

## E-Poster Learning Media Based on Scientific Approach on Temperature and Heat Material

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ARTICLE INFO	ABSTRACT
Article History: Received : 02-11-2021 Accepted : 20-12-2021 Published : 31-12-2021	This study aims to produce an e-poster learning media based on a scientific approach on temperature and heat material on temperature and heat material suitable for use in learning. The method used in this study is a research and development (R&D) method with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). Media experts and material experts have validated this e-poster learning media. The validation results from media experts get a percentage value of 81.25%, and the validation results from content experts get a percentage value of 80%. This e-poster learning media has also gone through a trial stage for teachers and students. The results of the teacher trial get a percentage value of 85.45%, and the results of the student trial get a percentage value of 91.4%.
Keywords: <i>e-poster, scientific approach, temperature and heat</i>	
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### 1. INTRODUCTION

Information and Communication Technology (ICT) is developing rapidly and making it easier for humans to carry out their activities [1]. One of the uses of ICT is in the world of education. Education Census data shows that more than 67% of students in Indonesia use gadgets in learning, and more than 81% of these gadgets are used to do school assignments by students.[2].

However, the rapid development of ICT has not been accompanied by an increase in the quality of education in Indonesia. The quality of Indonesia's education has decreased from the 2018 PISA results compared to the 2015 PISA results. Based on the 2018 PISA results, Indonesia ranks 9th lowest in the science performance category and 7th lowest in the mathematics category from a survey of 79 countries[3]. The contributing factor is inadequate facilities and infrastructure and the use of technology.

Based on the results of the needs analysis conducted by researchers, as many as 95% of students need learning media that are easily accessible using smartphones such as e-posters. E-poster is one of the learning media with the help of technology. Poster learning media consists of images, colors, and writing containing messages with attractive designs[4]. At the same time, e-posters are posters used and displayed in electronic media so that they are easily accessible by students and are not easily damaged because they are not printed in the form of paper or banners.

In studying physics, students should play an active role in learning. So that students are not only able to remember and memorize formulas, but students can understand concepts and facts in physics. Based on the report from the Ministry of Education and Culture of the Republic of Indonesia, the results of the 2019 National Examination found that physics subjects were below chemistry and biology with an average score of 46.47[5]. This is in line with the declining ability of science performance, one of which is physics. A scientific-based learning process such as a scientific approach can be carried out[6]. Scientific approach or in English Scientific Approach is a learning process designed using a scientific approach so that students play an active role in building competency attitudes, knowledge, and skills through the stages of observing, asking, gathering information, reasoning, and communicating[7].

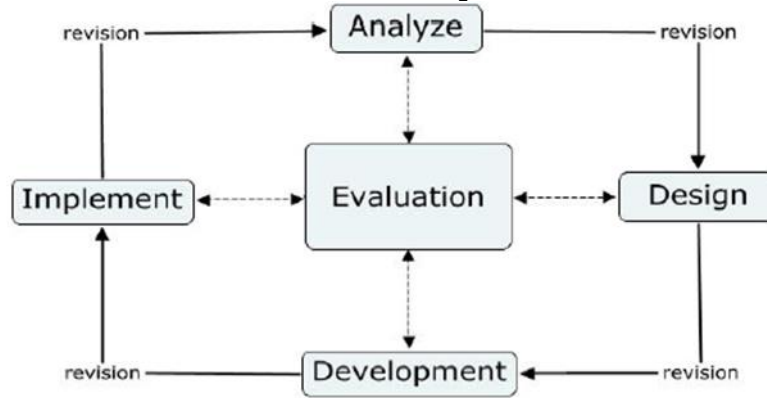
The learning process using a scientific approach can improve science performance because students are directly involved in understanding concepts [8]. This is supported by the results of the needs analysis conducted by researchers. As many as 97% of students need to conduct experiments to understand the concept of physics. Based on the description above, it can be concluded that it is necessary to develop an e-poster learning media based on a scientific approach on the material of temperature and heat, namely the subject of the expansion of substances. The choice of temperature and heat material on the development of substances is seen from the results of item analysis conducted by researchers. Of the several physics questions given, as many as 40 out of 80 students answered incorrectly on the material of temperature and heat on the subject of expansion of substances.

## 2. METHODOLOGY

The method used in this research is Research and Development (R&D). The Research and Development (R & R&D) method is a method in research to produce and test the effectiveness of a product being developed [11]. This study refers to the ADDIE model whose stages consist of Analysis (analysis), Design (Design), Development (Development), Implementation (Implementation), and Evaluation (Evaluation).

