Prima: Jurnal Pendidikan Matematika
Vol. 9, No. 1, January 2025, pp. 229 - 238
P-ISSN: 2579-9827, E-ISSN: 2580-2216
Web: http://jurnal.umt.ac.id/index.php/prima

EFFECTIVENESS OF USING MS EXCEL IN NUMERICAL METHODS COURSES

Muhammad Arie Firmansyah[1], Sigit Raharjo[2], Yenni[3], Barra Purnama Pradja[4], Retno Andriyani[5]
[12345]Universitas Muhammadiyah Tangerang, Jalan Perintis Kemerdekaan, Kota Tangerang, Indonesia
e-mail: arieabusyamil@gmail.com

Abstract

In the interpolation material requires precise and complex calculations, if done manually it is less effective because it takes a lot of time. Building innovative learning can be done by utilizing the Ms Excel application in the numerical methods course in the interpolation material. The purpose of this study was to determine the effectiveness of utilizing Ms Excel in learning numerical methods in the Mathematics Education study program, Faculty of Teacher Training and Education, Muhammadiyah University of Tangerang. This study used experimental research that compared the mathematics learning achievement of 7th semester students in the Mathematics Education study program, Muhammadiyah University of Tangerang Ms Excel and those who did not use Ms Excel. The treatment given was the use of Ms Excel in learning the numerical methods course. The results of this study showed that the average difference in achievement of students who used Ms Excel in learning was 80.9 while the group of students who did not use it was 68.4. The results of the t-test showed a significance value of 0.001, with a significance level of 0.05, which means that there is a difference in student learning achievement between those who used and did not use Ms Excel. So it can be concluded that learning with Ms Excel in the interpolation material has a significant effect.

Keywords: interpolation, ms excel, numerical methods

Abstrak

Abstrak

Pada materi interpolasi memerlukan penghitungan tepat dan kompleks, jika dilakukan secara manual maka kurang efektif karena memerlukan waktu yang cukup banyak. Membangun pembelajaran inovatif bisa dilakukan dengan cara memanfaatkan aplikasi Ms Excel pada mata kuliah metode numerik dalam materi interpolasi. Tujuan penelitian ini adalah mengetahui efektifitas pemanfaatan Ms Excel dalam pembelajaran metode numerik di prodi Pendidikan matematika fakultas keguruan dan ilmu pendidikan Universitas Muhammadiyah Tangerang. Penelitian ini menggunakan penelitian ekperimen yang membandingkan prestasi belajar matematika mahasiswa semester 7 program studi Pendidikan matematika Universitas Muhammadiyah Tangerang Ms Excel dan yang tidak memanfaatkan Ms Excel. Perlakuan yang diberikan adalah pemanfaatan Ms Excel pada pembelajaran mata kuliah metode numerik. Hasil penelitian ini menunjukkan rata-rata perbedaan prestasi mahasiswa yang memanfaatkan Ms Excel dalam pembelajaran adalah 80,9 sedangkan kelompok mahasiswa yang tidak memanfaatkan adalah 68,4. Hasil uji t menunjukkan nilai signifikasi 0,001, dengan level signifikansi 0,05 yang artinya ada perbedaan prestasi belajar mahasiswa antara yang memanfaatkan dan tidak memanfaatkan Ms Excel. Sehingga dapat disimpulkan bahwa pembelajaran dengan Ms Excel pada materi interpolasi memberikan pengaruh secara signifikan.

Kata kunci: interpolasi, ms excel, metode numerik

INTRODUCTION

Technology-assisted learning plans are very important in supporting the realization of all quality competencies of a learning process. This is in line with the concept of curriculum objectives that contain what should be taught to students that learning is a way how what is

Received: January 5, 2025; Revised: February 1, 2025; Accepted: February 19, 2025

taught can be mastered by students (Suryadi, 2007). Along with the needs of the era, science and technology are developing very rapidly, including in the planning of teaching materials for students of the Mathematics Education study program at the Muhammadiyah University of Tangerang, so that it demands an increase in quality learning resources. The role of learning strategies is very important to ensure the development and improvement of learning resources that encourage lecturers to gain knowledge, expertise, ideas, attitudes, and appreciation that change behavior and development in learning.

