

## **Development of Articulate Storyline-Based Interactive Media for Grade VIII Middle School Students on Vibrations and Waves**

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### **Abstract**

Vibration and wave material in science subjects has several abstract concepts that make junior high school students' learning motivation low. One way to increase student learning motivation is to develop interactive learning media. This study uses the ADDIE model which consists of the stages of analysis - design - development - implementation - evaluation. The purpose of this research is to produce interactive media based on an Articulate Storyline on vibration and wave material that is valid, feasible, and able to motivate students to learn. The results of the interactive media that have been developed have the following content, namely, a) a description of the concept of vibration and wave material, b) the role of waves in various natural phenomena, c) a mathematical equation of the concept of vibration and waves. Then for the results of the expert validation test, our media was declared very valid with a percentage of 100% by material experts and 95.0% by media experts. Furthermore, from the results of the due diligence, our media obtained very appropriate criteria with a score of 96.2% by students and 98.0% by teachers. Meanwhile, from the results of the student learning motivation questionnaire after learning, our media obtained a percentage of 91.1% in the very good category. Therefore, it can be concluded that the interactive media based on Articulate Storyline that we developed on vibration and wave material for junior high school students is valid, feasible, and able to motivate students to learn.

**Keywords:** *Interactive media; junior high school students; vibrations and waves; and learning motivation.*

## **I. Introduction**

The integrated science subject contains material from three basic areas; physics, biology and chemistry. In line with the demands of the 2013 Curriculum in Indonesia, this science subject must be taught to students at the junior high school level. Based on the results of the research, the level of understanding of junior high school students in science subjects is still low, especially in physics. The reason is that students tend to have difficulty understanding concepts from books in school [1]. This problem is important to solve, because a good understanding of the concept will motivate students to learn more about the material [2].

Science lessons with lots of concepts and a high level of understanding are one of the reasons why students are not interested in science lessons. Physics, in this case, is one of the fields of science that contains many concepts, laws, and theories [3]. Physics concepts that are abstract in nature cause students to have difficulty understanding concepts and tend to get bored during learning. The low understanding of students' concepts is also influenced by the model and learning media used by the teacher [4]. This causes students to just know the material and do not understand the concept.

This was reinforced by the results of interviews conducted by researchers with several science teachers at SMP Negeri 2 Pandaan, East Java Province, Indonesia. The science teacher confirmed that junior high school students often had difficulty understanding physics concepts in science subjects, especially vibration and wave material. This makes the low motivation of student learning in the classroom. The teacher's action in overcoming this problem is by doing demonstrations and practicum. As for learning media, teachers have used several media that are considered appropriate such as PowerPoint, videos, or quizzes. However, students' learning motivation in the material is still not optimal. This is reinforced by the data on student assignments and examination scores which are still below standard, so that many students take part in the remedial. This information convinced researchers to develop appropriate media for vibration and wave material in natural science subjects.

In the 21st century, science is growing rapidly and everything can be managed using technology [5]. There must be a guarantee that every student has the skills to learn and innovate, use technology and information media, as well as readiness, to be able to work and survive using these skills [6]. Technological developments in education have been extensively studied by professional academics in the form of innovative learning media. Innovative learning media can arouse interest in learning, motivate learning, and have a psychological impact on students [7]. Therefore, to achieve better learning goals, it is necessary to develop technology-based learning media [7]. With learning media, teachers can help students understand concepts and motivate students to learn. This is in accordance

with previous research, where the use of media in learning can make it easier for teachers to deliver material in class [7].

Good learning media has three aspects, namely objectives, materials, and evaluation [8]. This important aspect is the basis for making learning media so that students understand the material being taught. Along with technological developments, many learning media are made in digital form and can be stored on computers, tablets and smartphones. Digital media is a combination of various media formats such as text, sound, images and video. Technological features integrated in digital media make this media interactive because it can provide feedback to its users. One of the efforts to generate student learning motivation is to do interesting things in learning, such as visualizing the material explained using interactive media. Interactive media makes learning more fun and motivates students' desire to learn [9]. Motivation is a person's condition to do something with encouragement from oneself or from outside [10]. The more interesting the media used can make students become motivated, interested, and not easily bored in learning.

