

Development of Learning Media using Powtoon Application on Liquid Pressure Topic

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Abstract

A valid, practical, and effective cartoon-based learning media on liquid pressure material has been developed by employing the Powtoon application and using Four-D (4D) stages. Expert validity and empirical validity of the media achieved an average score of 3.94 and 3.84 respectively with very valid criteria. The test instrument validity score was 3.37 with valid criteria. Supporting data for implementation is obtained using several instruments. The learning implementation observation sheet is used to observe teacher activity in the classroom; student responses were collected through questionnaires; and student activity is observed through the observation sheet. The practicality quality of teaching materials is obtained a percentage of 100% with very good criteria. The student responses to indicators of learning motivation with a percentage of 86.7%, indicators of ease and satisfaction of learning with a percentage of 84.7, learning innovation indicators with a percentage of 87.8%, and learning achievement indicators with a percentage of 89.2%. The effectiveness of the teaching material was obtained from observing student activities with a percentage of 86% in meeting I and of 88.7% in meeting II. The student's competency C2 (describing) achieve a percentage of 88.7%, C3 (applying) with a percentage of 81.75%, C4 (analyzing) with a percentage of 93.25%, and C5 (proving) with a percentage of 73%, all in good criteria. Learning outcomes in classical completeness obtains a percentage of 93.3%. It can be concluded that learning media in the form of teaching materials using the Powtoon application has the potential to increase students' understanding of concepts.

Keywords: learning media, powtoon, liquid pressure

INTRODUCTION

The problem often faced by education in developing countries is the less control of the learning process. The learning process in the classroom is more directed at completing the curriculum. Implementation of concepts in everyday life is still not an important reference. The issue is also experienced in physics learning which is less attractive to students because it is considered difficult to learn. By responding to students' opinions about the complexity of physics concepts, the presence of learning media to increase students' interest in learning physics becomes crucial (Dewi, 2019).

One of the learning media that potentially increase students' interest in learning is cartoon-based learning media. This is supported by the theory of Rieseco, Paukner & Ramirez (2013) that cartoon-based learning media is good to use during the learning process because it gives space for students to develop their imagination. The same idea was also conveyed by Mustaka, Hikmah, & Mahtari (2018) that cartoon learning media is easy for students to understand because cartoon presentations also represent the implementation of concepts in everyday life.

Therefore, in this study it is important to develop

cartoon-based learning media as a problem-solving step in learning activities. Dalacosta, Kamaritaki, & Pavlatou (2011) revealed that the use of cartoons is very effective presented in pictures and animations. From several research shows that not many cartoon books have been developed based on research. Kabapinar (2015) explains that the cartoons are only in the form of text without audio support to get an interesting cartoon meaning. Dalacosta, Kamaritaki, & Pavlatou (2011) revealed has deficiencies in cartoon displays, especially in stiff images, narration and animation that are not aligned so that the combination of cartoon displays is less effective. Therefore, it is important to develop cartoon-based learning media containing images and animations that were added to audio and enhanced by the Powtoon application to clarify the cartoon concepts to be shown.

Cartoon animation using the Powtoon application provides demonstrations of physics concepts in cyberspace. By using this media students tend to not easily bored and stiff during the cartoon animation process. Furthermore, it helps students able to create a new learning atmosphere and can increase students' interest in learning about physics. Especially in the subject of Archimedes' Law, many students still meet the constrains to understand physics concepts

especially physical phenomena in everyday life. As has been asked to students about the understanding of Archimedes' law in the event of objects floating, buoying, and sinking. There are still many students who do not know when asked why large ships can float while small stones sink easily.

