International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

Development of Android-Based Interactive Physics Learning Media for Gas Kinetic Theory Materials

Ratna Tanjung[1], Teguh Febri Sudarma[2], Rugaya[3], Parasian Sitinjak[4], Ida Wahyuni[5]
[1,2,3,4,5] Physics Department, Universitas Negeri Medan, Medan – Indonesia

ABSTRACT: This study aims to produce a decent Android-based interactive physics learning media, to know the user's response to the learning media and to measure the effectiveness of the learning media. This type of research is development research using a 4-D model with 34 students as research subjects. The instruments used in this study were due diligence questionnaires by experts and physics teachers, student response questionnaires and tests. Based on the results of data analysis, the material expert validation was 96% with very feasible criteria, media expert validation was 96% with very feasible criteria and the physics teacher's assessment was 80% with feasible criteria. Student responses to small group tests with 10 respondents obtained effective (2.8), productive (3), safe (2.9) and satisfied (3) results. Whereas in the large group test with 34 respondents the results were effective (3.12), productive (3.25), safe (3.01) and satisfied (3.17). Based on the calculation of the gain value, learning media is included in the medium category in the effectiveness of increasing students' conceptual understanding with a value of 0.6.

KEYWORDS: Android, Conceptual Understanding, Development, 4D, Learning Media.

INTRODUCTION

The world's rapid progress has now entered the era of the industrial revolution 4.0 and information technology as the foundation of human life. The ongoing industrial revolution 4.0 has brought challenges and influences for the younger generation and also the education system in Indonesia. This is marked by the use of a digital format for the education system which instructs each aspect of education to adjust to the rate of transition that occurs (Siahaan et al 2019).

In the current era, the development of science and technology is changing all the time. Therefore, this change also causes a shift in learning methods and learning media. The rapid development of science and technology has caused teaching and learning activities to no longer be centered on one source of learning, namely the teacher. One of the learning methods that is currently developing is distance learning. The distance learning method requires media as an intermediary for teacher-student interaction, which directly overcomes the limitations of face-to-face learning. Distance learning can be quickly adjusted so that educators and students can interact anytime and anywhere (Delkisyarangga, 2017).

In 2020, distance learning or better known as online learning is an obligation that must be implemented in almost all schools and also tertiary institutions in Indonesia. This is because the world is being shocked by the Corona Virus (Covid-19) pandemic. The very current crisis conditions have caused direct face-to-face learning process activities to be stopped. As a result, teachers have to work extra to be able to carry out teaching and learning activities even from their respective homes.

Learning media is an important part of learning resources. The presence of learning media intervenes to ensure the success or failure of learning. Technological developments make it easier to make learning media and facilitate learning. Various software can be used to develop learning media. This kind of software assistance makes learning media more enjoyable and easier to develop (Astuti et al., 2017).

Learning media that are suitable for development at this time are ICT-based media that operate on smartphones equipped with the Android operating system. This refers to the use of Android which is increasingly popular and in demand by students. The use of Android-based learning media is a modern way of learning in the 21st century. This type of learning aid is able to improve student learning outcomes in the form of empirical factual knowledge and students' willingness to learn. This type of learning media allows students to learn in fun applications without time and place restrictions

Based on the results of an initial study conducted by the developer by interviewing via the WhatsApp application with the physics teacher at SMA Negeri 1 Onanrunggu, the learning tools used by the physics teacher during online learning are WhatsApp group media as well as Google Classroom and the ZOOM application for virtual meetings. From the online interviews conducted, there

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

were several problems or obstacles faced by teachers. The obstacle faced by the teacher is the limitation in explaining the material, which is due to the reduction in lesson hours from 45 minutes to 30 minutes in one lesson. Then in the learning process the teacher is constrained in delivering material because some of the student residences do not have a stable internet network. So, the teacher makes teaching materials in the form of Powerpoint presentations which are delivered via the Whatsapp group referenced from the textbook.

In connection with the problems described above, it is necessary to develop a learning media that suits the needs of teachers as well as students to improve skills in understanding physics concepts. Therefore, the media that will be developed by researchers is Android-based learning media.

To create an Android-based media, the file is saved in HTML 5 format. After that, the HTML 5 formatted file is converted into an .apk format with the help of the Website 2 APK Builder software (Shofilia and Achmadi, 2019).

Based on the background of the problems above, the formulation of the problem in this study is as follows: 1) How is the development of Android-based interactive learning media on Gas Kinetic Theory material for class XI students at SMA Negeri 1 Onanrunggu? 2) What is the feasibility of Android-based interactive learning media on Gas Kinetic Theory material for class XI students at SMA Negeri 1 Onanrunggu? 3) How is the user's response to the Android-based interactive learning media developed by researchers on the Gas Kinetic Theory material for class XI students at SMA Negeri 1 Onanrunggu? 4) How is the effectiveness of Android-based interactive learning media developed by researchers towards increasing students' conceptual understanding? The objectives of this study are: 1) To develop Android-based interactive learning media on Gas Kinetic Theory material for class XI students at SMA Negeri 1 Onanrunggu. 2) To find out the feasibility of Android-based interactive learning media on Gas Kinetic Theory material for class XI students at SMA Negeri 1 Onanrunggu. 3) To find out the user's response to Android-based interactive media that has been developed on Gas Kinetic Theory material for class XI students at SMA Negeri 1 Onanrunggu. 4) To measure the effectiveness of Android-based interactive learning media developed on the level of students' conceptual understanding.

