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# Development of Scientific Approach-Based Learning Videos to Improve Student Learning Outcomes on Cell Biology

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**Abstract:** The use of learning video media can attract students' attention so that it fosters curiosity and is motivated to learn. This study aims to determine the level of feasibility of learning video media based on the scientific approach that was developed. The eligibility criteria for the learning video used is validity. The development model used refers to the Borg and Gall model, where there are two main criteria, namely the design of learning videos and validation of learning videos. Assessment of the validity of the instructional video was evaluated by material experts and media experts. The test results are declared valid with an average percentage of 90% material experts, the average percentage of media experts is 90.8%. And the average percentage of the results of the limited field trial is 91.55%. The student learning outcomes have an N-Gain score of 0.60, this indicates a moderate category, the percentage of N-Gain Score is 60.09% with a fairly effective category. The overall results indicate that the learning video media based on a scientific approach is very feasible to be used as a medium for learning biology on cell material. The results of this study are expected to improve students' scientific thinking skills so that students have the ability to solve any problems they face and have high learning outcomes.

**Keywords:** learning videos, scientific approach, research and development.

***Abstrak:*** *Penggunaan media video pembelajaran dapat menarik perhatian siswa sehingga menumbuhkan rasa ingin tahu dan termotivasi untuk belajar. Penelitian ini bertujuan untuk menentukan tingkat kelayakan media video pembelajaran berbasis pendekatan saintifik yang dikembangkan. Kriteria kelayakan video pembelajaran yang digunakan adalah kevalidan. Model pengembangan yang digunakan mengacu pada model Borg and Gall, dimana terdapat dua kriteria utama yaitu perancangan video pembelajaran dan validasi video pembelajaran. Penilaian kevalidan Video pembelajaran dievaluasi oleh ahli materi dan ahli media. Hasil pengujian dinyatakan valid dengan persentase rata-rata dari ahli materi 90%, persentase rata-rata dari ahli media sebesar 90,8%. Dan persentase rata-rata dari hasil uji coba lapangan terbatas sebesar 91,55 %.Perolehan hasil belajar siswa tersebut memiliki score N-Gain 0,60 ini menunjukkan kategori sedang, persentase N-Gain Score sebesar 60,09 % dengan kategori cukup efektif. Hasil keseluruhan tersebut menunjukkan bahwa media video pembelajaran berbasis pendekatan saintifik sangat layak digunakan sebagai media pembelajaran biologi pada materi sel. Hasil penelitian ini diharapkan dapat meningkatkan kemampuan berpikir ilimah siswa sehingga siswa memiliki kemampuan untuk meyelesaikan setiap masalah yang dihadapinya dan memiliki hasil belajar yang tinggi.*

***Kata kunci:*** *video pembelajaran, pendekatan saintifik, penelitian dan pengembangan.*

## ▪ INTRODUCTION

The times have brought an increase in science and innovation, thus encouraging reforms in the learning process. This reform is influenced by the era of globalization (Ananga, 2020). One of the technological developments in question is video-based learning media as a tool to provide materials or references for use by teachers and

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students. Online learning is a learning method that refers to the use of internet technology to deliver a series of solutions that can improve skills a006Ed knowledge (Ferri et al, 2020; Octaberlina & Muslimin, 2020; Simamora, 2020). Video-based learning media are expected to help students understand and generate interest in the materials (Reiss et al., 2017). Learning video development is considered very good for understanding the material because the combination of images, graphics, text and sound integration is very helpful (Magner, 2014; Mendoza et al., 2015; Morris & Lambe, 2017; Wiana, 2017; Yu, 2018).

Education is an effort to shape students to become knowledgeable, skilled, skilled, able to compete globally and master technological developments (Fonda & Sumargiyani, 2018). While learning is the acquisition of knowledge and skills which is possible through systematic interactions between teachers and students as well as methodologies. This section of material is known as instructional resources. As for the action of learning Biology in schools, educators play an important role in determining whether or not the learning objectives are achieved.

The way to improve student learning outcomes is to use a scientific approach. The scientific approach is a learning process designed in such a way that students will actively observe concepts, laws or principles through several stages such as: observing (to identify or find problems), formulating problems, formulating or proposing hypotheses, collecting data with various techniques, analyzing data , then draw conclusions and communicate the concepts, laws or principles that have been set (Sufairoh, 2016). Student motivation is an important measure of academic performance and achievement (Maurer, 2013).