Powtoon application-based learning media is suitable to be used in SMPN 5 Paguyaman Pantai schools. According to the recognition of students and teachers, the learning lasts for two to four credits in each class and only provide theory. This condition causes the physics practicum cannot be carried out because the teacher focuses on completing the theory required by the curriculum. Based on the interviews with science teachers at SMPN 5 Paguyaman Pantai, information was obtained that during the learning process they only provided textbooks as learning media to study. Students also explained that face-to-face learning was very limited in time, and they studied physics only from textbooks lent by the school. As a result, they feel less motivated to learn and have an impact on students' low scores on physics concepts.

METHODS

Research and development (R&D) methods were employed in this study. The model used in this study was the define, design, develop, disseminate (4D) model which was developed by Thiagarajan & Samel in 1974. The subjects of this study were 15 grade 8 students of SMP Negeri 5 Paguyaman Pantai, Boalemo Regency, Gorontalo Province. The research instruments were observation sheets, validation sheets, and test sheets used to measure the validity of the content and construction of the media, as well as the validity of the research instruments. The practicality aspect of using Powtoon media is measured through observation sheets of learning implementation (teacher activity) and questionnaires for students. The effectiveness of implementing Powtoon media is measured from the observation sheet of student activities and achievement tests.

Data analysis techniques in this study are validity, practicality, and effectiveness data analysis. This validation was carried out by two validators namely, validator 1 expert on learning media and validator 2 experts on learning materials and research instruments. The results of the assessment by each expert validator use equation (1) Arikunto (2013).

$$X : \frac{\sum X}{n} \tag{1}$$

where:

X : average scores

$\sum X$: the total number of answer values from the validator

n : number of validators

Furthermore, the validation criteria for the analysis of the average value can be seen in Table 1.

Table 1. Validation Analysis Criteria

Average Scores	Criteria
3.75 < x ≤ 4.00	Very valid
3.00 < x ≤ 3.75	Valid
2.25 < x ≤ 3.00	Moderate
1.50 < x ≤ 2.25	Poor

Table 1 shows that cartoon-based learning media using the powtoon application can be used if it meets valid or very valid criteria based on expert judgment.

An analysis of the practicality of the learning media developed in this study was obtained based on an analysis of the implementation of learning (teacher activity) and a questionnaire to see student responses using a closed questionnaire. Analysis of the implementation of learning is based on the analysis of data from observations of the implementation of learning. This analysis consists of two options, namely carried out or not carried out. According to Sukardi (2013), the equation (2) is used to calculate the implementation of the learning process.

$$\% \text{ Accomplishment} = \frac{\text{Number of steps accomplish}}{\text{Number of steps planned}} \times 100\% \tag{2}$$

Assessment of the implementation of learning is carried out by determining the results of the average total score given with the criteria in Table 2 proposed by Sukardi (2013).

Table 2. Accomplishment of learning activity

Range percentage (%)	Interpretation
86 – 100	Very good
76 – 85	Good
66 – 75	Moderate
56 – 65	Poor
0 – 55	Very poor

To obtain the practical quality of the

implementation of learning (teacher activity), the results of the questionnaire scores should in the interpretation with good or very good criteria. A questionnaire rating scale to see student responses to cartoon-based learning media using the Powtoon application on liquid pressure concept was also analyzed. The criteria for the questionnaire data analysis as proposed by Arifin (2010) is shown in Table 3.

Table 3. Criterias for students' responses to Powtoon learning media

Score	Criteria	Range (%)	Interpretation
4	Strongly agree (SS)	86 – 100	Very good
3	Agree (S)	66 – 85	Good
2	Disagree (TS)	46 – 65	Poor
1	Strongly disagree (STS)	0 – 45	Very poor

Based on Table 3, the average score of the assessment can be calculated using equation (3) as proposed by Arifin (2010).

$$\text{Percentage (P)} = \frac{\text{every aspect appears}}{\text{number of students}} \times 100\% \quad (3)$$

Not only using equation 3, but the percentage calculation can also use equation (4) as proposed by Agustin (2020).

$$P = \frac{\text{number of aspect appear}}{\text{number of students} \times \text{maximum score weight}} \times 100\% \quad (4)$$

A questionnaire to see student responses is used to measure the practicality of learning from cartoon-based learning media using the Powtoon application and is said to be effective if the results of the questionnaire have a very good or good interpretation.

