Indonesian Journal of Education & Mathematical Science
Vol. 6, No. 2, Mei 2025, pp. 70~77
ISSN: 2715-985X, DOI: 10.30596/ijems.v6i2.24014

Development of Practical Learning Videos Based on Science, Technology, Engineering, and Mathematics (STEM) Assisted by KineMaster Application on Acid Base Material

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ABSTRACT

This study aims to develop a STEM-based practical learning video to help students achieve learning objectives. Where in the research location, practical activities on acid-base material were not carried out due to the lack of tools and materials used in the laboratory. The development model used is the Lee & Owens model, with five stages: analysis, design, implementation, and evaluation. The implementation of the research used was a teacher interview sheet, a student needs analysis questionnaire, a media expert validation questionnaire, a material expert validation questionnaire, teacher assessments and student response questionnaires. The trial was conducted on a small group of 10 students in grade XI Phase F2. The results of this development research were declared valid and suitable for use in learning. The material expert validator, the media expert validator gave a value that was suitable for testing by validating each 2 times. The teacher's assessment stated that it was suitable for testing with one validation. Students gave a good response with a value of 87.07% with the category "very suitable". Practical learning video based onscience, technology, engineering, and mathematicsThis has been proven to be valid, feasible and effective for use in acid-base learning and can help students achieve learning objectives even if they do not carry out practical activities directly in the laboratory.

Keywords: Practical Learning Videos, STEM, Acid Bases

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1. INTRODUCTION

Learning Learning is a process by which a person acquires knowledge, skills, attitudes, and understanding through experience, training, and education. This process involves interaction between students and learning resources (teachers, books, technology, environment, etc.). The purpose of learning is to change a person's behavior and understanding to a better and deeper level and be able to apply the knowledge and skills in everyday life. The process of learning is called learning, in learning in high school according to the curriculum used there is a chemistry subject.

Chemistry studies the composition, structure, properties, changes, and energy that accompany them,(Redhana 2019). One of the materials in chemistry learning is acid-base material. Some of the learning objectives in this acid-base material are measuring the pH acidity level and analyzing the pH change trajectory of several indicators. So to achieve these learning objectives, practical activities are needed. In practical activities, students can measure and analyze pH changes directly based on several indicators.In chemistry learning, understanding one of the materials, namely acids and bases, cannot only be learned through theory, but also requires practical activities (Khairunnufus et al. 2019)

According to Chandra and Dian (2020)Practical activities are an inseparable part of chemistry learning, because with the existence of practicals, students' skills will be trained, starting from the skills of observing a problem to the skills of communicating research results in the form of work reports and with the existence of practicals, students will be more skilled in using practical equipment in the laboratory. Practicals are important and cannot be separated from theory, but many obstacles are found in their implementation,(Jumrodah et al. 2023). These obstacles include, the lack of standardized tools and materials for practical work, the high cost of tools and materials for practical work, the limited time for practical work, and the lack of facilities for processing practical waste in schools. In addition, other obstacles faced are the low level of teacher motivation in planning, preparing and implementing chemical practical work due to the high workload while the time teachers have to carry out practical

work is limited, (Alifani et al. 2022). Practical activitiesprovide unexpected experiences to students,(Yudianto 2017).

In the learning objectives and learning objectives flow, students are required to be able to measure pH and analyze the pH change trajectory of several indicators, where to achieve this, practical activities are needed. If practical activities are not carried out, the learning objectives have not been achieved. One alternative that can overcome the problem of not implementing practical work in schools is the creation of substitute media for practical work. Learning media functions as a channel for messages from the sender to the recipient so that it can stimulate students' thoughts, attention and interest in the learning process, (Ardiman, Tukan, and Baunsele 2021). Media that can replace the role of practicums is practicum learning videos. Practical video learning media can help students understand practical material, (Putri et al., 2020). Students prefer learning video media because they are easier to understand and can be played repeatedly, (Putri and Dewi 2020). Student activity and responses to chemistry practicum learning video media are classified as very good, (Maulida and Nazar 2016)