The solution proposed by the researchers is to create digital learning media that can be accessed by all students and is interactive [11]. The right application to realize this media is the Articulate Storyline application [11]. This application can be run on a smartphone or Personal Computer (PC) with a light size. In addition, the Articulate Storyline application makes it easy for users to design interactive media, because in its manufacture it does not require programming and coding processes. Other advantages of the Articulate Storyline application are: (1) the application design is practical and easy to use, (2) the application features can be adapted to the developer's storyboard, (3) the application extension can be run on various platforms. Powerpoint, video, and quiz features as previously used by teachers are also available in this application. To support interactive activities such as simulation features, layer recording, drag-and-drop interactions, prev-and-next, and others, facilitating interaction between teachers and students in their implementation. This is in accordance with the results of previous research, where the Articulate Storyline application can be used in making objects from a material and can be presented interactively [12]. The Articulate Storyline application is a type of application specifically designed to simplify and package material in learning [13]. Because when the Articulate Storyline is used as a learning medium, students are directly involved and become active in learning activities. The Articulate Storyline application is also proven to facilitate teachers in learning so that it becomes more interesting and fosters student learning interest [14]. Therefore, this application is very appropriate to be developed by teachers and used in learning activities.

Based on the problems above, it is necessary to develop interactive media based on Articulate Storyline for junior high school students on vibration and waves. Although in previous research the Articulate Storyline application has been used, the use of this application as an interactive medium on

vibration and wave material has never been done. Therefore, this media is expected to provide a positive response from students' learning motivation so that their understanding of concepts also becomes better. In addition, this application is also expected to be an effective tool for teachers to support learning activities, so students can easily understand vibration and wave material. The purpose of this study is to produce interactive media based on Articulate Storyline on vibrations and waves that are valid, feasible, and able to motivate students to learn.

## II. Method

The type of research used is research and development following the ADDIE model. This model was chosen because it fits the interactive media being developed and is a special model for developing a media [15]. This model is also called the procedural model because it has systematically arranged steps. The steps in the ADDIE model consist of five stages which can be seen in Figure 1. The advantage of using the ADDIE model is that at each step an evaluation is carried out to improve each development step that has been carried out [15]. Evaluation in this case is intended to improve the quality of the interactive media developed. The steps for developing interactive media with the ADDIE model are presented in Table 1 below.

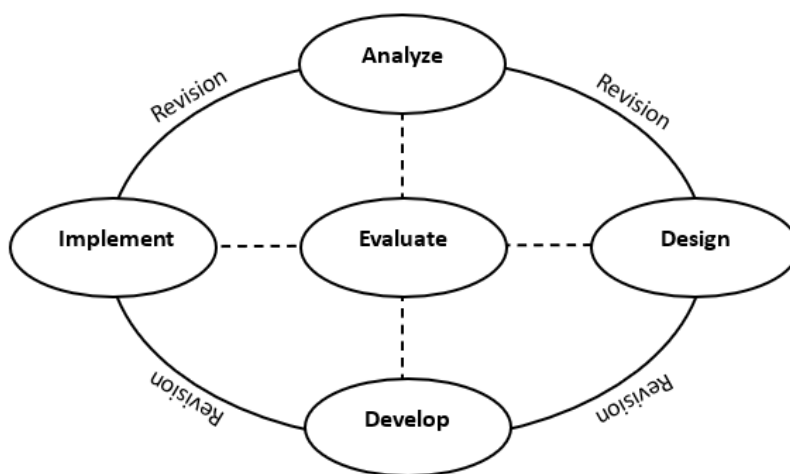


Figure 1. Product development steps with the ADDIE model by Ref [16]

As for measuring student learning motivation, a questionnaire was prepared consisting of seven questions related to student motivation for the material and media developed. Indicators of student learning motivation can be seen in Table 2. The measurement scale in the material validation questionnaire, media, and readability uses the Likert scale in Table 3. Meanwhile, the learning motivation questionnaire uses a scale of 1 and 0 as in Table 4. The validation of concept truth as part of material validation also uses the Guttman scale in Table 4.

Tabel 1.

## Interactive media development steps details

<b>Steps</b>	<b>Action</b>	<b>Data collection technique</b>	<b>Subject</b>
Analyze	Doing a needs analysis	Interview sheet and needs analysis questionnaire	1 science teacher at Junior High School No. 2 Pandaan, East Java, Indonesia
Design	1. Drafting designs and materials	-	-
	2. Preparing material expert and media expert validation instruments	-	-
Development	1. Developing products through Articulate Storyline software	-	-
	2. Performing validation tests	Material validation questionnaire  Media validation questionnaire	1 Physics lecturer, alumni of the University of Adelaide  1 Science lecturer, alumni of the Brawijaya University
Implementation	1. Performing a readability test	Readability test questionnaire	2 science teachers from Junior High School No. 2 Pandaan, East Java, Indonesia
	2. Testing students' learning motivation on the concepts and media used	Questionnaire of student learning motivation on the concepts and media used	35 students of Class VIII at Junior High School No. 2 Pandaan, East Java, Indonesia
Evaluation	Make revisions based on suggestions and input from research subjects by correcting the deficiencies that exist at each step	-	-

Quantitative data calculations from the results of all the questionnaires are presented in percentage form, where the score obtained is divided by the maximum score multiplied by 100%. After getting the percentage, the data is then analyzed based on the criteria in Table 5. Interactive media can be used in learning if it gets a percentage of validation and readability results of more than 70% [17]. If the score obtained is less than that, then the indicator is revised.