Effectiveness analysis was obtained based on the analysis of the results of observations of students' activities and analysis of student learning outcomes tests in the cognitive domain (knowledge). Analysis of student activity during the learning process for two meetings with the results of observing student activity can be analyzed using equation (5) as proposed by Sukardi (2013).

$$\% \text{ Students' activity} = \frac{\text{Total scores (A)}}{\text{Maximum scores (N)}} \times 100\% \quad (5)$$

Analysis of learning outcomes is obtained

based on the analysis of student learning outcomes tests in the cognitive domain (knowledge) and can be analyzed using equations (6) and (7) as proposed by Sukardi (2013).

$$\text{Individual completeness} = \frac{\text{Total scores}}{\text{Maximum scores}} \times 100\% \quad (6)$$

$$\text{Classical completeness} = \frac{\text{Complete students}}{\text{Total number of students}} \times 100\% \quad (7)$$

The effectiveness of completeness refers to Table 4 proposed by Sukardi (2013).

Table 4. Effectiveness Criteria

Range percentage (%)	Interpretation
85 – 100	Very good
70 – 85	Good
66 – 70	Moderat
0 – 65	Poor

Learning outcomes are said to be effective if the criteria are in very good or good interpretations from the range of 70% - 100%.

RESULTS AND DISCUSSION

Maesyarah (2018) explains that feasibility of media based on the aspect of validity is obtained through media validation by experts. The practicality of the learning process as explained by Rieseco (2017) are said to be practical if the respondents state that learning media can be used in learning which is indicated by high scores or assessed by both students and teachers in good criteria. In line with the explanation by Kabapinar (2015) that practicality tests can be carried out by distributing questionnaires to student respondents. In addition, according to Kafah (2020) in development research, learning is said to be effective as can be seen from student learning outcomes and student activities.

The FourD research model (Define, Design, Develop, and Disseminate). The 4D research stages can be described as follows.

The definition stage begins with establishing and defining the requirements for media development according to user needs through observation activities (Dewi, 2019). This definition was observed at SMPN 5

Paguyaman Pantai by establishing several problems in the learning process. The observations were made to see the characteristics of students, analyze teaching materials used by teachers, and formulate learning tools needed to solve problems.

At the design stage, research instruments and products have been designed (Fajar, 2017). At this stage, learning media products use the Powtoon application and the necessary research instruments have been designed.

The develop stage is validating research instruments and learning media products that have been developed (Arif, 2021). At this stage, validation of research instruments was carried out in the form of observation sheets and questionnaires which were then used to conduct observations at SMPN 5 Paguyaman Pantai.

The disseminate stage is the stage for promoting the benefits of the product developed (Kafah, Nulhakim & Pamungkas, 2020). The Powtoon application-based learning media has been tested and disseminated at SMPN 5 Paguyaman Pantai schools through a link to class 8 students, Science Teacher at SMPN 5 Paguyaman Pantai, as well as Principal Schools of SMPN 1 Paguyaman Pantai, SMPN 3 Paguyaman Pantai, and SMPN 4 Paguyaman Pantai School, as well as disseminated through YouTube media. The media display is shown in Figure 1. The cartoon-based learning video with the Powtoon application was broadcasted 22 minutes. Basic competencies are presented in Figure 2 and followed by learning objectives as shown in Figure 3.



Figure 1. Media front page
(<https://www.powtoon.com>)



Figure 2. Display of Basic Competency
(<http://www.powtton.com>)



Figure 3. Profile of learning objectives
(<http://www.powtton.com>)

The first topic in this learning media is hydrostatic pressure as shown in Figure 4.



Figure 4. Display of Hydrostatic Pressure
(<http://www.powtton.com>)

The next topic presentations, namely Connected Vessels, Pascal's Law, and Archimedes' Law are shown in Figures 5, 6, and 7.

