Developing the interactive multimedia in physics learning

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Abstract. In this study, researchers developed Lectora-based interactive multimedia on the topics of kinetic gas theory. This research was intended to describe the feasibility of interactive multimedia in terms of validity, practicality, and effectiveness. This research used ADDIE model design. The developed interactive multimedia was implemented on 39 students of class XI IPA 1 SMA PGRI 6 Banjarmasin. Instruments used are media validation sheets, questionnaires, and learning result tests. Interactive multimedia is validated by 2 validators of academics and 1 validator of practitioners. The result of the analysis shows that the developed interactive multimedia has a very valid category, a very practical category, and high effectiveness category. Based on these findings, it can be concluded that the developed interactive multimedia was considered feasible to use in the process of high school physics learning.

1. Introduction

Technological advances that are increasingly developed can be used as an interesting learning media to improve the quality of education [1]. Learning media serves to increase students’ attention [2], improves understanding of learning materials [3], improves motivation [4,5] and student learning outcomes [6]. The accuracy in using media is a major factor in maximizing the quality of learning [7]. Therefore, a requirement for teachers to develop an interesting learning process for the creation of instructional media [8].

Computer technology research (CTR), states that people can only remember 20% of the views and 30% is heard. But people can remember 50% of what is seen and heard and 80% of which are seen, heard and done at once [9]. The multimedia can present information that can be seen, heard and performed, so that the media is effective in learning [10]. Interactive learning media can increase motivation student so that learning objectives can be obtained optimally [11], and can improve student learning outcomes [12].

Teachers tend to deliver the subject matter verbally so that students only get the results of learning through the senses to hear it. The subject of the gas kinetic theory is one part of physics, with abstract material characteristics. Students must begin to develop their imagination in order to understand the concepts that exist on the material. The description of something abstract becomes an important thing in the process of physics learning [1].

Observations and interviews that had been conducted by teachers of physics class XI SMA PGRI 6 Banjarmasin show that learning outcomes of physics are still low (below the maximum completeness standards set by the school). The learning resources used by the students are just the Student Worksheet so that they do not provide material understanding. In addition the use of media, especially interactive media is rarely used in learning.
Interactive multimedia-based learning needs to be developed, especially for abstract physics teaching materials. Interactive multimedia is a multimedia display that is designed to display the function of informing the message and have interactivity to users [13]. The use of interactive Multimedia is perfect for abstract physics teaching material [1].

Lectora is a software development of electronic learning (e-learning) is relatively easy to apply and is applied as it can be made without having to know a programming language [14]. Lectora can be used to combine files form of flash, video recording, combining images, and screen to capture [13]. Lectora inspire has several advantages including 1) can be used to create websites, 2) e-learning content interactive, 3) features that are presented very easy for novice users to create multimedia learning, and 4) the template Lectora complete enough [14]. Development of Lectora-based multimedia can increase motivation, interests [15] and student learning outcomes [16].

This research develops and produces Lectora-based interactive multimedia products on the topic of kinetic gas theory at the high school level. The purpose of this study describes the feasibility of interactive multimedia developed in terms of validity, practicality, and effectiveness.

2. Method
This study is a research and development using ADDIE model consisting of analysis, design, develop, implement, and evaluate. The analysis phase includes field study activities at SMA PGRI 6 Banjarmasin, curriculum analysis, characteristic analysis of students, and analysis of device utilization to use Lectora based learning multimedia. The design phase includes the activities of determining basic competencies and learning objectives, designing interactive multimedia (creating a storyboard and Lectora trial design for class XI on the subject of gas kinetic theory, image selection, video, animation and test material in accordance with the material and the purpose of making multimedia learning). The development phase is product creation that is interactive multimedia-based Lectora. The developed medium is validated (material validation and media validation) by the validator. The Implementation phase, that is interactive multimedia implemented in the learning process in class XI IPA 1 SMA PGRI 6 Banjarmasin. The evaluation phase, the phase of evaluating the feasibility of interactive multimedia from the aspects of validity, practicality, and effectiveness [17]. The test subject is 39 students of class XI IPA 1 SMA PGRI 6 Banjarmasin. Instruments used in this study include multimedia validation sheet, questionnaire and learning result test.

Feasibility products of the aspect of validity, practicality and effectiveness [17]. Media validation was obtained using the media validation sheet [6]. Validator consists of 2 academics and 1 practitioner. The average score of validation results was then adjusted to the validity criteria [18]. Practicality media was measured using questionnaires [19]. The mean score obtained is then adjusted to criteria of practicality [18]. Media effectiveness is measured using a learning result test. Then it is analyzed using the N-gain equation [20].

3. Result and Discussion
The e-learning media developed using Lectora application on the subject of gas kinetic theory, for high school grade XI students. Content developed with Lectora software can be published to various outputs such as HTML, exe, CD-ROM, and e-learning standards such as SCORM and AICC that can be run without having a Lectora application [14]. The developed media contains kinetic gas theory material that contains core competence, basic competence, learning objectives, learning materials, animation, graphics, video, sample questions and exercises. The media is to facilitate students to increase understanding and deepen knowledge. Each meeting there is a virtual laboratory using PhET media to broaden the concept of students because the material is an abstract kinetic theory of gases and microscopic lab so it can not be done directly.
The product developed can be seen in the Figure 1.

