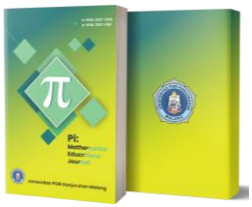
Pi: Mathematics Education Journal
e-ISSN: 2597-6915 p-ISSN: 2597-5161
Vol. 8, No. 2, 2025 | pp. 96 – 104



Analysis Student Motivation and Learning Satisfaction in the Implementation of Statistics Application in Maritime Sector

Faradiba Jabnabillah[a,1,*], Refli Noviardi [a,2], Fidya Farasalsabila [a,3], Moh. Khoirul Anam[b,4], Amanda Puspita Sari[a,5]

[a]Sistem Informasi, Institut Teknologi Batam, Batam
[b]STIA Bayuangga, Probolinggo
[1] faradiba@iteba.com
[2] refli@iteba.ac.id
[3] fidya@iteba.ac.id
[4] khoirulanam30101992@gmail.com
[5] ps.amanda04@gmail.com
[*]Corresponding Author

ARTICLE HISTORY
Received :
May 19, 2025

Revised :
October 08, 2025

Published :
October 31, 2025

Keywords:
Learning Motivation
Learning Satisfaction
Statistical Application
Maritime Sector
Mathematics Lessons

ABSTRACT

The purpose of this study was to describe the differences in the average value of learning motivation and student satisfaction in Mathematics lessons by applying statistical applications. This study used an experimental method with a One Group Pretest Posttest design. The subjects in this study were grade XII IPA students at SMA N 21 Batam. The average pretest score from the student motivation questionnaire was recorded at 80.5. After applying statistical applications in mathematics learning, the average posttest score increased to 96.4. Furthermore, the average pretest score from the student satisfaction questionnaire was 83.2. Moreover the average posttest score of students after applying statistical applications in mathematics learning increased to 99.2. The results of statistical analysis using Paired Sample t-Test, found a significance value (Sig. 2-tailed) of learning motivation and student satisfaction of 0.000 < 0.05. Thus, the null hypothesis (H0) is rejected, which indicates a significant difference between the pretest and posttest scores for both motivational material and student satisfaction after the statistical application was applied.

How to Cite: Jabnabillah, F., Noviardi, R., Farasalabila, F., Anam, M. K., & A. P. Sari. (2025). Analysis Student Motivation and Learning Satisfaction in the Implementation of Statistics Application in Maritime Sector. *pi: mathematics education journal, 8*(2), 96-104. https://doi.org/10.21067/pmej.v8i2.12049

1. Introduction

Mathematics is a fundamental discipline that plays a vital role in various fields of science and everyday life because it fosters logical, critical, and analytical thinking. However, in the process of learning mathematics, teachers and students often face various challenges. For teachers, a common obstacle is limited creativity in developing contextual and engaging learning methods, resulting in material often being delivered conventionally, emphasizing formula memorization and solving routine problems. This makes it difficult for students to understand the connection between mathematics and everyday life. Meanwhile, students often encounter obstacles such as the perception that mathematics is difficult,

abstract, and boring, which reduces interest and motivation to learn. Furthermore, limited facilities and infrastructure, such as a lack of interactive learning media or supporting digital devices, also exacerbate the situation. As a result, learning becomes monotonous and less able to foster students' critical thinking skills, creativity, and confidence in problem-solving [1] . One solution is the implementation of digital-based statistical applications in learning. Statistics helps students understand mathematical concepts in real-world contexts, such as data analysis, decision-making, or monitoring phenomena. The use of digital applications makes learning more interactive and engaging, increasing student motivation and learning satisfaction [2] .

This application is generally equipped with various interactive features that allow students to visualize data, perform simulations, and interpret results directly. With the support of a user-friendly interface and content tailored to learning needs, students can more easily understand statistical materials and feel more confident in completing data-based tasks [3][4]. They will feel that learning activities are more meaningful, according to their needs and interests, and provide benefits [5][6]. Not only that, statistics also has an important role in the field of education, including to obtain a general or specific picture of a phenomenon, monitor developments or changes over time, conduct hypothesis testing, determine the relationship between variables, compile reports based on quantitative data systematically, and draw conclusions logically and objectively [7].

