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# The Development of Learning Video Media for Earthquake Themes Using Four-Step Teaching Materials Development (4S-TMD)

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**Abstract**

This research was conducted to develop and know the quality and feasibility of learning video media for the earthquake theme using four-step teaching materials development (4S-TMD). This research is a type of research and development that refers to Borg and Gall's development design. This study's subjects were students of class XI IPA Al-Qomar (N = 18) MAN Insan Cendekia Palu. Data collection was done by using a questionnaire method. The validation data analysis results of material experts and media experts show an average score of 3, or with a percentage of 75% with a good category, the teacher's assessment shows an average score of 3.84 in a good category. Students' responses show an average score of 3.28, or with a percentage score of 82% with the category agree completely. The results of this study indicate that the earthquake theme learning video media developed using four-step teaching materials development (4S-TMD) is feasible and can be used as a learning medium. This research implies that the teaching media that are processed using appropriate methods make learning more interesting. The resulting instructional videos can also be used as learning media in class, in groups, or independently.

**Keywords:** Learning media for earthquake themes; four-step teaching materials development (4S-TMD)

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## INTRODUCTION

Learning physics is about the combination of various kinds of mathematical equations and understanding and experiencing natural phenomena. Applicatively, physics is expected to be used to reveal the secrets of nature that usually occur in everyday life, one of which is the occurrence of natural disasters. The application of physics to reduce the impact of natural disasters is an implementation of physics's vision (Trisnawati & Jumadi, 2018).

Natural disasters are natural events that have a significant impact on human

life. One of the natural disasters that often occurs in Indonesia is the Earthquake. The activity of a mega magnitude earthquake that recently appeared in Palu was an earthquake with a magnitude of 7.4 which rocked Palu City and its surroundings on September 28, 2018. The Earthquake which lasted for approximately 3 minutes succeeded in destroying Palu City and its surrounding areas and resulting in secondary impacts, namely Tsunami and Liquefaction (soil liquefaction) at several points in Palu City such as Balaroa and Petobo (Anggresta & Wonoseputro, 2019).

In terms of reducing the impact of disasters and losses on development achievements, the Indonesian government has adopted the concept of disaster risk reduction which includes prevention, mitigation, and preparedness and integration efforts (Rahma, 2018). Integrating earthquake disaster education into relevant subjects such as physics is an alternative for implementing earthquake disaster education in a sustainable manner (Sasma & Fauzi, 2020).

Natural phenomena related to physics should be shown directly to students. In this case, the role of the media is needed (Mubarrok & Mulyaningsih, 2014). Media is anything that delivers or carries information to recipients of the information. In the teaching and learning process which is essentially a communication process, the information or message communicated is the content of teaching materials that have been defined in the curriculum, the sources of information are teachers, book authors, designers and other instructional media makers; while the recipients of the information are students or learning citizens (Divayana, Suyasa, & Sugihartini, 2016).

The learning media generally used by teachers in schools is human-based, namely the teacher itself and printed-based media such as textbooks and worksheets (Ratnaningsih, Hidayat, & Patmawati, 2017). There are various types of learning media, and one that can be used to explain phenomena in physics learning is video-based media. The level of retention (absorption and memory) of students on learning material can be increased significantly if obtaining information through the senses of sight and hearing (Utami, 2013). Video is an audio-visual medium used to convey the material through sound and move images (Utaminingtyas, 2012). The use of video media can increase students' interest and enthusiasm for the given learning. Still, it is also expected to increase students' understanding of the material and phenomena presented.

Also, selecting and processing material to be included in learning media is very important. The material to be taught is to see whether the material is suitable for the media to be used or not. Then see what methods are suitable for processing the material being taught. Moreover, the subject matter will be integrated with other topics such as earthquake disaster education. Therefore, good stages are needed in terms of material selection and processing of teaching materials. One of the good teaching materials processing methods is Four-Step Teaching Materials Development.

Since 1995, Anwar has developed the idea of managing teaching materials that aim to produce effective teaching materials according to the curriculum in schools. The stages of processing teaching materials developed by Anwar are called Four Step Teaching Materials Development (4S-TMD). These stages are: the selection process, structuring, characterization, and didactic reduction. The teaching material products produced in these four stages are teaching materials that are ready to be presented by the teacher as teaching material or

studied by students as independent teaching materials (S. Anwar, 2014).

