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Development of Learning Videos on Vibration, Waves, and Sounds Material at Junior High Schools based on Local Wisdom of Gamelan Lumajang

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Abstract

One of the local wisdoms in Lumajang, East Java, Indonesia, namely the Gamelan musical instrument used to accompany Lumajang's typical performances such as Jaran Kencak, Jaran Slining, Ludruk, and so on, has a similar context with junior high school science material, namely Vibrations, Waves, and Sound. Therefore, a learning video for Vibrations, Waves, and Sound based on Lumajang's local wisdom was developed to introduce Lumajang culture to students. The objectives of this study are to describe (1) the validity of and (2) students' responses to the learning video on Vibrations, Waves, and Sound based on the local wisdom of Gamelan Lumajang. This study applies the 4-D development model (Define, Design, Develop, and Disseminate), where the dissemination stage is not executed. The learning video was validated by three experts (material expert, media expert, and teacher as a practitioner) and responded to by 36 junior high school students from the Lumajang district. The video is 31 minutes long, was created with Wondershare Filmora, and was uploaded via YouTube. The results showed that (1) This video met the criteria for material assessment, media assessment, and practicality assessment of 95%, 95%, and 91%, respectively, so it was declared very valid. (2) Descriptions of student responses to the learning video have been explained as a pie chart with the most comments, including engaging, making learning more manageable, and adding insight into Lumajang local wisdom.

INTRODUCTION

Indonesia is the largest archipelagic country in the world, with diverse cultures originating from various ethnic groups, religions, races, and languages [1], [2]. According to Pesurnay, culture is a form of self-expression, communal identity, and the expression of local wisdom, a distinctive character [3]. Local wisdom is the view of the life of a community in a specific area regarding the natural environment in which they live. Local wisdom is a powerful cultural identity in society because it comes from values that have existed since ancient times. Local wisdom is found in regional culture, life mottos, literary works, symbols, regulations, and traditions [4].

Natural sciences (IPA) are subjects that discuss nature and its applications in everyday life. Natural science material will be much easier to understand if the learning is linked to the surrounding environment, such as its application to local activities [5], [6]. Rusilowati *et al.* explained that many objects of local wisdom have the same content and context as science material so that these objects

can be discussed in science learning [7]. However, discussions about the relationship between objects of local wisdom and IPA materials are often ignored in the classroom [8].

A preliminary study conducted by the author in one of the public junior high schools in Lumajang, East Java, Indonesia, reported that in IPA learning, the teachers had never integrated the discussion of objects and values of local wisdom with IPA material. In addition, students expect a more varied, creative, and exciting learning mode, especially one that makes students better understand examples of IPA applications on objects of local wisdom. Preliminary studies also found that selecting inappropriate learning methods and media impacted decreasing student learning outcomes, as supported by various studies [9]–[11]. In addition, the lack of variation in learning and the use of instructional media causes a decrease in students' interest in IPA lessons.

The preliminary study focused on one of the IPA materials related to local wisdom objects, more precisely, in traditional musical instruments. The science material is Vibration, Wave, and Sound [12]. Marlina *et al.* reported that Vibration, Wave, and Sound materials are relatively complex for students [13]. Kurnia *et al.* and Hartina reported that students' scores on this material were low and under the minimum completeness criteria[14], [15]. The author also found the same findings during the study introduction in one of the public junior high schools in Lumajang. Thus, two opportunities can be highlighted in this preliminary study: The first is the need to present a more accessible and more interesting natural science lesson on Vibration, Waves, and Sounds, and the second is the need to introduce Lumajang local wisdom through discussions about the application of Vibration, Waves, and Sounds on traditional Lumajang musical instruments.

Based on these issues, the effort that can be made is to develop relevant learning media. One of the recommended learning media to explain the relevance of Vibration, Waves, and Sound materials with traditional musical instruments is learning videos. The advantage of learning videos is that they can be captured and distributed easily through the www.youtube.com page and played repeatedly. In addition, several studies report that using well-designed learning videos makes it easier for students to understand the material [16]–[18]. Students who tend to learn visually, learning videos will be able to maintain long-term memory [19]. In addition, using learning videos also has several benefits, such as developing the student's thoughts and opinions, expanding students' imaginations, motivating students' interests, and improving the quality of learning [20]–[23].

