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## **DEVELOPMENT OF INTERACTIVE MULTIMEDIA BASED MULTIPLE INTELLIGENCE ON THE SOUND WAVES FOR STUDENTS OF CLASS XII SENIOR HIGH SCHOOL**

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### **Abstract**

This study aims to produce interactive multimedia based multiple intelligence on the sound waves for students of class XII High School are valid, practical and know the potential effects of use. The method used is development research by adapting Rowntree development model which consists of several steps: (1) the planning stage; (2) the development stage; and (3) the evaluation stage. Phase evaluation is done by using Tessmer formative evaluation model consisting of five stages, namely: (1) self evaluation; (2) The expert review; (3) one-to-one evaluation; (4) small group; and (5) field test. Data collection techniques used are sheets of expert validation, questionnaire responses and test student learning outcomes. The results showed on the stage of expert reviews on a percentage of average total validator experts of 93.6% to the category of very valid and at the stage of a small group average percentage of 96.78% with a very practical category. The test results on the field test phase obtained N-gain of 0.69 which showed an increase in the potential effects of the use interactive multimedia based multiple intelligences on the sound waves included in the medium category. Based on the results of this study concluded that interactive multimedia based multiple intelligences on the sound waves for students of class XII High School developed have been valid, practical and have a potential effect on improving student learning outcomes.

**Keywords:** development research, multimedia interactif, multiple intelligence, sound waves

### **1. Introduction**

Physics is one of the subjects that exist in secondary education. Physics learn the concepts that are abstract, microscopic and macroscopic. So far, most teachers teach subjects dominated physics lecture method and rarely uses interactive media to involve all the potential and capabilities of the students. The material which is abstract physics course difficult to visualize and display the process before the students directly. Moreover, the facts contained in the

materials physics also not entirely be displayed significantly to the presence of students. For learning physics more interesting and students more easily understand the concept of physics well, it is necessary for innovation in learning physics, namely the integration of information and communication technology in the form of interactive multimedia (Wiyono, 2014).

The use of interactive multimedia facilitate students in learning physics concepts that are abstract and microscopically. This is because the animation in interactive multimedia can present things that are not visible and difficult to imagine (Wiyono, 2013). In addition, the integration of elements such as text, images, animation and video to optimize the role of the senses in the students receive information and transfer it to memory.

One of the causes of the importance of using media in teaching and learning is actually caused by the fact that all human beings are different (Sutijati, 2010). Interactive multimedia that exist today generally provide learning material presentation of physics are the same for each user by assuming that the characteristics of all the users is homogeneous. In fact, every user has different characteristics both in terms of skill level, learning style, background and intelligence. Supposedly an interactive multimedia system can provide learning materials that the difficulty level according to the user's ability and learning how to present the material in accordance with intelligence users. In other words, interactive multimedia system should be able to adapt zoom to a wide variety of user characteristics, so as to have a high learning effectiveness including its intelligence characteristics (Wiyono, 2012).

Humans are gifted by the Creator of the brain that has the dimensions of a complex intelligence, particularly complex in terms of its potential (Hadi, 2006). Only in educational practice in many countries for centuries, including in Indonesia brain potential is not yet developed for the education system prevailing until now only focused on the outside part of the left brain. The left brain play a role in the processing of mathematical logic, words (verbal) and the dominant sequence for learning. While the right brain that deal with the rhythm of the music, pictures and creative imagination had not yet received a

proportionate for developed (Kushartanti, 2004). Optimization of the brain is very necessary considering that the various steps to promote this life, including to improve human welfare required new ideas from the brain are balanced.