Building innovative learning can be realized in various ways, including utilizing the Ms Excel application in interpolation material for students. Humans are unique individuals, some students are able to absorb knowledge visually or rely on their abilities, vision, auditory or hearing abilities, and kinesthetic. This situation requires lecturers to be able to adjust the needs of each student's absorption ability with efforts to balance the functions of the left and right brain which will result in a mental renovation process, including building student self-confidence, so that the use of Ms Excel can increase student motivation (Hanip, 2014).

Learning with the Ms Excel application is very suitable for students because it can be studied individually and independently according to student abilities. For students who have high-level thinking skills, they can understand learning materials quickly, conversely students with low thinking skills can learn according to their level of difficulty. Therefore, it is necessary to conduct research on the use of Ms Excel in learning numerical methods, especially in interpolation material. The problem is that mathematics is considered difficult, so lecturers are expected to be able to adjust learning strategies to the unique abilities in the thinking process of students, with the aim of making it easier for students to understand lecture materials.

The rapid development of information technology has brought significant changes to education today (Aisyah, 2013). Microsoft Excel or Microsoft Office Excel is a spreadsheet application program created and distributed by Microsoft Corporation that can be run on Microsoft Windows and Mac OS. This application has mathematical and graphical features

that, using Microsoft's aggressive marketing strategy, make Microsoft Excel one of the most popular computer programs used in microcomputers to date (Suliyanto, 2012).

Through the use of technology, students in general benefit from a wider range of knowledge or insight (Lohans, 2024), while students in particular gain additional knowledge beyond that obtained from their lecturers. Given the great potential of MS Excel that can be utilized for learning purposes, it should be able to make it one of the learning resources and utilize it in learning activities. The learning process is varied, innovative, and constructive in reconstructing knowledge insights and their implementation so that it can increase student activity and creativity (Trianto, 2011)

Using Microsoft Excel for numerical method calculations has several strong reasons (Murni, et al., 2023):

1. User-friendly: Excel has an easy-to-use interface, allowing users to quickly enter, manage, and manipulate data without requiring an in-depth understanding of programming.
2. Built-in functions: Excel provides a variety of mathematical functions that can help in performing numerical calculations quickly and efficiently.
3. Data visualization: Excel allows users to easily create graphs and charts, helping in visualizing the results of numerical calculations and seeing patterns or trends in data.
4. Integration with VBA: Using Visual Basic for Applications (VBA), users can automate repetitive tasks, create complex calculation scripts, and customize applications according to their needs.
5. Ease of access: Excel is a software that is widely used in various industries, making it easy to collaborate and share results with others.

Ms Excel provides powerful data analysis tools such as solvers and sensitivity analysis which are very helpful in solving numerical method problems more effectively. I hope this research is useful for lecturers so that they can utilize Ms Excel in numerical methods courses so that learning is more effective. The hypothesis in this study is that mathematics learning with Ms Excel is more effective than without Ms Excel

METHODS

This study uses quasi-experimental research with t-test with the posttest only control group design, which compares the learning achievement of numerical methods courses in semester 7 that utilize Ms Excel and those that do not utilize Ms Excel. The treatment given is the utilization of Ms Excel in interpolation material. The independent variable in this study is the utilization of Ms Excel in interpolation learning; while the dependent variable is student learning achievement in the numerical methods course on interpolation material.

In this study, the class that became the experimental group was class 7 B with 12 students as the group that utilized Ms Excel in learning, and class 7 A with 12 students as the control group. Class 7 B and Class 7A of the Mathematics Study Program at the University of Muhammadiyah Tangerang have been considered homogeneous, because the division of students into classes has been randomized based on the results of the tests conducted during the class division. The data collection technique in this study is in the form of tests on interpolation material.

