

GAUSS JORDAN 3X3 APPLICATION DEVELOPMENT BASED ON ANDROID

Anisatul Farida^{1*}, Ratna Puspita Indah², Sofyan Nur Rohman³

^{1*}Informatics Engineering, Faculty of Computer Science, Duta Bangsa University, Surakarta

²Information Systems, Faculty of Computer Science, Duta Bangsa University, Surakarta

³ Informatics Engineering, Faculty of Computer Science, Duta Bangsa University, Surakarta
Jl. Bhayangkara No 55, Surakarta, Indonesia

ABSTRACT

The purpose of this research is to develop a mobile-based application product using the Gauss Jordan method on a valid, effective, and practical system of linear equations. This research is an R&D (Research and Development) research using ADDIE as its development model. Data collection techniques used are material validation sheets and application display; practicality sheet; test sheets (pretest and posttest); and student opinion sheet. The application design technique used is to use mobile programming with Android Studio to design software applications. Based on the data that has been obtained and processed, the average score of the material validation assessment is 4.31 and for media display validation is 4.33, where both these values are included in the valid category, the score for improving student learning outcomes is 0.71 which includes classification. Improvement is high and includes effective, as well as an average score of 4.2 practicality assessment which is included in the high category. The application of this application also received a positive response from students who have used it, so the Gauss Jordan 3x3 application is suitable for use in learning and determining solutions to linear equations.

Keywords: ADDIE; Gauss-Jordan; Linear Equation

1. Introduction

The rapid development of software technology today is undeniable, especially Android-based mobile devices. Mobile technology has become a part of everyday human life. In general, smartphones are used as an effective and efficient tool to solve existing problems. Therefore, the smartphone has become one of the devices that are widely used in various fields of human life, including in the field of education (Surahman, 2019).

Based on data on the use of gadgets for student age, the use of gadgets/smartphones used for education is still minimal. Children and adolescents have three main motivations for accessing the internet: to seek information, to connect with friends (old and new) and for entertainment. The search for information is often driven by schoolwork, while the use of social

media and entertainment content is driven by personal needs (Arriany et al., 2020).

For this reason, it is necessary to use the right for students in using smartphones. The use of learning support applications, such as applications for calculating linear equations in the world of education is very important. Some of the difficulties experienced by students, including students of Informatics Engineering class 2019 Faculty of Computer Science, Universitas Duta Bangsa Surakarta who take Linear Algebra courses in studying linear equations include: 1) difficulties in understanding concepts and definitions, 2) difficulties in applying a careful and thorough attitude and students in solving contextual problems of a three-variable linear equation system, 3) difficulties in drafting the SPLTV concept, 4) difficulties in solving contextual problems with a three-variable linear equation system using the elimination and substitution method, 5) difficulties in drawing

conclusions about the solution of contextual problems with a system of linear equations three variables (AP et al., 2020). This linear equation calculation application can solve linear equations with the order of 3x3. Computerized calculations are needed to get results quickly and accurately. In solving linear equations can use the Gauss Jordan method. The Gauss Jordan method is one of the mathematical methods devoted to programming linear equations (Indo, 2019). This method can determine a linear equation that has one to nine variables.

Based on this analysis, an idea emerged that prompted researchers to build an application for calculating linear equations with the mobile-based Gauss Jordan method that can be run on an Android-based smartphone, so it is hoped that it can be used as the right solution for calculating linear equations quickly and accurately. This is in accordance with research (Sumarni, 2021) that misunderstandings, errors in the completion process and errors in drawing conclusions from linear equations system problems using the Gauss Jordan method manually. Based on these difficulties, an Android-based Gauss Jordan 3x3 application will be built.

This system of linear equations will be very useful in life and enterprise applications. The application of linear equations in everyday life is used to calculate income over time, calculate interest rates, or predict the profits of a company (Saputra, 2018). In addition, this research will produce a theoretical study and an android-based application.

The purpose of this study is to develop a mobile-based Gauss Jordan application product on a valid, effective, and practical system of linear equations. Valid here is that the application is expected to be valid in appearance and valid in determining the solution. Effective is the use of gauss Jordan application can improve student learning outcomes. While practically the application is expected to get a positive response from students.

2. Research Methods

This research is a development research or R&D (Research and Development). Development research is research conducted to produce a particular product and test the effectiveness of that product (Oktaviani & Ayu, 2021). The product produced in this development research is the application of Gaus Jordan of the order of 3x3 to

determine the solution of a system of linear equations.

