian, 2009).

Along with the matter, nowadays development is more rapid. This rapid development can be seen from how many electronics or technologies are sold, how much electricity is used for daily human needs. These electronics have many kinds of shape, color and benefit. Some of electronics have been maximally utilized, however more of its benefits also need to be discovered because it only focuses on one form of usability and it can not be developed to another form. For example, on one hand, schools have been maximally use Lamp, Fan, and other facilities whose benefits can not be developed further into learning process. On the other hand, some electronics such as mobile phones, laptops, computers, and Liquid Crystal Display (LCD) can be developed to support learning process.

In nowadays world, technology extends classroom learning to community learning, the same applies to the concept of scaffolding or direct face-to-face learning is no longer implemented (Tasir & Jumaat, 2014). Also, in nowadays growing world, technology is very important in teaching and learning of mathematics where it can improve students' understanding (Saha, A, & R, 2010). According to (Hussain, Tan, & Idris, 2014), the use of multimedia for teaching can be in various forms. (Chiu & Churchill, 2015) also states that digital education materials for mathematics learning currently used in schools frequently incorporate mainstream teaching methods that focus primarily on improving procedural knowledge.

Considering those phenomena, future educator should begin to critically think that learning process can be developed using electronic media such as computer and Liquid Crystal Display (LCD) because the development of science and technology has brought rapid changes in various aspects of human life, includes the field of education (Swida, 2016). It is hoped that in the future, students can learn more easily and teachers will be more effective and efficient in making teaching materials. According to (Endro, 2013). learning media is a medium of information teaching and learning activities so as to provide the effectiveness and interactivity in the learning process. Therefore, interactive learning media is considered more affective and efficient for teaching and learning activities. For instance, learning media that only use one effect or picture is called interactive media but learning media that uses more than one effects is called interactive multimedia.

Thus, technology can display real objects that drives students' interest and happiness into the learning process. Contextual approach considers learning to be contextualized into real world, because students are constantly invited in daily environments and students knowledge is formed from students basic knowledge that they have owned (Anetha, 2012)). By implementing a particular approach, the students will be more enthusiastic in learning. The approach used is the contextual approach because it links learning with daily life. (Silvia, Nilaswati, & Mirna., 2012) states that students ability, in the aspect of mathematics inter-topics connection with other disciplines and real world or students daily life during contextual approach application with the assignment of mind maps, tends to increase. Therefore, contextual approach will also affect the improvement of students' problem-solving skills on a learning material.

According to the data of 2018/2019 national examination results, the mathematics understanding level in Central Java is 47.43, it

falls below our national mathematics understanding level average of 56.28. According to (Buchori, 2017), the ability of academic language, the ability to think, the success of mathematics, and problem-based learning can affect the ability to solve mathematical problems as well as common problems. Based on the problem stated above, a research has been done on the Development of Interactive Multimedia with Contextual Approach to Improve Problem-Solving Ability of Class VIII Students on social arithmetic Subject Matter.

## **2. LITERATURE REVIEW**

### **2.1. Interactive Multimedia**

Azhar (2011: 170) argues "although the definition of multimedia is still unclear, it is simply interpreted as more than one media. Multimedia can be a combination of text, graphics, animation, sound and images. But in this section the combination and combination of two or more types of media is emphasized on computer control as the overall driving force of this media. Thus the meaning of multimedia that is commonly known today is a variety of combinations of graphics, text, sound, video, and animation. This merger is a unity that together displays information, messages or lesson content.