METHODS

This type of research is research and development (Research and Development) , namely research that is intended with the aim of developing Android-based interactive physics learning media on the material of gas kinetic theory. This interactive learning media development research uses a 4-D model (define, design, develop and dissimilate). The subjects of this study were all students in class XI IPA 2. The small group test was conducted on 10 students in class XI IPA 1.

A. Define Stage

The define stage is the initial stage for determining and formulating development provisions. This stage is also called the needs analysis stage. This stage includes five main steps, namely: front end analysis, analysis of student characteristics, task analysis, concept analysis and formulation of objectives.

B. Design Stage (Design)

Design phase is the learning device design phase. The stages are: media selection, format selection and initial design.

C. Stage Develop (Development)

The develop phase is the phase for producing product development. This phase includes two main steps, namely: expert validation and product trial.

D. Dessiminate Stage (Dissemination)

The dessiminate stage is the phase of introducing the product so that it can be accepted by users. Dissemination and utilization of this learning media by submitting files to the physics teacher at SMA Negeri 1 Onanrunggu as a practitioner and uploading ¬the application on the Blog site page .

RESULTS AND DISCUSSION

A. *Research result*

The ultimate goal of this research is to produce a product in the form of Android-based interactive physics learning media on Gas Kinetic Theory material for class XI SMA/MA to improve students' conceptual understanding. This type of research is research and development (Research and Development) using a 4-D development model which has four phases. These phases begin with define

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

(definition), design (design), develop (development) and disseminate (dissemination). The results of this study will be explained in the following description:

1) Define Stage _

The *define* stage is the first stage of this research process which is useful for knowing the initial description of field conditions and determining problems related to the teaching and learning process of physics for class XI IPA at SMA Negeri 1 Onanrunggu. This is done to assist developers in providing solutions to the problems found, namely the development of learning media and the limits of the material being developed. This stage includes five main steps, namely:

2) Front End Analysis

Front end analysis was carried out with the aim of knowing the conditions in the field and determining the obstacles experienced by teachers and students when learning at SMA Negeri 1 Onanrunggu, by interviewing physics teachers and distributing questionnaires to students.

During the interview with the physics teacher, the developer identified the problems faced by the teacher during the online learning process. First, limited time in teaching. During this pandemic, online teaching and learning activities experienced a reduction in class hours, where during face-to-face learning the time given per lesson hour was 45 minutes, but during online learning it was reduced to 30 minutes. In one week, physics lessons only have one meeting with a duration of two hours of lessons, i.e. 60 minutes. Second, to support teaching and learning process activities, teachers have not fully utilized existing technology. Where it is known that each student in class XI IPA already has their own Android, but the subject teacher only makes learning media in the form of *Powerpoint*, where the material contained is referred to from the printed book provided by the school. Thus, learning media is needed that is able to support student learning through the use of technology and facilities owned by students, especially in the material of Gas Kinetic Theory.

After carrying out interviews with the physics teacher, the developer then distributed questionnaires to students and obtained the results shown in the diagram below.

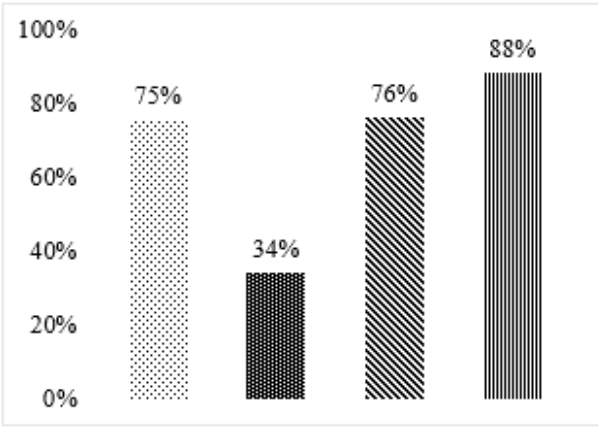

Figure 1. Front end analysis result diagram for students

3) Analysis of Student Characteristics

Analysis of the characteristics of students is intended to examine and adjust the characteristics of students to the learning media that will be developed. Analysis of the characteristics of students is reached through distributing questionnaires, where the aspects to be analyzed are attitudes, language and skills of students using Android. So, the results of the analysis are shown in the figure below:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