The system development method used in making this software is ADDIE (Rokhim & Rohmah, 2020) which has 5 stages. The stages of the ADDIE development model consist of 1) Analysis which includes smartphone analysis; 2) Design which includes product plans to be developed; 3) Development, namely the development or process of making a Gauss Jordan 3x3 application based on android; 4) Implementation, namely the process of validation and application; 5) evaluation aims to make this Android-based 3x3 Gauss Jordan application feasible to be implemented.

Data collection techniques used are material validation sheets and application display; practicality sheet; test sheets (pretest and posttest); and student opinion sheets (Farida & Indah, 2019). The application design technique used is to use mobile programming with Android Studio to design software applications. Previously, a validation test was carried out on the appearance, practicality tests for lecturers and student opinions on the response from the application of this application. Each validation sheet is given to who are experts in their fields to validate Gauss-Jordan and applications the practicality sheet is given to the lecturer from the student who is the subject study. The data obtained were then analyzed with the following steps:

1. Validation sheet
 - a. Application

The validation results from the validator for all aspects assessed are presented in tabular form. Then find the average score using the formula:

$$R = \frac{\sum_{i=1}^n V_i}{n}$$

With:

R = the average of the assessment results from the validators

V_i = score of the i -th validator assessment results

n = many validators

Then the mean obtained is confirmed with the specified criteria. How to get these criteria is as follows (Yolanda & Hasanah, 2022):

- 1) Score range from 0 to 4
- 2) The criteria are divided into five levels. The terms used are adapted to the relevant aspects.



Figure 2. Home View

b. Menu

contains views towards gauss, gauss-jordan workmanship, materials, and about applications. The display of the application's main menu looks like Figure 3 below.

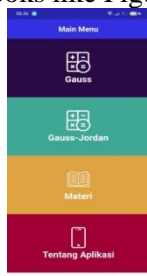


Figure 3. Menu Display

c. Theory

Contains a brief description of Jordan's gauss and gauss material. The display of the material looks like Figure 4 below.



Figure 4. Material Display

d. About the App

Contains a description of the application, the display of the application looks like the following Figure 5



Figure 5. Appearance of the application

4. Implementation

a. Expert validity

This 3x3 gauss-jordan application is validated by validators in their field. The validation instrument covers aspects of the accuracy of application work

and application appearance. Validation of the accuracy of the application and the appearance of the application is carried out to get criticism and suggestions from the validator in developing the application so that it is feasible to use. Input from the validator in the form of criticism and suggestions becomes a reference to improve the shortcomings of the 3x3 gauss-jordan application. Criticisms and suggestions from the validator are listed in table 1 below.

Table 1. suggestions and criticisms of the validator

Giver of suggestions and criticism	Suggestions and critics
Validator 1	Add how to use the application on the main menu Details of work give writing step by step
Validator 2	The result of the solution put an equal sign and a conclusion

b. Product revision

The revision of the gauss-jordan 3x3 application development is an effort to improve the application so that it is more feasible and better for students to use. The follow-up to these criticisms and suggestions is described in table 2 below.

Table 2. follow-up of suggestions and criticism

Suggestions and critics	Follow-up
Validator 1	add how to use the application on the main menu Details of work are given in writing step by step
Validator 2	The result of the solution is given an equal sign and a conclusion

Observation of the Gauss-Jordan 3x3 application that has been developed is used to determine the effectiveness of the application on TI21A4 students who are research subjects. The instrument used for this observation was in the form of student opinion sheets, pretest and pretest questions. The pretest questions are in the form of 1 question before using the application and 1 question after using the application. The pretest and posttest questions are used to determine the increase in student learning outcomes before and after using the Gauss-Jordan application.

5. Evaluation

a. Validity data analysis

This analysis is to get the results of the assessment from the validator by using the application validation assessment instrument. Aspects of this instrument consist of the accuracy of the application and the appearance of the application. The explanation of the above aspects is as follows.

1) Assessment sheet for the accuracy of the application process

Based on the assessment of the accuracy of the application process by the validator, an average score of 4.31 is obtained and is in the valid category.

2) App display rating sheet

Based on the assessment on the application display aspect by the validator, an average score of 4.33 was obtained and was in the valid category.

b. Effectiveness data analysis

The effectiveness of the Gauss-Jordan application is assessed from the results of the student opinion sheets as well as changes in the results of the initial and final tests. The results of the students' pretest and posttest are in table 3 below.

