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E-Comic as an Alternative Learning Media for Analytical Mechanic Course During COVID-19 Pandemic

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ABSTRACT

The covid-19 pandemic era causes teaching and learning activities to be carried out online. Thus, many variations of learning media are used to conduct teaching and learning activities in the pandemic era. This research developed one learning media that uses e-comics or electronic comics. The comic is expected to be a learning medium worth using in the pandemic era. This research aims to develop the medium of learning physics comics on the history of analytical mechanics. The research method used is the research and development method, covering data stages, product design, product testing. The software used in creating comics was ibisPaint X and MediBang Paint. The findings of this study are that E-comic improves reading culture. E-comics as an alternative learning media in analytical mechanics courses during the covid-19 pandemic is very worthy of being used as learning media.

INTISARI

Era pendemi covid-19 menyebabkan kegiatan belajar-mengajar dilakukan secara daring. Dengan begitu, banyak variasi media pembelajaran yang digunakan untuk melakukan kegiatan belajar-mengajar di era pandemi. Penelitian ini mengembangkan salah satu media pembelajaran yaitu menggunakan e-komik atau komik elektronik. Komik tersebut diharapkan dapat menjadi media pembelajaran yang layak digunakan di era pandemi. Penelitian ini bertujuan untuk mengembangkan media pembelajaran komik fisika pada sejarah mekanika analitik. Metode penelitian yang digunakan adalah metode penelitian dan pengembangan, meliputi tahapan data, perancangan produk, pengujian produk. Adapun software yang digunakan dalam pembuatan komik yaitu *ibisPaint X* dan *MediBang Pain*. Temuan dalam penelitian ini adalah e-komik dapat meningkatkan budaya membaca. E-komik sebagai media pembelajaraan alternatif pada mata kuliah mekanika analitik di masa pandemi covid-19 sangat layak digunakan sebagai media pembelajaran.

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A. Introduction

Technological advancement brings various impacts on learning activities. Based on the interview results, most learning activities only make the students listen to the lecturers and note the materials shared by lecturers. However, students are not interested in these teaching styles. The students prefer learning via various learning media to listening and noting the lectures from the observation. An analytical mechanic learning process requires supportive media to learn autonomously. It also needs interesting presentations because the analytical mechanic course is challenging. Thus, it will be difficult if the students only receive theoretical materials.

Comics is an excellent medium for the analytical mechanic course because it provides many interesting figures to learn. The comic is a learning medium to share materials and courses [1-2]. In this context, learning media mediates the communication process between students and the comic's learning source. The comic has some strong points, such as motivating students during the teaching-learning process, increasing the quality of the learning, having a permanent nature, motivating students to read, especially for those who do not like reading, being a popular part of a culture [3-4]. Comics can also improve the students' reading skills [5-6]. It can also improve the student's interest, activity, and learning outcome. Thus, the comic is useful as a learning medium.

The most primitive science is mechanics because this discipline discusses motion. Thus, mechanics become the basic science and physics [7-8]. The mechanic system is usually more complex than Newton's mechanic. The advanced mechanic development emerges from famous figures of classical mechanics. Classical mechanic implementation is not efficient in solving simple mechanic problems. From the explanation, the researchers found the students needed effective and efficient learning media to motivate their learning. Physics comic learning media with an Analytical Mechanic history could be an alternative and learning source for the students.

B. Method

The applied research method is research & development to produce comics. The researchers used Borg & Gall's [9] model in this research. The first stage was data collection. In this stage, the researchers collected the data and determined the materials for the comic. The second stage was designing the product. In this stage, the researchers synthesized the storyboard as the framework of comic production for physics. The researchers also determined the topics and discussed the title to have a systematic story plot and material relevance. The designed characters included excellent and smart characters to motivate readers.

Then, the researchers tested the product by distributing the questionnaire sheet as an evaluation medium. From this questionnaire, the researchers could also find out

the students' understanding during analytical learning mechanics with the comic as the learning media. The questionnaire distribution was useful to obtain analytical data.

The researchers used analytical techniques to analyze the quantitative data in this research. The researchers obtained the assessment data from experts. Then, the researchers analyzed the data descriptive qualitatively. The analysis results were useful to revise the products. In this research, the experts' judgment used a validation sheet. Then, the results on the sheets were useful to develop the designed product. The researchers used the Likert scale to assess and judge all measured aspects.