Tabel 2.

Indicators of Student Learning Motivation adapted by Ref [18], [19]

No.	Indicators	Description
1.	Attention	Curiosity and Student interest
2.	Relevance	Relevance of learning media with learning objectives and student needs
3.	Confidence	Confident in understanding the material and doing the evaluation
4.	Satisfaction	Satisfaction in understanding the material

Tabel 3.

Likert Scale Assessment Criteria [20]

Score	Criteria
1	Strongly disagree/ very unfavorable/ very unattractive
2	Disagree/ less good/ less attractive
3	Agree/ good/ interesting
4	Strongly agree/ very good/ very interesting

Tabel 4.

Guttman Scale Assessment Criteria [21]

Score	The Truth of Concept
1	True or Agree
0	Wrong or Disagree

Tabel 5.

Product criteria based on the percentage range obtained [17]

The range of Percentages	Criteria
85.01% - 100.00%	Very decent/ Excellent
70.01% - 85.00%	Decent/ Good
50.01% - 70.00%	Decent Enough/ Good Enough
01.00% - 50.00%	Less Decent / Less Good

### III. Results and Discussion

The media that we have developed is in the form of interactive applications that are compiled using our national language, namely Indonesian. When opening the application, the user will enter the initial appearance of the application as shown in Figure 2(a). The initial appearance of the application contains a login page by entering the student's name and school name. In addition, there are instructions or how to use the application. If you have selected save and continue, the application page will enter the menu page as shown in Figure 2(b). This menu section contains competency buttons, materials, practice questions, and evaluation. The contents of each of these pages are shown sequentially in

Figures 2(c), 2(d), 2(e), and 2(f). In Figure 2(c), the competency page contains the basic competencies students must achieve, indicators of achieving basic competencies, and learning objectives. In Figure 2(d), the material page contains a choice of material to be studied, namely vibrations and waves. Each material begins with learning affirmations which are added with animations and supporting pictures. Important affirmations are given to motivate students and overcome students' boredom in learning [22]. Furthermore, each material discusses the following, namely the understanding of vibrations and waves, concepts, laws, practicum, sample questions, summaries, and practice questions. In Figure 2(e), the practice questions page contains instructions for working on the questions and variations on the types of questions for the vibration and wave material that has been made. The types of questions consist of matching questions, multiple choice questions, and true-false questions. Finally, in Figure 2(f), the evaluation page contains 20 multiple choice questions.



Figure 2. The results of the development of interactive media made in Indonesian

The interactive media that has been made is then tested for validation. We present the results of the media expert's validation in table 6. The total score obtained from the media expert is 95.0% with very

decent criteria. Media experts state that interactive media has been made very attractive so that it can make students not lose their motivation or desire to learn. Then the presence of animated displays such as transverse and longitudinal waves on this interactive media makes it easy for students to imagine their application in everyday life. This interactive media describes the concepts of the material. First, this media provides material explanations about how waves behave and how they play a role in various natural phenomena, such as the occurrence of lightning and sea waves. Second, this media provides a mathematical explanation of the concepts of vibration and waves.

Tabel 6.

Quantitative data from media expert validation results

No	Indicators	Average value (%)	Criteria
1	Application View	98.2	Excellent
2	Application Operation	89.3	Excellent
3	The material presented	92.5	Excellent
4	Application Benefits	100.0	Excellent
	Total average	95.0%	Excellent

Easy and straightforward application operation will make it easier for students to use the application. Based on the data in Table 6, the operation of the application gets an average of 89.3% with very decent criteria. How to make it easier for students to know the buttons on the application, a guide for using the application on the learning media that has been developed is made. The material presented in interactive learning media gets an average score of 92.5% with very decent criteria. Learning media cannot be separated from the material presented, with an assessment of the material presented it can make it easier for developers to make learning media. Making learning media must have intended benefits such as making it easier to convey messages or subject matter to students. The average benefit of the application is 100% with very feasible criteria, with the results of these criteria, the learning media that has been developed are feasible and ready to use.