## **2. Theoretical Background**

Results of research by experts of accelerated learning and modern learning methods showed that if all the intelligence grown, developed and involved in the learning process, it has the potential of improving the effectiveness of learning and learning outcomes (Gunawan, 2007: 231). Multiple intelligences or commonly referred to as multiple intelligences is some intelligence or talent of the students in solving various problems in learning Azizah (2014) (in Wiyono, 2015). According to Gardner intelligence is divided into eight intelligences such, visual-spatial intelligence, logical-mathematical intelligence, verbal-linguistic intelligence, interpersonal kinesthetic intelligence. Howard Gardner's theory can make learning more interesting and varied for each student will have the opportunity to develop its intelligence (Uno and Mohamad, 2010).

According to Armstrong (1996), the multiple intelligences learning strategy is one way of accessing information over eight lanes of existing intelligence on each student, but to opt back all the intelligence together in a unity that is unique in accordance with needs. So that students are able to solve the problems of learning in an amazing way. With the theory of multiple intelligences, allowing teachers to develop innovative learning strategies are relatively new in the world of education. Nonetheless, there is no set of learning that works effectively for all students. Each student has a certain tendency on the eight intelligences that exist.

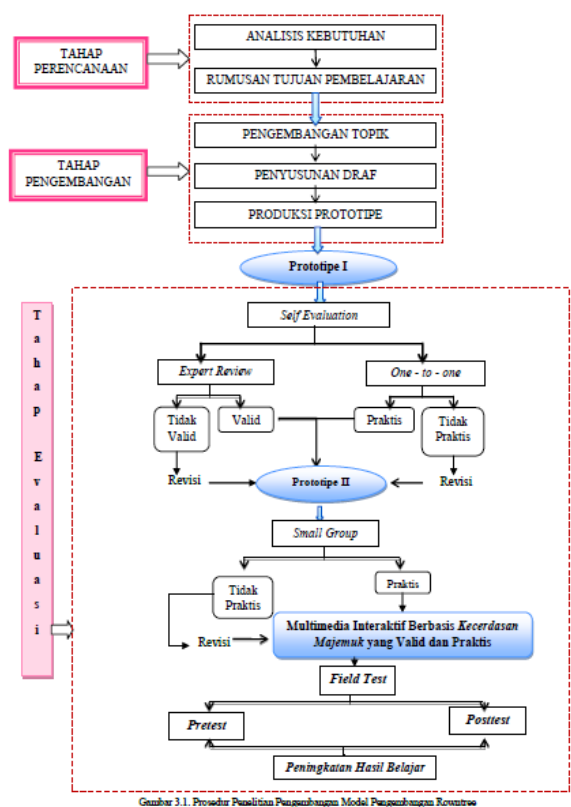
As one form of innovation in learning physics, researchers integrate the teaching of physics, interactive multimedia and multiple intelligences. Selection of multimedia as a learning medium must have the basic considerations, which are based on the analysis of material needs and characteristics of students (Riyana and Susilana, 2007). Based on the syllabus

of subjects Physics 2013 high school curriculum, material sound waves is one of the materials studied in class XII High School. Wittmann (2003) on the research results mention that a sound wave is the material difficult to understand because a lot of misconceptions in understanding equation. Sadoglu research results (2013) also mentioned that students have difficulties in understanding and delivering propagation through the medium of up to keteling listener. Based on the results of the analysis, the researchers chose the material sound waves to be poured into interactive multimedia to help students to more easily understand the material sound waves. As in choosing the type of intelligence that is applied in multimedia are developed, researchers conducted a preliminary study to determine the dominant intelligence XII student of Mathematics and Science in SMA Negeri 1 Banyuasin I were involved in trials of multiple intelligences, with a percentage of 3, include the interpersonal intelligence of 37.5%, logical-mathematical intelligence amounted to 15.63% and the musical intelligence of 14.1%. From these data, the researchers chose two of the three dominant intelligence to be used in the ineteraktif multimedia musical intelligence and mathematical logic. Then both the intelligence will be combined with visual-spatial intelligence and verbal linguistics. Election of the four intelligence is based on the consideration that the material sound waves that are abstract and microscopically there are many things that need to be explained and visualized to students. In addition, there needs new ideas from the brain of a balanced and optimal use of learning by using intelligence left brain and right brain in order to both get a share proportional to be developed in the world of education.