Munir (2009: 213) states that "the term multimedia is now used to describe a system that uses a computer where all media such as text, graphics, sound, animation and video are in one computer software". From the opinion of some experts, it can be concluded that multimedia is the use of computers to create and combine text, graphics, audio, video and animation, where the results of the combination of these elements will display information that is more interactive. An interactive media developed must meet several criteria. Thorn (in Munir 2009: 219-220) proposed six multimedia criteria to assess interactive multimedia, namely: (1). The first assessment criteria is ease of navigation. An interactive CD must be designed as simple as possible so that students can learn it without having to with complex abilities about media. (2). The second criterion is cognitive content. In the sense of a clear knowledge content. (3). The third criterion is information presentation, which is used to assess the contents and interactive CD program itself (4). The fourth criterion is media integration, where the media must integrate aspects of knowledge and skills. (5). The fifth criterion is artistic and aesthetic. To attract learning interest, the program must have an attractive appearance and good estesia. (6). The last assessment criteria is the overall function, in other words the program developed must provide the learning desired by the learning participants

### **2.2. Context Approach**

Sanjaya (2006, p. 253) suggests the basic concept of a contextual approach and contextual teaching and learning (CTL) namely, "A learning strategy that emphasizes the process of full student involvement to be able to find the material being studied and relate it to real life situations, thus encouraging students to be able to apply it in their lives".

The results of the Northwest Regional Education Laboratories research report that contextual teaching can create meaningful learning experiences and enhance student academic achievement. Sariningsih, R. (2014) states that contextual teaching practically promises to increase student interest in learning from a variety of backgrounds and increase student participation by actively encouraging them to construct opportunities and apply the knowledge they have acquired so as to increase mathematical problem solving in everyday life. In addition, Setiawan, R. H., & Harta, I. (2014). states that contextual teaching practically promises increased interest, student interest in learning from various backgrounds and increases student participation by actively encouraging them to apply knowledge understanding, connecting and applying the knowledge they have acquired in solve the challenges they face. Furthermore, Ulya, I. F., Irawati, R., & Maulana, M. (2016). mentions that there are five elements that must be considered in the contextual learning practice, namely: a. Activation of existing knowledge (activating knowledge) b. Acquiring new knowledge (acquiring knowledge) by first learning as a whole, then paying attention to details. c. Understanding of knowledge (understanding knowledge), namely by compiling (a) a temporary concept (hypothesis), (b) sharing to others in order to get a response (validation) and on the basis of that response (c) the concept is revised and developed. d. Practicing the knowledge and experience (applying knowledge) e. Reflecting (reflecting knowledge) on the knowledge development strategy.

### **2.3. Previous Relevant Research Results**

The relevant studies related to the research that researchers will conduct are:

1. Research Sariningsih, R. (2014). Which shows that the contextual approach is able to improve the ability of mathematical understanding of junior high school students for the better
2. Research Ulya, I. F., Irawati, R., & Maulana, M. (2016). Which shows that there is an Increase in Mathematical Connection Ability and Student Learning Motivation Using Contextual Approaches, so that students understand more the reality that is in the surrounding environment
3. Research Setiawan, R. H., & Harta, I. (2014). Demonstrate the influence of open-ended and contextual approaches to problem solving abilities and students' attitudes towards mathematics, students become quick in solving mathematical problems in class and their attitudes become more rigorous

## **3. METHOD**

This research method was research and development. It is a research method used to produce certain products, and test the effectiveness of these products (Sugiyono, D. R. (2006).). The research model used the ADDIE learning design model. This model, as the name implies consists of five main phases or stages, namely (A) analysis, (D) design, (D) e-development, (I) implementation, and (E) valuation. The five phases or

stages in the ADDIE model, need to be done systematically and systematically (Sugiyono, D. R. (2006). In this study only carried out until the third stage, namely as follows.

### 3.1. Analysis

The analysis step consists of two stages, namely performance analysis and needs analysis. The first stage, performance analysis is carried out to find out and clarify whether the performance problems encountered require a solution in the form of program implementation or management improvement. In the second stage, needs analysis is a step that is needed to determine the abilities or competencies that need to be learned by students to improve learning achievement (Sugiyono, D. R. (2006).).

### 3.2. Design

This step requires clarification of the learning program that is designed so that the program can achieve the learning objectives as expected (Private, 2010: 130). In product design, what is done is the next stage of the ADDIE model, namely design. In this step, there is a need for clarification of the learning program that is designed so that the program can achieve the learning objectives as expected (Sugiyono, D. R. (2006).).