Table 3. student score data

<i>pretest</i>		<i>posttest</i>	
Total score	average	Total score	average
138	6,3	195	8,9

The results of the analysis of the significance of increasing student learning outcomes with the following N-Gain formula.

$$N - Gain = \frac{8,9 - 6,3}{10 - 6,3} = 0,71$$

The increase in student learning outcomes is 0,71 .and is included in the category of high improvement. A significant increase after the use of the 3x3 gauss-jordan application was effective for TI21A4 students.

c. Practical data analysis

The practicality of the 3x3 gauss-jordan application through observations on the implementation of lectures and the results of interviews with students. The results of the student opinion sheet show that the appearance of the 3x3 gauss-jordan application is attractive and easy to use. The details of working on the questions are also easy for students to understand, every detail of the work has a description of each step and it is clear to read and understand. This 3x3 gauss-

jordan application makes it easy for students to determine the solution of solving a system of linear equations. In addition, based on the collected questionnaires, 58% results were obtained and included in the practical category.

Gauss-Jordan 3x3 application validity

The purpose of this research is to develop a 3x3 gauss-jordan application. Application development process with ADDIE development model (analysis, design, development, implementation, and evaluation). The validator has approved the application in terms of the accuracy of application execution and application appearance. The application trial was conducted on 22 TI21A4 FIKOM UDB students.

The Gauss-Jordan 3x3 application is a simple application that is useful to make it easier for students to determine the solution to the problem of a system of linear equations. This application can be used as a means of student learning without being limited by space and time because to run it, it is enough to use an Android smartphone. This is in accordance with research (Imania & Bariah, 2020) that android-based learning media supports learning that is not limited by space and time

This application contains work with the gauss and gauss Jordan methods where each solution has detailed workmanship. The details of this work are useful so that students better understand the process and the work steps. The assessment of the Gauss-Jordan 3x3 application is divided into two aspects, namely the accuracy of workmanship and the appearance of the application. The assessment from the validator obtained results in the form of criticism and suggestions for improving the gauss Jordan 3x3 application.

The application revision is related to the accuracy of the work in the form of adding conclusions from the completion results and solutions including complete details of the work. In terms of the appearance of the application, a clear writing font has been added. After repairing the application from criticism and suggestions from the validator, it is hoped that the Gauss-Jordan application is suitable for use. Based on the results of the validation of the Gauss-Jordan application in the aspect of working accuracy, the average score was 4.31 with a valid category. Assessment of the application display aspect obtained an average score of 4.33 with a valid category. Overall, based on these two aspects, the 3x3 gauss-jordan application is said to be valid.

according to research (Merdeka et al., 2022) that a valid application will be feasible to apply.

Gauss-Jordan 3x3 Application Effectiveness

The data from the pre-test and post-test results that have been collected are then analyzed for the significance of the increase using the N-gain formula. Through the N-Gain formula, an increase in student learning outcomes was obtained by 0.71 and included in the classification of high improvement. There is a significant increase and the classification of high improvement in students who use the application, it can be said that the 3x3 gauss-jordan application is effective for students. According to the effectiveness research (Merdeka et al., 2022), it can be seen from the results of working on questions manually and with a matrix calculator, it appears that there is an increase in the average value of 3.12 or about 20%.

Practical Gauss Jordan 3x3 App

The practicality of this gauss-jordan application was assessed based on the results of practicality data analysis using the application practicality instrument sheet. Based on the student opinion sheet (practical sheet) it was found that the Gauss-Jordan 3x3 application has a valid working accuracy and an attractive appearance and is easy for students to use. Students stated that this application was interesting because the application was easy to use by converting a system of linear equations into an augmentation matrix. The details of the work are also easy for students to read and understand because they show the details of each step of the work. The existence of the Gauss-Jordan 3x3 application makes it easier for students to understand the material on systems of linear equations and determine solutions. Students can also learn and determine settlement solutions without being limited by space and time because they can be accessed through their respective Android smartphones. Students agree and agree that the 3x3 gauss-jordan application makes it easier for students to determine solutions to solve systems of linear equations. The conclusion from the data is that the application of gauss-jordan 3x3 is effective and can be used as a tool in learning linear algebra.

Respondents of the practicality of this application are lecturers of linear algebra. Based on the practicality data analysis, 58% of the results were included in the practical category. The research (Kurniawati et al., 2021) also stated that

the practicality of the module or application was obtained from the opinions of students

4. Conclusions

Based on the results of the research and discussion described above, it can be concluded that the Gauss-Jordan 3x3 application that has been developed has an average score of 4.31 on the material aspect and 4.33 on the appearance aspect of the application, so this application can be said to be valid. This Gauss-Jordan 3x3 application obtained a score of 4.2 in the practicality category which is included in the high category. The effectiveness of the Gauss-Jordan 3x3 application meets 2 indicators, namely the percentage of student mastery has increased by 0.71 with the N-Gain formula which is included in the high category and there is a positive response from students with the Gauss-Jordan 3x3 application. This application is expected to be a medium to help students understand the material and determine solutions to systems of linear equations and this application has received a positive response from students who have received it.