Based on the qualitative results of media expert validation data, on the use of language, application appearance, application operation, the material presented, and application benefits in the form of suggestions and comments. The validator provides suggestions and comments in the form of displaying the title in the initial display in Fig. 3(a) and 3(b), application operation, accuracy of background selection in Fig. 3(c) and 3(d), lack of focus formula and suitability of the questions on competence in analyzing Fig. 3(e) and 3(f) so revisions must be made for improvement so that learning media can be used in the learning process according to Figures 3.



Figure 3. Results of Revision of Interactive Learning Media

Tabel 7.

Quantitative Data from Material Expert Validation Results

No.	Indicators	Average value (%)	Criteria
1	Language Use	100	Excellent
2	Vibration Material	100	Excellent
3	Wave Material	100	Excellent

The material expert validator assesses the correctness of the concept in the media that has been developed, the quantitative data from the results of validating the correctness of the concept can be seen in Table 7. Quantitative data from the results of truth validation by a Physics Education Lecturer with a PhD degree at the University of Adelaide Australia in the field of physics as a material expert. In Table 8 it can be seen that the results of the material validation have an average percentage of 100% with very decent criteria. The existence of criteria for using language is to assess whether the language used in the media is good, correct, and easily understood by students. If the use of language is not good and not correct, it can make students not understand and can create misconceptions about the material

being read by these students. Based on the qualitative results of the validation results by material experts on learning media that have been developed, suggestions and comments from the validator are only in the form of typo justification on words.

Tabel 8.

Quantitative Data on Readability by Science Teachers

No.	Indicators	Teacher 1		Teacher 2	
		Value (%)	Criteria	Value (%)	Criteria
1	Language use	95.8	Excellent	100	Excellent
2	Application view	96.2	Excellent	100	Excellent
3	Application operation	96.4	Excellent	96.4	Excellent
4	The material presented	97.7	Excellent	97.7	Excellent
5	Application benefits	100	Excellent	100	Excellent
	Average	97.2%	Excellent	98.8%	Excellent

Based on Table 8, the quantitative data on readability by one science teacher at SMP Negeri 2 Pandaan obtained a total average of 98.0% with very decent criteria. Aspects assessed on practicality by the teacher consist of the use of language, application display, application operation, material presented, and application benefits. The results of the readability test can be seen between teacher 1 and teacher 2, with detailed averages of 97.2% and 98.8% respectively, meaning that this media is very feasible to use. Based on the qualitative results of the readability by the teacher on the learning media that has been developed, suggestions and comments are given in the form of using easy-to-understand language, the application can be used properly, the material is appropriate, and the application can be used by students as a learning support.

Tabel 9.

Quantitative Data on Readability by Students

No.	Indicators	Average value (%)	Criteria
1	Application view	99.5	Excellent
2	Application operation	93.0	Excellent
3	The material presented	94.9	Excellent
4	Application benefits	98.7	Excellent
	Total average	96.2	Excellent

Based on Table 9, a total average of 96.2% is obtained with very decent criteria from the readability test results of 35 students. In accordance with previous research which stated that the development of media using Articulate Storyline 3 can produce valid and very feasible media with an average score of 4.54, a very feasible category of a maximum score of 5.00. [23]. Based on the qualitative results of

data readability by students, on learning media that has been developed suggestions and comments are given in the form of applications that help in the learning process, the animations used help to understand the material, and increase the desire to learn. This interactive learning media is equipped with questions and experimental activities so that it can facilitate students' conceptual understanding of vibration and wave material.

The developed media has drawbacks such as students can only see waves in two dimensions and if the smartphone does not support the application cannot be opened, but if you are using a PC you can open it using HTML 5 format. In addition, practicums using PhET Interactive Simulations can only be accessed if user connected to the internet. But the advantages of this media are that the material is explained briefly, there is a summary of the material, practice questions for each chapter, pictures to visualize, practice using PhET Interactive Simulations and it's easier to find material.

