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DEVELOPMENT OF ALMAJRITI (*APLIKASI MATEMATIKA JAGO PROGRAM LINIER INTERAKTIF*) FOR CLASS XI STUDENTS OF SENIOR HIGH SCHOOL

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Abstract

This research aims to develop a valid ALMAJRITI (*Aplikasi Matematika Jago Program Linier Interaktif*) learning media and to determine student responses. Student responses were obtained from questionnaires and tests (pre-test and post-test). The study conducted is in the form of R&D with ADDIE steps. Media, learning, material, IT (Information Technology), language, and practitioners experts validate the media. The validation results obtained from each validator sequentially are 100% (very valid), 85% (very valid), 84.62% (very valid), 70% (valid), 87.5% (very valid), 96 ,87% (very valid). The media is very valid if it gets 75% or more. Overall, the media obtained a very valid assessment result of 87.33%, so the media was feasible to use. Meanwhile, the test instrument was validated by a material expert. The media was tested in class XI IPA 3 MAN 1 Blitar. The use of media shows a positive student response. More than 65% of students gave a positive response based on the questionnaire results. In addition, the average pre-test was 17.07, the post-test was 77.5, and the percentage increase in student learning outcomes was 405%. Thus, there is an increase in student learning outcomes before and after using ALMAJRITI. This increase shows a positive response from students to the ALMAJRITI. Therefore, it can be concluded that the ALMAJRITI media is valid and feasible to be used as a learning resource for class XI students.

Keywords: development, learning media, application, mathematics, linear programming

1. Introduction

The use of technology as a learning medium can be an aspect of supporting success in teaching and learning activities. Technology-based learning media have been widely used and utilized among educators in the learning process (Leung, 2017; Nisiyatussani, Ayuningtyas, Fathurrohman, & Anriani, 2018). Some of the technology-based media used are animated videos (Chasanah, 2021; Nisa' & Rofiki, 2022), Geogebra (Segal, Stupel, & Oxman, 2016; States & Odom, 2016) or mobile-based applications (Apsari & Rizki, 2018; Rahayu, Rinaldi, & Gunawan, 2021). Thus, one of the alternative learning resources that can be developed by teachers today is technology-assisted media.

In 2010, the UNESCO Institute of Information Technology in Education declared the vital role of mobile devices in the lives of modern students (Sattarov & Khaitova, 2019). Learning no longer uses traditional sources on paper, such as textbooks, modules, and dictionaries. Almost all students take most information from the internet through computers or mobile devices. This means that the development of technology-assisted media, such as devices or applications, has changed education, so it is essential to ensure the proper use and implementation of technology-based learning.

The development of technology-assisted learning media is still not used effectively. One example is student difficulties, technical constraints, and limited space for teachers to use LMS (Learning Management System) (Melfawani, Roza, & Maimunah, 2022). In line with research Fauzy & Nurfauziah (2021) and T. H. Setiawan & Pamulang (2020), online learning media has several shortcomings, including the lack of interaction between teachers and students, inadequate internet networks, teachers not being able to control students' academic activities fully. This results in students being negligent of the tasks provided by the teacher (Nisa' et al., 2022) and having difficulty understanding the material, especially mathematics. In line with the results of observations made by researchers on the use of E-Learning, many students have difficulty understanding the material independently because the media is monotonous, neglecting the tasks given because there are no quotas and networks, many activities, and so on. Therefore, one solution to overcome these obstacles is a mobile-based application that can be accessed offline.

The use of mobile learning applications can be a solution for student learning resources today because of the high number of users of technology devices such as gadgets among students and teachers. Kominfo (2017) showed that smartphone users among students were 70.98%, and 5.97% of students used tablets. In line with the research of Gikas & Grant (2013), mobile-based technology has become a significant part of the teaching process in schools because it provides several prospects for students and teachers. This means that the use of mobile-based applications is familiar in the field of education and has been widely used in learning activities more comfortably and flexibly.

Mobile-based applications are one of the media that can stimulate students to solve problems independently, especially on material containing abstract concepts such as mathematics. Students expect mobile-based technology learning media to be applied in schools to make it easier to understand and solve mathematical problems (Dahlstrom, 2012; Sari & Sumuslistiana, 2018). It is expected that students can receive information and materials that are appropriately delivered through mobile-based learning media. One of the materials delivered through mobile-based media is the Linear Programming.