### 3.3. Development

This development step includes creating, buying, and modifying learning media to achieve predetermined learning goals. The step of development, in other words, includes the activity of selecting and determining methods, media and learning strategies that are suitable for use in conveying Sugiyono, D. R. (2006).). In this development stage, the framework that has been designed will be realized to produce a product that can be implemented. At the stage of developing Android-based learning media will be made in accordance with the material after the Android or computer-based media is completed it will be validated by media experts and material experts by the validator to get input and evaluate according to the input provided by the validator. Furthermore, the Android-based media is revised according to the input provided by the validator to improve the product.

## 4. RESULT AND DISCUSSION

Based on the learning system design procedures used the ADDIE development model, the stages of research implementation for the first year that have been implemented will be explained in detail as follows.

### 4.1. Analysis

The analysis step consists of two stages, namely performance analysis and needs analysis. At this stage, interviews were conducted with several high school mathematics teachers or economic teacher in Semarang City. From the results of the interviews produced the fact that nearly 90% of senior high schools in Semarang City still use mathematics textbooks that have not been touched by renewable technologies yet such as augmented reality, virtual reality, kahoot, macromedia flash other mathematical software applications. For this reason, it is necessary to

develop textbooks that are able to accommodate these problems. Based on observations made by researchers at State Senior High School 1 Semarang, the mathematics economic learning process was less active and less attractive, this was due to the absence of instructional media used by teachers so that students become bored quickly. Teaching and learning interactions in the classroom were inseparable from the influence of the media used by the teacher in delivering teaching material. The existence of technology, especially smartphones or computer that are now increasingly developed must be addressed wisely. One of the benefits that can be taken from the existence of this technology is to use it as an effective, creative and educative learning media. So the educational application media can continue to be developed, one of which is the technology of multimedia interactive).

### 4.2. Design

At this stage, the researcher designed the product to be developed based on the results of the analysis that has been done. From this research, an android-based learning media was produced using kahoot and prezi called themultimedia interactive. The material in this media was class X mathematical material consisting of Equations and Inequalities of Absolute One-Variable Linear Value, Social Arithmetic, Rational and Irrational Equations and Inequalities, One-Variable Linear Equation System, Dimension Three. Display multimedia interactive for the Equation and Inequality of Absolute Linear Values of One Variable can be seen in the following image.

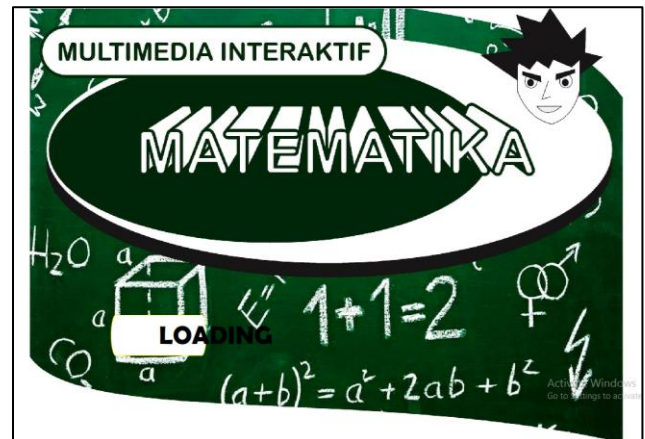


Figure 1 Multimedia Interactive Display

### 4.3. Development

At the stage of developing computer based learning media using Kahoot, prezi would be made in accordance with the material, after the computer-based media using kahoot and prezi was completed, it would be validated by media experts and material experts by the validator to get input and evaluate according to the input provided by the validator. The results of the validation will be described below.

#### 4.3.1. Material Validation

Validation by the material expert is done so that the media that will be tested is truly feasible to be used in research. Development products evaluated by Lecturer of Mathematics at Universitas PGRI Semarang namely

multimedia interactive based on Khoot and Prezi using a questionnaire that must be filled out by material experts.

The results of the validation and assessment of the learning material experts for each aspect are presented in the following table.