![Lectora-based interactive multimedia on the subject of gas kinetic theory](image)

**Figure 1.** Lectora-based interactive multimedia on the subject of gas kinetic theory

3.1. **Validity Result of Interactive Multimedia**

Media validation is done by 3 validators (two academics and one practitioner). The validation results by validating can be seen in Table 1 below.

| Aspects of assessment                  | Average | Category       |
|----------------------------------------|---------|----------------|
| Navigation ease                        | 4.1     | Very valid     |
| Cognition Content                      | 4.2     | Very valid     |
| Presentation of Assessment Information | 4.0     | Very valid     |
| Media Integration                      | 4.0     | Very valid     |
| Artistic and Aesthetics                | 4.0     | Very valid     |
| Overall function                       | 4.3     | Very valid     |

Based on Table 1 of media validation results, viewed from the aspect of Navigation ease, Cognition Content, Presentation of Assessment Information, Media Integration, Artistic and Aesthetics, and Overall function, categorized very valid. Media developed feasible to be used as a supporter of the learning process. Media learning good views of clarity and neatness, cleanliness and attractive, match the goals, good quality and relevant to the topic being taught [21].

3.2. **Practicality of interactive multimedia**

Practicality interactive multimedia obtained from the student questionnaire responses. The results of the students' response to the media can be seen in Table 2 below.

| Aspects of assessment                  | The average score | Category       |
|----------------------------------------|-------------------|----------------|
| Product results                        | 3.90              | Very practical |
| Effectiveness for students             | 3.53              | Very practical |
Based on the Table 2 aspects of program results have an average value of 3.90 categorized as very practical. This indicates that the media developed using appropriate language, materials that are in accordance with school teaching materials and clarity of content contained in the media. The effectiveness aspect has an average of 3.53 categorized as very practical. This means the media makes it easier for students to learn the material, helps students learn through animation and gets students interested in the material. The developed multimedia is easy to use/practical. Ease of using interactive multimedia can help students learn independently. The use of multimedia can help students learn independently and interested in the material. The developed multimedia is easy to use/practical. Ease of using interactive multimedia can help students learn independently [11]. Thus, the Lectora-based learning media developed is said to be very well used by students to improve the quality of the learning process [22].

3.3. Effectiveness of interactive multimedia
Media effectiveness is measured from the test of learning outcomes in the cognitive domain. The Result of student learning outcomes can be seen in Table 3 below.

| Table 3. The effectiveness of interactive multimedia          |
|---------------------------------------------------------------|
| On Average pretest | On Average posttest | N-gain | Category |
| 9.38               | 83.33               | 0.81    | High     |

Media effectiveness has a high category. This shows the success of the media developed in achieving the learning objectives. The use of media accelerates student acceptance of material content [1,9]. The use of Lectora can clarify abstract material [13] and microscopic so as to increase students’ interest [15], attention and motivation of students in the learning process [11]. So that student is helped in learning. Learning using Lectora can clarify abstract material and microscopic so as to increase student learning outcomes that are taught with Lectora media are better than student learning outcomes taught by conventional learning models [23].

4. Conclusion
Based on the results and discussion of the study, it can be concluded that interactive multimedia categorized eligible to be used in the process of physics learning at the high school level on the subject of gas kinetic theory. This is supported by: 1) the validity of media which is categorized as very valid, 2) Practicality of media which is categorized as very practical, and 3) the effectiveness of media which is categorized as high.

References
[1] Maimunah M, An’nur S, Misbah M 2016 Berk. IIm. Pendidik. Fis. 4 8.
[2] Wirdaus I, Arief ZA, Syafri UA 2014 Teknol. Pendidik. 3 .
[3] Afif M 2014 Bioedu. Berk. IIm. Pendidik. Biol. 3 472.
[4] Wati M, Hartini S, Hikmah N, Mahtari S 2018 J. Phys. Conf. Ser. 997.
[5] Mahmudah M, Munzil M, Yulianti E 2018 J. Penelit. Fis. Apl. 8 42.
[6] Mahyuddin RS, Wati M, Misbah M 2017 Berk. IIm. Pendidik. Fis. 5 229.
[7] Musfiqon HM 2012 Pengembangan Media dan Sumber Pembelajaran (Jakarta: PT Prestasi Pustakarya).
[8] Hartini S, Misbah M, Dewantara D, Oktovian RA, Aisyah N 2017 J. Pendidik. IPA Indones. 6 313.
[9] Munir 2013 Multimedia Konsep dan Aplikasi dalam Pendidikan (Bandung: Alfabeta)
[10] Fitroh S, Mardiyah 2015 PG-PAUD Trunajoyo. 2 50.
[11] Saputra W, Purnama BE 2011 Penelit. Eng. dan Edukasi. 4.
[12] Krisnawati T 2010 J Ilm Guru Caraka Olah Pikir Edukatif 2.
[13] Romadhan A, Rusimamto PW 2015 J. Pendidik. Tek. Elektro. 4.
[14] Mas’ud M 2014 Membuat multimedia pembelajaran dengan Lectora (Yogyakarta: Pustaka Shonif)
[15] Prasetyo S 2015 J. Pendidik. Islam 4 319.
[16] Rahmawati A, Isroah I 2013 J. Pendidik. Akunt. Indones. 11.
[17] Nieveen N, Tjeerd P 2010 An Introduction to Educational Design Research (Enschede: Netzodruk)
[18] Widoyoko EP 2016 Evaluasi Program Pembelajaran (Yogyakarta: Pustaka Pelajar)
[19] Hamdi H 2013 Pillar Physic Educ 1.
[20] Hake RR 1999 Analyzing Change/Gain Scores (Woodland Hills: Dept. of Physics, Indiana University).
[21] Asyhar R 2012 Kreatif Mengembangkan Media Pembelajaran (Jakarta: Referensi)
[22] Suartama IK 2010 J. Pendidik. Pengajaran. 43.
[23] Hidayat MI, Harahap MB 2015 J. Pendidik. Fis. 4 25.