In this study, the application selected as *the platform* for making learning videos was *Wondershare Filmora*. These applications often involve developing teaching products, such as integrated learning media, thematic learning, learning videos, audio-visual learning media, instructional videos, and animation videos [24]–[29]. *The Wondershare Filmora* application also has many advantages, including being lightweight, being used on laptops with low specifications, being very easy to operate, and being equipped with various exciting effects and features [30], [31].

The traditional musical instrument introduced through the learning video is the Lumajang Gamelan. Gamelan Lumajang is one of Lumajang's typical musical instruments that accompanies some typical arts, such as *Jaran Kencak* and *Jaran Slining* [32]. The author chose the discussion about Gamelan Lumajang as an example of the application of integrating IPA material with local wisdom because the features of Gamelan Lumajang match the things discussed in the Vibration, Wave, and Sound material, such as vibration components, longitudinal waves, and their propagation, loud and weak voice, organ pipe, timbre/tone of voice, scale, and resonance. Through this learning video, junior high school students in Lumajang can learn IPA material and get to know their own culture.

Previous research on the development of local wisdom-based learning media has been widely carried out and has been shown to improve the quality of learning. Choirudin *et al.* used the *Prezi* application to develop learning media on Social Arithmetic material based on local wisdom [33]. Furthermore, Sari *et al.* developed a physics comic based on local wisdom of the traditional *Engklek* game on Impulse and Momentum material. The development of learning videos on Prism material based on Palembang's local wisdom has been reported [34]. However, the development of learning videos on Vibration, Waves, and Sound materials based on the local wisdom of Gamelan Lumajang using the *Wondershare Filmora* application has never been documented.

Based on the description above, it is understandable that this research has a novelty, namely how to describe the video learning material for Vibration, Waves, and Sounds at the junior high school

level, based on the local wisdom of Gamelan Lumajang. In detail, the research objectives achieved are 1) validity and 2) student responses to the result of the development.

METHOD

This research is included in the category of Research and Development (R & D). The research location is at SMPN 2 Lumajang, East Java, Indonesia. The research subjects included two experts/lecturers (1 material expert validator and 1 media expert validator), a physics teacher, and 36 class VIII SMPN 2 Lumajang students. The stage chosen was the 4D model (Define, Design, Development, and Dissemination) that was adapted from Thiagarajan (1974), with the Disseminate stage not being carried out because it focused on producing products aimed at only one educational institution and not widely distributed [35].

The initial procedure in this research is defined, and the activities carried out include front-end analysis, student analysis, task analysis, concept analysis, and goal specification. The next phase is the design. In this stage, designing a learning video based on the local wisdom of Gamelan Lumajang occurs using the *Wondeshare Filmora* application. The last stage is the development stage. At this stage, validators (expert appraisal) and user responses (developmental testing) assess the learning videos developed. The student response test in this study was limited to a small group of 6 students and a large scale of 30 students. The research flow of the 4D model is shown in Figure 1.

This study uses research instruments such as validation questionnaires and student response questionnaires. The questionnaire is in the form of a checklist with scoring on each aspect of The Likert Scale, including excellent (score 5), good (score 4), fair (score 3), less (score 2), and very poor (score 1). In addition to the assessment in the form of scores, there are suggestions and comments from the validators. Assessment and indicators aspects of validation questionnaires and student responses are shown in Tables 1, 2, 3, and 4.

The data obtained in the research are qualitative data and quantitative data. Qualitative data comes from comments, criticisms, and suggestions from material experts, media experts, natural science teachers, and students, both written and unwritten. Quantitative data were obtained from expert validation scores and student response questionnaires. Quantitative data is used to determine the feasibility of learning video media based on local wisdom. To determine the percentage of validation scores of material experts, media experts, natural science teachers, and student responses, the author uses Equation (1) [36]:

$$V_{\mathrm{a}} = \frac{T_{se}}{T_{sh}} \times 100\% \quad (1)$$

Keterangan:
V_a: Expert/Audience Validation (Percentage Value)
T_a: Total empirical score
T_{sh}: Maximum expected total score

The criteria for assessing the validity and responses of students regarding the development of learning videos on Vibration, Waves, and Sound materials based on the local wisdom of Gamelan Lumajang are shown in Tables 5 and 6.