One of the applications that can be used in making learning media videos for practical work is the KineMaster application. KineMaster is a full-featured and professional video editing application for iOS and Android devices. It supports multiple layers of video, audio, images, text, and effects equipped with various tools that allow teachers to create high-quality videos. The learning materials are designed to be as attractive as possible, can display videos, and animated images related to the learning materials so that students can focus more on what is conveyed by the teacher,(Hafizatul 2020)

One of the learning strategies that is suitable for application in acid-base learning is learning with a STEM approach.(Marpaung et al. 2022).STEM is a learning model that integrates aspects of science, technology, engineering and mathematics in developing student creativity through learning activities that prioritize problem solving in everyday life.(Munandar, Izzani, and Yulian 2020). The implementation of STEM-based learning models has been declared successful in improving chemistry learning outcomes (Suriti 2021). VideoSTEM-based learning can increase students' interest in learning and the use of STEM-based learning videos has a significant effect on increasing students' interest and learning outcomes (Devi and Subali 2021)

2. RESEARCH METHOD

This development research applies qualitative and quantitative methods with the type of researchresearch and development(R&D). The development model used is the Lee and Owens development model as a foundation in product development. The Lee & Owens development model is one of the multimedia development models whose series of steps in the development process are arranged systematically and clearly (Lee & Owens, 2004). In the Lee & Owens development model there are five stages of development, namelyAssessment/analysis, design, development, implementation, Andevaluation

A. Analysis stage

The analysis stage is the initial stage for identifying and determining needs. learning needs by collecting various information related to videos practical learning that will be developed. In this analysis stage, it is carried out several stages, namely, needs analysis, student characteristics analysis, objectives analysis, Educational technology materials and analysis.

B. Design Stage

The next stage carried out after conducting the analysis is the design stage. product. The product design stage will then be developed into a media learning in the form of STEM-based practical videos assisted by the Kinemaster application on acid base material.

C. Development Stage

The development stage is the stage of completing the product manufacturing process. Where what has been conceived in the design stage is then implemented into a finished product. The product to be developed is a video of practical learning STEM based. After the initial product is finished, it is continued to the next stage where The product must first be validated by material experts and media experts. The product that is made assessed by media experts and material experts in terms of material suitability and media suitability. So that researchers can then identify the product's deficiencies and weaknesses. Then This product will be revised according to input and suggestions from the expert team until the product is ready. declared worthy to be tested on students at the next stage.

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D. Implementation Stage

The implementation stage is a step to implement learning video products. STEM-based practicum on acid-base material. At the implementation stage, the product is tested try to find out the quality and feasibility of the product. After getting the feasibility test try from material experts and media experts the product is implemented to students, implementation is done in small groups

E. Evaluation Stage

Evaluation is conducted to see whether the developed practical learning video is feasible or not. At the evaluation stage it is called formative evaluation because it aims for revision needs, formative evaluation is conducted by media experts and material experts. The revised product is in accordance with input from media experts and material experts so that the product is declared feasible to be tested.

3. RESULTS AND DISCUSSION

A. Analysis stage

The results of the analysis obtained data as many as 57.1% of students agreed that practicums in chemistry learning were needed. And as many as 60.7% of students agreed that practicum activities helped the chemistry learning process. The results of an interview with one of the chemistry teachers at SMA N 10 Muaro Jambi, it was found that practicum activities were not carried out. The practicum activities were not carried out because there were several obstacles. The obstacles found were inadequate tools and materials in the laboratory. The results of the distribution of student characteristic questionnaires obtained data as many as 53.6% stated that they were less interested in acid-base material. And as many as 57.1% stated that acid-base material was difficult to understand. Based on teacher interviews in the chemistry learning process in class XI F2 only used book media as teaching materials. However, in the results of the questionnaire distribution, as many as 57.1% of students did not like the learning media used. This made 64.3% of students feel bored in the learning process. As many as 60.7% of students stated that they were interested in learning video media and as many as 67.9% of students agreed to use learning video media on acid-base material. From the data obtained, it can be concluded that learning media is needed to replace the role of practicums in learning and help students' learning process to better understand acid-base material.