5. Acknowledgments

The authors would like to thank Duta Bangsa University, Surakarta, Indonesia for funding this research in the academic year of 2022.

6. References

- AP, D. C., Napisah, D., Wungo, D. D., Utama, G. D., & Ambarawati, M. (2020). Analisis Kesulitan Siswa dalam Mempelajari sistem persamaan linear tiga variabel. *Laplace: Jurnal Pendidikan Matematika*, 3(1), 27–42.
- Arriany, I., Ibrahim, N., & Sukardjo, M. (2020). Pengembangan modul online untuk meningkatkan hasil belajar Ilmu Pengetahuan Sosial (IPS). *Jurnal Inovasi Teknologi Pendidikan*, 7(1), 52–66.
- Farida, A., & Indah, R. P. (2019). Pengembangan Modul Pembelajaran Kalkulus 1 Berbasis Problem Based Learning Di STMIK Duta Bangsa. *Jurnal Derivat: Jurnal Matematika Dan Pendidikan Matematika*, 4(1), 26–36. <https://doi.org/10.31316/j.derivat.v4i1.162>
- Imania, K. A., & Bariah, S. H. (2020). Pengembangan Flipped Classroom Dalam Pembelajaran Berbasis Mobile Learning Pada Mata Kuliah Strategi Pembelajaran.

- Jurnal Petik*, 6(2), 45–50.
<https://doi.org/10.31980/jpetik.v6i2.859>
- Indo, L. (2019). Perancangan Aplikasi Perhitungan Sistem Persamaan Linear Menggunakan Metode Gauss Jordan Berbasis Android. *MASITIKA*, 3.
- Kurniawati, T. D., Akhdinirwanto, R. W., & Fatmaryanti, S. D. (2021). Pengembangan E-Modul Menggunakan Aplikasi 3D PageFlip Professional Untuk Meningkatkan Kemampuan Literasi Sains Peserta Didik. *Jurnal Inovasi Pendidikan Sains (JIPS)*, 2(1), 32–41.
<https://doi.org/10.37729/jips.v2i1.685>
- Merdeka, B. K., Ariyanti, N., Taurusta, C., Amir, M. F., Sidoarjo, U. M., & Psikologi, F. (2022). Kalkulator Matriks Berbasis Android Sebagai Pengejawantahan Kampus Merdeka Belajar. *Procedia of Sciences and Humanities*. 0672(c), 1237–1251.
- Oktaviani, L., & Ayu, M. (2021). Pengembangan sistem informasi sekolah berbasis web dua bahasa SMA Muhammadiyah Gading Rejo. *Jurnal Pengabdian Pada Masyarakat*, 6(2), 437–444.
- Rokhim, A., & Rohmah, S. L. (2020). Pembuatan Aplikasi Mobile Pembelajaran Adab Dan Do'a menggunakan Metode Addie. *SPIRIT*, 12(1).
- Saputra, D. (2018). Pengaruh manfaat, modal, motivasi dan edukasi terhadap minat dalam berinvestasi di Pasar Modal. *Future: Jurnal Manajemen Dan Akuntansi*, 5(2), 178–190.
- Sinollah, S., & Wahyu, R. (2020). Penerapan Software Bahasa R untuk Meningkatkan Motivasi dan Pemahaman Statistika Mahasiswa. *LEMMA: Letters of Mathematics Education*, 7(1), 6–15.
- Sumarni, T. (2021). Analisis Kesalahan Mahasiswa Menyelesaikan Sistem Persamaan Linier dengan Menggunakan Metode Gauss Jordan pada Mata Kuliah Aljabar Linier Elementer. *Menara Ilmu*, 15(2).
- Surahman, E. (2019). Integrated mobile learning system (imoles) sebagai upaya mewujudkan masyarakat pebelajar unggul era digital. *JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran): Kajian Dan Riset Dalam Teknologi Pembelajaran*, 5(2), 50–56.
- Yolanda, F., & Hasanah, A. (2022). Pengembangan Perangkat Pembelajaran Matematika dengan Model Pembelajaran Kooperatif Tipe Numbered Heads Together pada Materi Aritmatika Sosial. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 6(1), 1039–1051.
<https://doi.org/10.31004/cendekia.v6i1.1218>