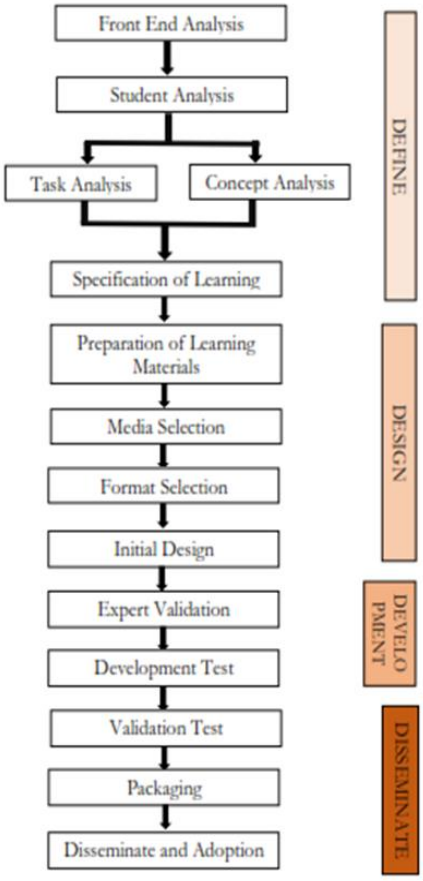

Figure 1. 4D Model Flow (Thiagrajan)

Table 1. Instrument of Material Expert Validation

Assessment Aspect	Indicator
Content eligibility	The suitability of the material with essential competencies, indicators, learning objectives, and the materials are complete, clear, and engaging.
The material description is easy to understand	Systematics are easy to understand, and the material is explicit and exciting, with examples.
Linkage of materials with local wisdom	Materials and local wisdom are interrelated, encourage students' curiosity about the Lumajang Gamelan, and help students to understand the material of vibration, waves, and Sound.
Language	Precise and easy-to-understand

Table 2. Instrument of Media Expert Validation

Assessment Aspect	Indicator
Visual	The background colour matches the letters and symbols, and there is a combination of learning media (text, images, animation, and video) and an attractive display (consistent, reasonable, and up-to-date)
Animation	Easy to understand and consistent, the letters' type, size, and colour are correct.
Teks	The text is clear and not too dense, and the font, size, and colour are correct.
Local Wisdom	Increase students' knowledge about the local wisdom of Gamelan Lumajang.
Audio	The dubbing Sound is clear, and the sound effects are appropriate.
Language	Easy to understand, effective, and communicative

Table 3. Instrument of Natural Science Teacher Validation

Assessment Aspect	Indicator
Content eligibility	The suitability of the material with essential competencies, indicators, learning objectives, and the materials are complete, clear, and engaging.
Visual and audio	There is a combination of learning media (text, images, animation, video) and engaging.
Linkage of materials with local wisdom	Adding insight and encouraging students' curiosity about the local wisdom of the Lumajang Gamelan and helping students understand the material of vibration, waves, and sounds.
Language	Easy to understand

Table 4. Instrument of Student Respons

Assessment Aspect	Indicator
Content eligibility	The learning videos (animations, designs, pictures, materials) are exciting, and the language used is easy to understand
Visual and audio	Attractive visuals: the dubbing Sound is clear, and the sound effects are appropriate
Local wisdom	Encouraging students' curiosity about the Lumajang Gamelan, and students easily understand the subject matter.
Benefit	Increase students' motivation in learning the material and help students understand the material.

Table 5. Learning Video Validation Criteria

Score	Validation Level
85,01%-100,00%	Very valid or can be used without revision
70,01%-85,00%	It is reasonably valid or usable but needs minor revision.
50,01%-70,00%	It is not valid; it is recommended not to be used because it needs a significant revision.
01,00%-50,00%	Invalid, or should not be used

Table 6. Criteria for Withdrawal of Student Response Results

Score	Attractiveness Criteria
81% - 100%	Very High
61% - 80%	High
41% - 60%	Fair
21% - 40%	Low
0% - 20%	Very Low

RESULT AND DISCUSSION

The development of learning videos on Vibration, Waves, and Sound materials for junior high school students based on local wisdom Gamelan Lumajang has the following description:

Define

At the define stage, a needs analysis is carried out, including front-end analysis, student analysis, task analysis, concept analysis, and goal specification. In the front-end analysis, interviews with natural science teachers were conducted. The result of the analysis indicates that (1) The learning method that is more often applied is in the form of lectures, (2) The use of media such as videos from *YouTube* is rarely used, and (3) The discussion of natural science material related to local wisdom objects has never been done.