B. Design Stage

The design process at the design stage begins with the creation of a flowchart to visualize the product development flow. After that, a storyboard is created containing the initial design which will then be developed into a media in the form of a practical learning video. In this stage, a team is also formed, a research schedule is determined so that the results of the developed learning videos are of high quality and can be used by students. At this stage, the material is arranged in line with the learning objectives set out in the independent curriculum. The material and content in the practical learning video are designed to be more interesting so that it is easier for students to understand.

C. Development Stage

In the development stage, the researcher implemented the Storyboard design that had been compiled into a STEM-based practical learning video product. The development stage includes two main processes, namely product development and validation.



Fig 1. Video cover view



Fig 2. Explanation of the Definition of Acids and Bases

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Fig 3. Characteristics of acids and bases



Fig 4. Practical Activities

Video development is carried out using the KineMaster application for editing and combining elements such as text, animation of the practical process into a practical learning video.

Subject matter expert validation

Validation of material experts is done quantitatively by asking for advice and input from experts until the media is declared worthy of being tested. In the first stage of validation of material experts, there were several improvements from material experts.

Table 1. Material expert validation

No	Aspect Evaluation	Question	Correct	Improvements/Suggestions
1	Format	Is the acid-base material presented in the STEM-based practical video appropriate? Independence curriculum module?	It's all right	-
		Is the topic of the acid-base material in the STEM-based practical video appropriate? with TP and ATP?	Already appropriate	-
2	Contents	Is the arrangement of acid-base material in the practical learning video STEM-based?	Not yet suitable	• In the example section, the application of STEM is not yet appropriate • In the practical activities, STEM is not yet depicted
		Is the arrangement of acid-base material in STEM-based practical learning videos complete? regular?	Already appropriate	-
		Is the acid-base material in the STEM-based practical learning video easy to understand?	Yes, it is easy to understand	-
		Can the material in the STEM-based practical learning video achieve the practical objectives contained in the flow? learning objectives?	Yes it is achieved	-

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		Can the elements in the practical learning video visualize the material concept? acid base	Yes, it is appropriate	-
		Whether component contextual in the learning video is appropriate	Yes, it is appropriate	-
3	Language	Is the use of language in the practical learning videos clear, simple and easy? understood?	Yes, it is simple and easy to understand	-
		Is the use of language in Is the learning video standard?	Not yet suitable	• In the explanation of STEM there are non-standard words

From the results of the first validation, the researcher then revised the parts that were not appropriate. Then the second stage of validation was carried out again, the results of the second stage of validation obtained the conclusion that the product developed was "Eligible for Field Trials with Revisions".

Media Expert Validation

Media expert validation is also done quantitatively by asking for advice and input from experts until the media is declared worthy of being tested. In the first stage of media expert validation, there were several improvements from media experts.

Table 2. Media expert validation

No	Aspect Evaluation	Question	Correct	Improvements/suggestions
1	Simplicity	What is a learning video?STEM-based practicums easy to understand?	Yes, it is easy to understand	-
		Are the images and text in the STEM-based practical learning videos easy to understand?	Yes, it is easy to understand	-
		Is the quality of the STEM-based practical learning videos good?	Yes, good quality	-
		Can the supporting elements of the video clarify the concept you want to convey?	Not yet	Some supporting elements are not related to the material presented, such as the characteristics of acid-base solutions stating the pH measurement, but the element is a universal indicator.
2	Integration	WhetherIs the video layout correct?	Yes, it is appropriate	-
		Is the arrangement of fonts and audio clear and appropriate?	Not yet	There are several font sizes that are not appropriate

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3	Emphasis	Do the elements, images and fonts in the video provide emphasis to the material being explained?	Not yet	There are images that do not match the concept that is being conveyed, such as a teacher explaining but the image of the teacher is younger than the student.
4	Balance	Is the layout of text, images and elements in the video appropriate?	Not yet	In the practical activities there is a section where the narrator covers the practical tools and materials.