At the selection stage, sorting and selecting the information needed in the preparation of teaching materials is carried out. Selection is made of material following the demands of the applicable curriculum, including various values adjusted to the concepts presented. The selected material is then compiled in the form of a draft collection of materials. The compiled teaching materials are then structured, including the preparation of concept maps, macrostructures and multiple representations. Then the characterization of teaching materials was carried out to identify easy and difficult concepts by conducting a test of understanding with several students. The identified concept is difficult to reduce teaching materials' difficulty level through the didactic reduction stage (Astuti, 2017).

What is different from the textbooks widely developed (mainly foreign textbooks) in the selection stage in the 4STMD method, the aspects of values contained in the material concepts are developed. Furthermore, at this stage, validation of the draft material has been collected by experts (Expert Judgment) (Lotaningrat, 2019).

## METHOD

The type of research used is research and development or research and development (R&D). According to Borg and Gall, this study uses a research and development design (Sugiyono, 2015). These steps can be seen in Figure 1.

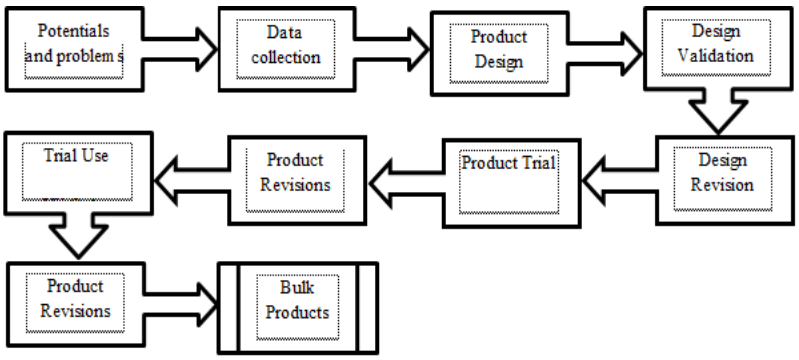


Figure 1 R&D research design according to Borg and Gall

In this study, not all stages or steps were used, but only up to product trials. The product trial in question is a product trial on a small scale. This is because we will only see the quality and feasibility of the media being developed, following this study's objectives. As with any research, the final result of this research is also the analysis and reporting stage. These steps can be seen in Figure 2.

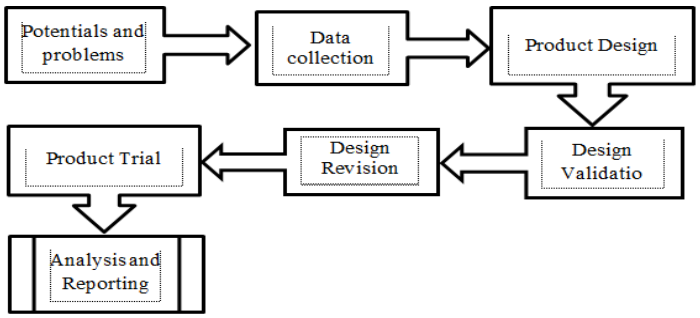


Figure 2 Research design

The subjects of this study were 18 students of class XI IPA Al-Qomar MAN Insan Cendekia Palu. This was because the learning video media developed contained the wave material taught in class XI IPA.

The data collection techniques used in this study were generally in the form of non-test instruments, namely questionnaires given to media experts, material experts, subject teachers and students as respondents. A questionnaire is used to assess the quality and feasibility of the resulting learning media. The questionnaires outline include: (1) instrument characterization stage; (2) didactic reduction stage instrument; (3) instrument feasibility of teaching materials; and (4) student response questionnaire instrument.

The analysis technique used to analyze the data from the characterization stage instrument is the score of determining the main idea. The score interpretation criteria can be seen in Table 1.

Table 1 Interpretation criteria for main idea determination

| Score Percentage (x) | Criteria |
|---|---|
| x < 50% | Difficult |
| x ≥ 50% | Easy |

The data were obtained through a questionnaire on the feasibility of teaching materials and student responses. The data were analyzed by calculating the average (Arikunto in (Widyawati, Saehana, & Wahyono, 2018), then processed in qualitative data based on the assessment category criteria in tables 2 and 3 (Astuti, 2017).