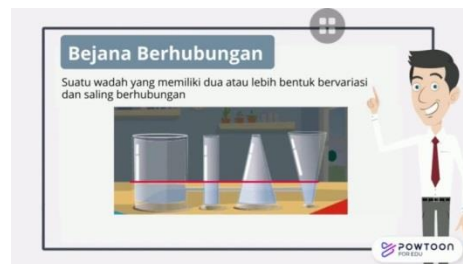


Figure 5. Connected Vessels
(<http://www.powtton.com>)

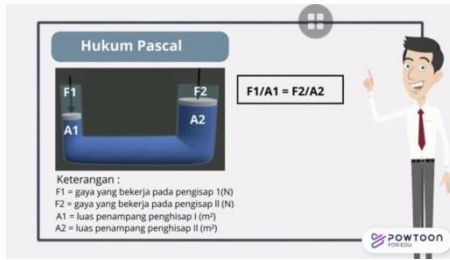


Figure 6 Pacal's Law
(<http://www.powtoon.com>)



Figure 7. Archimedes's Law
(<http://www.powtoon.com>)

The media is also equipped with problem excercises as shown in Figure 8.



Figure 8. View of problem exercises page
(<http://www.powtoon.com>)

The last display in this learning media is acknowledgement to students to end learning as shown in Figure 9.



Figure 9. Acknowledgement page
(<http://www.powtoon.com>)

Based on the results of the media development carried out, the research results obtained for three indicators, namely validity, practicality, and effectiveness.

The validity of this study includes the validity of learning media, learning material validation and research instrument validation. The developed learning media has produced cartoon-based media products using the Powtoon application on liquid pressure topic that is feasible to use.

The aspects assessed by the learning media design expert validator are the attractiveness of the animation presentation, the suitability of animation and sound, the attractiveness of the display form, the suitability of color proportions, and the ease of use. These five aspects are presented in Figure 10 showing a graph of the results of learning media validation.

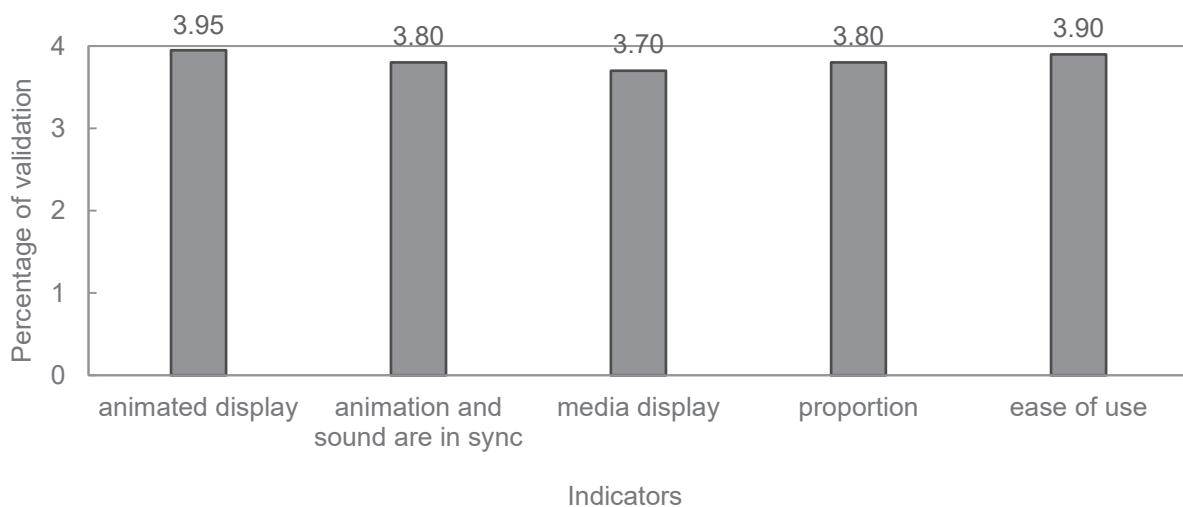


Figure 10. Scores of learning media validation

Based on the results of the media expert's validation as shown in Figure 10, there are 4 items validated in learning media with the highest validation rating score, namely attractiveness of animated display (3.95) and the lowest score, the media display (3.75).