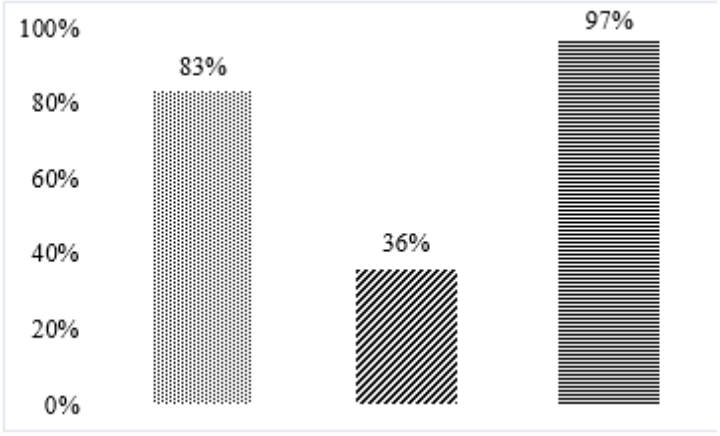

Figure 2. Analysis diagram of student characteristics

4) Task Analysis

Task analysis is carried out by the developer to carry out an analysis of the assignments conveyed by the teacher to students during learning activities. The aspects that were analyzed through distributing questionnaires to students were the form of implementation, usefulness and the place and time of assignment by the teacher. The results of the analysis are shown in the figure below.

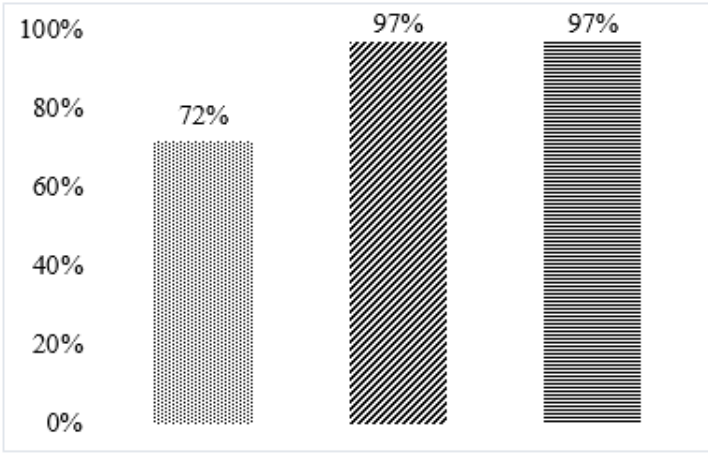

Figure 3. Student task analysis diagram

5) Concept Analysis

Concept analysis is used with the intention of determining the basic concepts in the Gas Kinetic Theory material. The concept is adapted to the syllabus and curriculum used by the school. Through interviews that have been conducted with physics teachers, it is known that SMA Negeri 1 Onanrunggu uses the Revised 2013 Curriculum. The following is a concept map of the Gas Kinetic Theory material.

6) Goal Formulation

After the developer conducted interviews with the teachers, it was found that SMA Negeri 1 Onanrugu used the Revised 2013 Curriculum where the learning center was in the students. However, because of the *current Covid-19 pandemic* , learning is still teacher-centered. In helping the achievement of these learning objectives the teacher develops learning media in the form of *Powerpoint* , but students still need media development. This is because the material available on the media provided by the teacher is a summary of the printed books they use. Therefore, it is necessary to develop Android-based learning media on the required Gas Kinetic Theory material that is suitable for the facilities owned by students.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

B. Design Stage (Design)

The *design* phase is the process phase of designing learning media to be developed. This stage consists of several steps that must be done, namely:

1) Media Selection

The selection of media is based on identification and adjustment to field conditions. Therefore the developer chose to develop Android-based physics interactive learning media on the material of Gas Kinetic Theory.

2) Format Selection

The development of learning media was made using the *iSpring Suite 10 application* and *Website 2 APK Builder Pro* 4.1 which later the learning media has the extension .apk contains material about Gas Kinetic Theory and is referred to from the revised 2013 Curriculum. The material contained in this learning media is referred to from several high school physics books and university books. The reason why using these two *software* is because the operation is easy and can be used for free.

3) Initial Plan

The developer makes a picture or product design that will be developed on physics learning media. Developers start looking for and collecting content that suits their needs. Some of the content or menu designs that will be loaded in this Android-based interactive learning media are, KI/KD, material supported by animation, sample questions, practice questions, video experiments in accordance with the material of Gas Kinetic Theory, references or material sources provided, assistance the use of *tools* in the application and also the developer profile. The initial design of the media developed was adjusted to the *flowchart* and *storyboard* that had been prepared previously.

C. Stage Develop (Development)

This stage is the phase of producing the product that has been designed. This stage is composed of development tests and expert assessments. Before testing the experts, a software development test is carried out in terms of functional specifications by the developer himself. The results obtained at this level are as follows:

1) Integrity Testing Test (Black Box Test)

Black box testing is used to see the functional specifications of the *tools* provided in learning media that have been designed to be able to run and carry out their duties according to their proportions. The stages of the test process are carried out by downloading and installing the application and after that it is run on an Android *smartphone* . Based on the test data, it can be obtained that the functionality of the *tools* developed can run well and get a percentage score of 100% in the very high functionality category.