Student analysis was conducted based on the questionnaires collected from 61 class VIII students. Based on the needs analysis, it is known that (1) 84% of students feel more motivated in learning if the teacher uses engaging learning media, and (2) 87% of students admit that Vibration,

Waves, and Sounds are classified as complex materials. As stated by Hariapsari *et al.,* Vibration, Waves, and Sound are closely related to everyday life [37]. Therefore, to facilitate the delivery of learning materials, it should be linked to daily applications, especially learning that has the opportunity to introduce local culture. The recommendations obtained at this stage are the need to develop learning videos.

Task analysis is carried out by detailing the material's content to be delivered in the learning video. The analysis results are in the form of an outline of the content of the material required in learning following The Core Competencies (KI) and Basic Competencies (KD). The concept analysis indicates the results of The Core Competence and Basic Competence analysis used to develop learning videos that connect Vibration, Waves, and Sound materials to The Gamelan Lumajang musical instruments. The results of the analysis are detailed as follows: (1) The magnitude of the vibration is associated with the source of vibration on the Lumajang Gamelan musical instrument; (2) The sound waves that radiate from the Lumajang Gamelan musical instrument to the ears are longitudinal; (3) The frequency, period, and speed of wave propagation associated with the materials of the Lumajang Gamelan musical instrument; (4) Sound characteristics (loud-weak, high-low, tone formation, timbre, and resonance) associated with the Lumajang Gamelan musical instrument.

The goal specification is done by adjusting the indicators based on Core Competencies (KI) and Basic Competencies (KD). Learning objectives on Vibration, Waves and Sound materials include: through video learning (1) Students can explain the meaning of vibration correctly, (2) Students can identify the relationship between frequency and vibration correctly, (3) Students can explain the meaning of waves correctly, (4) Students can explain the characteristics of transverse waves and longitudinal waves correctly, (5) Students can explain the relationship between wavelength, frequency, speed of propagation, and wave period correctly, (6) Students can explain the meaning of Sound correctly, and (7) Students can explain the characteristics of Sound correctly.

Design

At the design stage, learning videos on Vibration, Waves, and Sound materials based on Lumajang Gamelan local wisdom are made using *The Wondeshare Filmora* application. In addition, supporting applications such as *Canva* (to design the background) and *Adobe After Effects CC* (to remove the background) are used. Finally, a learning video product was obtained with MKV format, 32.26 minutes duration, 720p HD quality, file size 135.02 MB, and made in Indonesian. The video is uploaded on the page https://youtu.be/Ffy4IPVpq7U. Product descriptions are shown in Table 6.

Development

At this stage, an assessment process is carried out on the developed media. The results of the quantitative assessment are shown in Figure 2. In Figure 2., the results of material validation obtained a score of 62 with a percentage of 95% (very valid). In addition, the material expert validator suggested that (1) the hand animation (for the learning objectives) be adjusted to the voice of the researcher, and (2) in the title of the vibration period, the font size was increased even more. According to the material expert validator, the learning video developed has the advantage that this media can combine explanations about traditional musical instruments with Vibration, Waves, and Sounds. According to Fauzi *et al.,* of course, this will make students better understand the subject matter [38]

Table 7. Product Display

No.	Screenshot	Description
1.	 	An explanation of the vibrations emanating from the gamelan musical instrument being played. The vibrations vibrate

No.	Screenshot	Description
		The air propagates as longitudinal waves toward the eardrum.
2.		An explanation of the high-low notes associated with the characteristics of the Lumajang Gamelan instrument. For example, The difference in tone in *Saron* and *Peking*.
3.		An explanation of The Resonance Room on the Lumajang Gamelan musical instrument. For example, The Resonance Room in *Kentongan, Gong, Kenong,* and *Peking* is under the instrument.

The results of the media expert's assessment, as shown in Figure 2, show that the total score is 62 with a percentage of 95% (very valid). In addition, the media expert validator suggested that the front page of the media be added to the identity (university logo and developer name) and the learning objectives to adjust the ABCD format (Audience, Behavior, Condition, and Degree). The media expert validator explained that the advantage of this learning video is that the local wisdom of the Lumajang Gamelan presented has been linked to the subject matter. Students get to know the richness of their own culture [39].