Linear Programming is one of the mathematical materials that include everyday problems related to the concept of a system of linear equations and inequalities, while the learning media is still not supportive. Thus, the Linear Programming is one of the materials that are difficult for students to understand because it requires accuracy and mastery of algebraic operations, manipulating, representing, and connecting concepts well (Nisa', Susanti, Rofiki, & Chandra, 2021; Nisa & Marhayati, 2022; Sriyanti, Wahyuni, Latuconsina, & Amin, 2022). In line with the results of the researchers' observations, 14 out of 24 students scored below average in the Linear Programming test. This can be seen from the many students who have difficulty determining the point of intersection, drawing graphs, determining the objective function and objective function, and determining the settlement area. This shows that students have not understood the Linear Programming material well.

Apsari & Rizki (2018) developed Android-based learning media on Linear Programming material. However, media trials are still limited to 10 students. In addition, research by Sari & Sumuslistiana (2018) also developed Linear Programming learning media in the form of an Android application which was developed based on the Hannafin & Peck model. In this model, the media that has been implemented does not go through the evaluation stage. Likewise, research by

Rahayu et al., (2021) developed a similar media but used the stages of ADD development which is a simplified form of ADDIE. Thus, the research's novelty is the development of mobile learning applications for Linear Programming material. The development model uses ADDIE because it is a more precise, complete, and systematic stage, and media trials are carried out on more than ten students.

Based on these problems, the researchers developed a mobile-based learning media named ALMAJRITI (*Aplikasi Matematika Jago Program Linier Interaktif*). ALMAJRITI media can be accessed offline or online via mobile devices. The development focuses on the Linear Programming material with a scientific approach, and the development target is class XI SMA/MA students. The novelty of the research to be carried out with previous research lies in the material and form of learning media. Therefore, this study aims to develop a valid ALMAJRITI learning media and to determine student responses to its use in learning.

2. Method

The type of research conducted is Research & Development using ADDIE development steps. The researcher uses the ADDIE development steps because it is one of the research and development models for complete learning products with simple and easy learning steps. The ADDIE model consists of 5 steps in developing media, namely: a) Analyzing, b) Designing, c) Developing, d) Implementing, and e) Evaluating. The stages of ADDIE development are presented in Figure 1.

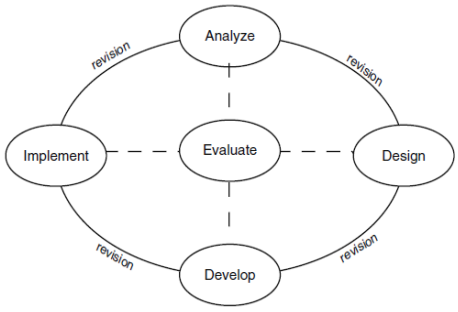

Figure 1. Steps ADDIE (Branch, 2009)

This study used instruments in the form of student response questionnaires, media assessment questionnaires, and pre-test and post-test sheets. Before being tested, the ALMAJRITI media was tested for validity in learning through an assessment questionnaire by five experts, namely media, learning, material, IT, language, and one practitioner expert for improvement. Media assessment is carried out through a questionnaire containing statements and scores. The assessment score uses a Likert scale of 1 – 4, calculating each indicator.

$$P(s) = \frac{S}{N} \times 100\%$$

Information:
P(s) = Percentage of sub indicators
S = Total score for each sub-indicator
N = Total maximum score

Then, the results obtained from these calculations are classified based on the qualitative assessment criteria as in Table 1.

Table 1. Validator Assessment Criteria (Chasanah, 2021)

Interval	Criteria
$75\% \leq \text{Score} \leq 100\%$	Very Valid
$50\% \leq \text{Score} < 75\%$	Valid
$25\% \leq \text{Score} < 50\%$	Less Valid
$0\% \leq \text{Score} < 25\%$	Not Valid

After that, the product was tested in class XI IPA 3 MAN 1 Blitar, which contained 30 students. Student responses are required through questionnaires and pre-test and post-test sheets to evaluate media use in learning. A student response questionnaire in the form of a closed questionnaire with a scale of 1-4 was given to students after ALMAJRITI was used. The student's response is positive if the percentage is 65%. The calculation of the percentage value is presented as follows:

$$P = \frac{F}{N} \times 100\%$$

Information:
P = Percentage value
F = Number of student answers
N = Total number of students