Table 2 Criteria for interpretation of the feasibility questionnaire for teaching materials

| **Score Percentage (x)** | **Criteria** |
|---|---|
| x < 25% | Too little |
| 25% < x < 50% | Less |
| 50% < x < 75% | Pretty good |
| x ≥ 75% | Well |

Table 3 Criteria for interpretation of student responses

| **Score Percentage (x)** | **Criteria** |
|---|---|
| x < 25% | Strongly Disagree |
| 25% < x < 50% | Disagree |
| 50% < x < 75% | Agree |
| x ≥ 75% | Strongly agree |

## RESULTS AND DISCUSSION

This study's results were in the form of an earthquake themed learning video whose content was processed using the four-step teaching materials development (4S-TMD) method. This method has stages that aim to produce effective teaching materials. These stages are the process of selection, structuring, characterization, and didactic reduction. The resulting video contains earthquake material closely related to wave material, earthquake disaster education, and earthquake mitigation. The resulting product display can be seen in Figure 3 - Figure 7.


Figure 3 Product display at minute 00:27 as the opening of the video


Figure 4 Product display at the minute of 00:32, the transition of the definition of the Earthquake

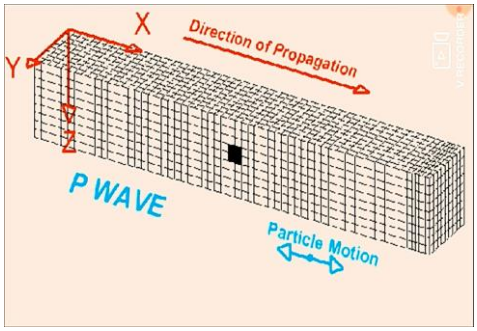


Figure 5 Product display at the minute of 02:20, primary wave animation

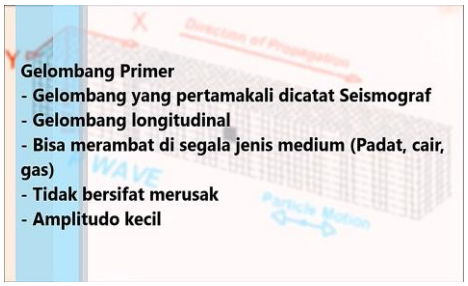


Figure 6 Product display at the minute of 02:55, primary wave summary

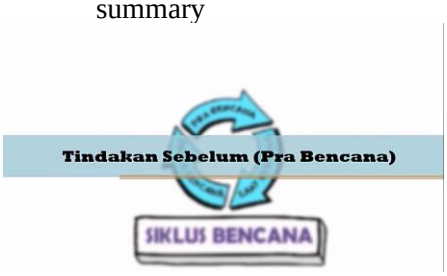


Figure 7 Product display at the minute of 06:36, the transition to pre-disaster measures

At first, the media was in the form of a draft material which was then poured into a learning video. In the selection stage, descriptions analysis and analysis of the textbooks related to the material presented are carried out to compile the material as draft 1. Then in the second stage, namely the structuring stage, macrostructures and multiple representations are made. At the macrostructure stage, an outline of what topics will be loaded on the media is made. The macrostructure aims so that the material to be presented is sequential and interrelated. This is similar to what was conveyed by Syamsuri, Anwar, & Sumarna (2017) that macro-structure gives guidance on the systematic writing instructional materials. It facilitates students in connecting one concept with another concept so that students' knowledge was more structured. Meanwhile, multiple representations aim to make the text or reading in the draft easily understood by the combination of supporting text, images or graphics. From this structuring stage, the compilation of material as draft two is produced.

The next stage is the characterization stage. At this stage, the preparation of a characterization instrument was carried out, in this case, a questionnaire to determine the main idea and students' responses related to the text presented in the draft material produced in the previous stage. Material experts then validate the questionnaire that has been compiled. After being validated and revised according to the validation results, the instrument was tested on students and analyzed the results.

The last step in the 4S-TMD method is the didactic reduction stage. At this stage, the identified material or material concept is difficult to reduce its difficulty level. This stage is optional. If the previous stage's analysis results were low, then proceed with the didactic reduction stage, and vice versa. In this study, the average result of students' responses to the text in the draft material was 77.38% in the easy category. Therefore, it was immediately continued to the product design stage (making instructional video media).

The resulting video media contains education material on earthquake disasters in which earthquakes are an example of one of the physics materials, namely waves. This is similar to what Wahyudi (2013) said that it is necessary to reduce the impact of disasters, which

one of the things that can be done is the defence of disaster insight through schools in disaster-prone areas. Honesti & Djali (2012) also said that disaster education in primary and secondary schools helps children play an important role in saving lives and protecting community members.