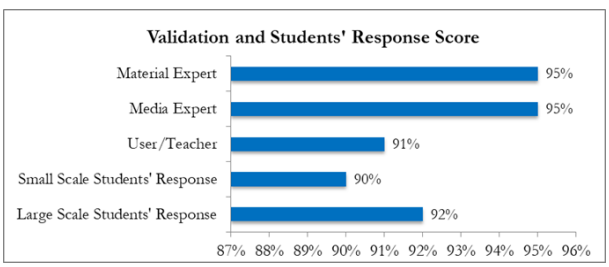

Figure 2. Validation and Students' Response Score

The results of the science teacher assessment in Figure 2. show that the total score obtained is 59 at a percentage of 91% (very valid). The product developed is very interesting because the developed media has linked the material with everyday life (local wisdom). The integrated learning media approach to local wisdom also has a positive value because it can bring science closer to culture. In addition, the IPA teacher suggested that the developer's name be placed in the upper right corner.

The success of the validity test results and student responses in developing this product is in line with Rusilowati *et al.*, who reported that the development of teaching materials on the material of vibration, waves, and Sound based on *Bundengan's* ethnoscience was declared to be very valid and able to improve students' scientific literacy [7]. Wati *et al.* also successfully developed a physics module on Vibration, Waves, and Sound based on *Madihin* culture with valid, practical, moderate effectiveness, and feasible criteria for use [40].

Furthermore, the results of product trials on a small and large scale are shown in Figure 1. Six students of class VIII A carried out small-scale trials with high, medium, and low ability criteria. The score for the small-scale trial was 352, with a percentage of 90.25% (exciting). At the same time, the large-scale trial was carried out by 30 students in class VIII A with the criteria of students with high, medium, and low ability. The score for the large-scale trial was 1860, with a percentage of 92.3% (exciting).

The learning videos developed have advantages and disadvantages. Figure 3. shows data in the form of student responses to the advantages and disadvantages of learning videos on Vibration, Waves, and Sounds for junior high school students based on the local wisdom of Gamelan Lumajang.

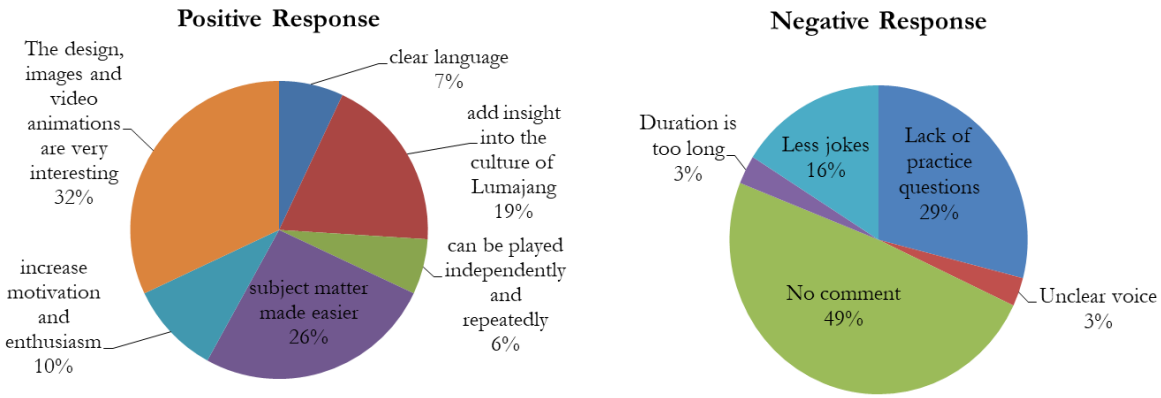

Figure 3. Student Comments on The Positive and Negative Sides of Learning Videos on Vibration, Waves, and Sound material at Junior High Schools based on The Local Wisdom of Gamelan Lumajang

Figure 3 shows that the learning videos developed have the most positive sides, including very interesting designs, pictures, and animations, making it easier for students to understand the material and broaden their knowledge about Lumajang culture. In addition, this learning video also has a negative side, one of which is the lack of practice questions.

CONCLUSION

This study has successfully developed a product in the form of learning videos on Vibration, Waves, and Sound materials based on the local wisdom of Gamelan Lumajang at SMPN 2 Lumajang. The results of material expert validation obtained an average score of 95% (very valid), the results of media expert validation obtained an average score of 95% (very valid), the results of the validation of natural science (IPA) teachers as users obtained an average score of 91% (very valid). The results of student responses on a small scale obtained an average score of 90.25% (exciting). While on a large scale, I obtained an average score of 92.3% (exciting).

The development of this learning video is limited to the development stage, and further research is expected to be carried out up to the dissemination stage. Further research can also use other subject matter and different local wisdom. The researcher recommends the local wisdom approach to insertion into science learning, which requires real-life examples.

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