The students' test results were used to analyze the differences in the scores of the students' pre-test and post-test. The calculation of the increase in pre-test and post-test scores is presented as follows:

$$Enhancement\ (\%) = \frac{Posttest - Pretest}{Pretest} \times 100$$

3. Result and Discussion

3.1 ALMAJRITI Media Development

The results of the development of the ALMAJRITI media are broken down into five stages according to the ADDIE steps as follows:

3.1.1 Analysis

At this stage, researchers collect data related to the root of the problem in learning mathematics, both from literature studies and observations in the

field. The results of interviews conducted by researchers with compulsory mathematics teachers for class XI IPA 3 MAN 1 Blitar showed that most students were reluctant to fill in attendance and were negligent of the tasks provided by the teacher in E-Learning. At this stage, the researcher also monitored the recapitulation of student learning outcomes in class XI MAN 1 Blitar in E-Learning to determine students' difficulties in learning mathematics. It was obtained that 70% of students' learning outcomes for Linear Programming material were still below the KKM (Minimum Criteria for Completeness). This means that students still do not understand the Linear Programming material.

In field studies, researchers provide practice questions to students. Information obtained shows that students are constrained in solving problems related to graphics. Some do not understand the concepts of constraint and objective functions, especially those related to contextual problems in Linear Programs.

3.1.2 Design

At the design stage, the researcher designs the media to be developed, such as determining and compiling the materials used. Researchers compiled materials, questions, and answers from several references such as modules, electronic school books, and others that were packaged into interactive audio-interactive animations. Some of these references are collected into material that will be packaged in the form of interactive audio-visual animation. The material design, questions, and answers are presented in Figure 2.

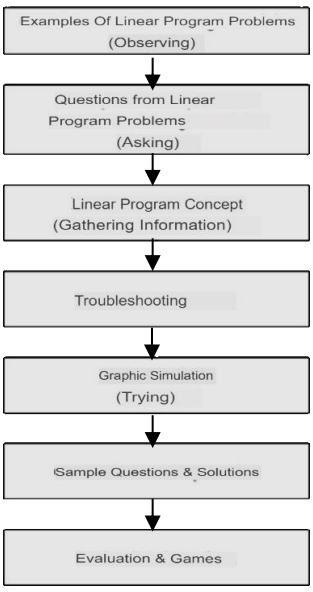

Figure 2. Material Design

To facilitate media development, the researchers made a design flow of media applications, commonly referred to as a flowchart. The flowchart contains slides of the media to be created, namely the splash screen page (the first page that appears for a few seconds after the media is opened), the opening page, the menu page, the user guide, fundamental skills & indicators, materials, graphic simulations, sample questions, games, discussions, and the developer profile page. At this stage, the researcher also determines the name of the media to be made, namely ALMAJRITI. ALMAJRITI's flowchart is presented in Figure 3.

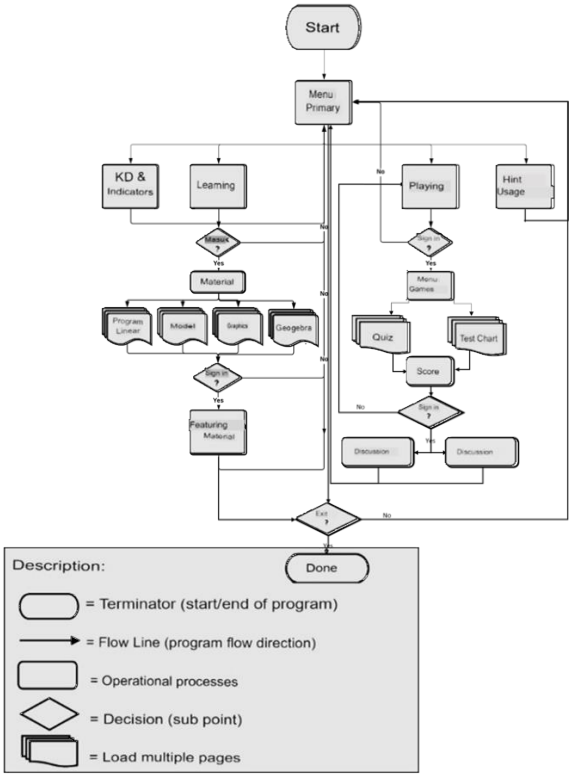

Figure 3. Flowchart ALMAJRITI

The next stage is to prepare the components of ALMAJRITI. The learning media component is a software as an ingredient in making applications. The software used by researchers to create ALMAJRITI includes Microsoft PowerPoint, Website 2 Apk Builder, Geogebra Applet, and iSpring Suite 10. Microsoft PowerPoint functions to create media framework designs, iSpring Suite 10 to make media more interactive and applicable, Geogebra Applet to train students in simulating various graphs, and Website 2 APK Builder Pro to convert iSpring Suite 10 output in the form of .html into apk files.

