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Development of instruments for measuring contextual-based video quality of fluid for physics at senior high school grade XI

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Abstract. Contextual learning videos present various events related to the topic of the lesson. One of the benefits of contextual-based learning videos is to improve critical thinking, creative thinking, collaboration, and communication skills (4C). The requirement for a video to meet the standards as a learning medium is valid, practical, and effective. An instrument is needed to measure the three the quality standard of the learning media. The instrument must meet valid and reliable criteria. An instrument has been developed to measure the validity, practicality, and effectiveness of CTL-based fluid learning videos for high school physics lessons level XI. The instruments consist of (1) validity according to expert physics learning and physicists, (2) practicality according to senior teachers and high school students, and (3) effectiveness for measuring critical thinking skills, creative thinking, collaboration, oral communication, and written communication; over all 9 instrument units. Expert validation tests have been carried out and all instruments are considered valid. Experts, teachers, and students have tested the use of instruments, the test results show that all the instruments are reliable. Based on the results obtained, it can be concluded that the instrument made meets the standards as a measuring tool for the quality of contextual-based fluid learning media.

1. Introduction

Product development in education is a series of activities carried out by the education system and educational research to produce learning products. The development of learning products aims to improve existing products in schools and can be used to facilitate students to learn according to the needs and demands of the 21st century era which is also called the millennium era or the digital era or the information age,[1, 2].

The needs and demands of the millennial era by utilizing technology in the learning process and increasing 21st century students' skills include critical thinking skills, creative thinking skills, collaborative skills and communication skills [3, 4].

Fulfillment of information age learning requires the development of media in the form of contextual-based learning videos. Contextual-based videos were developed to complement the videos used by teachers in advance. Those video displays whole and real fluid phenomena in everyday life, while train and develop students' abilities to find out and find the relationship between fluid phenomena and the material being studied. The existence of a contextual approach in the video can guide, train and develop students' 21st century skills in accordance with the demands of the present



era. Applying a contextual approach is the right solution to use in the video. Haryanto & Indiyah [5] & Wang., At all [6] suggested that the use of a contextual approach can train and encourage students to analyze deeply using higher-order thinking skills against real-life contexts solved by students independently and also increase students' self-efficacy from solving that has been done. The existence of contextual in addition to making students get meaning for the material they learn related to the application of daily life, contextual can also motivate students [7,8, 9] and improve their learning outcomes [10,11] .

In other that contextual-based videos can teach students according to the needs and demands of the present era. Then a feasibility test was carried out [12]. The video feasibility test was conducted to determine the quality of the learning videos in a valid, practical and effective manner. These three tests are the main requirements that must be met in development research to produce quality products [13, 14].

Testing the quality of the learning videos in a valid, practical and effective manner using instruments. Instruments need to be developed to assess video quality. In order for the instrument to be able to judge the quality of the video, it is first tested for quality. Testing the quality of the instrument by testing the validity of the instrument [15]. Testing the validity of the instrument by providing instruments to experts [16,17,18,19,20]. The expert will assess the quality of the instrument using the instrument rating sheet and test the validity of the instrument made.

The validity of the instrument indicates the instrument used authentic. The validity of the instrument can reveal what should be disclosed [21]. Through the validity test of the instrument, we can find out the authentic of the instrument and can find out whether the instrument is feasible or not [22].

To obtain quality instruments, scientific procedures are applied in their construction, so that the instruments can be used and assess the quality of the learning videos in a valid, practical and effective manner. Through this research, it can solve the problem of the need for the instrument used.

2. Method

This study applies development research, research and development. The model used on develop instrument refers to the ADDIE model stage. ADDIE stands for analysis, design, development, implementation and evaluation. The analysis stage begins with the need for instruments used to assess the quality of contextual-based learning videos by setting goals and analyzing a number of literature related to instrument development. The design stage is carried out by designing the instrument starting from determining the form of the test, determining the aspects to be assessed, formulating indicators based on the literature review and research objective next designing the grid. The development stage is carried out by making real instruments, then validating the instruments to experts using the instrument assessment sheet. The implementation stage is carried out after the instrument is declared valid from the validator then applied to assess the video. There are two stages of evaluation, namely formative evaluation and summative evaluation. Formative evaluation is carried out an assessment for each ADDIE stage then summative evaluation is the final assessment of the instrument developed to obtain a valid instrument.