2) Validation of Pretest-Posttest Questions by Expert Lecturers and Teachers

validation of the test instrument by the *expert* is used as a reference for repairing and perfecting the instrument that has been compiled. The validation activity uses the method of distributing a question grid along with answer keys totaling 30 items to the validator, namely Dr. Derlina, M.Sc as a physics expert lecturer at the Faculty of Mathematics and Natural Sciences, Medan State University and Mrs. Dameria Samosir, S.Pd as a physics teacher for Class XI IPA at SMA Negeri 1 Onanrungu.

Based on the validator's assessment, the test instrument prepared by the researcher received a minimum score of 84.05 and a maximum score of 98.85. If calculated as a whole, the assessment of the test instrument carried out by experts and teachers gets an average score of 95.34 which is classified as a very valid criterion. So it was concluded that the 30 questions that had been prepared by the researcher could be used for *pretest* and *posttest activities* for students .

3) Media Validation By Experts

Expert validation is a method of assessing or testing the appropriateness of a product that has been developed. In this phase, expert validation tests are submitted to material expert lecturers, learning media expert lecturers and user feasibility tests, namely from physics subject teachers.

a) Assessment Results By Material Experts

Assessment by material experts aims to see the language and suitability of KI/KD and the concept of material in the developed learning media. Overall the material contained in the learning media obtains an average percentage of 96%. The results obtained from the validator are shown in the image below:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

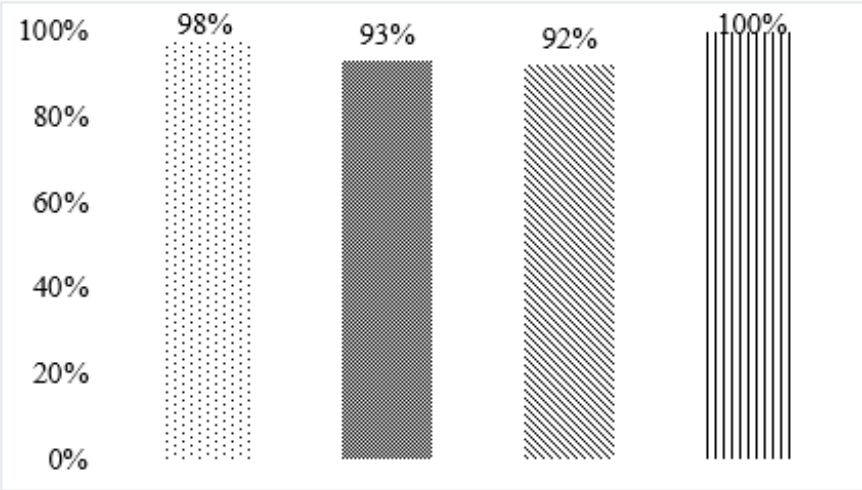

Figure 5. Diagram of the results of the assessment by material experts

b) Assessment Results By Learning Media Experts

This expert's assessment was carried out to see the feasibility of the developed learning media which includes the format and design of learning media. Overall, learning media gets an average percentage of 96%. The results obtained from the validator are shown in the image below:

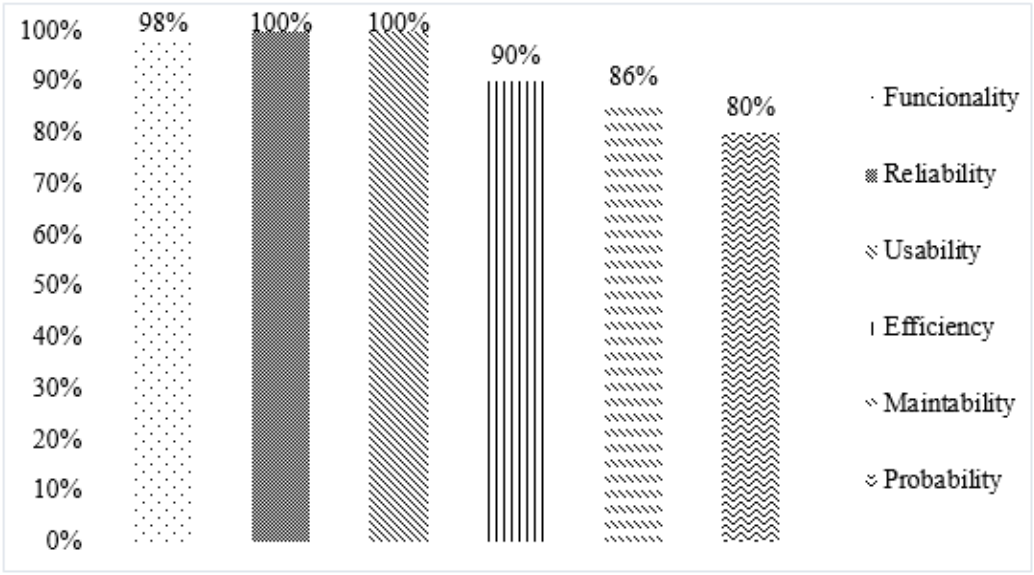

Figure 6. Diagram of the feasibility level of learning media by material experts

c) Results of Assessment by Subject Teachers

Assessment by the physics teacher is useful to see whether the learning media that has been developed can be used when learning. Overall, the learning media developed received an average score of 80%. The results of the physics teacher's assessment can be seen in the image below:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

