Experimental Video of Heat Transfer Science Based on Information Technology

Asiah Ramadhani¹, Sahyar Sahyar² and Rachmat Mulyana³

¹ Basic Education, Postgraduate Medan State University, Medan, Indonesia
²-³ Postgraduate Medan State University, Medan, Indonesia

Email: asiahramadhani96@gmail.com

Abstract. This research was conducted to produce an experimental video that is feasible and practical to use, to produce a scientific experiment video on heat transfer based on information technology. The development model used is an adaptation of the Borg & Gall model. The results of this study indicate the validation of material experts included in the feasible category, validation of media experts with very feasible categories, testing small groups with very practical categories and field trials with very practical categories.

1. Introduction

In this globalization era, Indonesian education is experiencing a big paradigm. Currently education is in the digital and computerized era where the Indonesian education system has been based on technology. Changes that occur in education in Indonesia also affect the mindset of humans to keep abreast of the times, one of which they must have knowledge about digital technology and computerization in order to be able to survive and compete in the world of education.

Technology is a media that has a role in the world of education. With the advancement of technology students get learning not only through textbooks provided by the teacher but rather adapted to the development of science and technology available at this time. Learning media that is suitable in the digital and computerized era is video media.

Hamdani (2017: 254) that video describes the real state of a process, phenomenon or event so that it can enrich an exposure. Video media can bring up moving pictures accompanied by sound about events that occur in students' daily lives. Video is very suitable for use in teaching material in the cognitive, affective and psychomotor domains. By using video media in learning helps the teacher to deliver learning material so that students also more easily understand the material. The video that will be produced contains activities that are experimental or experimental, such as activities providing a series of equipment and materials, experimental activities or experiments in this video media used as a guide for students in conducting the same experiment in class.

In this video in conducting experimental activities in accordance with the steps of a scientific approach. The steps of a scientific approach, namely observing (observing), asking, gathering information, associating / reasoning / processing information, summarizing information and communicating, Daryanto (2014: 59).

This experimental video contains about heat transfer material. In one material there are three experimental videos produced, namely heat transfer by conduction, heat transfer by convection and heat transfer by radiation. Each experiment was carried out according to a scientific approach.
1.1 Stages in Making a Heat Transfer Experiment Video
Steps for producing a video program, i.e.
1) Formulate ideas, can be in the form of a title or topic,
2) Formulate basic competencies, core competencies, indicators and objectives in accordance with a predetermined topic,
3) Writing a script, as a guideline for recording pictures and sounds,
4) Storyboards, as a means used to interpret the written description of the picture elements contained in a script.
5) Recording images and sounds consisting of narration, music, and sound effects into video tape or video tape.
6) Image and sound editing or video editing.
7) After editing, the video should be evaluated by agencies or experts related to the video,
8) Then after the assessment, the video can be duplicated or duplicated, A.Priadi (2017: 155)

1.2 Computer Applications in the Making of Heat Transfer Experiment Videos
In making scientific heat transfer video experiments using the help of a computer application, namely Wondershare Filmora Video Editing, is an application designed to help the process of editing a video easily, simply with a faster time compared to other computer applications and has sufficient video quality well. This video is also stored in the Digital Versatile Disc (DVD) format and Internet video because the format is able to store data and information with a large capacity, has better image quality and sound clarity.

2. Method
The development model used is the Borg & Gall development model which has been simply adapted to suit the needs of researchers. The development steps taken are:

![Diagram of Experimental Process](image.png)

**Figure 1.** Procedure for Developing Video-Based Experiments in IT-Based Heat Transfer Adapted from Borg & Gall (1983).
3. Results And Discussion
To make scientific heat transfer video experiments required grid material in the form of basic competencies, core competencies, indicators and experimental objectives. Then a design is needed to conduct an experiment in accordance with a scientific approach. After that, make a script or storyboard, then the editing process. After completion of the experiment video is validated.

3.1 Validation of Heat Transfer Video
The video that has been made is carried out a validation process with media experts and material experts. The validated aspects of the media experts are the construction of the media and the material experts, namely the media content or the content of the material that is on the media itself. The results of the validation assessment of the experimental video can be presented as follows:

**Table 1. Results of the assessment by material experts on the heat transfer video**

| No. | Video                          | Average | Criteria  |
|-----|--------------------------------|---------|-----------|
| 1   | Conduction Heat Transfer       | 4,12    | Worthy    |
| 2   | Convection Heat Transfer       | 4,18    | Very Decent |
| 3   | Radiation Heat Transfer        | 4,06    | Worthy    |

**Table 2. Results of the assessment by media experts on the heat transfer video**

| No. | Video                          | Average | Criteria  |
|-----|--------------------------------|---------|-----------|
| 1   | Conduction Heat Transfer       | 4,50    | Very Decent |
| 2   | Convection Heat Transfer       | 4,57    | Very Decent |
| 3   | Radiation Heat Transfer        | 4,42    | Very Decent |

**Table 3. Results of small group test assessments on heat transfer videos**

| No. | Video                          | Average | Criteria  |
|-----|--------------------------------|---------|-----------|
| 1   | Conduction Heat Transfer       | 4,14    | Practical |
| 2   | Convection Heat Transfer       | 4,18    | Practical |
| 3   | Radiation Heat Transfer        | 4,11    | Practical |

**Table 4. Results of field test assessments on heat transfer videos**

| No. | Video                          | Average | Criteria  |
|-----|--------------------------------|---------|-----------|
| 1   | Conduction Heat Transfer       | 4,60    | Very Practical |
| 2   | Convection Heat Transfer       | 4,70    | Very Practical |
| 3   | Radiation Heat Transfer        | 4,50    | Very Practical |
The benefits of using this information technology-based video are,

1) Experimental videos developed can be used by students as initial knowledge to conduct actual practicum activities independently.
2) Experimental video media developed can be used as a substitute for conducting experiments for schools whose experiment tools are incomplete.
3) As a good reference to provide information and insights to teachers to conduct heat transfer experiments,
4) The availability of experimental videos that use a scientific approach,
5) Attract students' attention and make it easy for students to understand the material

4. Closing
   Conclusion

Based on these results, it can be concluded as follows:

1. In the result of validation from the material expert, the information technology-based heat transfer scientific experiment video is included in the appropriate category for use.
2. In the results of validation from media experts, video technology-based heat transfer scientific experiments are included in the category of very feasible to use.
3. In the small group trial evaluation results, information technology-based heat transfer scientific experiment videos fall into the very practical category for use.
4. In the results of field trial assessments, information technology-based heat transfer scientific experiment videos fall into the very practical category for use.

Suggestion

The suggestions to consider in developing this information technology-based scientific heat transfer video experiment are:

1. To make this experimental video requires clear communication with media experts and material experts.
2. For teachers, this experimental video should be used well as a guide in conducting experiments in the learning process
3. For students, this experiment video should be able to help students to conduct experiments independently.

References

[1] A. Pribadi, B. 2017. Media & Technology in Learning. Jakarta: Kencana
[2] Borg, W.R. & Gall, M.D. Gall. (1983). Educational Research: An Introduction, Fifth Edition. New York: Longman.
[3] Daryanto 2014. Scientific Learning Approach for Curriculum 2013. Yogyakarta: Gava Media
[4] Hamdani. 2017. Teaching and Learning Strategies. Bandung: Faithful Reader