The research object is related to validation instruments (physicists and learning physic experts), practicality instruments (teachers and students) and effectiveness instruments (critical thinking skills, creative thinking skills, collaboration, oral communication and written communication).

The instrument was used to collect data using an instrument assessment sheet in the form of a questionnaire. On the instrument appraisal sheet, there are three aspects of the assessment of the instruments developed, the assessment of the instrument from the content, the assessment of the instrument from the presentation and the assessment of the instrument from the charts used. The three aspects will be filled in by experts based on the Likert scale available in the instrument rating sheet. There are five scales; very good, good, sufficient, lacking and very poor. The Likert scale is used to measure a person's opinion on the instruments made [23].

Data analysis was carried out by analyzing the instrument validly using the opinion of Aikens' V to find out whether the instrument was developed valid or not by classifying the data obtained through the criteria in Table 1.

Table 1. Validity Criteria [24]

Value	Criteria
$\geq 0,6$	Valid
$< 0,6$	Not Valid

3. Result and Discussion

Nine sets of instruments have been successfully developed to measure the quality of CTL-based physics learning videos for fluid material, as presented in Table 2 below:

Table 2. Nine sets of instruments measure the quality of the contextual-based physics learning video

No	Name of instrument	Number of Aspect	Number of statement
1	Physicist expert instrument	3 aspect	13 statement
2	Learning physics expert instrument	3 aspect	12 statement
3	Teacher practical instrument	3 aspect	14 statement
4	Students practical instrument	3 aspect	11 statement
	Students critical thinking skills instrument	3 aspect	14 statement
5	Students creative thinking skills instrument	3 aspect	13 statement
6	Students collaboration skills instrument	3 aspect	14 statement
	Students oral communication skills instrument	3 aspect	15 statement
8	Students written communication skills instrument	3 aspect	15 statement
9	Students written communication skills instrument	3 aspect	15 statement

Nine instruments that were assessed by experts using the instrument assessment sheet. There are several suggestions given by relevant experts from the instruments developed as shown in Table 3.

Table 3. Summary of expert suggestions

Name of Instrument	expert suggestions
Physicist validation instrument	Statements related to examples of video shows related to daily events have a new side ", are broken down into 3 statements, namely a) related to daily events, b) related to technology, and c) having updates. Video view statements related to everyday events can be used for exploration ", changed to" video views can be used for exploration " Overlapping statements are removed
Learning Physics validation instrument	Change the term "response" to "interaction" The statement "video presentation can foster learning motivation and increase student creativity" is broken down into 2 statements, namely a) assessing motivation and b) assessing creativity
Teacher practical instrument	Add a number of instrument items for the contextual-based learning component
Student Practical Instrument	Write a statement about the convenience, benefits and attractiveness according to the characteristics of the video, for example: 1. the cases