Fifth, develop research instruments. The research instrument consists of media assessment instruments and student responses. The media assessment instrument is in the form of a material expert validation questionnaire, learning, IT, media, language, and practitioners, as well as

student response instruments. Student response instruments consist of two kinds, namely test and non-test instruments. Questionnaires are used to determine changes in attitude aspects that are the research objectives.

3.1.3 Development

At this stage, the researcher developed an application based on the design that had been made previously, the validity sheet for the feasibility of learning media, and student response questionnaires. The stages of ALMAJRITI development are:

First, the development of ALMAJRITI. The components of ALMAJRITI that have been designed and then developed by researchers are Splash Screen, Opening page, Menu page, User Guide page, Basic Competence (KD) & Indicators page, Learning page, Evaluation & Game Menu page, KUMIS (Kuis Menarik dan Asyik) Evaluation page, the KUMIS Evaluation Score page, the KUMIS Evaluation Discussion page, the Choose & Click Game page (select and click the completion area on the graph), the Choose & Click Game Score page, the Choose & Click Game Discussion page, and the Developer Profile page.

Figure 4. Splash Screen

Figure 5. Welcome Page

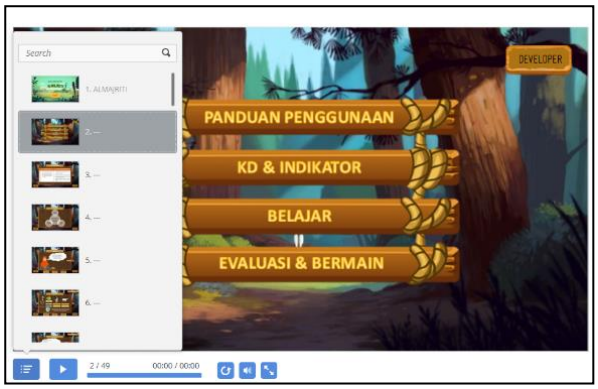

Figure 6. Menu Page

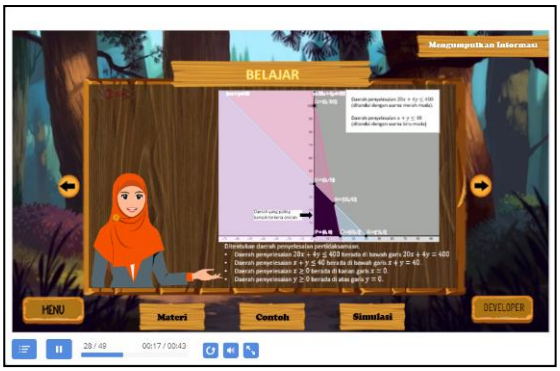

Figure 7. Study Page

Figure 8. KUMIS Evaluation Page

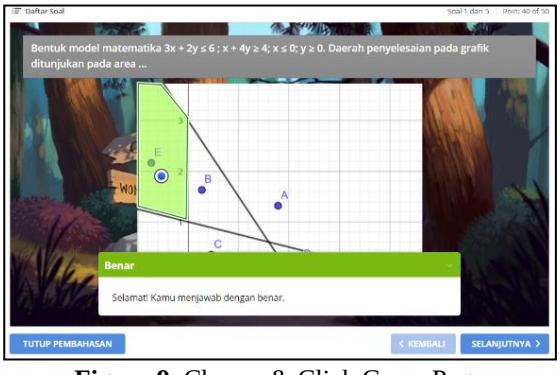

Figure 9. Choose & Click Game Page

After the media was developed, the researchers validated it with five experts and practitioners. Media experts assess the presentation's technical aspects, feasibility, and practicality. Learning experts assess aspects of the efficiency and suitability of media with learning objectives. Material experts assess the feasibility aspects of content and construction. IT

(Information Technology) experts assess application introduction, user control, UI (User Interface), and the feasibility of closing applications. Linguists assess aspects of language suitability in the media. Practitioners assess aspects of learning design, device engineering, and visual media appearance.