The steps in carrying out the experiment are: In the preliminary activities: (a) the lecturer prepares students psychologically and physically to follow the learning process; (b) through questions and answers, students are reminded of examples of data in class that can be diagrammed; (c) students observe examples of the benefits of the interpolation concept; (d) the lecturer asks, "can you mention other contextual examples of data whose results can be predicted by the interpolation concept?"; (e) students are given problems related to everyday life related to presenting data in the form of an interpolation concept. "Try to estimate the inflation that will occur in 2025, based on data from 2017 to 2023?"; (f) the lecturer emphasizes the objectives to be studied today; (g) the lecturer conveys the scope of the material.

The core activity is carried out with the observation stage, namely students observe an example of a country's inflation data prediction displayed by the lecturer. At the questioning stage, the lecturer gives a bait question, "after observing the data, how possible is it that we can predict inflation in 2030, and what are the steps to make the prediction reasonable?", students formulate questions related to the problems raised by the lecturer, what methods can be used to obtain data, after the data is obtained, how to process the data so that it can be understood by everyone. At the data collection stage, to answer all the

questions asked, students are asked to collect information by reading books about interpolation material, and the use of Ms Excel. Students exchange opinions in groups about alternative solutions to existing problems.

At the stage of associating/analyzing data or information, students conclude the steps in predicting data using interpolation concepts and formulas with the help of Ms Excel, students write down the results of solving the problem. To find out the understanding of the material being studied, students do practice questions in the textbook.

At the communicating stage, one student presents the results of their discussion/work, other students provide responses to the presentation presented, including: asking, confirming, completing information or other responses, the lecturer provides feedback or confirmation.

The closing activity is carried out by students together with the lecturer making conclusions about the steps in predicting financial data for a stock based on previously known data, each group is given an award related to group activities. To find out the students' understanding individually, the lecturer gives independent assignments and homework related to the material that has just been studied. Learning achievement measurement is a process of measuring the level of mastery of subject matter that has been studied by students using a test measuring instrument and the results can be in the form of numbers or statements as a form of student learning achievement. In this study, learning achievement measurement is based on the minimum completion criteria set by taking the Final Semester Exam (UAS) score data. With the following indicators: 1) Cognitive domain, according to Bloom's taxonomy, 2) Affective domain, related to attitudes, interests, and values held by students, 3) Psychomotor domain, related to physical and motor skills. The rubrics in this study are:

Table 1 : Rubrics

Score	Description
4	Response to assignment is very specific. Information provided is accurate and demonstrates complete understanding. Response is presented in fluent, lively writing. Answers are concise and direct to the problem asked and conclusions and opinions flow logically. Overall, the response is complete and satisfactory.
3	The response has answered the task given. The information provided is accurate. The response is presented in fluent writing but the description tends to be long-winded.

2	The response is less than satisfactory. Although the information provided is accurate, there is no conclusion and opinion and it is less logical.
1	Response does not answer the task given. Much information is missing and inaccurate. No conclusion or opinion.

In this study, a homogeneity test was conducted using SPSS, with the following criteria: sig (p) value ≥ 0.05 means that the original data group is from a population that has the same variance (homogeneous), sig (p) value <0.05 means that each data group is from a population that has different variances (not homogeneous). Furthermore, a normality test was conducted using SPSS using the shapiro wilk test. Furthermore, a data analysis technique was carried out to test the specified hypothesis, namely the t-test using the spss application by comparing the average learning outcomes of the group of students who studied using Ms excel (as a treatment group), namely class 7 B and another group of students who did not use ms excel (as a control group), namely class 7 A. This experiment was carried out in December 2024, at the Muhammadiyah University of Tangerang

RESULTS AND DISCUSSION

The results of this study present the learning achievements of students in the treatment group (class 7 B) and the control group (after learning with Ms Excel on the interpolation material, can be explained in table 1.