Based on this background, the researchers are interested in developing interactive multimedia based on multiple intelligences (musical intelligence, visual-spatial intelligence, verbal intelligence linguistic and logical-mathematical intelligence) on the material sound waves to class XII High School.

### 3. Method

This study uses Development Research method with the model Rowntree development and use Tessmer evaluation. Flow of this research can be seen in Figure 1:



To obtain the necessary data in this study used data collection techniques as follows :

- 1) To get the validation of expert validation of a questionnaire used sheets and pieces of advice.
- 2) To get the practicality evaluation evaluation of one to one and small group used a questionnaire sheets and pieces of advice.
- 3) To determine the potential effects of products on learning outcomes of students used a field test

Data from the validation results of experts (HVA) in the score and made in percentage then grouped according to the following categories:

**Table 1. Category Expert Validation Results  
(Wiyono, 2015)**

Percentage (%)	Category
$86 \leq HVA \leq 100$	Very Valid
$70 \leq HVA < 86$	Valid
$56 \leq HVA < 70$	Less Valid
$0 \leq HVA < 56$	Invalid

Data from the evaluation of one to one and small group (HEOS) in the score and made in percentage then grouped according to the following categories:

**Table 2. Evaluation Results Category One to One and Small Group  
(Wiyono, 2015)**

Persentase (%)	Kategori
$86 \leq HEOS \leq 100$	Very Practical
$70 \leq HEOS < 86$	Practical
$56 \leq HEOS < 70$	Less Practical
$0 \leq HEOS < 56$	Impractical

To view the N-gain in each group used the following equation:

$$\langle g \rangle = \frac{(\text{skor post test}) - (\text{skor pre test})}{(\text{skor maksimum}) - (\text{skor pre test})}$$

N-gain results obtained will be categorized based on the following Table 3.

**Table 3. Category N-gain (Hake, 1998)**

Category	N-Gain
High	$\langle g \rangle \geq 0,70$
Medium	$0,70 > \langle g \rangle \geq 0,29$
Low	$\langle g \rangle < 0,29$

#### **4. Result and Discussion**

Development of multiple intelligences based interactive multimedia sound wave that the researchers did use Rowntree development model which consists of three stages, namely: (1) the planning stage (planning); (2) the development stage (development); and (3) the evaluation stage (evaluation).

##### **The planning stage**

Based on the analysis of acquired competence syllabus potential to be loaded into multiple intelligences based interactive multimedia which describe the sound wave. Sound waves are abstract enough material to learn and many require explanation visualization to enhance students' understanding, but but the objects on the material sound waves can not or hardly presented directly in the classroom. Therefore, by using interactive multimedia, such objects can be presented directly in front of the students so that learning physics is more meaningful (meaningful learning). Not only that, the development of interactive multimedia in order to achieve the learning objectives established in accordance with the benefits of learning media according to Rusman (2012), which clarify the meaning of learning materials are delivered, so that students better understand and further enable students to achieve the learning objectives well.

##### **The development phase**

From the competence of the selected researchers compiled a derived materials (JM) and Multimedia Content Outline (GBIM) which will be published in multiple intelligences based interactive multimedia sound waves. Before performing multimedia authoring researchers first create a flowchart and storyboard as a guide in making multimedia. In the process of making researchers used a computer program to auto-merge some multimedia aspects that could involve the senses of sight and hearing of students during the learning. This is consistent with that put forward by Asyhar (2011) is a multimedia learning involves the senses of vision and hearing through the

media text, visual silent, visual motion and audio as well as computer-based interactive media and information and communication technology. Researchers use Sothink SWF Quicker application to create interactive multimedia on the material sound waves because Sothink SWF Quicker have a lot of animation effects on text created. At this stage of development, created the first and following prototype is the Main Menu Page Views Interactive Multimedia.