The results of the validation by media experts show that the technical aspects and feasibility of presentation, as well as the practicality of the media, are good, with several suggestions such as removing certain sub-materials, animation, and readability of the media. At the revision stage, the researcher deleted the "Materi" page, which contained arithmetic terms because it did not match the Linear Programming material, adjusted the sound to the material, corrected spelling and material errors, and adjusted the speed of the animation according to the validator's suggestions. The final results of media validation were very valid, with a final percentage of 100%.

The validation results by material and learning experts show that aspects of efficiency, content, and media construction are very valid. However, there are several indicators on content aspects such as suitability of material with scientific learning, syllabus, KI, KD, teaching needs, competency achievement indicators, and media's usefulness for students with valid values. The validator suggests that the developer first includes the general concept of Linear Programming on the "Belajar" page before going into the problems of Linear Programming. The final results of learning validation show that the media is in the very good category, with a final percentage of 85%. In contrast, the validation results by material experts show that the media is very valid, with a final percentage of 84.62%.

The validation results by IT experts show aspects of application introduction, user control, UI (User Interface), and application closing in the good category. In comparison, some indicators still need improvement, namely the ease of the title in providing an overview of the application, the suitability of images and animations with the material, and the clarity of the final application message. As an improvement, the researcher fixed the color of the letters in the application title to make it clear what the acronym "ALMAJRITI" stood for and added a button to make it easier for users who want to go to a particular page, namely the "Outline" button according to the advice of the IT validator. The final result of IT validation is that the media is very valid, with a final percentage of 70%.

The results of the validation by linguists show that some of the use of words in the media needs improvement to become a functional language. The researcher made improvements by changing sentences that were less effective into effective ones and correcting word mistakes according to suggestions from the language validator, such as using the word "also" with "day" and placing the word "every day" at the beginning of the sentence. The final result of language validation was that the media was very valid, with a final percentage of 87.5%.

The validation results by practitioners show that the aspects of learning design, device engineering, and visual media appearance are very valid. However, several indicators, such as ease of management and operation of the media, are in a good category. Thus, the final validation results obtained from practitioners show that the media is in the very good category, with a final percentage of 96.87%.

3.1.4 Implementasion

After the media revision stage is complete, the next stage is implementation. The media implementation was carried out in class XI IPA 3 MAN 1 Blitar with a total of 30 students. There are obstacles to implementing ALMAJRITI. One student cannot access it because the smartphone used does not support the installation of it. In this case, the researcher cannot make improvements. The researcher also obtained student response data using ALMAJRITI through a questionnaire at this stage. The data shows positive student responses because they get a percentage of 65%. Ease of operation and clarity of content is the highest scores with a percentage of 100%. Furthermore, the ease of using the application outside of class hours and the usefulness of the application to increase interest in learning occupies the second position with a percentage of 96.66%. The application's ability to increase students' enthusiasm and motivation occupies the last position with a percentage of 86.67%. Thus, it can be concluded that the student's response to the ALMAJRITI Linear Programming material is positive, with a percentage of 65%.

3.1.5 Evaluation

At the evaluation stage, an assessment of the ALMAJRITI media that has been tested is carried out. The evaluation results are used to describe the validity of ALMAJRITI. The media is said to be very valid if it gets a percentage result of 75% or more (Chasanah, 2021). The validity of the ALMAJRITI media is based on the results of assessments by media, learning, material, IT

(Information Technology), language, and practitioners experts. The validation results obtained from each validator sequentially are 100% (very valid), 85% (very valid), 84.62% (very valid), 70% (valid), 87.5% (very valid), 96,87% (very valid). Overall, the media obtained a very valid assessment result of 87.33%, so the media was feasible to use.

The student's responses to the use of ALMAJRITI media were seen from the results of questionnaires and tests. The percentage of student response questionnaire results showed that more than 65% of students responded positively. In addition, there was also an increase in the students' pre-test and post-test scores by 405%. Thus, it can be concluded that the media is valid and effectively used as a source of student learning.

3.2 Student Response to the Use of ALMAJRITI

Students gave a positive response to the use of ALMAJRITI in learning. Positive responses can be seen from the number of students who answered strongly agree and agree. The students' responses to the ALMAJRITI Linear Programming material were positive, with a percentage of 65%. Apart from the questionnaire results, positive student responses were also seen from the increase in the pre-test and post-test results. The pre-test result was 17.07, the post-test average was 77.5, and the average percentage increase in student learning outcomes was 405%. Thus, there is an increase in student learning outcomes before and after using the ALMAJRITI learning media. This increase shows students' positive responses to the developed media.

