

Physics vlogs learning videos on parabolic motion on youtube channels based on scientific approach

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Article Info

Article history:

Received: February 19, 2022

Revised: May 06, 2022

Accepted: June 11, 2022

Keywords:

Youtube Channel;
Feasibility;
Scientific Approach;
Vlog Physics.

Abstract

Physics learning media that attract students' learning interests are difficult for physics teachers to find. This research aims to produce a physics vlog learning video on YouTube that is suitable for use, to find out the responses of teachers and students regarding the developed learning media, and to find out the method of video development. The research method used was R&D with the Borg and Gall model. The feasibility of the learning video was obtained from the assessment by six material, media, and IT validators. Two validators represented each validation. The validation results showed that the learning video was feasible. The media, material, and IT experts validated the product with a percentage of 84%, 72.25%, and 98%, respectively. The teachers and students were satisfied with the learning video, as proven by the percentages of 85% for the small-group trial, 94% for teachers' field testing, and 78% for the large-scale trial. The results declared that the product was feasible to use. Thus, the developed physics learning video can be implemented in the learning process as a learning medium.

To cite this article: Surya, J., Suryani, Y., & Saregar, A. (2022). Physics vlogs learning videos on parabolic motion on youtube channels based on scientific approach. *Online Learning in Educational Research*, 2(1), 19-29

INTRODUCTION

The global Covid-19 pandemic has caused extraordinary turmoil in all aspects of human life (Rusdi, 2020). Human habits have changed in stark contrast compared to before the pandemic. Education is not an exclusion from the impact of the pandemic (Samudera, 2020). Learning and activities involving many people are very limited, and schools were not allowed to conduct direct learning because it was feared to increase the number of victims (Telaumbanua, 2020). Online learning forces teachers to innovate since it presents numerous obstacles and problems (Saefullah & Sawaiy, 2020).

One of the problems arising from online learning is that teachers and students do not meet directly, so students cannot see the teacher's gestures directly in explaining the material. Also, teachers' intonation and facial expressions will help students more quickly understand the material presented (Natasya & Cendana, 2020). Online learning does not provide complete and optimal learning. Learning that should be essential in educating the character of students is reduced because students do not meet directly with teachers. Online learning, especially in physics subjects, is still difficult for students to understand (Khumaidah & Nurman, 2021). Online learning tends to be compacted to textbooks, so students are not interested in participating in learning because the media used are not interactive.

These problems can be overcome by selecting learning media that can attract students' interest in learning and can convey the material properly and intact so that students gain

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knowledge (Ulfah et al., 2021). A learning video was chosen as a solution to these problems. It can show teachers' gestures in delivering learning material so that students can easily understand the material presented. Learning videos visualize the concept of physics in a contextually oriented way for students' lives in solving everyday problems. This addresses the challenges of prior learning (Holmén et al., 2021).

Pre-study has been carried out in three senior high schools (SMA/MA/SMK) in the Natar sub-district. A total of 250 students participated in this pre-research. The questions asked were related to the habits of students in using smartphones and their experiences with physics learning media. The researcher also conducted pre-research on five physics teachers in the Natar sub-district regarding learning media. The pre-research results showed that 92% of students used social media daily. 91% of students accessed YouTube, 97% of students watched videos on YouTube for entertainment, and 96% of students had never seen a physics learning video associated with sports.

From the results of the pre-research, most students used YouTube social media. All teachers agreed that learning media could be a stimulus in learning. However, 80% of teachers still had difficulty making video learning media. Eighty per cent of teachers had never made physics learning videos because they took a relatively long time to make, and a hundred per cent of teachers had never seen or used physics learning videos on sports. However, students and teachers had never seen physics learning videos that combined physics material with sports activities.