From the results of the first validation, the researcher then revised the parts that were not appropriate. Then the second stage of validation was carried out again, the results of the second stage of validation obtained the conclusion that the product developed was "Eligible for Field Trials with Revisions".

Teacher Assessment

This teacher assessment is used as a consideration for improving the teaching material product being developed. This assessment sheet is filled in by the Chemistry teacher. And this assessment sheet is in the form of questions containing comments and suggestions as improvements to perfect the product. Based on the results of the teacher's assessment, overall the teaching material developed is very good and worthy of being tested.

D. Implementation Stage

The trial was only conducted as a small group trial consisting of 10 students in class XI F2. In the implementation of the trial, students watched and listened to the learning video displayed through a projector. Furthermore, students were given a student response questionnaire to be filled in and to provide an assessment of the STEM-based learning video product that was developed. And the results obtained from the student response questionnaire regarding the STEM-based practical learning video are as follows:

Table 3. Student response questionnaire results

No Questions	Respondents										Score
	1	2	3	4	5	6	7	8	9	10	
1	4	4	4	5	4	4	4	4	4	4	41
2	5	4	4	4	5	4	5	4	4	5	44
3	5	4	4	4	4	4	5	4	4	5	43
4	5	4	4	5	4	4	4	4	4	5	43
5	5	5	4	4	5	4	4	5	5	4	45
6	5	4	5	4	5	4	5	4	4	4	44
7	5	4	4	4	4	4	4	4	5	5	43
8	5	4	5	4	4	4	4	5	4	4	43
9	5	4	5	4	4	4	5	4	4	4	43
10	5	4	4	4	4	4	5	4	4	5	43
11	5	5	4	4	4	4	4	5	4	5	44
12	5	4	4	4	5	4	4	4	4	4	42
13	5	5	5	4	5	5	4	5	5	5	48
Total number											**566**

According to Riduwan, (2014) to determine the classification of student responses, the percentage of eligibility is used with the formula:

$$\boldsymbol{K} = \frac{\boldsymbol{F}}{\boldsymbol{N} \times \boldsymbol{I} \times \boldsymbol{R}} \times 100\%$$

Information:
K = Percentage of eligibility value
F = Total number of respondents' answers
N = Highest score in the questionnaire

I = Number of questions in the questionnaire
R = Number of Respondents
The interpretation of the scores can be stated as follows:

Table 4. Student Questionnaire Assessment Categories

Number of Item	Average Answer Score	Description of Criteria
1	81%-100%	Very Good
2	61%-80%	Good
3	41%-60%	Not Good
4	21%-40%	Bad
5	0%-20%	Very Bad

$$\boldsymbol{K = \frac{566}{5 \times 13 \times 10} \times 100\%}$$

$$\boldsymbol{K = 87,07\%}$$

E. Evaluation Stage

The evaluation in this study is formative in nature, which is carried out at every stage, both at the analysis, design, development and implementation stages. Evaluation is carried out for the need for revision and improvement to obtain a feasible product.

4. CONCLUSION

Based on the results of the research on the development of practical learning videos based on Science, Technology Engineering and Mathematics (STEM) assisted by the KineMaster application on acid-base material, the following conclusions can be drawn:

The process of developing a video product for learning practical work based on Science, Technology Engineering and Mathematics (STEM) assisted by the KineMaster application on acid-base material, was designed using the KineMaster application and this video product for learning practical work was developed using the Lee and Owens (2004) development model.

A practical learning video based on Science, Technology Engineering and Mathematics (STEM) assisted by the KineMaster application on acid-base material that was developed is conceptually feasible based on the validation results of material experts and media experts.

The video product of practical learning based on Science, Technology Engineering and Mathematics (STEM) assisted by the KineMaster application that was developed received a decent response from chemistry subject teachers and obtained a percentage of answers from all student respondents of 87.07% with the category of student responses "Very Good".

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