Name of Instrument	expert suggestions
Critical Thinking	<p>in the video are easy for me to understand, 2. the cases in the video are packaged attractively.</p> <p>The critical thinking skills assessment instrument should be linked to the research topic.</p> <p>Simplify writing indicator sentences.</p> <p>fix the overlap indicators of critical thinking skills instruments.</p>
Creative thinking skills instrument	<p>It is recommended that the instrument for assessing creative thinking skills be linked to the research topic</p> <p>fix the indicators of the overlapping creative thinking skills</p> <p>Change the descriptive assessment of creative thinking skills from: not yet right to "not quite right".</p>
Collaboration skills instrument	<p>Refine instruments that measure individual student collaboration skills.</p> <p>Create a scoring rubric for each student</p> <p>Statement hearing opinions and helping people. Breaking down into: 2 statements, namely a) listening to opinions and b) helping others.</p> <p>It would be nice if the collaboration skills assessment instrument was connected with the research topic.</p>
Oral Communication skills instrument	<p>It is suggested that the instrument for assessing oral communication skills be linked to the research topic.</p> <p>Improve instruments that measure each student's oral communication skills.</p> <p>It is recommended that we replace the terms mostly and partially in the instrument description.</p> <p>We recommend that you replace the word "very capable / capable / less able / unable to be always / often / rarely / never" to "always / often / rarely / never said and by entering the appropriate numbers"</p>
Written Communication skills instrument	<p>It is recommended that the written communication skills assessment instrument be linked with the research topic.</p> <p>It is suggested to improve the instrument that can measure each student's written communication skills.</p> <p>Use simple sentences in making indicators.</p> <p>Replace the words for the most part and part of the instrument description.</p>

Based on the suggestions given by experts in Table 3, revisions were made to the instruments according to these suggestions. Furthermore, the revised instrument was re-validated by these experts. The results of instrument validation can be seen in Table 4.

Table 4. The results of the validation of nine sets of instruments

No	Name of instrument	Number of Aspect	Assessment by the Validator (V)		Category
			V ₁	V ₂	
1	Physicist expert instrument	Content	0,75	0,75	Valid
		Construct	0,89	0,94	Valid
		Graphic	1	1	Valid
2	Learning physics expert instrument	Content	1	0,75	Valid
		Construct	0,92	1	Valid
		Graphic	1	1	Valid
3	Teacher practical instrument	Content	0,88	1	Valid
		Construct	0,94	0,91	Valid
		Graphic	1	1	Valid
4	Students practical instrument	Content	1	0,5	Valid
		Construct	0,92	0,75	Valid
		Graphic	1	1	Valid
5	Students critical thinking skills instrument	Content	1	0,75	Valid
		Construct	0,78	0,83	Valid
		Graphic	1	0,96	Valid
6	Students creative thinking skills instrument	Content	0,75	0,75	Valid
		Construct	0,79	0,85	Valid
		Graphic	1	0,96	Valid
7	Students collaboration skills instrument	Content	0,75	1	Valid
		Construct	0,94	0,96	Valid
		Graphic	1	1	Valid
8	Students oral communication skills instrument	Content	1	1	Valid
		Construct	0,89	0,93	Valid
		Graphic	1	1	Valid
9	Students written communication skills instrument	Content	1	0,75	Valid
		Construct	0,9	0,8	Valid
		Graphic	1	0,86	Valid

From Table 4, it describe that the nine sets of instruments developed are valid. The validity of the instrument shows that the instrument has met the three aspects of the assessment contained in the instrument assessment sheet. The content aspect states that the instrument can measure the video quality according to the actual problem and in accordance with the objectives achieved. Construct aspect states that the instrument has clear instructions, is easy to use to assess, has the accuracy of the items being assessed, has clarity of feedback in assessing. The graphic aspect states that the instrument has a legible size and type of writing and has consistent regularity in the presentation.

From the results of the data obtained regarding the assessment of the nine sets of instruments developed, they are all in the valid category. Valid shows that nine sets of instruments are feasible to be used to assess the quality of contextual-based physics learning videos. Nafi'ah, at all [25], Pertiwi [26], Simanjuntak, at all [27] & Arifin, at all [28] stated that they are valid by experts describing the developed instruments are correct and suitable for use in measuring. Meet the requirements contained in the instrument rating sheet [29] and can measure a situation accurately [30, 31].

4. Conclusion

Based on the results and data analysis related to nine sets of instruments; physicist validation, physics learning expert validation instrument, teacher practicality instrument, student practicality instrument,

student critical thinking skill effectiveness instrument, student creative thinking skill effectiveness instrument, collaboration skill effectiveness instrument, and instrument effectiveness. Oral and written communication skills state that the instrument is in the valid category. Valid shows that the instrument has met the standard as a means of measuring the quality of contextual-based fluid learning videos.

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