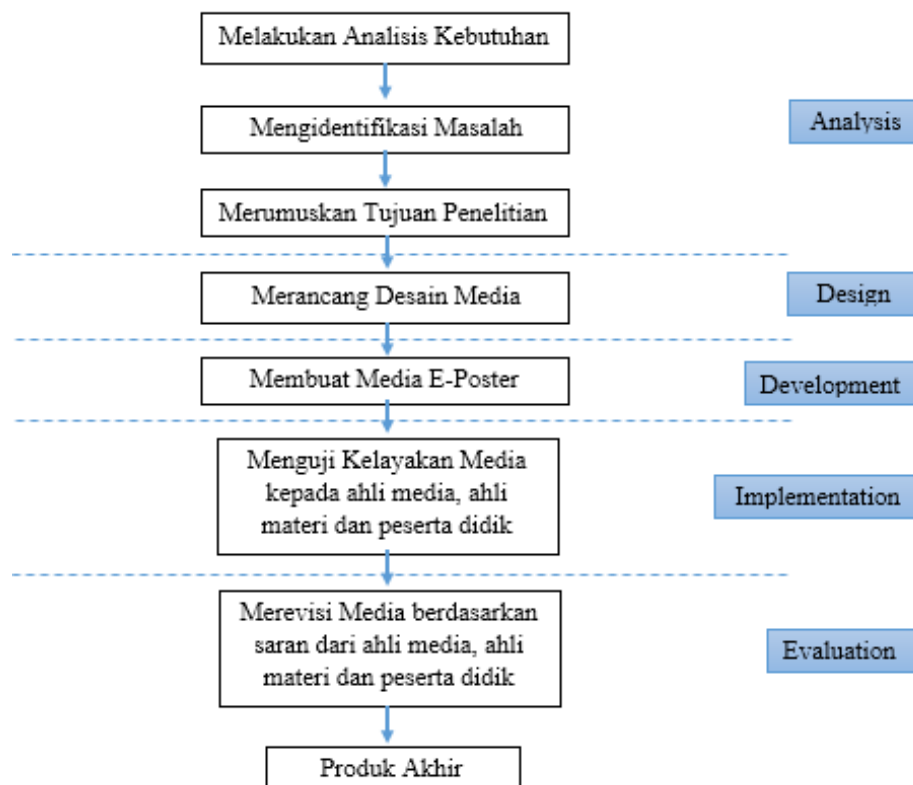
The first stage is analysis. At this stage, information is collected to identify the needs of students for the background of this research. Researchers analyzed students' needs for learning media. In addition, researchers also conducted item analysis to find out the physics material that students did not understand. The second stage designs. Design is the stage for designing media products to be developed. At this stage, the researcher begins to design or framework of the e-poster learning media. The third stage is the development stage. At this stage, the researcher made an e-poster learning media product according to the design made at the design stage. The fourth stage is the implementation stage. The finished media product is then validated by media experts and material experts and tested on teachers and students. The last step is evaluation. At the evaluation stage, product improvements are made based on suggestions and input

from the validator. The ADDIE model can be depicted in the chart below:



**Figure 1.** Addie Model Chart [12]

According to Sanjaya, research and development used in education is a development and validation that produces educational products [13]. The research and development steps carried out by the researcher are described in the chart below:



**Figure 2.** Research And Development Chart

To determine the feasibility of the product developed by the researcher, validation tests were carried out by media experts and material experts, as well as trials by teachers and students. The assessment of the developed product refers to the Likert scale with a score range of 1-5 according to the scoring rules made by the researcher.

To calculate the percentage of score, the following formula is used:

$$Score\ percentage = \frac{\Sigma\ acquisition\ score}{\Sigma\ maximum\ score} \times 100\%$$

After calculating and getting the percentage score, the scientific approach-based e-poster learning media on temperature and heat material can be analyzed for its feasibility level using the feasibility interpretation scale below.

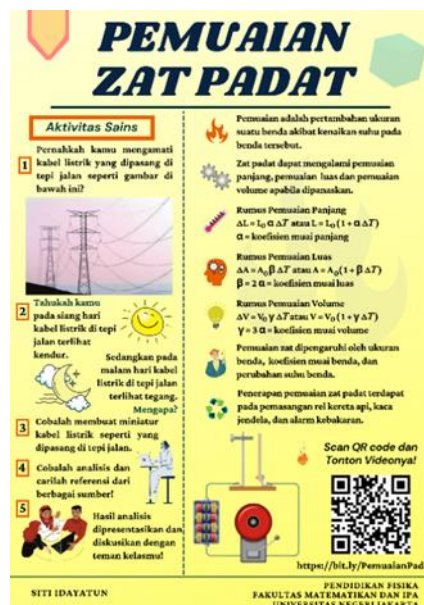
**Table 1.** Feasibility Interpretation Scale