The material contained in the resulting learning media generally consists of earthquake disaster material, earthquake-related physics material, which mostly waves material. At the end of the video, there is material on earthquake disaster mitigation. Apart from waves, it is also mentioned in the video that several other physics material topics such as convection currents as the cause of the shift or enlargement of the earth's crust, and Law II Thermodynamics which causes the birth of these convection currents.

There are seven stages in this research, namely potentials and problems, data collection, product design, design validation, product revision, product testing, and analysis and reporting. The study of the results of the development of learning media is based on validation and product testing.

The material expert is the validator chosen to assess the learning media's quality and appropriateness from the material aspects, learning aspects, and language aspects. A physics lecturer carries out validation. In general, the results obtained from the material expert's assessment can be seen in Table 4.

Table 4 Validation results by material experts

| No | Aspect | Score Percentage (x) | Criteria |
|---|---|---|---|
| 1 | Theory | 75% | Well |
| 2 | Learning | 75% | Well |
| 3 | Language | 75% | Well |
| | Average | 75% | Well |

Table 4 shows that the overall aspect assessment results' average percentage score is 75% in the good category.

Likewise, the display validation on the media is carried out by media expert validators. The aspects assessed from the resulting learning media include colouring, use of words and language, display on the screen, presentation, animation and sound, video duration, resolution, and file size. A physics education lecturer carried out validation. In general, the results obtained from the media expert's assessment can be seen in Table 5.

Table 5 Validation results by media experts

| No | Aspect | Score Percentage (x) | Criteria |
|---|---|---|---|
| 1 | Colouring | 75% | Well |
| 2 | Use of words and language | 75% | Well |
| 3 | Display on screen | 75% | Well |
| 4 | Presentation | 75% | Well |
| 5 | Animation and sound | 75% | Well |
| | Average | 75% | Well |

Table 5 shows that the percentage of the overall average score of the aspect assessment results is 75% in the good category. From these results, the material and media expert validator stated that the resulting learning media was feasible to be tested with revisions as needed.

After the revision is carried out, then a product trial is carried out. Learning media trials were carried out on physics teachers MAN Insan Cendekia Palu. The aspects assessed from this learning media are learning, material content, use of words and language, the suitability of language with the level of development of students, display on the screen, video duration, and video resolution. The average score of the overall aspect

assessment by the physics subject teacher is 3.84 and categorized as good.

After testing the product to subject teachers, then product testing was carried out on 18 students in grade 11 IPA Al-Qomar MAN Insan Cendekia Palu. Students carried out the trial by filling out a questionnaire on students' responses to the resulting learning media. The questionnaire has 20 question items with four options or choices: strongly disagree, disagree, agree, and agree. After analyzing the data, it was obtained an average score of 3.28 or a percentage score of 82% in the "Agree" category. The student response questionnaire results show that the category "Totally Agree" shows that the resulting video media is suitable for learning.

The resulting instructional video media certainly has advantages and disadvantages. This learning video has a shorter duration, the video size is not too large, and the display is more attractive. The video has a good resolution. There are pictures and animation. Video stimulates students to become more familiar with the material presented. Learning videos have more than one sub material. The material presented is related to the phenomenon of earthquakes, so that this material can be used for physics and geography and others. This video contains disaster education which is very important to be taught to students, especially students who live in areas prone to natural disasters such as earthquakes.

This instructional video media's weakness is that the material contained is not specific and not too in-depth. Hence, students still have to look for other references to further add to their insight into the material presented. Then not all of the disaster mitigation material in the draft was included in the video because it made the video duration too long. Also, the video transitions are not smooth, and the presenter's voice can sometimes sound small. This is due to the knowledge and skills of researchers in using video editor applications.

Research on the theme of earthquakes with video products has never been done before. Previous research only focused on developing teaching materials in draft materials such as modules and worksheets. For example, in Anwar (2015) and Lotaningrat (2019), his research uses a four-step teaching material development method. Both of these studies produce a final product in the form of printed teaching materials (books). Whereas in this research, the material that has been made in draft form through the Four Step Teaching Materials Development (4S-TMD) method is poured back into the instructional video media. Research on the development of instructional video media with the theme of the Earthquake using four-step teaching materials development (4S-TMD) at MAN Insan Cendekia Palu as a whole can be said to have good quality and suitable for use as a learning video media.

## CONCLUSION

The quality of the instructional video media developed has a good category based on the validation of material experts and media experts. The teacher's response to the learning video obtained through a questionnaire was in a good category. Student responses to instructional video media have the category "Totally Agree". These results indicate that the learning video media for the earthquake theme developed is suitable for learning video media. This research implies that teaching media that are processed using appropriate methods makes learning more enjoyable. Besides, the resulting instructional videos can be used as learning media in class, in groups or independently.