The aspects assessed by the material expert validator include clarity of instructions for use, learning

media relevant to the material being studied by students, learning objectives in accordance with the applicable curriculum, the content of the material is easy to understand, the content of the material is presented sequentially, and the clarity of language use. The six aspects are presented in Figure 11.

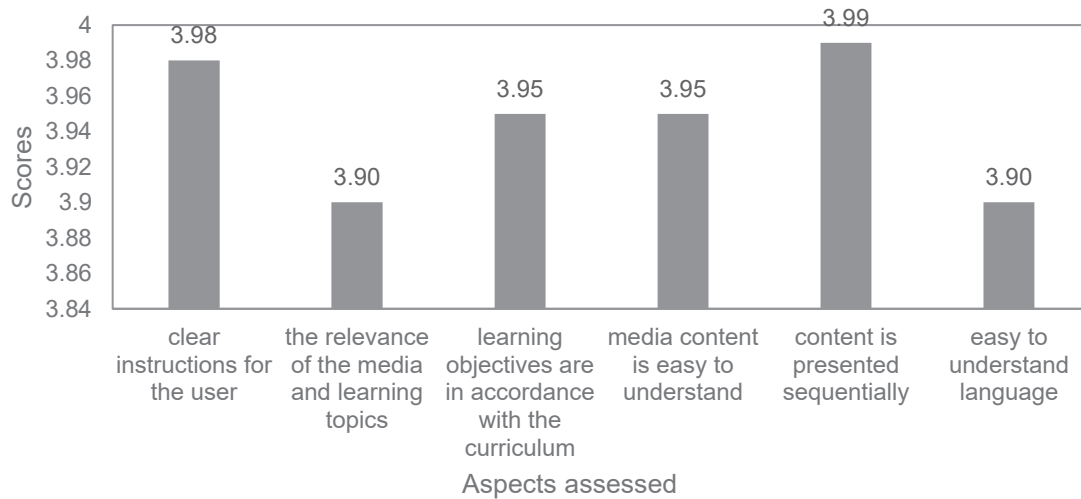


Figure 11. Learning topics validation

Based on the results of the physicist's validation assessment in Figure 11, there is the highest validation score on the content aspect presented sequentially 3.99 and the lowest score is on the clarity of language use and media relevance to the content presented with the acquisition of the same score. In addition to validating learning materials, expert

validator 2 also validates the research instrument. Assessment for instrument validation includes questionnaires to see student responses, observation sheets of learning implementation (teacher activities), observation sheets of student activities, and tests of student learning outcomes. the assessment of the research instrument can be presented in Figure 12.