**Figure 2. Main Menu Page Views Interactive Multimedia**



### **Evaluation phase**

Evaluation used is a formative evaluation aims to determine the validity, practicality and potential effects of the use of interactive multimedia sound waves intelligence-based compound. In the evaluation phase consists of:

#### **a) Self Evaluation**

At this stage the researchers checked himself against the prototype 1, a result the researchers found some errors and shortcomings as functions of the navigation keys that are not in accordance with the hyperlink is desired, or a button that does not work, see an opening page that is less attractive, the main page, the choice of music less varied, as well as some text typing wrong. From the findings of researchers to revise that first prototype is ready for validation by experts.

#### **b) Expert Review**

Prototype 1 which has passed the next phase of self evaluation submitted to the validator 3 to be validated. Validator checking, analyzing and



assessing prototypes 1. Then validator gives ratings and comments on the validation sheet that has been provided. Prototype 1 is still to be improved based on the comments and suggestions validator the addition of animation or video examples of objective and close in everyday life. Based on the percentage of votes obtained by the average total validator validator vote was 93.6%. Seen from table 1 that percentage included in the category of very valid. Validation results obtained from the interactive multimedia are as follows:

**Table 4. Validation Results Interactive Multimedia**

Hasil Penilaian Validasi Ahli pada Tahap <i>Expert Review</i>			
Validator ( <i>Expert</i> )	Indikator / Aspek yang Dinilai	Rerata skor	Persentase (%)
1	Aspek Materi ( <i>Content</i> )		
	Kesesuaian materi dengan bidang kurikulum yang terkait	3,1	77,5
	Mengandung informasi yang cukup luas	3	75
	Kemudahan uraian materi untuk dipahami	3	75
	Evaluasi pembelajaran	4	100
	<b>Rerata Aspek Materi (<i>Content</i>)</b>	<b>3,3</b>	<b>82,5</b>
2	Aspek Media ( <i>Lay-Out</i> )		
	Secara visual menarik minat siswa	4	100
	Kejelasan teks yang ditampilkan	4	100
	Kemudahan navigasi	4	100
	Kesesuaian penyajian materi dengan kecerdasan majemuk yang digunakan	4	100
	<b>Rerata Aspek Media (<i>Lay-Out</i>)</b>	<b>4</b>	<b>100</b>
3	Aspek Materi ( <i>Content</i> )		
	Kesesuaian materi dengan bidang kurikulum yang terkait	4	100
	Mengandung informasi yang cukup luas	4	100
	Kemudahan uraian materi untuk dipahami	4	100
	Evaluasi pembelajaran	4	100
	<b>Rerata Aspek Materi (<i>Content</i>)</b>	<b>4</b>	<b>100</b>
	Aspek Media ( <i>Lay-Out</i> )		
	Secara visual menarik minat siswa	3,7	92,5
	Kejelasan teks yang ditampilkan	4	100
	Kemudahan navigasi	3	75
	Kesesuaian penyajian materi dengan kecerdasan majemuk yang digunakan	4	100
	<b>Rerata Aspek Media (<i>Lay-Out</i>)</b>	<b>3,68</b>	<b>91,9</b>
	<b>Rerata Keseluruhan Hasil Penilaian Validasi Ahli pada Tahap <i>Expert Review</i></b>	<b>3,75</b>	<b>93,6</b>

c) One to One

At this stage the first prototype tested on 3 students of class XII Mathematics SMAN 1 Banyuasin I with different abilities that each low, medium and high based on the recommendations provided by the subject teachers of physics who taught in the class. At this stage, students are asked to do a study with a prototype 1. After learning students are asked to complete a questionnaire and provide comments and suggestions to improve the prototype

1. Based on the questionnaires filled out by the students calculated the percentage of the average total judging of students to see the level of practicality prototype 1. from the calculations, the percentage of the average total student judging by 97.69%. Based on the percentage of table is categorized as very practical.