Therefore, the researcher developed a physics learning video uploaded to YouTube social media using a scientific approach. The scientific approach is intended as a reference in making learning videos so that students have direction when watching learning videos. Innovation in all forms of work can build better capabilities (Alm et al., 2022). Previously, research on the development of learning videos has been carried out on Newton's Law of Gravity (Bakri et al., 2020), Kepler's law (Mulyati et al., 2021), the concept of light (Pairunan et al., 2021), geometric optics (Ramadani et al., 2020), and trigonometric comparisons (Yudela et al., 2020). Scientific-based physics learning videos have also been developed on wave mechanics (Megalina et al., 2021) and economics (Fardany & Dewi, 2020). However, there has been no development of learning videos with a scientific approach to the theme of sports. Therefore, the purpose of this study was to produce a physics vlog learning video on the YouTube channel that is feasible. Also, the researchers intended to find out the responses of teachers and students regarding the developed learning media and how to develop learning videos.

METHOD

This research method employed was research and development (R&D). The research model used was proposed by Borg and Gall, consisting of seven product development stages. The following figure depicts the Borg and Gall research model.

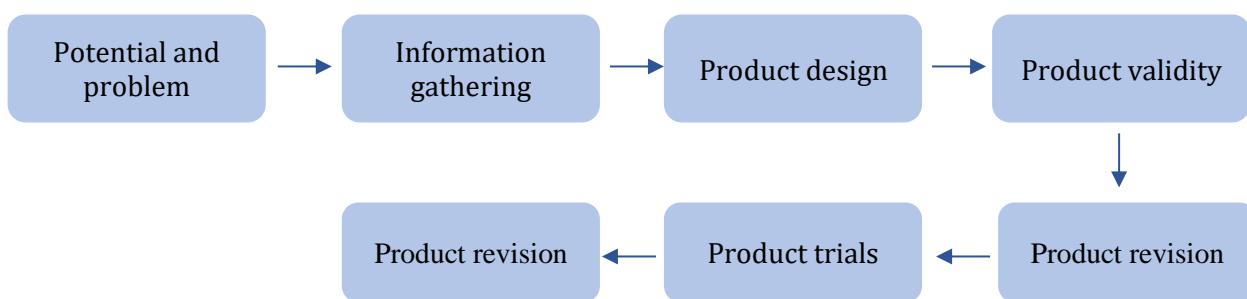


Figure 1. Stages of Research

Product validation was carried out by six experts consisting of two media experts, two material experts, and two IT experts. A small-scale product trial was performed on 30 Bahrul Ulum Natar High School students. A large-scale product trial was conducted in three senior high schools in Natar District, South Lampung Regency, with 167 students and three teachers as respondents.

The data collection technique that the researchers used was a questionnaire. The questionnaire used the Likert scale for the experts' validation and teachers.

The data obtained in this development research were qualitative and quantitative data. Qualitative data were obtained from comments or responses from the experts, students, and teachers after seeing the product. Quantitative data included data from validators through validation instruments and quantitative data from respondents (students) through student questionnaires. The data obtained from the non-test instrument was qualitative and was analyzed using quantitative data processing. The data were analyzed using the Likert scale instrument analysis technique. The Likert scale, also called a summated rating scale, measures attitudes towards something expressed through a series of statements about a tendency, a thing, an object, and a situation.

In the Likert scale, the score or value of a statement is usually one that shows a positive tendency, as shown in Table 1 below:

Table 1. Likert Scale

| Statement | Score |
|-----------------|-------|
| Highly feasible | 5 |
| Feasible | 4 |
| Moderate | 3 |
| Less Eligible | 2 |
| Not Eligible | 1 |

When the questionnaire given to the validator had been filled out or validated, the next step taken by the researchers was to analyze the data and use them as the basis for product revision. Each indicator on the non-test Likert scale instrument contains five score variants. So, the researcher must calculate the average score of all respondents on each indicator.

The researchers conducted pre-research on five physics teachers in the Natar sub-district to obtain answers following the real events regarding the developed learning media using certain criteria (SA = strongly agree, A = Agree, D = Doubtful, DA = disagree, SDA = strongly disagree).

The researchers used a questionnaire in this development study to measure the learning videos' feasibility. The questionnaires were distributed to six physics lecturers or experts who were reliable in their fields. The experts/lecturers were divided into three types: media experts, IT experts, and material experts.