The scientific approach makes learning more active and not boring, students are able to connect knowledge and skills through the facts found in field observations for the learning process. In addition, through a scientific approach, students are encouraged to be better able to observe, ask questions, reason, think scientifically (Ahlam & Gaber, 2014), and communicate or present things learned from natural phenomena or direct experience. Models that support the scientific process, such as Problem Solving or inquiry, Discovery Learning (Alberida et al., 2022; Utami et al., 2021) and Project Based Learning (Borhan, 2014; De, 2014; Lee et al., 2014; Mohamed, 2015; Temel, 2014).

Biology is the study of living things, both in terms of structure, taxonomy, function, growth and development, including cell biology. In cell biology learning, students are expected to be able to practice understanding, reasoning skills,application of concepts, analytical thinking, and broaden students' horizons about life phenomena related to the structure, function and relationship between cell structure and function (Dianing et al., 2016). ). The way to know the concept of cell biology material is to have the expertise to reason, have a strong imagination and be able to think analytically (Saptono et al., 2013).

The high level of quality education is judged by the high ability to develop students' knowledge and skills (Rasyid et al., 2016). Improvement efforts must be made by moving all components that become sub-systems in an education system. The important role of the teacher is very large in the learning process because the teacher acts as the most dominant channel of information to students (Krisnawati et al., 2014).

Meanwhile, schools are places that facilitate teaching and learning activities (Rahmawati et al., 2020).

But the fact is that in the field there are still many schools or teachers who are still focused on teachers or what is commonly referred to as conventional learning. Biology learning is not applied or taught according to its nature, but only how to transfer knowledge (Marjan et al., 2014). Students tend to use lower-order thinking skills and only learn facts (Ursavas, 2012). More students are instructed to take notes from textbooks, so that this situation makes students easily sleepy and bored in class (Gazali & Nahdatin, 2019). The main task of educators or teachers is to plan, implement and evaluate the learning process (Hala et al., 2015). Supposedly in learning, students try to find their own answers to existing problems, including the way that the teacher uses a scientific approach, so as to produce meaningful knowledge supported also by interesting learning media such as learning videos based on scientific approaches and interesting audio to generate enthusiasm for learning and a sense of belonging. want to know the students.

The development of Biology learning videos has been widely carried out such as Biology learning video media for making tempeh and yogurt (Irawan et al., 2017), developing ecosystem succession learning videos (Handziko & Suyanto, 2015) and Biology learning videos on excretory system material (Shintya & Putri, 2015). 2022). However, there are still few learning videos on cell biology material, especially those based on a scientific approach. Therefore, the purpose of this study is to determine the level of feasibility of learning video media based on the scientific approach that was developed. The results of this study are expected to improve students' scientific thinking skills so that students have the ability to solve every problem they face and have high learning outcomes.

## ▪ METHOD

### Participant

This research was conducted at the Nurul Hakim Islamic Boarding School, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra on July 6, 2022. This study was conducted on 20 students. Determination of the subject using a probability sampling technique which aims to determine the participants themselves based on the research objectives.

### Research Design and Procedures

This research uses theResearch and Developmentmethod from the Borg and Gall by the Puslitjaknov Team (2008). The selection of research and development methods is based on the fact that the Borg and Gall is more in line with the objectives of ICT-based product development and is easier to understand. The aim is to develop and validate products with lesson plans in the development of learning videos. The steps of this research refer to the research and development model Borg and Gall which has been simplified by the Puslitjaknov Team (2008) as follows: (1) Conduct product analysis to be developed, including reviewing the curriculum and identifying product needs. (2) Developing a product, namely in developing learning videos based on a scientific approach to cell biology material through the collection of learning materials to making videos. (3) Expert validation and revision, namely, an activity process to assess whether

the design of learning videos is rationally more feasible or not, while revision is to correct errors in the product according to the directions and inputs from experts. (4) Small field trials, namely, to collect student responses to learning videos that have been developed through questionnaires. (5) The final product, which is a description of the final product of the learning video that has been developed. This research was conducted in one meeting.

**Instruments**

The instrument or tool for collecting data in this research is a questionnaire. Questionnaire is a data collection technique that involves giving written statements or questions to respondents to answer (Sugiyono, 2019). The purpose of this instrument is to determine the feasibility level of a media in the form of learning videos that have been developed and to evaluate learning videos before they are released. The questionnaire used is a questionnaire on material experts, media experts and student response questionnaires. The material expert validator and the media expert validator came from the Tadris Biology lecturer, Faculty of Tarbiyah and Teacher Training, North Sumatra State Islamic University. The contents of this questionnaire are aspects that will be assessed at the feasibility level of the learning video media that has been developed.