In this research, the researchers used a response questionnaire for the students, material reliability validation, and product reliability validation. In this research, the researchers classified the answers of each instrument into five options. Each measured indicator has a score scale from 1 until 5. The scale of 5 refers to the attributes of very excellent, relevant, reliable, and clear. The scale of 4 refers to fairness, relevance, reliability, and clarity attributes. The scale of 3 refers to the attributes of below average, less adequate, less reliable, and less clear. The scale of 2 refers to the attributes of not excellent, inadequate, unreliable, and unclear). Then, the scale of 1 refers to extremely not excellent, extremely inadequate, extremely unreliable, and extremely unclear.

After collecting the data, the researchers calculated each weight of the responses by calculating the average score. Here is the applied formula to calculate.

$$\bar{x} = \frac{\sum x}{n} \quad \textbf{[. 1]}$$

Remarks :

$\bar{x}$ = average score

n = the numbers of the assessors

$\sum x$ = total scores of each item

For the percentage result formula, the researchers calculated with the following formula.

$$\text{Result} = \frac{\text{Total skor yang diperoleh}}{\text{Skor maksimum}} \text{x}100\% \quad \textbf{[. 2]}$$

The reliability categories are based on these criteria [10].

Table 1. Reliability Criteria of the Media

No	Scores in percentages (%)	Reliability Categories
1	< 21 %	Extremely unreliable
2	21– 40 %	Unreliable
3	41– 60 %	Fairly reliable
4	61– 80 %	Reliable
5	81– 100 %	Very reliable

C. Results and Discussion

The researchers collected the data from the instruments of the experts and the respondents. The questionnaire results were useful to determine the reliability of the

developed learning media. Before the respondents tested the given instrument judgment, each respondent did the test toward the e-comic as the alternative learning media for the analytical mechanic course during the COVID-19 pandemic.

Figure 1. The appearance of analytical mechanic history e-comic

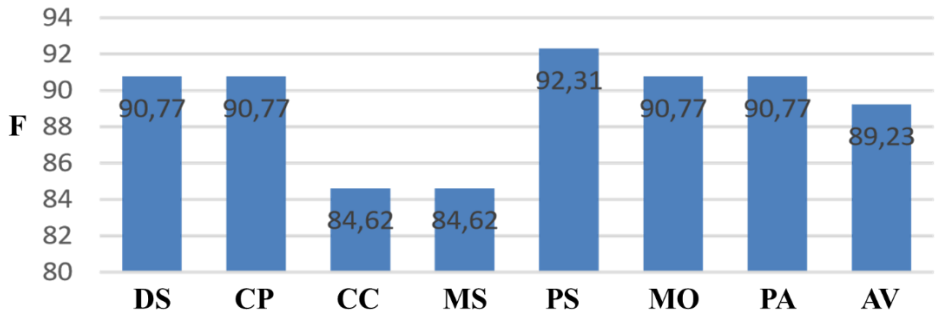

Figure 2. The results of material indicator validation test

Based on Figure 2 it can be seen that F is the frequency and DS is describing the history. CP is the presence of the component and CC is the content conformity. MS is the material suitability and PS is the systematic presentation. MO is the material organization and PA is presentation accuracy. Meanwhile, AV is average. The results of the reliability test showed the average percentage from all aspects. The developed electronic comic was reliable because the percentage reached 89.23%. The developed electronic comic had relevant content illustrations based on analytical mechanic histories. In this stage, the experts suggested the researchers discuss the learning objectives by using e-comic. This suggestion deals with the material relevance aspect.

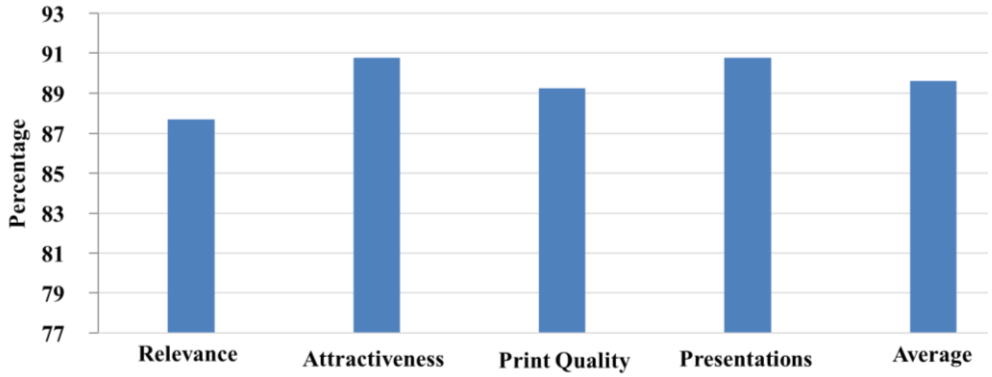

Figure 3. The Validation Results of Presentation Indicator

The table shows the presentation aspect of the e-comic base don the experts' judgment. The results show an average presentation score is 96.53%, categorized as reliable. The experts argued that the product had excellent relevance, attractiveness, appearance, and figure presentation quality. The results are observable from the experts' judgment on each aspect that mostly obtains 4 and 5. The experts suggested the researchers type a phrase of "Ayo Belajar" without using shadow effects on the e-comic cover appearance.