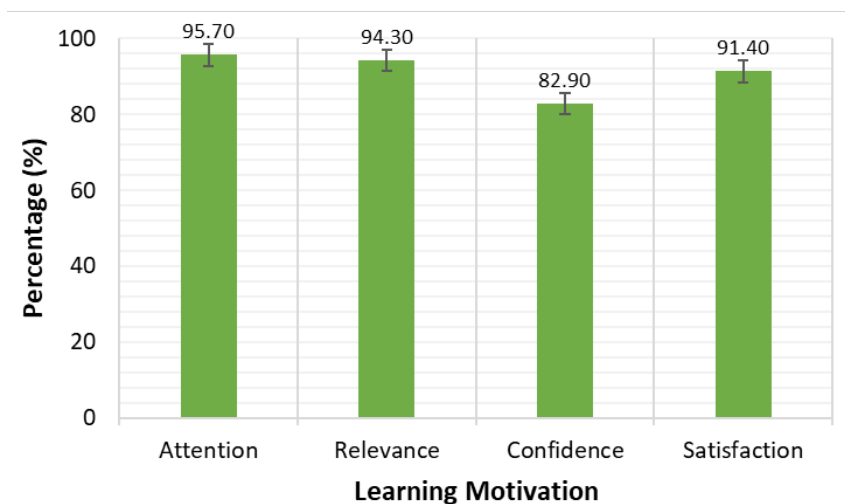


Figure 4. Quantitative Data on Student Learning Motivation Questionnaire Results

Interactive application learning media based on Articulate Storyline can have the potential to facilitate students' understanding of concepts in vibration and wave material through the materials presented and the questions that have been provided. Starting from sample questions, practice questions for each material to evaluation questions. Students become more active and responsive in answering questions without having to be pointed at and do the assignments correctly [24]. Learning activities using learning media can facilitate students' understanding of concepts and increase student learning motivation. Students are more easily interested in electronic media such as smartphones, laptops and computers because students are currently growing up with electronic items around them.

The results of the data on students' learning motivation in Figure 4 obtained the average percentage value of students' learning motivation in the presence of this learning media of 91.1% with a success

rate including the very good category. The percentage of student learning motivation in each indicator is: 1) Attention is 95.7% in the very good category, 2) Relevance is 94.3% in the very good category, 3) Confidence is 82.9 in the good category, and 4) Satisfaction is 91.4%.

Increased student learning motivation helps in understanding the material presented, if learning uses a media students can understand the abstract concepts contained in the subject. In accordance with previous research which states that motivation is the driving force in carrying out certain activities to achieve a goal [25]. Interactive application learning media can be used on each student's smartphone and is very helpful in increasing learning motivation [26]. Physics lessons are not rote subjects, but are more directed at students' abilities in understanding concepts and applying the material concepts [27]. The output of this learning media is in the form of an application that can be downloaded via a smartphone and HTML 5 which can also be opened via a PC. Media Articulate Storyline is software that functions as a media presentation as well as communication. This learning media is no less interesting than other interactive media [28]. Learning using the media that has been developed will be more effective and flexible, meaning that students are able to study anywhere and the teacher can give assignments contained in the application. The higher the student's learning motivation, the easier it will be for students to understand the material being studied.

Based on the results of the research and discussion above, it can be concluded that interactive learning media in the science subject subject to vibration and waves can be concluded to be very suitable for use in the learning process at SMP Negeri 2 Pandaan, according to the assessment of one media expert, one material expert, and two teachers and 35 grade VIII students of SMP Negeri 2 Pandaan, each giving a score of 95.0% from media experts, 100% from material experts, 98.0% from teachers, and 96.2% from SMP Negeri 2 Pandaan students. The score above can be categorized as very feasible. So that this media can and is very appropriate to be used in helping the learning process of science subjects on wave vibration material at Pandaan 2 Public Middle School. Learning using interactive learning media makes students active and helps teachers in the process of learning and teaching activities such as conveying material, motivating students, and helping to understand the concepts of learning material. Interactive learning media also has the potential to help facilitate students' understanding of concepts with explanations of material and pictures and even moving animations.

Our learning media is using Articulate Storyline software because it is rarely used by teachers. It friendly used in research compared to other media based on Adobe Flash and PowerPoint. Because this media is similar to PowerPoint, it is easier to use. In addition, this media offers features that are not found in PowerPoint, such as trigger buttons, characters, and publications in various formats for e-learning platform output types, both online and offline, one of which is a web-based HTML 5 site and

application. Thus, the learning media is seen as a physical tool used by teachers to convey messages to students and stimulate learning.

#### IV. Conclusion

Based on the validation results above, the development of learning media on vibration and wave material has been declared valid by material experts and media experts with 100% and 95.0% respectively with very feasible criteria. This study shows that the developed learning media helps students understand concepts and increases learning motivation with the results of the student learning motivation questionnaire percentage of 91.1% and the student readability test results of 96.2%. Learning media facilitate teachers in the learning and teaching process in delivering material, understanding concepts, and motivating students with teacher readability test results of 98%.

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