The development of multi-representation media based on Instagram on temperature and heat materials

A Jatmiko¹, M Mila¹, I Irwandani¹, C Anwar¹, A Taher¹ and P M Sari²

¹Universitas Islam Negeri Raden Intan Lampung, Indonesia
²Universitas Lampung, Bandar Lampung, Indonesia
*agusjatmiko@radenintan.ac.id

Abstract. This study aims to develop Instagram-based multi-representation media as an alternative to online learning, knowing the feasibility of Instagram-based multi-representation media as an alternative to online learning. Knowing the attractiveness of the Instagram-based multi-representation media as an alternative to online learning. This is a research and development type research. The instruments used in this study were questionnaires using the Likert Scale and non-test instrument data analysis using descriptive data analysis techniques. This study discovers that Instagram-based multi-representation media on temperature and heat material is appropriate to be used in the learning process, the feasibility of Instagram-based multi-representation media on temperature and heat material, according to experts, is highly feasible. This research proves that this Instagram-based learning media is effectively used as an alternative online learning media. As one of the evidences that in the 21st century online-based media is very needed and sought after by students, especially in high school students.

1. Introduction
Everyone knows in 21st-Century skills Information and Communication and Technology (ICT) [1] plays an important role in human activities, especially in the field of education [2][3]. Physics is one of the branches of science that underlies the development of technology [4]. Problems that are often found in physics as subjects that are considered difficult by students [4][5]. Encouraging these statements, in this case the teacher must be able to overcome the problems that occur where most students are at a difficult stage to learn the concepts of physics [6]. The more sophisticated the development of ICT in this era, teachers should be able to design learning that supports problem solving that occurs by utilizing existing technology [2]. In accordance with industry 4.0, where all activities utilize ICT [7][8]. One way to improve the ability to solve problems in physics must be supported by using media that has multiple representations [9].

One of the excellent learning media to be applied in science learning, especially physics, is Multi-representation learning using the E-Learning approach [10]. Multi-representation is a model that repeats the same concepts in several different formats[11]. Students have different abilities in understanding the learning concept[12]. By using Multi Representation media through the E-Learning approach [10], students can learn science materials without having to look up a book and make direct observation [13]. Learners can learn directly through online media using computers, laptops, or Android-based devices [3].
There are so many learning alternatives that can be utilized through social media [9]. One of them is the use of Instagram as an online learning media [5]. Instagram can be accessed via a device by using the Instagram application that can be downloaded on the Play Store [14]. In September 2015, Instagram has reached more than 400 million users and that number will certainly continue to grow [15].

Based on the description above, the researchers tried to use the features provided by Instagram to be used as online learning resources [16]. The use of this media can be effective considering Instagram users are always increasing and can also be useful for users who are still in school age, especially student in junior high school as subjek this research [17]. The Instagram feature to share photos can be used to share certain physics materials presented in an interesting drawing design [15].

This research is a further development of multi-representation product development that has been carried out for junior high school students [11, 14, 17]. Based on the results of the literature study conducted by the researchers, there are no Instagram based multi-representation media products that have been developed, thus the researchers need to do research and development on this matter. see if this media product is interesting as an alternative media to online learning.

2. Methods
This research is a qualitative study using research and development methods. Researchers used the concept of the research and development method from Borg and Gall which is limited to only using 7 stages. This research and development method is used to produce and develop certain products [19]. The subjects of this study were students at junior high schools in Bandar Lampung. The study was conducted in two schools, SMPN 1 Bandar Lampung and SMPN 25 Bandar Lampung in the even semester of 2018/2019. The researchers collect the information using various procedures for collecting data based on a predetermined time [18].