d) Small Group

At this stage the second prototype tested on 9 class XII student of Mathematics SMA Negeri 1 Banyuasin I with details of low student academic ability 3, three students and three students were high based on the recommendation of subject teachers of physics who taught in the class. Students doing the learning, guided by the researcher as if he were in a real learning in the classroom. After the learning process is completed the students were given a questionnaire sheet to be filled by students. Based on the calculation of the value of a questionnaire completed by the students obtained percentage of the average total student responses amounted to 96.78%. The mean overall questionnaire stage one to one and small group was 97.24%. Based on Table 2 shows that the percentage of interactive multimedia intelligence-based compound that researchers have developed a sound wave is very practical. Questionnaire results obtained from the four multimedia interaktif are as follows:

**Table 5. Results Questionnaire Interactive Multimedia**

No.	Nama	Rerata Tanggapan	Persentase (%)
1.	AA	3,92	98
2.	ANF	4	100
3.	AW	4	100
4.	IW	4	100
5.	K.S.N	3,92	98
6.	L.A.W.R	3,31	82,75
7.	RY	3,69	92,25
8.	V.E.P	4	100
9.	YA	4	100
Rerata keseluruhan		3,87	96,78 (Sangat Praktis)

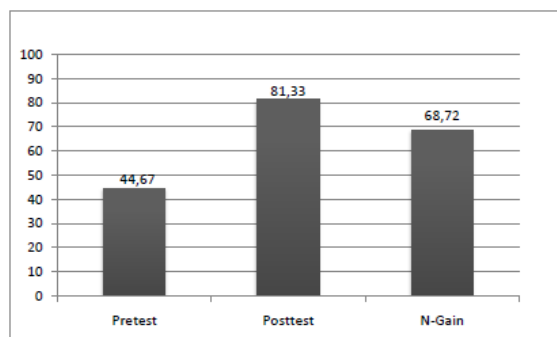
e) Field Test

At this stage based interactive multimedia multiple intelligences sound wave that has been expressed very valid and very practical tested in actual class with the subject of the research students of class XII Mathematics and Science 1 SMAN 1 Banyuasin I totaling 30 students with allocation of 6 hours of lessons (three meetings) including meeting for the initial test and final test. This stage aims to determine the potential effects and responses of students to the interactive multimedia sound waves intelligence-based compound. At the first meeting the students were given an early test. During the learning process students use multiple intelligence based interactive multimedia sound waves that have very valid and very practical and at the end of the meeting students were given a final test to determine student learning outcomes. By looking at the students' learning hail from the value of the initial test and final test score gain normalized sought, obtained by N-gain 0.69 and table 3 based on improving student learning outcomes included in the medium category.

Based on the evaluation the researchers did it can be concluded that the multiple intelligences based interactive multimedia sound waves to class XII SMA expressed very valid and very practical, as well as having the potential effects on student learning outcomes in the medium category.

And field test results as follows:

**Figure 3. Field Test Results**



## **5. Conclusion and Remark**

Based on the research-based interactive multimedia development of multiple intelligences in matter of sound waves to class XII student high school, can put forward some conclusions, namely:

1. Has been successfully developed multiple intelligences based interactive multimedia on the material sound waves are very valid with a percentage of average total 93.6%.
2. Has been successfully developed multiple intelligences based interactive multimedia on the material sound waves are very practical with a percentage of the average total of 96.78%.
3. Has been successfully developed multiple intelligences based interactive multimedia on the material sound waves that have a potential effect on student learning outcomes with N-gain of 0.69 and into the category of medium

### **Advice**

Based on research that has researchers do, then suggestions that researchers provide include:

1. Conduct research-based interactive multimedia development of multiple intelligences to other physical materials,
2. Applying for a computer-based learning materials physics that have a need to be visualized.
3. Taking into account the diversity of intelligence on students in the implementation of the learning process.
4. For developers who will use Sothink SWF Quicker, in order to develop more innovative multimedia product for teaching physics at other material.

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