**REFERENCES**


Anggresta, C. H., & Wonoseputro, C. (2019). Museum Gempa dan Tsunami di Palu. *Jurnal EDimensi Arsitektur*, *VII*(1), 1033–1040.

Anwar, K. (2015). Pengembangan bahan ajar ipa terpadu menggunakan four step teaching material development dengan tema pemanasan global.

Anwar, S. (2014). *Pengolahan bahan ajar. bahan perkuliahan pengolahan bahan ajar SPS UPI*. Bandung UPI.

Astuti, R. (2017). *Pengembangan bahan ajar kimia untuk siswa smp pada materi asam basa menggunakan metode four steps teaching material development*. Universitas Pendidikan Indonesia.

Divayana, D. G. H., Suyasa, P. W. A., & Sugihartini, N. (2016). Pengembangan media pembelajaran berbasis web untuk matakuliah kurikulum dan pengajaran di jurusan pendidikan teknik informatika universitas pendidikan ganesha. *Jurnal Nasional Pendidikan Teknik Informatika: JANAPATI*, *5*(3), 149–157.

Honesti, L., & Djali, N. (2012). Pendidikan kebencanaan di sekolah-sekolah di indonesia berdasarkan beberapa sudut pandang disiplin ilmu pengetahuan. *Jurnal Momentum*, *12*(1), 51–56.

Lotaningrat, D. (2019). Pengembangan bahan ajar ipa terpadu pada tema kelistrikan pada makhluk hidup dengan menggunakan metode four step teaching material development (4STMD. *Didaktik: Jurnal Pendidikan*, *5*(1), 80–96.

Mubarrok, M. F., & Mulyaningsih, S. (2014). Penerapan pembelajaran fisika pada materi cahaya dengan media phet simulations untuk meningkatkan pemahaman konsep siswa di smp. *Jurnal Inovasi Pendidikan Fisika*, *3*(1), 76–80.

Rahma, A. (2018). Implementasi program pengurangan risiko bencana (prb) melalui pendidikan formal. *Jurnal Varia Pendidikan*, *30*(1), 1–11.

Ratnaningsih, N., Hidayat, E., & Patmawati, H. (2017). Pembuatan dan penggunaan media pembelajaran berbasis komputer melalui pendekatan saintifik bagi guru-guru. *Jurnal Pengabdian Siliwangi*, *3*(1), 193–199.

Sasma, N., & Fauzi, A. (2020). Analisis kesesuaian materi fisika sma dengan materi gempa bumi. *Pillar of Physics Education: Jurnal Berkala Ilmiah Pendidikan Fisika*, *13*(1), 81–88.

Sugiyono, S. (2015). *Metode penelitian pendidikan (pendekatan kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta.

Syamsuri, B. S., Anwar, S., & Sumarna, O. (2017). Development of teaching material oxidation-reduction reactions through four step teaching material development (4S TMD. *Journal of Physics: Conference Series*, 895.

Trisnawati, T., & Jumadi, J. (2018). *Keefektifan pembelajaran fisika sma terintegrasi pendidikan kebencanaan gempa bumi ditinjau dari penguasaan materi dan kesiapsiagaan bencana alam*. Skripsi pada Program Studi Pendidikan Fisika FMIPA Universitas Negeri Yogyakarta: tidak diterbitkan.

Utami, K. (2013). Penggunaan media audio visual untuk meningkatkan pemahaman konsep siswa di sekolah dasar. *Jurnal Penelitian Pendidikan Guru Sekolah Dasar*, *1*(2), 1–10.

Utaminingtyas, S. (2012). Pengaruh penggunaan media video terhadap kemampuan menyimak dongeng pada mata pelajaran bahasa indonesia siswa kelas v sd negeri panjatan, panjatan, kulon progo.

tidak diterbitkan, Negeri Yogyakarta.

Wahyudi, E. H. (2013). Integrasi peristiwa gempa bumi dan teknik mitigasi dalam diktat gejala gelombang. *Jurnal Inovasi Pendidikan Fisika*, *2*(3), 167–173.

Widyawati, W., Saehana, S., & Wahyono, U. (2018). Pengembangan media pembelajaran berbasis e-learning pada mata kuliah fisika modern. *Jurnal Pendidikan Fisika Tadulako*, *6*(1), 32–39.