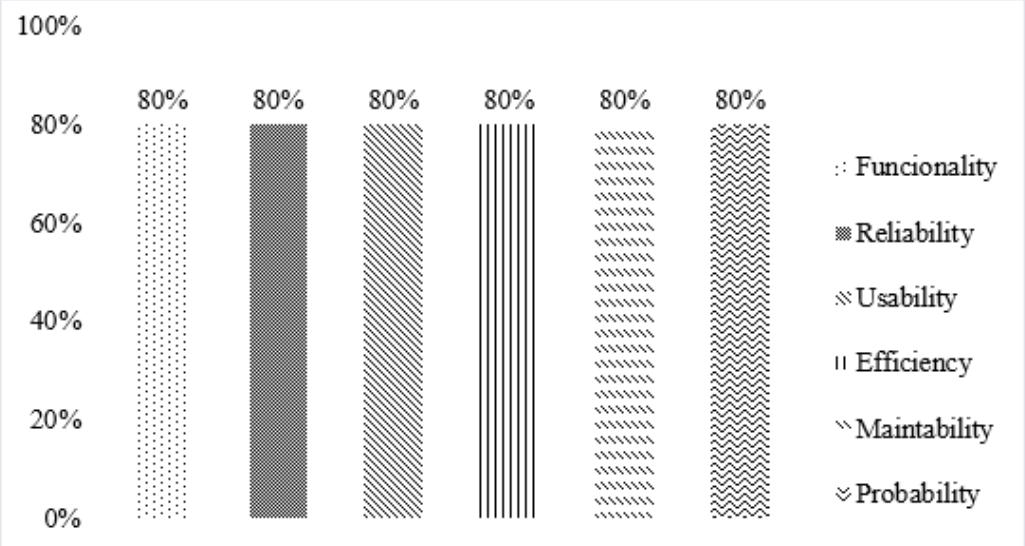

Figure 7. Diagram of the results of the assessment by subject teachers

4) Product Trials

After the product feasibility test stage by the expert and the subject teacher's assessment and revisions have been made according to the suggestions received, the next activity is to test the product on students who have been divided into two test groups. The product trial groups are as follows:

Small Group Trial

The small group test was aimed at 10 students in class XI IPA 1 at SMA Negeri 1 Onanrunggu who had been randomly selected by the subject teacher. Small group trials aim to obtain responses and reactions from students on the media that have been developed. The acquisition of student responses after the small group test was carried out can be seen in the image below:

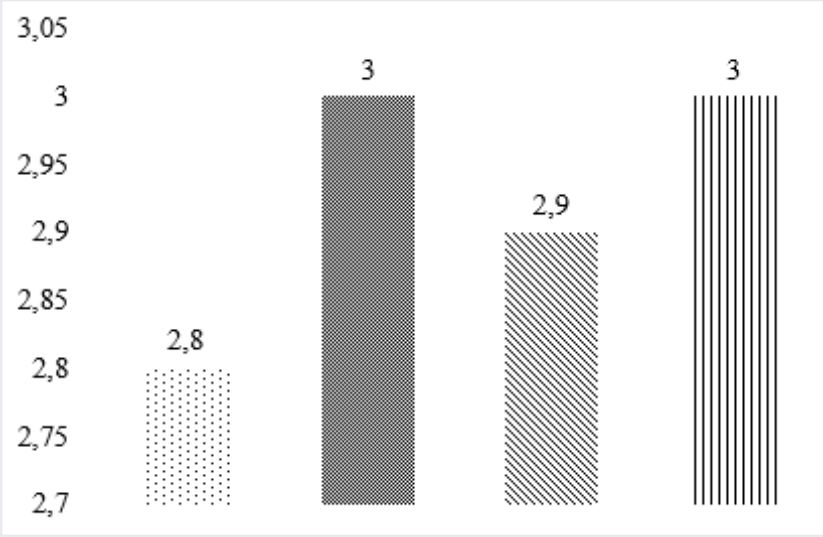

Figure 8. Diagram of small group trial results

a) Large Group Trial

The large group trial was aimed at 34 students in class XI IPA 2 at SMA Negeri 1 Onanrunggu. The response obtained from the large group test is shown in the following figure:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