**Data Analysis**

The data analysis that the researcher uses is descriptive statistics as proposed by Sugiyono, which is a statistic used to analyze data by describing the data that has been collected in accordance with reality without any intended public conclusions (Sugiyono, 2019). The feasibility analysis of this learning video uses the descriptive analysis proposed by Sugiyono by using the feasibility percentage formula. Then the average score on each aspect obtained is converted into qualitative data on the feasibility level of learning video media products.

## ▪ RESULT AND DISSCUSSION

Based on the research resulted in a teaching media in the form of a scientific approach-based learning video on cell biology material. This research was not carried out until the effectiveness test was carried out due to the limited time of the researcher and the effectiveness test could be carried out in new research. This learning video was developed using the steps of the Borg and Gall which has been simplified by the Puslitjaknov Team (Puslitjaknov, 2008). Analysis of product requirements for learning video media based on a scientific approach to cell biology material includes reviewing the curriculum and identifying product needs. The fact is that in the field there are still many schools or teachers who are still focused on educators or what is commonly referred to as conventional learning. The purpose of curriculum analysis and field analysis is to adapt the media to the needs of the students' learning process. Based on this analysis, students need learning media in the form of learning videos that support teaching and learning activities more effectively.

**Product Development**

development of learning videos based on a scientific approach to cell biology material is through the collection of learning materials to making videos. The design for

making videos includes: recording, collecting videos,capturing images, making used animations, editing (sound, images, text and instruments), developing and making learning video media and packaging the initial learning video product in the form of a link drive. .

**Expert Validation and Revision**

Validation is an activity process to assess whether the design of instructional videos is rationally more feasible. The validation of the learning video media was carried out by material experts and media experts. Validators came from lecturers in the Biology Department, Faculty of Tarbiyah and Teacher Training.

**Table 1.** Material expert validation results

| No. | Category | Average Percentage | Criteria |
|---|---|---|---|
| 1 | Content feasibility aspect | 90% | Very feasible |
| 2 | Presentation aspect | 90% | Very feasible |
| 3 | aspect | 90% | Very feasible |
| | Average | 90% | Very appropriate |

Material experts give an assessment of the learning videos that have been developed. Then provide suggestions and input for improvement or revision. Before the final validation results were obtained, there were several inputs from material experts which included: to complete the material on cell biology in the learning video, adding the holy Qur'anic verses to the learning video and adding material about cell types. After revisions have been made and have been in accordance with input and suggestions from material experts, validation results are obtained, based on the results of validation by material experts which have been carried out the results are with an average percentage of 90%. This average percentage indicates that the learning video media developed is very feasible to support the student learning process on cell biology material.

**Table 2** Media expert validation results

| No. | Aspect | Percentage | Criteria |
|---|---|---|---|
| 1 | Feasibility of content | 90% | Very feasible |
| 2 | Presentation of learning | 95% | Very feasible |
| 3 | Graphics | 87% | Very feasible |
| 4 | Programming Aspect | 89% | Very feasible |
| 5 | Technical quality or appearance | 93% | Very feasible |
| | Average | 90.8% | Very feasible |

Media experts provide an assessment of the learning videos that have been developed. Before the final validation results are obtained by media experts, there are several inputs from media experts which include: the steps in the learning video should be adjusted to the steps of a good and correct scientific approach, the sound or sound in the learning video is not aligned so it is necessary to improve the sound on the video learning and the duration of the learning video is too long so it is necessary to reduce the duration of the learning video. After revisions were made and were in accordance

with the input and advice from media experts, the final results from media experts showed an average percentage of 90.8%. This average percentage shows that the learning video media developed based on a scientific approach is very feasible for the Biology learning process on cell biology material, because it is designed in such a way and meets the learning design criteria.

**Product Field Trial**

Based on a small field trial of 20 students, obtained results which state that the text or writing on the scientific approach-based learning video is easy to read, the images presented in the scientific approach-based learning video, the introduction of the material in this video invites to study and pay attention to problems in cell biology learning, students can understand cell biology material effectively, students can follow cell biology learning exercises, the sentences used in the video are easy to understand, students are interested in learning cell biology material using a scientific approach. So that the results obtained with an average percentage of 91.55%. Based on these results, the learning video media made are categorized as very feasible to be used for learning mechanisms on cell biology material.