Sugiyono (2018) explains that the formula for calculating the average score on the feasibility and product attractiveness indicators is:

$$Me = \frac{\sum xi}{n}$$

Description:

Me = Mean (average)

Epsilon = (read the number)

X_i = X value to I sample to n

n = number of individuals

The formula to calculate the percentage for each indicator is as follows.

$$P = \frac{\sum x}{\sum xi} \times 100 \%$$

Description:

P = Percentage

x = Number of respondents' answers

xi = Number of ideal scores in one item

The criteria interpretation scale is presented in table 2

Table 2. Criteria Interpretation scale (Amirudin et al., 2021)

| Interval | Criteria |
|-------------|---------------------|
| 0% - 20,9% | Highly not feasible |
| 21% - 40,9% | Not feasible |
| 41% - 60,9% | Fairly feasible |
| 61% - 80,9% | Feasible |
| 81% - 100% | Very feasible |

RESULTS AND DISCUSSION

The Results of Potential and Problems Analysis

The researchers found that most students considered physics subjects difficult to understand because they did not know the benefits and application of physics in everyday life. Furthermore, physics learning media that support students to learn with an interest in learning was limited.

The results of the pre-research showed that most of the students had potential. This potential was the high intensity of social media use. Of the 250 students, 91.2% used social media every day, 91% of students accessed YouTube, 97% of students watched videos on YouTube for entertainment, and 96% of students had never seen a physics learning video associated with sports.

Results of Information Gathering

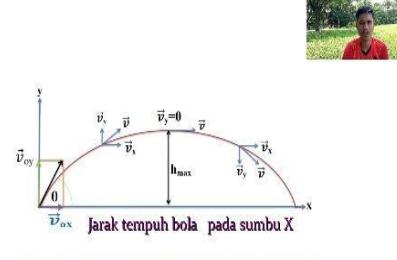
Based on the pre-research questionnaires, the researchers analyzed the students' problems in learning physics. They concluded that the problems could be overcome by integrating physics learning media with social media and collaborating it with exercise activities for visualization (Susilawati & Sari, 2019). In previous studies, it was explained that social media could attract students' interest in learning. Social media can also attract positive learners' learning interests (Sahlan & Sihombing, 2022). Social media is one of the modern information delivery media with more recipients of messages than one-way communication (Fan et al., 2022). The duration of the learning video developed was 10 minutes by taking pictures on a football field.

The Results Product Design

The product design results are presented in table 3.

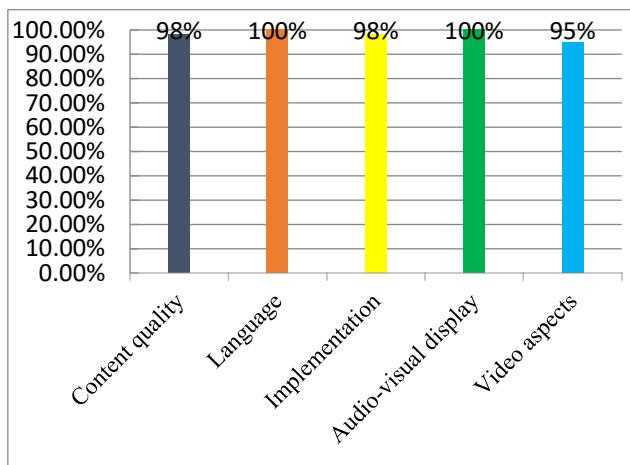
Table 3. Product Design Results

| No | Scene | Time | Narrative | Video Footage |
|----|---------|------------|--|--|
| 1 | Intro | 10 seconds | Showing a ball juggling video |  |
| 2 | Opening | 11 seconds | Greeting, introducing yourself, mentioning your name, department, faculty, and universities, and mentioning the material to be discussed |  |