**Table 1. Result of Material Validation**

No.	Assessment Aspect	Expected Score	Evaluation Score	Feasibility
1.	Relevance	24	23	95,83%
2.	Accuracy	16	14	87,50%
3.	Completeness of Serving	4	3	75%
4.	Basic Concepts of Material	8	6	75%
5.	The suitability of the presentation with the demands of student-centred learning	16	13	81,25%

The next stage the researcher analyzes the overall results of the assessment by material experts.

$$\begin{aligned} \sum_{n} (\text{answer} \times \text{score each choice}) &= 61 \\ n &= 17 \\ \text{highest score} &= 4 \end{aligned}$$

Then the data above is calculated using the following formula

$$\text{percentage} = \frac{\sum (\text{answer} \times \text{score each choice})}{n \times \text{highest score}} \times 100\%$$

$$\text{Percentage} = \frac{63}{17 \times 4} \times 100\%$$

$$\text{Percentage} = 92,64\%$$

From the above calculation, the percentage of eligibility for multimedia interactive basic context approach is 92.64% by the material expert. After being converted to a scale conversion table, multimedia interactive basic context approach is in the range of 81% to 100%. So placing the position on the criteria is very good.

Comments on expert learning materials (validation of expert judgment of materials) in general, namely the material presented is more adapted to everyday life. Comments and suggestions from learning material experts are taken into consideration for improving the design of multimedia interactive based multimedia interactive media, following up on comments and suggestions from the validator of learning material experts, it is necessary to make revisions to Augmented Reality based multimedia interactive media ). The revision made is by giving contextual problems that are in accordance with students' daily lives. This is results proofed by Novaliendry, D. (2013) with game education basic multimedia interactive can make student at junior high school very interesting to learn geographic

**4.3.2. Media Validation**

Validation by media experts is done so that the media that will be tested is really feasible to be used in research. Development products evaluated by media experts Ika Lecturer of Information Technology at Universitas PGRI Semarang, which is an prezi and kahoot based multimedia interactive using a questionnaire that must be filled out by media experts.

The results of the validation and assessment by media experts for each aspect are presented in the following table.

**Table 2 Result of Media Validation**

No.	Assessment Aspect	Expected Score	Evaluation Score	Feasibility
1.	General Display	24	21	87,5%
2.	Special Display	12	10	83,33%
3.	Media Presentation	16	14	87,5%

The next stage the researcher analyzes the overall results of the assessment by media experts.

$$\begin{aligned} \sum_{n} (\text{answer} \times \text{score each choice}) &= 47 \\ n &= 13 \\ \text{highest score} &= 4 \end{aligned}$$

Then the data above is calculated using the following formula:

$$\text{Percentage} = \frac{\sum (\text{answer} \times \text{score each choice})}{n \times \text{highest score}} \times 100\%$$

$$\text{Percentage} = \frac{47}{13 \times 4} \times 100\%$$

$$\text{Percentage} = 90,38\%$$

From the above calculation, the percentage of eligibility for multimedia interactive basic context approach is 90.38% by media experts. After being converted to a scale conversion table, multimedia interactive basic context approach is in the range of 81% - 100%. So placing the position on the criteria is very good.

Media expert comments (validation of media expert judgment) in general, namely the multimedia interactive basic context approach can be used in high school mathematics learning and the multimedia interactive basic context approach is an interesting product, hopefully, this media can be applied in play store so students can easily download it. Comments and suggestions from media experts are taken into consideration for improving the design of the multimedia interactive basic context approach, following up on the comments and suggestions from the validator of media experts, it is necessary to make revisions to the multimedia interactive basic context approach media. The revision is to manage Android or computer users by registering students who have an Android so that all students can learn to use computer and try this media to be applied later in the Play Store.

## 5. CONCLUSION

The conclusions of this study are (1) Produced computer-based learning media products using kahoot and prezi called multimedia interactive basic context approach in which discussing high school grade X mathematics material, (2) Development of multimedia interactive basic context approach is valid and suitable for use by students. This can be seen from the assessment of material experts, media experts, and student responses where the results are in very good criteria.

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