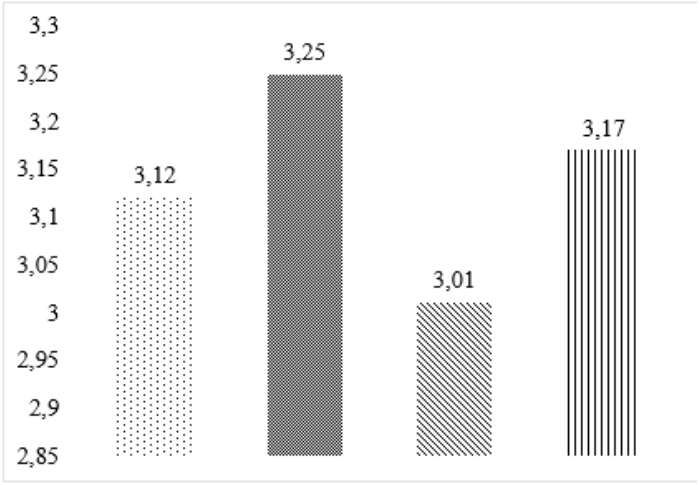

Figure 9. Diagram of the results of the large group trial

b) Analysis of the Effectiveness of Learning Media

At this stage the developer aims to analyze the increase in students' conceptual understanding of the Gas Kinetic Theory material before and after using the learning media that has been developed. This section is sequenced from the *pretest* and *posttest activities*, namely the *pretest is* carried out before the developed learning media is distributed to students and the *posttest* is held after learning to use the developed media.

After the pretest and posttest activities were completed, an average value of 35.8 was obtained , where the lowest correct answer was 7 and the highest was 19 in the pretest activity and the average value was 74.5 with the lowest correct answer being 19 and the highest being 29 in the posttest activity. The following is an overview of the average *pretest-posttest scores* by students:

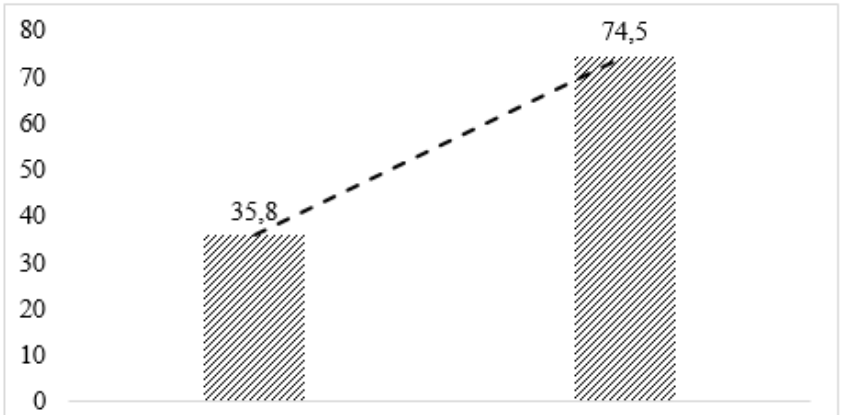

Figure 10. Gain test analysis result diagram

D. *Dessiminate Stage (Dissemination)*

The disseminate stage is the final sequence of this research where the learning media that has been developed are disseminated so that users can accept them. The dissemination of this learning media product is done by uploading the product to Google Drive , and giving it to students in class XI IPA 1, XI IPA 2 and to teachers of physics subjects at SMA Negeri 1 Onanrugu and also uploading it on the blog page with link https://mediapembelajarandroidfisia.blogspot.com/2021/06/application-for-learning-physics-materi.html

DISCUSSION

The learning media feasibility test phase is given to experts, namely the material validator and media validator. At the feasibility test stage of learning media by the material validator, an average percentage score of 96% is obtained and if it is converted to a

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 11 November 2022
DOI: 10.47191/ijcsrr/V5-i11-35, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

qualitative statement, the material in the media developed includes very feasible criteria by making additions and also improvements according to the suggestions of the validator. In the media feasibility test by the media validator, an average percentage score of 96% was obtained and included in the very feasible criteria by making improvements according to the validator's suggestions. In the feasibility test of this learning media, the instrument given to the validator is a questionnaire that has been adjusted to The International Organization for Standardization (ISO) 9126. The feasibility test of the material on the learning media by the material validator assesses 4 aspects namely functionality, reliability, usability and efficiency. Meanwhile, the media validator assesses 6 aspects, namely functionality, reliability, usability, efficiency, maintainability and probability. After being validated and revised in line with input from the validator, the learning media is then given to expert users (subject teachers) at the research location to find out the teacher's assessment of the developed media whether it is appropriate to use it during learning. Based on the results of the assessment by subject teachers, the developed learning media obtained an average percentage of 80% in the Eligible category. The teacher's assessment instrument was compiled and adapted to ISO 9126 by assessing 6 aspects namely functionality, reliability, usability, efficiency, maintability and probability.