Table 2: Recapitulation of Interpolation Learning Achievement in Learning with Ms Excel in Classes 7 A and 7 B

Group Statistics					
	Kelas	N	Mean	Std. Deviation	Std. Error Mean
Hasil Belajar	Kelas 7 A	12	68.4167	8.80556	2.54195
	Kelas 7 B	12	80.9167	6.74818	1.94803

Based on the data analysis in table 1, it is shown that the average learning achievement score of class 7 A is 68.4 while the average learning achievement score of class 7 B is 80.9. This information concludes that the average class achievement score of the experimental class, namely class 7 B, is greater than that of the control class, namely class 7 A. The learning achievement of students in the experimental and control groups as presented in table 1 was then subjected to a t-test. This t-test was conducted to test the hypothesis that learning interpolation material with Ms Excel is more effective than without Ms Excel (Salam,

2020). Before the t-test was conducted, prerequisite tests were required, namely the normality test and the homogeneity test. The Normality Test is a test carried out with the aim of assessing the distribution of data in a group of data or variables, whether the data distribution is normally distributed or not. The normality test was carried out using SPSS with the following results:

Table 3: Results of Normality Test for Classes 7A and 7B

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
kelas_7A_kelas_kontrol	.174	12	.200*	.938	12	.469
kelas_7B_kelas_Eksperimen	.138	12	.200*	.944	12	.549

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

From the table, it can be seen that the results of the normality test for class 7A are 0.469, which means that class 7A is normally distributed because the sig value is > 0.05, and the results of the normality test for class 7B are 0.549, which means that class 7B is normally distributed because the sig value is > 0.05. So it can be concluded that classes 7A and 7B are normally distributed.

The homogeneity test aims to ensure that a set of data to be measured does come from a homogeneous (same) population. The calculation of homogeneity is carried out by researchers to compare an attitude, intention, or behavior (variance) in two groups. The homogeneity test was carried out using SPSS with the following results:

Table 4: Results of Homogeneity Test for Classes 7A and 7B

Prestasi Belajar			
Levene Statistic	df1	df2	Sig.
.024	1	22	.879

After the prerequisite test is carried out, the next step is to conduct a t-test which is used to test the significant difference between the two samples, to test the hypothesis above,

a t-test is used using SPSS software. The results of the calculation with SPSS are obtained in table 4.

Table 5: T-test in Class 7 A and 7 B
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Hasil Belajar	Equal variances assumed	.294	.593	-3.903	22	.001	-12.50000	3.20255	-19.14168	-5.85832
	Equal variances not assumed			-3.903	20.607	.001	-12.50000	3.20255	-19.16781	-5.83219

The average difference in interpolation learning achievement utilizing ms excel in learning is 80.9 while the group of students who do not utilize it is 68.4. With a significance result of 0.001, with a significance level of 0.05, it can be decided to reject ho and accept ha, which means there is a difference in student learning achievement between those who utilize and do not utilize ms excel. The results can be concluded that learning with ms excel has a significant influence. Based on the results of the study which stated that the average difference in learning achievement utilizing ms excel is better than those who do not utilize ms excel in learning. The results of the t-test calculation with spss were also obtained, the results were significant so that a decision could be made that there was a difference in student learning achievement between those who utilized and did not utilize ms excel. The results can be concluded that learning with ms excel has a significant influence.

CONCLUSION

The conclusion that can be drawn from this study is that there is a significant difference in the learning achievement of students in numerical methods between those who use Ms Excel and those who do not use Ms Excel. The average learning achievement of students who use Ms Excel is better than those who do not use Ms Excel.