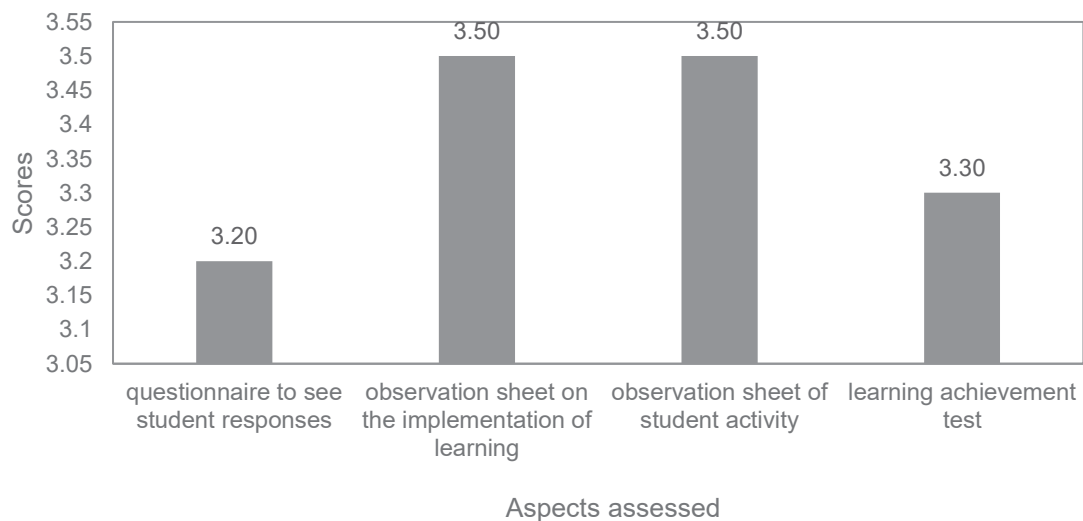


Figure 12. Results of research instrument validation

Based on the results of the validation in Figure 12, the highest rating score is on the Learning Implementation Observation Sheet Instrument and Student Activity Observation Sheet (3.50) obtaining the same value and the lowest score is on the Questionnaire Instrument to View Student Responses (3.20).

Practicality in this study was obtained based on the implementation of learning observation sheets (teacher activities) and questionnaires to see student responses.

a. Implementation of Learning

The results of the implementation of learning in the two meetings identified 14 aspects that were implemented well. The 14 aspects of implementability include:

- 1) presenting apperceptions,
- 2) providing motivation,
- 3) conveying learning objectives,
- 4) conveying hydrostatic pressure material and related vessels through a combination of lectures and demonstrations,
- 5) distributing student worksheets on hydrostatic pressure material and related vessels,
- 6) delivering hydrostatic pressure material and related vessels through cartoon-based learning using the powtoon application,
- 7) provide opportunities to work on student worksheets that have been distributed,
- 8) guide students in working on student worksheets on hydrostatic pressure and

related vessels,

- 9) check student worksheets that have been worked on by students,
- 10) provide opportunities for one of the students to submit answers to the worksheet,
- 11) asking students if there are different questions,
- 12) giving students the opportunity to ask about things that are not understood in the liquid pressure material,
- 13) giving opportunities to students to answer questions raised by classmates and
- 14) provide reinforcement to students. In accordance with the results of observations of the implementation of learning (teacher activity) observed by observers, it turns out that all aspects are implemented and none of the aspects are not implemented.

b. Questionnaire to see students' responses to the learning process using cartoon-based learning media using the powtoon application

Based on the data from the questionnaire results from student responses, there are four statement indicators including learning motivation indicators, learning ease and satisfaction indicators, learning innovation indicators, and learning achievement indicators. The percentage results of each indicator can also be seen from Figure 13.