Interval	Criteria
$0 \leq x \leq 20\%$	Very Less Worthy
$20\% < x \leq 40\%$	less worthy
$40\% < x \leq 60\%$	Decent enough
$60\% < x \leq 80\%$	Worthy
$80\% < x \leq 100\%$	Very Worthy

(Source : [11] )

### 3. RESULTS AND DISCUSSION

This research produces a product in the form of an e-poster learning media based on a scientific approach to the material of temperature and heat. The resulting media product is shown in the following figure:



**Figure 3.** E-Poster Expansion Of Solids

**PEMUAIAN ZAT GAS**

- Cobalah amati balon udara pada gambar di samping!
- Mengapa balon udara membutuhkan kalor untuk mengembang dan terbang mengudara? Apa yang terjadi pada balon udara apabila kalor yang diberikan diperkecil atau diperbesar?
- Untuk mengetahui jawabannya. Yuk Eksperimen!
- Cobalah analisis dan carilah dari berbagai sumber!
- Hasil analisis dipresentasikan dan diskusikan dengan teman kelasmu.

**Alat dan Bahan**  
Balon Karet, Baskom, Botol, Air Dingin, Air Panas

**Langkah Percobaan:**

- Pasanglah balon pada mulut botol.
- Siapkan air panas di dalam baskom.
- Letakkan botol dalam baskom berisi air. Amati!
- Ulangi percobaan dengan air dingin.

**RUMUS**  
Rumus Pemuaian Volume  
 $\Delta V = V_0 \gamma \Delta T$  atau  $V = V_0 (1 + \gamma \Delta T)$   
 $\gamma$  = koefisien muai volume

**ISOKHORIK**  
 $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

**ISOKHORIK**  
 $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

**ISOTERMAL**  
 $P_1 V_1 = P_2 V_2$

$V_1$  = Volume gas keadaan 1 ( $m^3$ )  
 $V_2$  = Volume gas keadaan 2 ( $m^3$ )  
 $P_1$  = Tekanan gas keadaan 1 (Pa)  
 $P_2$  = Tekanan gas keadaan 2 (Pa)  
 $T_1$  = suhu gas keadaan 1 (K)  
 $T_2$  = suhu gas keadaan 2 (K)

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Figure 4. Gas Expansion E-Poster

**PEMUAIAN ZAT CAIR**

- Cobalah amati gambar A, B, dan C di bawah ini!
- Zat cair dalam tabung yang diberikan panas lebih besar akan meluap. Mengapa?
- Yuk Bereksperimen!  
Membuat Termometer Sederhana
- Cobalah analisis hasil eksperimen dan carilah referensi dari berbagai sumber!
- Hasil analisis dipresentasikan dan diskusikan dengan teman kelasmu!

**Alat dan Bahan:**  
Air, Botol, Pewarna, Sedotan, Plastisin

**Langkah Percobaan:**

- Tuangkan air yang diberi warna ke dalam botol.
- Masukkan sedotan ke dalam botol hingga menyentuh permukaan air.
- Tutup rapat mulut botol dengan plastisin.
- Letakkan di bawah panas matahari atau tempelkan kain hangat pada botol. Amatilah!

**RUMUS**  
Rumus Pemuaian Volume  
 $\Delta V = V_0 \gamma \Delta T$  atau  $V = V_0 (1 + \gamma \Delta T)$

**Keterangan:**  
 $V$  = volume benda saat dipanaskan ( $m^3$ )  
 $V_0$  = volume benda mula-mula ( $m^3$ )  
 $\Delta V$  = Perubahan volume zat ( $m^3$ )  
 $\Delta T$  = Perubahan suhu ( $^{\circ}C$ )  
 $\gamma$  = koefisien muai volume ( $/^{\circ}C$ )

**Grafik Anomali Air**

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Figure 5. Liquid Expansion E-Poster

Media experts and material experts have validated the e-poster learning media. The validation results by media experts get a percentage value of 81.25% and are categorized as "Very Appropriate" media used in learning. Meanwhile, the validation results by material experts got a percentage value of 80% and were categorized as "appropriate" media used in education. In addition to the validation test, the e-poster learning media has also been tested by teachers and students. The results of the teacher's trial get a percentage value of 85.45% and are categorized as "Very Appropriate" media used in learning. At the same time, the trial results of students get a percentage value of 91.4% and are categorized as "Very Appropriate" media used in learning.

#### 4. CONCLUSION

Based on the results of the validation of media experts and material experts, the e-poster learning media got an average percentage value of 80.62%. It was categorized as a very suitable medium for use in learning. Meanwhile, based on the results of teacher trials and student trials, the e-poster learning media got an average percentage value of 88.42%, so it was categorized as a suitable medium for learning.

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