| No | Scene | Time | Narrative | Video Footage |
|----|-----------------------|----------------------|--|--|
| 3 | Observing | 44 seconds | Showing a free kick taken by a United Arab Emirates player against Indonesia |  |
| 4 | Gathering Information | 1 minute 18 seconds | Showing the trajectory of a parabola with lines and physical quantities that can be found |  <p>Jarak yang ditempuh bola pada sumbu x, ketinggian maksimal pada sumbu y, dan jarak tempuh maksimal</p> |
| 5 | Reasoning | 6 Minutes 31 seconds | Explains the equation: <ul style="list-style-type: none"> Speed and distance travelled by the ball on the X-axis Speed and distance travelled by the ball on the Y-axis Resultant Speed on the X and Y-axes Maximum altitude and distance travelled on the Y-axis Maximum time and distance travelled on the X-axis |  |
| 6 | Communication | 2 minutes 6 sec | Displaying a long-range kick from Wayne Rooney and asking the audience a question. |  |
| 7 | Closing | 15 Seconds | Closing statements |  |

The Results of Product Validation

The product was validated by material, IT, and media experts. The following are the results of the validation by the material experts obtained from the distribution of the questionnaires.



Gambar 2. Hasil validasi ahli materi

The first validation was carried out by two material experts in the field of physics. The validation results on the developed learning video showed a high percentage in each aspect. If viewed from the criteria interpretation scale table, the learning video developed was feasible for being used as a learning video. Feasibility obtained from material expert validation illustrates that the learning video material has met the learning media requirements. The delivery of physics material that should be done directly by the teacher can be delivered practically by learning videos, provided that the learning videos have been validated and get a score that meets the threshold for the feasibility of learning videos. Learning videos can be a solution for teachers because, in schools, many teachers do not maximize the available learning media due to limited time to deliver physics material (Hutabarat, 2017).

The physics learning videos that are suitable for use help teachers deliver physics material without being limited because learning videos can be used at any time. In line with this statement, it turned out that most students have smartphones that can be used to access learning videos on YouTube.

Two IT experts also carried out a validation. The results of the validation obtained a high score percentage in each aspect. This indicated that the learning video developed was feasible for use as a learning medium. The following is a graph of the results of IT validation:

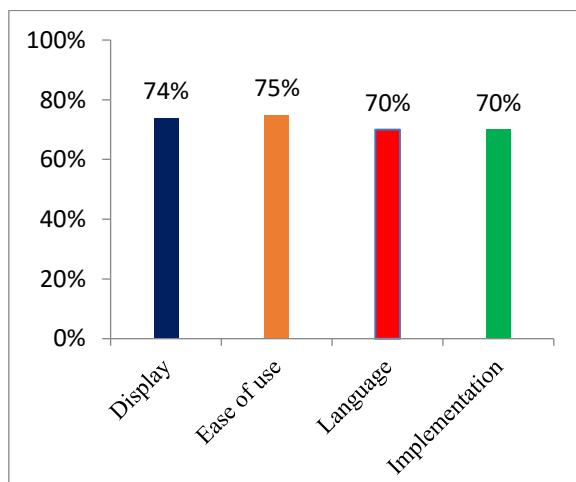


Figure 3. The Results of IT Experts' Validation

The learning video was developed using Wondershare Filmora software. This software has many advantages that editors can utilize to edit videos. It is relatively easy to use compared to other video editor software (Aliwardha, 2021). Wondershare Filmora has many edited storage resolutions so that the video resolution can be chosen easily according to its use. It has a fairly good and sharp image sharpness (Eliwatis & Sabarullah, 2021). so that it can support the edited learning video. Technology-based education makes it easier to deliver material and minimizes costs because it can be implemented flexibly (Chicoine et al., 2022), such as through learning videos on YouTube channels.

Two media experts carried out the final validation, which yielded a high percentage of scores in each aspect. Thus, the learning video was feasible. YouTube can accommodate quality learning videos according to learning needs (Wilkens et al., 2022).