The results of students' responses

In this stage, the researchers conducted field testing for 25 students of Physics Education (see graphic 1).

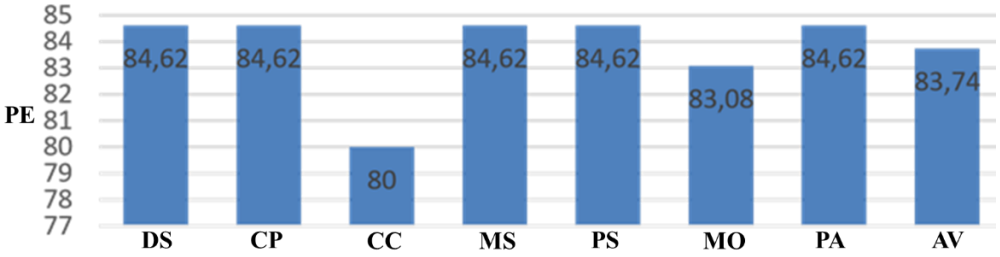

Figure 4. The Result of Average Judgment based on the Students' Responses

All aspects show that the developed electronic comic was reliable because the percentage reached 83.74%. Thus, the developed product could be an alternative learning medium for students of analytical mechanic course during the COVID-19 pandemic.

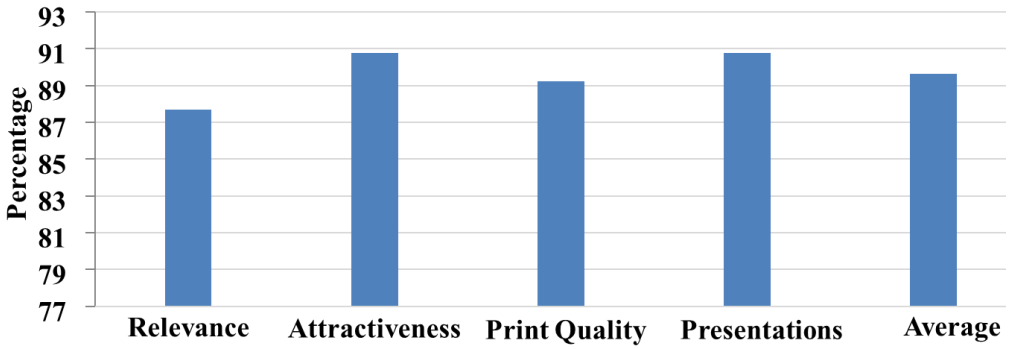

Figure 5. The Analysis Results of Average Judgment based on the Students' Responses

The graphic shows the average percentage results, 89.61%. The percentage indicates that the developed product could be an alternative learning medium for students of analytical mechanic course during the COVID-19 pandemic because the product is reliable based on the presentation aspect.

Table 2. The Validation Results of Language Indicator

The tested aspects	Percentage	Interpretation
Understandable language for students	96.67%	Very reliable

The table shows that the applied language in the e-comic as an alternative learning media during the COVID-19 pandemic is very reliable. Most respondents shared their judgment with scales of 4 or 5. Two respondents judged the product on a 4 (reliable) scale, while ten respondents judged the product with 5 (very reliable). The validation test obtains a percentage of 96.67%). The researchers validated and analyzed the e-comic production's objective. The objective of this product development was to create a reliable e-comic product with analytical mechanical history material.

The researchers expect the e-comic could motivate and facilitate physics education students to study. Most comments from the students indicated that the product was reliable as a learning alternative because of the understandable language and attractive presentation. Learning analytical mechanic history is more joyful because the comic is funny. However, the experts suggested the researchers discuss the comic's objective and the differences and similarities of Lagrange and Hamilton's equations.

D. Conclusion

From the reliability test with the indicators of material, presentation, and language, the developed product, e-comic as an alternative learning media of analytical mechanic course during the COVID-19 pandemic, was reliable as the teaching material for physics education students.

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