3.3 Final Product Review

The final result of the developed media is a mobile-based application called ALMAJRITI. The material contained in this media is Linear Programming. This media contains material, simulations, sample questions, practice questions (evaluation), games, and discussions. The advantages of ALMAJRITI are that this media has a variety of menus in the form of interactive animations, can be used flexibly anytime and anywhere, can be used through various devices, and can be used offline. The shortcomings of ALMAJRITI are that the teacher cannot update the materials and questions, and there are problems with certain types of devices in accessing them, requiring sufficient storage and internet to download them.

3.4 Discussion

Based on the results of this study, it is known that mobile-based media is an alternative to facilitating learning so that it can be done anytime and anywhere (Darmawan, 2013). In line with Aripin (2018), With the existence of mobile-based media, students can access learning at any time, offline and online, do student-centered learning, and facilitate interaction between teachers and students.

After ALMAJRITI is evaluated, it can be seen that the product is feasible and effective to use in learning. The learning products developed must be adequate, meaning that they can increase student motivation and achieve the expected competencies (Asyhar, 2011). In addition, in making learning media, several criteria must be considered, including learning objectives, effectiveness, student characteristics, availability, technical quality, cost, the flexibility of the ability of the people who use them, and available time (Sungkono, 2008).

This increase shows students' positive responses to the developed media. This is to the opinion Luh & Ekayani (2021), that there is an interaction between the use of learning media and student learning characteristics in determining student learning outcomes. Students will benefit significantly if they learn by using media according to their characteristics.

4. Conclusion

Based on the research results and discussion, the overall validation results obtained a percentage of 87.33%, with a correct category. The percentage of test instrument validation results, material experts, learning, language, IT, media, and practitioners are 78.57%, 84.62%, 85%, 87.5%, 70%, 100%, and 96 ,87%. Thus, it can be concluded that the media is very valid. Student responses to the ALMAJRITI Linear Programming material are positive, with a percentage of 65%. The average pre-test is 17.07, the post-test average is 77.5, and the average percentage increase in student learning outcomes is 405%. Thus, it can be concluded that the media is valid and feasible to be used as a source of student learning.

The suggestions for further research are that researchers need to expand the material so that it is not limited to Linear Programs, testing the implementation and effectiveness of media on learning activities, such as thinking processes, learning models, integration, and others. In addition, the ALMAJRITI application is expected

to be implemented in schools that have the same characteristics of problems.

References

Apsari, P. N., & Rizki, S. (2018). Media pembelajaran matematika berbasis Android pada materi program linear. *Aksioma*, *7*(1), 161–170.

Aripin, I. (2018). Konsep dan aplikasi mobile learning dalam pembelajaran biologi. *Jurnal Bio Educatio*, *3*(1), 1–9.

Asyhar, R. (2011). *Kreatif mengembangkan media pembelajaran*. Jakarta: Gaung Persada Press.

Branch, R. M. (2009). *Instructional design: The ADDIE approach* (Vol. 722). Springer Science & Business Media.

Chasanah, F. M. (2021). *Pengembangan video pembelajaran untuk meningkatkan minat belajar matematika siswa sekolah menengah pertama pada materi aritmetika*. Universitas Islam Negeri Maulana Malik Ibrahim Malang.

Dahlstrom, E. (2012). *ECAR Study of Undergraduate Students and Information Technology*. Louisville: EDUCAUSE Center for Applied Research.

Darmawan, D. (2013). *Teknologi pembelajaran*. Bandung: PT Remaja Rosdakarya.

Fauzy, A., & Nurfauziah, P. (2021). Kesulitan pembelajaran daring matematika pada masa pandemi covid-19 di SMP Muslimin Cililin. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(1), 551–561. https://doi.org/10.31004/cendekia.v5i1.514

Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, *19*, 18–26. https://doi.org/10.1016/j.iheduc.2013.06.002

Kominfo. (2017). *Survey penggunaan TIK 2017*. Jakarta. Retrieved from www.kominfo.go.id

Leung, A. (2017). Exploring techno-pedagogic task design in the mathematics classroom. In *Digital Technologies in Designing Mathematics Education Tasks* (pp. 3–16). Springer International Publishing. https://doi.org/10.1007/978-3-319-43423-0

Luh, N., & Ekayani, P. (2021). Pentingnya penggunaan media pembelajaran untuk meningkatkan prestasi belajar siswa. *Jurnal Fakultas Ilmu Pendidikan Universitas Pendidikan Ganesha Singaraja*, *2*(1), 1–11.