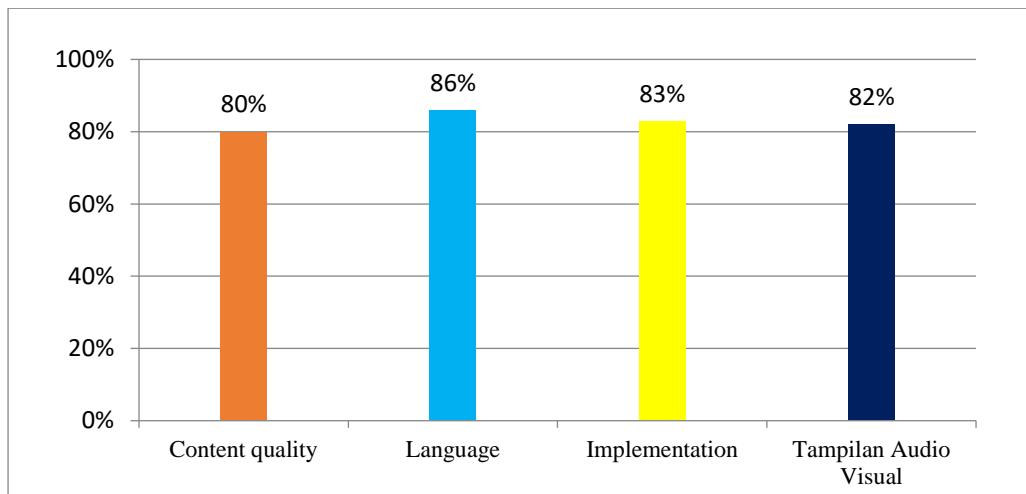


Figure 4. The Results of the Media Expert Validation

Product Revision

The validators commented the developed video to improve the quality. The results of the improvements are presented in Tables 4 and 5.

Table 4. Improvements Based on the Material Experts' Validation

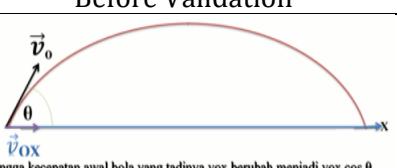
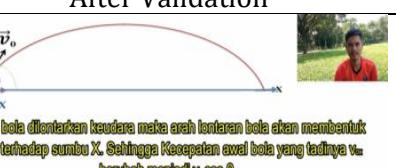
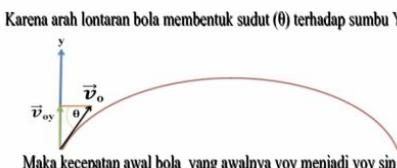
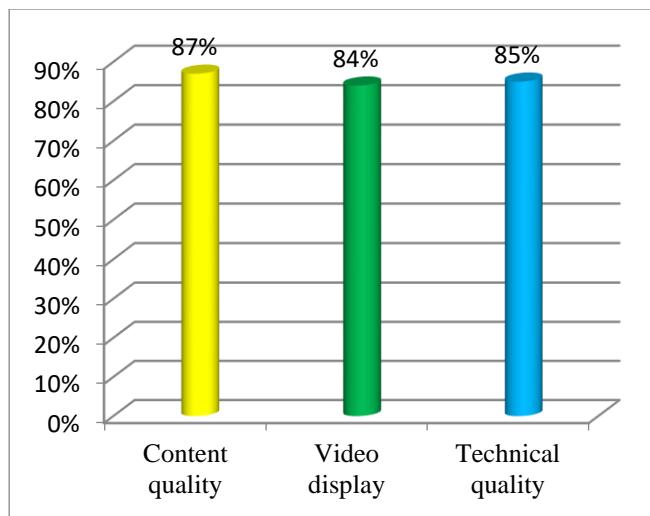
| Types | Before Validation | After Validation |
|--|--|---|
| Changed $\vec{v}_{ox} \cos$ to $\vec{v}_o \cos$ |  <p>Sehingga kecepatan awal bola yang tadinya vox berubah menjadi vox cos θ</p> $\vec{v}_{ox} = \vec{v}_o \cos \theta$ <p>Maka persamaan untuk jarak tempuh bola pada sumbu x yakni:</p> $\vec{x} = \vec{v}_{ox} \cos \theta t \quad \text{Persamaan 2}$ |  <p>Ketika bola dilontarkan keadaan maka arah lontaran bola akan membentuk sudut terhadap sumbu X. Sehingga kecepatan awal bola yang tadinya v_o berubah menjadi $v \cos \theta$</p> $\vec{v}_x = \vec{v}_o \cos \theta$ <p>Maka persamaan untuk jarak tempuh bola pada sumbu X yakni:</p> $\vec{x} = \vec{v}_o \cos \theta t$ |
| Reduced equations 3,4,5 into equation 6 and put them in one frame. | <p>Karena arah lontaran bola membentuk sudut (θ) terhadap sumbu Y</p>  <p>Maka kecepatan awal bola yang awalnya voy menjadi voy sin θ</p> $\vec{v}_{oy} = \vec{v}_o \sin \theta$ <p>Maka persamaan 3,4 dan 5 menjadi:</p> $\vec{v}_y = \vec{v}_{oy} \sin \theta - \vec{g} t \quad \text{Persamaan 6}$ | <p>Sehingga persamaan 3,4 dan 5 menjadi:</p> $\vec{v}_x = \vec{v}_o \cos \theta - \vec{g} t \quad \text{Persamaan 3}$ $\vec{h} = \vec{v}_{oy} t - \frac{1}{2} \vec{g} t^2 \quad \text{Persamaan 4}$ $\vec{v}_y^2 = \vec{v}_{oy}^2 - 2 \vec{g} \vec{h} \quad \text{Persamaan 5}$ <p>↓</p> $\vec{v}_y = \vec{v}_o \sin \theta - \vec{g} t \quad \text{Persamaan 6}$ $\vec{h} = \vec{v}_o \sin \theta t - \frac{1}{2} \vec{g} t^2 \quad \text{Persamaan 7}$ $\vec{v}_y^2 = \vec{v}_o \sin^2 \theta - 2 \vec{g} \vec{h} \quad \text{Persamaan 8}$ |