3. Results and Discussion
a. Preliminary Research
The developed product is an Instagram-based multi-representation media as an alternative to online learning. At this stage, the most important thing to do was analyzing the needs for products that will be developed through preliminary research conducted to 65 Junior High School students in Bandar Lampung city. The samples were chosen based on their respective school backgrounds, namely the public and private schools as well as favorite schools and non-favorite schools. Students were asked about physics lessons, learning media, and social media. Based on the preliminary research, the results obtained that a learning media that can be accessed through social media was needed. Multi-representation media is one of the learning media needed by students.
b. Research Planning
After the problem was identified, further research planning was carried out based on the stages according to Dick & Carey. This was done by considering the practicality of the development. Research planning was carried out by making lesson plans based on the 2013 curriculum (K-13) to design the implementation and stages of the learning process. Besides making lesson plans, the researcher also analyzed the development of the needs of students on learning media. By doing a case study in the library, a social media account as an online learning media was made. The researchers believed that Instagram-based multi-representation media can be used as an alternative to online learning.

c. Product Development
Based on the data of product specifications obtained through the preliminary research and field observation, a learning media that can help the teachers and students in the learning process and independent learning was developed.

d. Product specifications
The developed product is a multi-representation media in the form of videos and images by utilizing Instagram social media. This multi-representation media was made as attractive as possible in order to facilitate students’ understanding of the physics material. The multi-media representation was designed to be displayed online so that it could be easy to be understood, could be accessed anywhere, easy to use by unlimited users, and could help students who have different intelligence backgrounds to increase their interest in physics learning [20].

The specifications for multi-representation media are as follows:

1) Type of video
In this research, physics videos on temperature and heat material were developed in the form of learning videos that contained material that lasted one minute for homepage posting and one to more than two minutes for Instagram TV posts.

2) Form of video
The video form was adjusted to the size of a file that can be uploaded and stored on Instagram in the portrait orientation for the home post and landscape orientation for Instagram TV posts.

3) Basic color
The preferred basic colors for the video were soft or calm colors like white and light blue. The complementary colors chosen were bright colors like red, black, yellow, and green. This was done so that the video could be visually appealing.

4) Image type
The picture format chosen was in the form of photos/images that had been designed in such a way using the Corel Draw application.

5) Image size
The size of the image must be in accordance with the size of the file/photo that can be stored on Instagram (1080x1080 pixel).

6) Basic color
The basic colors used in making multi-representation media were white and purplish gray. The complementary colors were bright colors like red, green, yellow, and black. This was done so that the multi-representation media looked interesting.

7) Size and color of letters
The font sizes used in the explanatory videos were 12-24. The letters were adjusted to the video content presented. The letters’ color used on the image was black and each image was not distinguished by color.
### Table 1. Instagram Based Multi-Representation Media on Temperature and Heat Material

| No | Learning Indicators | Product Design | Explanation of Concepts |
|----|---------------------|----------------|-------------------------|
| 1  | Account Name        | "#FISIKASEKOLAH" | It is expected that this account can help students in science learning especially physics in the material of temperature and heat. |
| 2  | Logo                |                | The logo or profile image show fosters the students’ curiosity and feeling of wanting to learn. |
| 3  | Video explaining the concept and understanding of temperature | Video | Some countries in the world have different temperature units. Temperature can describe the weather in a region. |
|    |                     | Picture        | The tool designed to measure the temperature or temperature of an object is the thermometer. There are four types of scales in temperature measurement, namely the Celsius scale, Reamur, Fahrenheit, and Kelvin. |
| 4  | Video explaining expanding objects | Video | If the particles of an object move or vibrate very quickly because of an increase in temperature, the size of an object increases. This process is called Expansion. |
| No | Learning Indicators                      | Product Design | Explanation of Concepts                                                                 |
|----|-----------------------------------------|----------------|----------------------------------------------------------------------------------------|
| 5  | Describing the expansion of objects     | Picture        | The expansion means an increase in the length, area, and volume of an object. The expansion of large objects depends on 3 things, namely: the type of object, its original size, and changes in temperature received by objects. |
| 6  | Examples of substance transformation    | Slide image    | The process of substance transformation begins with an increase or decrease in the temperature of the object. If the temperature of the object reaches the boiling point or the melting point while the heat energy is still being given, the energy is used to transform the substance. |
| 7  | Explaining the heat concept             | Slide Image    | Heat is the amount of energy transferred or moving from an object to another object at a different temperature. |
| 8  | Explaining the meaning of heat          | Video          | Energy moves from one object to another because there is a temperature difference called Calor. |
The 9th International Conference on Theoretical and Applied Physics (ICTAP)  
Journal of Physics: Conference Series 1572 (2020) 012070  
doi:10.1088/1742-6596/1572/1/012070