Melfawani, W., Roza, Y., & Maimunah, M. (2022). Analisis kesulitan siswa dalam pembelajaran matematika menggunakan Learning Management System selama pandemi. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *6*(1), 837–847. https://doi.org/10.31004/cendekia.v6i1.802

Nisa', A. Z., Marhayati, & Masamah, U. (2022). Strategi self-regulated learning untuk menurunkan tingkat prokrastinasi akademik siswa pada tugas program linier. *Jurnal Pengembangan Pembelajaran Matematika*, *3*(1).

Nisa', A. Z., & Rofiki, I. (2022). Kegiatan pembelajaran berbasis video sebagai strategi penguatan moderasi beragama santri di kota Blitar. *Journal of Dedicators Community*, *6*(1). https://doi.org/https://doi.org/10.34001/jdc.v6i1.2295

Nisa', A. Z., Susanti, E., Rofiki, I., & Chandra, F. (2021). Hambatan bernalar siswa SMP dalam menyelesaikan masalah kontekstual. In J. Juhari (Ed.), *SI MaNIs (Seminar Nasional Integrasi Matematika dan Nilai-Nilai Islami)* (Vol. 4, pp. 110–116). Malang: Mathematics Department, Universitas Islam Negeri Maulana Malik Ibrahim Malang. Retrieved from http://conferences.uin-malang.ac.id/index.php/SIMANIS/article/view/1500

Nisa, A. Z., & Marhayati. (2022). *Pengembangan aplikasi M-Learning materi program linier sebagai sumber belajar siswa SMA kelas XI*. Universitas Islam Negeri Maulana Malik Ibrahim.

Nisiyatussani, N., Ayuningtyas, V., Fathurrohman, M., & Anriani, N. (2018). GeoGebra applets design and development for junior high school students to learn quadrilateral mathematics concepts. *Journal on Mathematics Education*, *9*(1), 27–40.

Rahayu, S. S., Rinaldi, A., & Gunawan, W. (2021). *Aplikasi program linear : Media pembelajaran berbasis Android menggunakan MIT App Inventor*. *2682*(1), 107–120.

Sari, I. W., & Sumuslistiana, S. (2018). Aplikasi mobile learning berbasis android sebagai media pembelajaran pada materi program linear kelas XI di SMA Widya Dharma Surabaya. *MUST: Journal of Mathematics Education, Science and Technology*, *3*(2), 175–193.

Sattarov, A. ., & Khaitova, N. . (2019). Mobile learning as new forms and methods of increasing the effectiveness of education. *European Journal of Research and Reflection in Educational Sciences*, *7*(12), 1169–1175. Retrieved from http://www.idpublications.org/wp-content/uploads/2019/12/Full-Paper-MOBILE-LEARNING-AS-NEW-FORMS-AND-METHODS-OF-INCREASING-THE-EFFECTIVENESS.pdf

Segal, R., Stupel, M., & Oxman, V. (2016). Dynamic investigation of loci with surprising outcomes and their mathematical explanations. *International Journal of Mathematical Education in Science and Technology*, *47*(3), 443–462. https://doi.org/10.1080/0020739X.2015.1075613

Setiawan, T. H., & Aden. (2020). Efektifitas penerapan blended learning dalam upaya meningkatkan kemampuan akademik mahasiswa melalui jejaring schoology di masa pandemi covid-19. *Jurnal Pembelajaran Matematika Inovatif (JPMI)*, *3*(5), 493–506. https://doi.org/10.22460/jpmi.v3i5.493-506

Sriyanti, A., Wahyuni, S., Latuconsina, N. K., & Amin, R. (2022). Pengembangan E-Modul berbantuan software Sigil dengan pendekatan kontekstual

pada materi program linear peserta didik kelas XI. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *6*(1), 300–313. https://doi.org/10.31004/cendekia.v6i1.1070

States, L., & Odom, J. (2016). Surviving on mars with geogebra. *North American GeoGebra Journal*, *5*(2), 48–55.

Sungkono. (2008). Pemilihan dan penggunaan media dalam proses pembelajaran. *Majalah Ilmiah Pembelajaran*, 71–80