Table 5. Improvement based on IT Experts' Validation

| Types | Image Improvements Before | Image Already Improved |
|--|--|--|
| Displays the video model in the top corner of the explanation. | $\vec{v}_y^2 = \vec{v}_{0y}^2 \sin^2 \theta - 2 \vec{g} \cdot \vec{h}$ Persamaan 8 KETERANAGAN v_y = kecepatan bola pada sumbu y (m/s) v_{0y} = kecepatan awal bola pada sumbu y (m/s) g = Percepatan gravitasi bumi (m/s ²) h = ketinggian bola (m) |  Keterangan x = Jarak tempuh bola pada sumbu X (meter) t = Waktu tempuh bola pada sumbu x (second) v_{0x} = Kecepatan awal bola pada sumbu x (meter/second) |
| Pauses after asking questions |  | <p>Wayne Rooney mencetak gol jarak jauh ke gawang lawan sehingga membuat penonton riuh gembira di stadion. Jika kecepatan awal bola yang ditendang oleh Wayne Rooney adalah 20,15 m/s dan sudut elevasi yang terbentuk adalah 28 derajat, dengan percepatan gravitasi sebesar 10m/s². maka tentukanlah:</p> <ol style="list-style-type: none"> Jarak tempuh bola dan kecepatan bola pada sumbu x ketika bola dilontarkan selama 1 detik. Ketinggian maksimal bola |

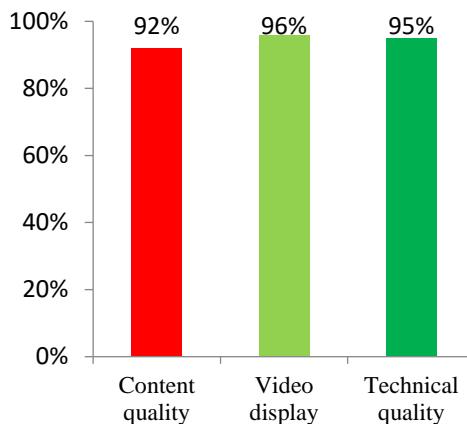
The Results of Product Trials

Small-group trials were conducted on 30 students by distributing questionnaires to determine student responses to the video developed. Figure 2 presents the results of the small-group trial.