In the product trial stage, there are two stages, namely group testing and large group testing. The small group test consisted of 10 students from class XI IPA 1 and for the large group test, namely 34 students from class XI IPA 2. The results obtained from the small group test were 2.8 for the effectiveness aspect, 3 for the productivity aspect, 2. .9 for the safety aspect and 3 for the satisfaction aspect. Based on the data obtained, the learning media developed received a response with the classification of effective, productive, safe, and students were satisfied with the media. Meanwhile for the large group test, the learning media developed obtained a score of 3.12 for the effectiveness aspect, 3.25 for the productivity aspect, 3.01 for the safety aspect and 3.17 for the satisfaction aspect. Based on the value obtained, the developed media received a response with the classification of effective, productive, safe and students were satisfied with the media.

The aspect of effectiveness is seen and measured from the ability of the media to provide assistance to students in learning. The productivity aspect includes students' awareness of the use of technology and the practicality of learning media. The security aspect includes the ease of use of the media and the security of the media to be downloaded on each student's Android. While aspects of satisfaction include the use of language in the media, readability, the attractiveness of the media and the ease of use of the media and the tools available in the media.

The fourth objective of developing this media is to measure the level of conceptual understanding of students after using interactive Android-based physics learning media on the kinetic theory of gases that has been developed. After the learning media was validated by the expert and revised until the media developed met the requirements for use, a large group field trial was conducted where the research subjects totalled 34 students. Then the learning media is distributed to students and used to study for 2 weeks.

The researcher carried out pre-test activities at the beginning and post-test activities at the end of the treatment with the same questions. The questions used were questions prepared by the developer and validated by experts, namely the physics expert lecturer at the Faculty of Mathematics and Natural Sciences, Medan State University and the physics subject teacher at SMA Negeri 1 Onanrunggu. The questions that were validated by experts were 30 items and all of them were valid.

At the first meeting, namely before the developed media was given to students the developer carried out the pre-test and got an average score of 35.8. After students are given time to study with the help of using learning media, then students carry out the post-test again and get an average score of 74.5.

gain test analysis to measure the level of effectiveness of the developed media in increasing students' conceptual understanding, and obtained a result of 0.6. The value obtained is classified as moderate criteria, which means that the learning media developed to help students learn has a moderate level of effectiveness in increasing students' conceptual understanding.

CONCLUSION

Based on the results of the analysis and discussion that have been described, it can be concluded that: 1) Android-based interactive physics learning media on Gas Kinetic Theory material which has been successfully developed through the define, design, develop and disseminate stages. 2) Media development. It can be concluded that the learning media developed are suitable for use in learning based on the results of the due diligence by material experts with a percentage of 96%, learning media experts 96% and expert users by subject teachers with a percentage of 80%. 3) Student responses in small group trials involving 10 respondents obtained effective (2.8), productive (3), safe (2.9) and satisfied (3) categories. Whereas in the large group trial involving 34 respondents, the categories

were effective (3.12), productive (3.25), safe (3.01) and satisfied (3.17). 4) The effectiveness of Android-based interactive physics learning media that has been developed in increasing students' conceptual understanding is included in the medium criteria with a gain value of 0.6.