Based on the results of the study and as a follow-up to the conclusions produced, the suggestions that can be submitted are as follows: (a) students are expected to be able to develop reasoning skills through activities utilizing Ms Excel, conducting exploration and experiments as problem-solving tools through mathematical thought patterns and models, and as a communication tool through symbols, tables, graphs, diagrams in explaining ideas; (b) students are expected to be able to use reasoning on patterns, properties or perform mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements based on learning experiences utilizing Ms Excel; (c) lecturers are expected to be able to demonstrate an understanding of the mathematical concepts studied, explain the relationship between concepts and apply concepts or algorithms, flexibly, accurately, efficiently, and appropriately in solving problems through utilizing Ms Excel; (d) lecturers are expected to be able to plan and utilize Ms Excel in teaching and learning activities regularly so that students gain learning experience from learning sources related to material outside the lecturer's

REFERENCES

Aisyah, MN. 2013. *Tingkat Penguasaan dan Penggunaan ICT (Information and Communication Technology) pada ma- hamahasiswa Akuntansi Universitas Negeri Yogyakarta.* Yogyakarta: Universitas Negeri Yogyakarta. Jurnal Nominal/ Volume II Nomor I/ Tahun 2013

Hanip. R. 2014. *Penggunaan Aplikasi Kom- puter Akuntansi Program Excel untuk Meningkatkan Motivasi dan Hasil Bela- jar Mahasiswa Kelas XI SMA Muhammadi- yah 3 Genteng Materi Pokok Memahami Penyusunan Siklus Akuntansi Perusa- haan Jasa Semester Genap Tahun Ajaran 2013/2014*. Skripsi. Jember: Pendidikan Program Studi Pendidikan Ekonomi (S1) Jurusan Pendidikan Ilmu Penge- tahuan Sosial Fakultas Kedosenan dan Ilmu Pendidikan Universitas Jember

Kalyani, Lohan Kumar. *The Role of Technology in Education: Enhancing Learning Outcomes and 21st Century Skills*. International Journal of Scientific Research in Modern Science and Technology, Vol 3, Issue 4, 2024.

Salam, Abdus. *A Critical Evaluation of Stephen Krashen*‟*s Input Hypothesis in Second Language Learning and Teaching*. Jagannath University Journal of Arts, Vol 10, No 2, 2020.

Suliyanto. 2012. *Analisis Statistik.* Yogyakarta: Penerbit Andi

Suryadi, A. 2007. *Pemanfaatan ICT dalam Pembelajaran.* Jurnal Pendidikan Terbuka dan Jarak Jauh, Volume 8, No- mor 1, Maret 2007, 83-98

Trianto. 2011. *Model-Model Pembelajaran Inovatif Berorientasi Konstruktivistik*. Jakarta: Prestasi Pustaka Publisher

Thera, D,. Sitorus, S, H,. & Midyanti, D, M. *Penerapan Metode Interpolasi Linier dan Histogram Equalization untuk Perbesaran dan Perbaikan Citra.* Jurnal Komputer dan Aplikasi, Volume 08, No. 1, 2020, hal 34-43.

Devianto, Y., Sari, Y,S,. & Manikam, R, M,. *Implementasi Metode Interpolasi dan Analytical Hirearchy Process untuk Penerimaan Pegawai*, Jurnal Ilmiah Fifo, Volume 15, No. 1, Mei, 2023

Furqaansyah, Y,. dkk., *Perbandingan Metode Interpolasi Newton dan Lagrange dengan Bahasa Pemrograman C++*, Jurnal JTIK, Volume 6, No. 3, 2022.

Pangruruk, F. A., & Barus, S. P. (2022). Predicting the number of people exposed to Covid 19 with the Newton Gregory maju polynomial interpolation method. *Formosa Journal of Science and Technology*, *1*(8), 1275-1290.

Murni, Viviana., dkk. *Pelatihan Microsoft Excel Berbasis Metode Numerik Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Mahasiswa.* Jurnal Masyarakat Mandiri Vol 07, No 04, Hal. 3853-3862. 2023.