**Table 3.** Field trial results

| No. | Category | Percentage | Criteria |
|---|---|---|---|
| 1 | Display | 90.94% | Very feasible |
| 2 | Presentation of material | 91.74% | Very feasible |
| 3 | Benefits | 91.97% | Very feasible |
| | Average | 91.55% | Very feasible |

**The Final Product**

Overview of the final product of the development of learning video media, the results of the development lasting 10 minutes 14 seconds. This video contains material about cell biology, this video was edited using an application called capcut, this video displays images of animal and plant cells. The use of animation and text in this video aims to clarify the material presented by the presenter. The results of this study are expected to improve students' scientific thinking skills so that students have high understanding and have high learning outcomes and students can solve problems.

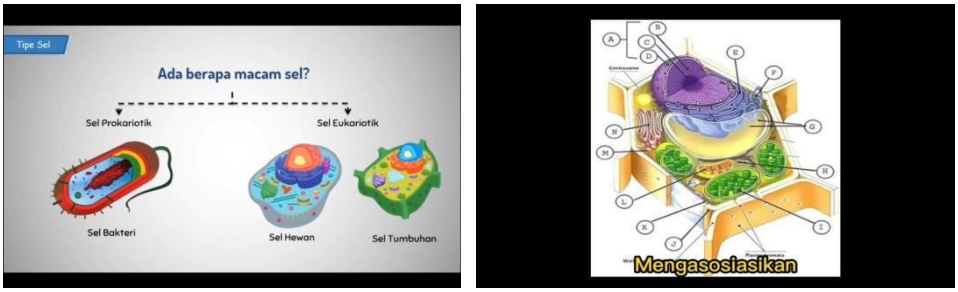


**Figure 1.** Example of learning video content

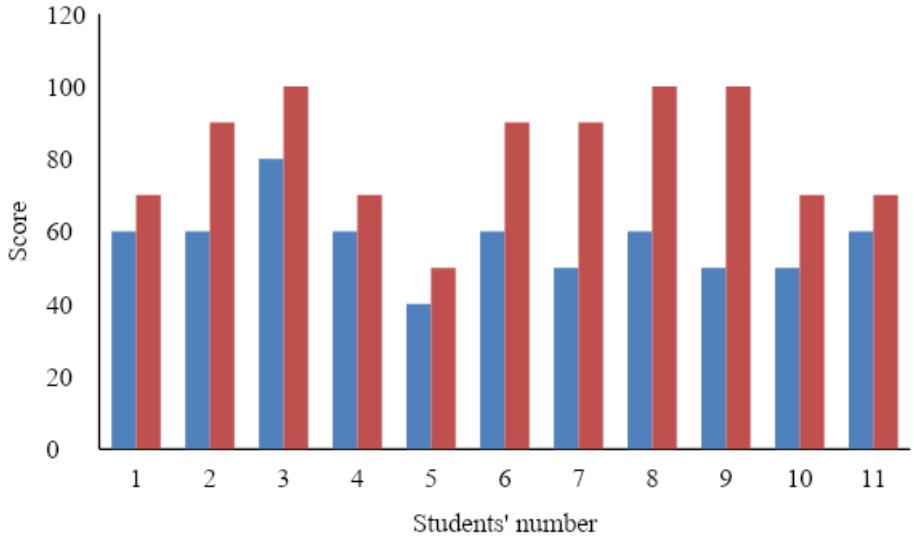


**Figure 2.** (blue) and posttest (red) scores of students

The pretest was given to students to determine student learning outcomes before using the learning video media that had been developed, while the post test was given to students to determine student learning outcomes after using instructional video media in cell biology material. Based on the table above, it shows that student learning outcomes when without using learning videos have an average of 57.27. Meanwhile, when using learning videos with an average of 81.82. From the results of the pre and post tests, it is clear that the increase in student learning outcomes is quite high, the acquisition of student learning outcomes is then calculated N-Gain score N 0.60 shows the medium category, the percentage of N-Gain Score is 60, 09% which indicates that the use of learning videos on cell biology material is quite effective in improving student learning outcomes.

## ▪ CONCLUSION

It can be concluded that the results of material expert validation on the developed learning video media fall into the very feasible category, with an average percentage of 90%, the results of the media expert validation on the developed learning video media fall into the very feasible category, with an average percentage of 90 ,8%. The results of a small field trial on the developed learning video media are in the very feasible category, with an average percentage of 91.55%. The students' learning outcomes have an N-Gain 0.60 which indicates the medium category, the percentage of N-Gain Score is 60.09% which indicates that the use of learning videos on cell biology material is quite effective in improving student learning outcomes. so that the scientific approach-based learning video media that has been developed is very suitable to be used as a learning medium on cell biology material.

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