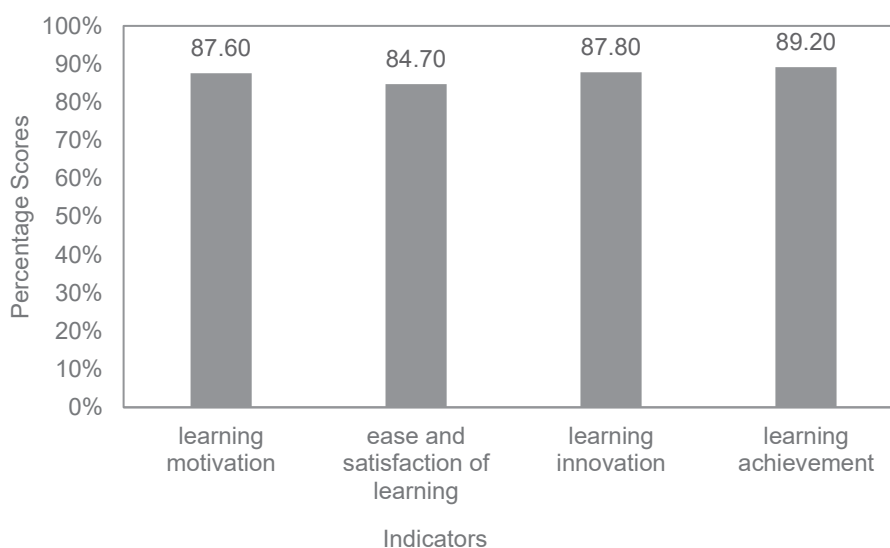


Figure 13. Percentage of student response indicators to learning

Based on Figure 13, there are four indicators of students' responses to the learning process using cartoon-based learning media using the powtoon application with the highest percentage, namely the learning achievement indicator of 89.2% and the lowest percentage, namely the indicator of learning ease and satisfaction of 84.7%.

The effectiveness of cartoon-based learning media using the powtoon application on the liquid

pressure material that has been developed can be seen from the activities of students while participating in learning and student learning outcomes in the cognitive domain.

In this student activity, there are ten aspects of student activity assessment that were observed in the learning process during 2 meetings. The results of the validation of the ten aspects at the first meeting can be presented in Figure 14.

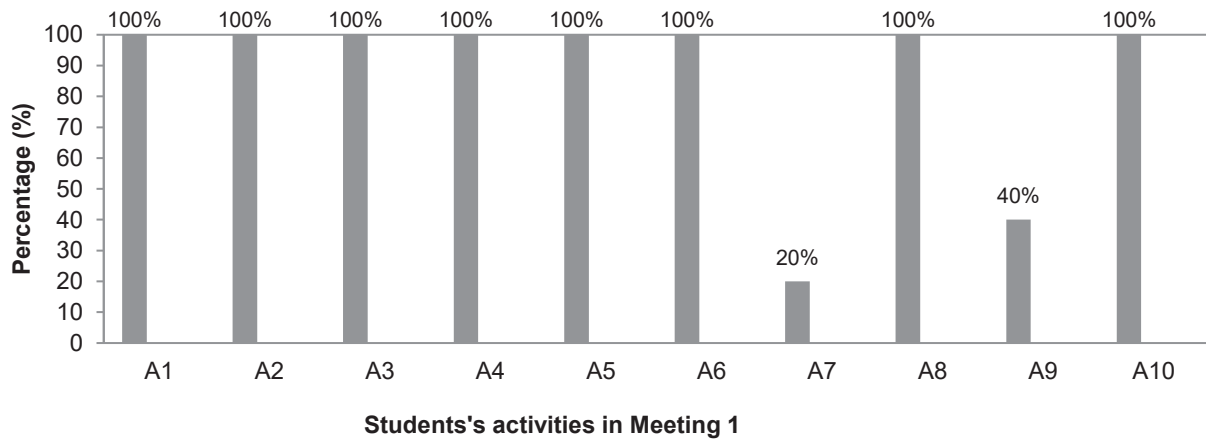


Figure 14. Percentage of student activity aspects that appear during the learning process

Based on Figure 14, there are ten aspects that are observed by students in learning activities. There are 8 aspects that are observed 100%, namely A (aspects) 1, 2, 3, 4, 5, 6, 8, and 10, then two other observed aspects, namely aspect 7 with a percentage of 20% and aspect 9 with a percentage of 40%. Whereas in the second meeting, in aspect 9 the percentage was 67%

higher than the first meeting which was only 40%. The learning outcomes of students in this study were assessed from the learning outcomes tests on cognitive competence (C2; Describe, C3; Apply, C4; Analyze, and C5; Prove) which includes individual and classical mastery. The percentage results from C2 – C5 can be presented in Figure 15.