REFERENCES

1. Aji, S. H., Saputra, A. T., & Tuada, R. N. (2020). Development of Physics Mobile Learning Media in Optical Instruments for Senior High School Student Using Android Studio. Journal of Physics. 1-8. doi:10.1088/1742-6596/1440/1/012032
2. Astra, M., Nasbey, H., & Nugraha, A. (2015). Development of an Android Application in The Form of a Simulation Lab as Learning Media for Senior High School Students. Eurasia Journal of Mathematics, Science &Technology Education. 11(5): 1081-1088s
3. Astuti, I.A.D., Sumarni, R.A., & Saraswati, D.A. (2017). Pengembangan Media Pembelajaran Fisika Mobile Learning Berbasis Android. Jurnal Penelitian dan Pengembangan Pendidikan Fisika. 3(1): 57-62.
4. Branchais, S. & Achmadi, H.R. (2019). Validitas Media Pembelajaran Interaktif Berbasis Android pada Materi Gejala Pemanasan Global. Jurnal Inovasi Pendidikan Fisika. 8(2): 508-511.
5. Dasilva, B. E., & Suparno. (2019). Development of The Android-Based Interactive Physics Mobile Learning Media (IPMLM) to Improve Higher Order Thinking Skill (HOTS) of Senior High School Students. Journal of Physics. doi:10.1088/1742-6596/1397/1/012010
6. Firmansyah, Y. & Jamilah. (2018). Implementasi Sdlc Waterfall Dalam Pembuatan Game Edukasi Perjuangan Indonesia "Hisotira" Menggunakan Rpg Maker Mv Berbasis Android. Jurnal Khatulistiwa Informatika. 6(2): 178-185.
7. Hendrawati, T.D., Tahtawi, A.R.A., & Fadilah, F. (2019). Sistem Monitoring Pencemaran Air Sungai Berbasis Teknologi Sensor Nirkabel dan Interner-of-Things. Polban. 286-292.
8. Husein, S., Herayanti, L., & Gunawan. (2015). Pengaruh Penggunaan Multimedia Interaktif Terhadap Penguasaan Konsep dan Keterampilan Berpikir Kritis Siswa pada Materi Suhu dan Kalor. Jurnal Pendidikan Fisika dan Teknologi. 1(3): 221-225.
9. Husna, M., & Kuswanto, H. (2018). Development of Physics Mobile Learning Based on Local Wisdom to Improve Vector and Diagram Representation Abilities. International Journal of Interactive Mobile Technology. 12(6): 85-100.
10. Ismail, A., Suherman, U., & Jamilah. (2017). Implementasi Model Pembelajaran Berbasis Multimedia Interaktif Untuk Meningkatkan Prestasi Belajar Siswa di SMK Garut. Jurnal Teknologi Pendidikan dan Pembelajaran. 2(1): 2015-214.
11. ISO/IEC FDIS 9126. (200). International Standard : Information Technology – Software Product Quality.
12. Kusuma, N.R., Mustami, M.K., & Jumadi, O. (2018). Pengembangan Media Pembelajaran Interaktif PowerPoint Ispring Suite 8 Pada Konsep Sistem Ekskresi di Sekolah Menengah Atas.
13. Mashuri, S. (2019). Media Pembelajaran Matematika Yogyakarta: Deepublish.
14. Nurhayati, V., Suyanto, E., & Suana, W. (2018). Desain Perangkat Blended Learning berbantuan Learning Management System Pada Materi Fluida Dinamis. Jurnal Pendidikan Fisika. 6(1): 21-33.
15. Pratama, R. A., Larasati, D. & Khitimah, H. (2020). TORIQ: Android-Based Mobile Learning for Vector Lessons. Journal of Physics. doi:10.1088/1742-6596/1613/1/012052
16. Saputra, M. R. D., & Kuswanto, H. (2018). Development of Physics Mobile (Android) Learning Themed Indonesian Culture Hombo Batu on The Topic of Newton's Law and Parabolic Motion for Class X SMA/MA. Journal of Physics. 1-8. doi :10.1088/1742-6596/1097/1/012023
17. Sani, R.A., Manurung, S.R., Suswanto, H., & Sudiran. (2018). Penelitian Pendidikan. Tangerang: TSmart.
18. Satrianawati. (2018). Media dan Sumber Belajar. Yogyakarta: Deepublish.
19. Septiawan, A.N., & Setiadi, Tedy. (2013). Aplikasi Pengenalan Huruf Hangeul Berbasis Multimedia Interaktif. Jurnal Sarjana Teknik Informatika. 1(1): 347-357.
20. Setyosari, P. (2015). Metode Penelitian Pendidikan & Pengembangan. Jakarta: Kencana
21. Shalikhah, N.D. (2016). Pemanfaatan Aplikasi Lectora Inspire Sebagai Media Pembelajaran Interaktif. Cakrawala. 11(1): 101-115.

22. Siahaan, A.D., Medriati, R., & Risdianto, E. (2019). Pengembangan Penuntun Praktikum Fisika Dasar II Menggunakan Teknologi Augumented Reality pada Materi Rangkaian Listrik dan Optik Geometris. Jurnal Kumparan Fisika, 2(2): 91-98.
23. Sianipar, P. (2013). Bekerja dengan PowerPoint 2013. Jakarta: Kompas Gramedia.
24. Simanjuntak, B.R., Desnita, & Budi, E. (2018), The Development of Web-based Instructional Media for Teaching Wave Physics on Android Mobile, Jurnal Penelitian dann Pengembangan Pendidikan Fisika, 4(1): 1-10.
25. Sudjana. (2002). Metoda Statistika. Bandung : Tarsito.
26. Sugiyono. (2017). Metode Penelitian Kualitatif, Kuantitatif dan R&D. Bandung: Alfabeta
27. Tanjung, R. (2019). Media Pendidikan Sains. Medan : UNIMED Press.
28. Undang-undang Republik Indonesia Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional.
29. Yaumi, M. (2018). Media & Teknologi Pembelajaran. Jakarta : Kencana.
30. Yektyastutu, R., & Ikhsan, J. (2016). Pengembangan Media Pembelajaran Berbasis Android pada Materi Kelarutan untuk Meningkatkan Performa Akademik Peserta Didik SMA, Jurnal Inovasi Pendidikan IPA. 2(1): 88-99.
31. Zhou, Z. (2019). Evaluating Websites Using a Practical Quality Model. De Montfort University

Cite this Article: Ratna Tanjung, Teguh Febri Sudarma, Rugaya, Parasian Sitinjak, Ida Wahyuni (2022). Development of Android-Based Interactive Physics Learning Media for Gas Kinetic Theory Materials. International Journal of Current Science Research and Review, 5(11), 4362-4372