| No | Learning Indicators                              | Product Design | Explanation of Concepts                                                                                                                                 |
|----|--------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9  | Explaining the heat transfer                     | Picture        | Conduction is the process of heat transfer without being followed by the displacement of the heating particles. Convection is the transfer of heat using the mass movement of fluid from one area to another. Radiation is the transfer of heat through electromagnetic waves. |
| 10 | Investigating the factors that influence the increase in body temperature due to heat | a. Instagram TV | Water with different temperatures has different densities. Hot water has a weak molecule (low) while cold water has a strong molecule.              |
| 11 | Question and Answer                              | a. Insta Story material temperature and heat | Based on the material contained in the pictures and videos, answer the questions in the following Insta story: Which International Unit (SI) is used to measure temperature? |

e. Product Validation
The developed product was then validated by the experts. The validated aspects were the media, material, and information and technology. The following is the result of product validation.

![Figure 2. The Comparison Chart of the Results of Media, Material, and Information and Technology Experts Validation](image-url)
The results of the average percentage produced by the three experts show a value of > 80. So, the Instagram-based multi-representation media on the temperature and heat material is declared very feasible and could advance to the next stage.

### Table 2. The Comparison of the Results Small-Group Trial and Large-Group Trial

| Aspect                        | Small Group Trial | Large Group Trial |
|-------------------------------|-------------------|-------------------|
| Media Multi-representation Based on Instagram | 87.05 Very Interesting | 81.57 Very Interesting |
| Temperature and Heat Materials | 87.56 Very Interesting | 81.94 Very Interesting |
| **Average**                   | 87.30 Very Interesting | 81.75 Very Interesting |

Based on the data in Table 2, all aspects point to the very interesting category. All percentages in small class trials and large class trials exceeds 80%. Evidence that 21st century millennials are very interested in online-based learning [21], and social media-based learning media can be used as alternative online learning media.

f. Product Publication

After going through a series of validation, revision, and trial stages, the Instagram-based multi-representation media on temperature and heat material were ready to be published on Instagram. The process of uploading the media was done in sequential stages according to the material taught at school. After that, the students were asked to give responses using the like or comment feature of Instagram for each uploaded content. The responses or comments would later be evaluated for further development.

4. Conclusions And Suggestions

**Conclusions**

Based on the results of the research, it can be concluded that Instagram-based multi-representation media on temperature and heat material is appropriate to be used in the learning process, the feasibility of Instagram-based multi-representation media on temperature and heat material, according to experts, is highly feasible. This research proves that this Instagram-based learning media is effectively used as an alternative online learning media. As one of the evidences that in the 21st century online-based media is very needed and sought after by students, especially in high school students.

**Suggestion**

Based on the research, the researchers have several suggestions for future improvements, namely:

a. Animated video examples related to daily life activities should be added.

b. The teachers junior high schools in Bandar Lampung are expected to be able to use innovative learning media to support learning that is tailored to the needs of students.

5. References

[1] Arsini, “Development of the ‘Science Learning Channel’ Portal as Online Learning Videos Through The ADDIE Model (Analysis, Design, Development, Implementation, and Evaluation),” *J. Phys. Sci. Technol.*, vol. 2, 2015.

[2] M. I. Farisi, “Developing the 21st-Century Social Studies Skills Through Technology Integration,” *Turkish Online J. Distance Educ.*, vol. 17, no. 1, 2016.
[3] Y. Yuberti, “Online Group Discussion pada Mata Kuliah Teknologi Pembelajaran Fisika,” *J. Ilm. Pendidik. Fis. Al-Biruni*, vol. 4, no. 2, 2015.

[4] D. Djamas, S. Sari, and R. Anshari, “Preliminary Condition Analysis of Physics Learning in SMAN Kota Padang (In the Framework of Development of Game-Assisted Interactive Multimedia Physics Teaching Materials),” *J. Res. Dev. Phys. Educ.*, vol. 2, no. 2, 2016.

[5] Irwandani and S. Juariyah, “Pengembangan Media Pembelajaran Berupa Komik Fisika Berbantuan Sosial Media Instagram Sebagai Alternatif Pembelajaran,” *J. Ilm. Pendidik. Fis. Al-Biruni*, vol. 5, no. 1, 2016.