**Figure 2. The Results of the Small-group Trial**

The results of the small-group trial were seen from several aspects, namely the quality of the content that obtained a high score. Thus, the students were very satisfied with the learning videos. The small-group test was conducted to obtain a limited assessment sample from students. The function of the small-group test was that it could be a reference for product improvement before conducting field trials on a larger scale. The function of a small-group trial in the learning media development stage is to find out the weaknesses of the learning videos that are developed and then corrected before heading to the field trial stage (Wijayanti, 2019)

The teacher field trial was conducted on three teachers to find their responses to the developed learning videos. Figure 3 depicts the teacher's response results based on the field trial.



Picture 3. The Results of the Teacher Field Trial

The field trial revealed that teachers were very satisfied with the learning media developed for use in learning. The learning media developed by the researcher was audio-visual learning media or a learning video. According to a research journal with the theme of developing learning videos using the Sparcol, learning videos that are suitable for use as a means to convey information or material to students are learning videos that several experts have validated, have been tested, and can represent the intent of the content of the material (Fadillah & Bilda, 2019).

The learning process was carried out in three schools with 167 students as subjects who were given a questionnaire to determine their responses to the learning video. The following are the results of the student response field trials:

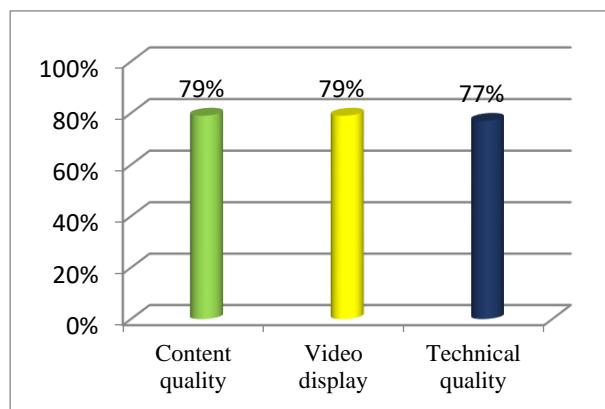


Figure 4. The Results of the Large-Scale Trial

The large-scale trial results obtained high scores on the three aspects assessed. The scores indicated that students were satisfied with the researcher's learning video.

If viewed from the requirements to meet the criteria for being a suitable learning video, the learning videos developed have met all the required criteria. Then the developed video was uploaded to the social media YouTube. Social media was chosen because of advantages that other facilities do not have. The advantages are that it entices students to learn, has a high level of clarity in delivering material, is easily accessible, and supports student learning skills (Salehudin, 2020). Learning videos are a product of an increasingly modern and growing educational paradigm (Midha & Kumar, 2022).

This development research can help teachers make parabolic motion material easier to understand because of the use of real parabolic motion visualization in sports activities. However, the drawback of this research is that it has not tested its effectiveness in learning. So, it is hoped that further researchers can continue to test the effectiveness of its use. With the development of interesting learning videos, students will become more interested in learning physics so that learning can run well.

CONCLUSION

The learning video developed was feasible because experts have validated it. The result of material expert validation was 98%, IT expert validation was 72.25%, and media expert validation was 84%. These percentages show that the learning videos developed were suitable for use as learning media. The teachers and students were satisfied with the percentage gain in the small-group trial of 85%, the teacher field trial of 94%, and the large-scale trial of 78%. The learning video contains parabolic motion material with football visualization and science as the approaches. However, this research has not yet reached the testing stage of its effectiveness; thus, its effectiveness is not yet known. It is hoped that further research will test the effectiveness of the learning video. The developed learning video can be used as an attractive and innovative learning media in schools.

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