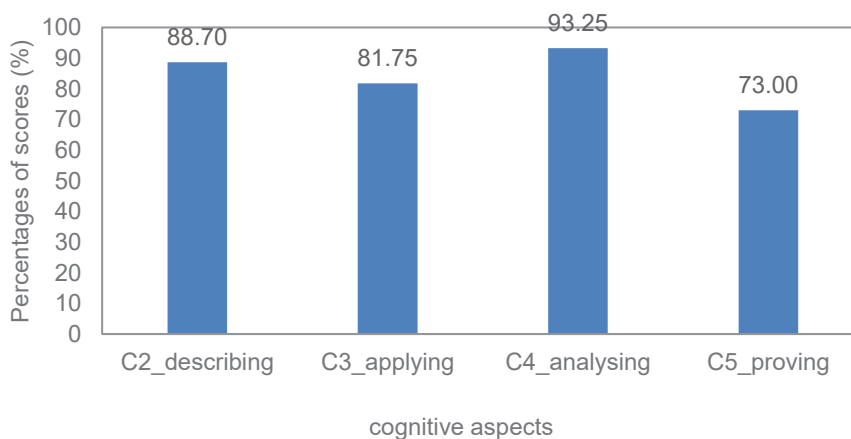


Figure 15. Percentage of scores of C2, C3, C4 dan C5

Based on the results of the C2-C5 percentages in Figure 15, there are 4 aspects of learning outcomes in cognitive domain competencies spread over 12 objective question numbers and answered by 15 students, the highest percentage is in competency C4 (analyzing) 93.25% and the percentage the lowest is at competence C5 (proving) 73%.

In addition, the learning outcomes to measure effectiveness, it can also be obtained from the individual completeness learning results, there are 14 people who complete and 1 person who does not complete, and the results of classical completeness reach 93.3% and 6.7% student who did not complete.

Validity is obtained from the results of learning media validation assessment, learning material validation, and research instrument validation. Based on Figure 10, it can be stated that in the validation assessment of cartoon-based learning media using the powtoon application on liquid pressure material that has been made is very interesting. This is shown in the validation item animated presentation attractiveness which obtained the highest score of 3.95, the highest score because the animated presentation in the powtoon application is full of unique cartoon shapes and the cartoon images have been combined with audio. However, the validation item attractiveness of appearance obtained the lowest score of 3.75

Based on Figure 11, it is found that in the validation assessment of cartoon-based learning materials using the powtoon application on liquid pressure material that has been made by researchers is very sequential. This is shown in the validation item content is presented sequentially obtaining the highest score of 3.99, while in the validation item learning media is relevant to the material being studied by students and clarity of language use which only achieves the lowest score of 3.90.

Based on Figure 12, it can be concluded that in the validation assessment the research instruments include implementation of learning, questionnaires to see student responses, observation sheets of student activities, and tests of student learning outcomes that have been made by researchers turned out to be valid. This is shown in the highest validation score of 3.50, namely the validation items of the learning implementation observation sheet and the student activity observation sheet.

Practicality is obtained from the results of observing the implementation of learning (teacher

activity) and questionnaires to see student responses. It can be said that the implementation of learning from two (2) meetings takes place during learning. Based on Figure 13, the responses of students in the questionnaire to see the responses of students stated that they had fulfilled practicality.

Effectiveness is obtained from the results of observing student activities and student learning outcomes. Students' activity can be seen based on the observation sheet that appears in 10 aspects as shown in Figure 14, it turns out that it has fulfilled practicality. Figure 15 displayed the percentages of C2-C5 have met the quality of effectiveness so that the learning outcomes of students in the cognitive domain are said to be practical.

CONCLUSION

The research on the development of cartoon-based learning media using the powtoon application on liquid pressure material has been carried out at SMP Negeri 5 Paguyaman Pantai. By analysing the data from validity quality of learning media, learning material, and research instrument, the practicality and the effectiveness of the media developed, it can be concluded that learning using cartoon-based learning media using the powtoon application on liquid pressure material is valid, practical and effective.

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