[6] I. M. Dwi, H. Arif, and K. Sentot, “Pengaruh Strategi Problem Based Learning Berbasis ICT terhadap Pemahaman Konsep dan Kemampuan Pemecahan Masalah Fisika,” *J. Pendidik. Fis. Indones.*, vol. 9, no. 5, p. 8, 2013.

[7] I. Irwandani, S. Latifah, A. Asyhari, M. Muzannur, and W. Widayanti, “Modul digital interaktif berbasis articulate studio’13: pengembangan pada materi gerak melingkar kelas x,” *J. Ilm. Pendidik. Fis. Al-Biruni*, vol. 6, no. 2, 2017.

[8] J. Tondeur, K. Aesaert, B. Pynoo, J. Van Braak, N. Fraeyman, and O. Erstad, “Developing a Validated Instrument to Measure Preservice Teachers’ ICT Competencies: Meeting the Demands of the 21st Century,” *Br. J. Educ. Technol.*, 2015.

[9] Abdurrahman, Liliasari, A. Rusli, and B. Waldrip, “Implementation of Multi-Representation Based Learning to Increase Mastery of The Concept of Quantum Physics,” *Cakrawala Pendidik.*, no. 1, 2011.

[10] H. A. Mu’arif and H. D. Surjono, “Development of E-Learning Based on Scientific Approach in Science Subjects in Yogyakarta State Middle School,” vol. 3, no. 2, 2016.

[11] B. Waldrip, V. Prain, and J. Carolan, “Learning Junior Secondary Science through Multi-Capital Representations,” *Electron. J. Sci. Educ.*, vol. 11, no. 1, 2006.

[12] L. Widianingtyias, S. Siswoyo, and F. Bakri, “Effect of Multi Representation Approach in Physics Learning on Cognitive Abilities of High School Students,” *J. Penelit. dan Pengemb. Pendidik. Fis.*, vol. 1, no. 1, 2018.

[13] A. Suhandi and F. . Wirbo, “Pendekatan Multirepresentasi dalam Pembelajaran Usaha-Energi dan Dampak Terhadap Pemahaman Konsep Mahasiswa,” *J. Pendidik. Fis. Indones.*, vol. 8, no. 1, 2012.

[14] V. P. Fauzi and E. E. Lubis, “Utilizing Instagram as Er-Corner Boutique’s Media Marketing in Building Brand Awareness in Pekanbaru City,” *J. Online Mhs. Fak. Ilmu Sos. dan Ilmu Polit.*, vol. 3, no. 1, 2016.

[15] I. R. Nugroho and B. Ruwanto, “Pengembangan Media Pembelajaran Fisika Berbasis Media Sosial Instagram Sebagai Sumber Belajar Mandiri Untuk Meningkatkan Motivasi dan Prestasi Belajar Fisika Siswa Kelas XI SMA,” *E-Jurnal Pendidik. Fis.*, vol. 6, no. 6, 2017.

[16] F. L. Suryani, “Instagram dan Fashion Remaja,” *J. Kommas*, vol. 205, no. 1, 2014.

[17] Irwandani and S. Juariah, “Pengembangan Media Pembelajaran Berupa Komik Fisika Berbantuan Sosial Media Instagram Sebagai Alternatif Pembelajaran,” *J. Pendidik. Fis. Al-biruni*, vol. 5, p. 34, 2016.

[18] K. Mushlihah, “Pengembangan Media Pembelajaran Berbasis Multi Representasi Bermuatan Sains Keislaman dengan Output Instagram pada Materi Hukum Newton,” UIN Raden Intan Lampung, 2017.

[19] S. Sugyono, *Metode Penelitian Kuantitatif Kualitatif dan RnD*. Bandung: Alfabeta, 2016.

[20] W. M. Muzdalahif and F. Fakhiruddin, “Efektivitas Penerapan Pembelajaran Fisika Berbasis Multirepresentasi untuk Melatih Keterampilan Proses Sains Fisika Siswa Man 1 Pekanbaru,” *J. Online Mhs. Fak. Kegur. dan Ilmu Pendidik.*, vol. 2, no. 1, 2015.

[21] G. Nadirova, S. Kaliev, A. Mustafayeva, D. Kokeyeva, M. Arzayeva, and Y. Paltore, “Religious Education in a Comparative Perspective: Kazakhstan’s Searching,” *Anthropol.*, vol. 26, no. 1–2, 2016.