This study aims to describe differences in student motivation and learning satisfaction before and after using statistical applications. Motivation was measured using five indicators (desire to succeed, internal learning drive, independence, mental readiness to face challenges, and perseverance) [8]. while learning satisfaction was measured using four indicators (ease of use, format, content accuracy, and user satisfaction) [9]. This research is expected to develop an innovative technology-based mathematics learning model and become a reference for related parties in education.

Through this approach, students learn how to apply mathematical concepts in more concrete and relevant context to real life, such as processing survey data, trend analysis, or data-based decision making. In other words, introducing statistics to students not only enriches their insights, but also develops critical and analytical thinking skills in a broader context.

2. Methods

This study uses experiment method with design One Group Pretest Posttest. Subject study consists of from 32 participants educate class XII IPA at SMA N 21 Batam 2024. Instruments used for collect data in this study is questionnaire (Pretest-Posttest) that focuses on motivation learning and satisfaction study participant educate. Before administering a questionnaire, its validity and reliability must be tested. The test using the SPSS 26 for Windows program. Validity testing is used to determine the extent to which an instrument is able to measure what it is supposed to measure. The formula is as follows.

$$r_{xy} = \frac{N(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

Description:
r_{xy}= correlation coefficient between item score and total score
X = item score
Y = total score
N = number of respondents

Validity Criteria:
Jika $r_{calculated} > r_{table} \rightarrow$ valid
Jika $r_{calculated} \leq r_{table} \rightarrow$ invalid

The r table value can be found in the Pearson Product Moment correlation table with degrees of freedom (df) = N – 2 and a significance level (usually 0.05). Meanwhile, reliability testing indicates the consistency of the instrument, namely the extent to which the measuring instrument produces the same results when used repeatedly. While the minimum reliability limit is 0.60. If the Cronbach's Alpha value is > 0.60, the instrument is considered reliable. The reliability test formula is as follows:

$$r_{11} = \frac{k}{k-1}(1 - \frac{\sum \sigma_i^2}{\sigma_t^2})$$

Description:
r_{11} = reliability coefficient (Cronbach's Alpha)
k = jumlah item pernyataan
σ_i^2 = variance of each item
σ_t^2 = total variance

Furthermore, the questionnaire assessing student motivation and learning satisfaction consists of four categories according to [10] which is explained in Table 1 below.

Table 1. Satisfaction and Interest Scale Points Study Student

Scale	Points
Strongly agree	4
Agree	3
Disagree Less	2
No Agree	1

This research using the paired t-test (Paired Sample t-Test) to evaluate influence treatment specific to the same sample in two period different [11]. Result of treatment This produce two types of data, namely pretest data and posttest data. All testing done with level significance of 5% using the SPSS 26 for Windows program. The design study This can seen based on illustration under This.

$$O_1 \; X \; O_2$$

with information as following:
O_1: Pretest (giving questionnaire before treatment)
X: Treatment / treatment in the form of implementation SPSS applications in the real world
O_2: Posttest (giving questionnaire after treatment

The pretest (O_1) was carried out before the researcher gave treatment to participant educate, researcher want to know the extent of motivation and satisfaction participant educate in learning mathematics. Treatment (X) is given after researcher obtain initial data from questionnaire pretest. Treatment This in the form of implementation SPSS applications in the real world to participant educate. After treatment given, steps furthermore are

implementation posttest (O_2) to find out the results of learning motivation and satisfaction in learning mathematics after the application of statistics was carried out. The hypothesis in this study for student satisfaction is as following:

H_0: no There is significant difference between motivation study in implementation application statistics on pretest and posttest data

H_1: there is significant difference between motivation study in implementation application statistics on pretest and posttest data

Whereas hypothesis for satisfaction study student is as following.

H_0: no There is significant difference between satisfaction study in implementation application statistics on pretest and posttest data

H_2: there is significant difference between satisfaction study in implementation application statistics on pretest and posttest data

As for the basis taking decision on both the above hypothesis is:

1. If the Sig value. (2-tailed) < 0.05 then there is significant difference between motivation learning and satisfaction study in implementation application statistics on pretest and posttest data.
2. If the Sig value. (2-tailed) > 0.05 then there is no significant difference between motivation learning and satisfaction study in implementation application statistics on pretest and posttest data.

3. Result and Discussion

This section discusses implementation research, results and discussion. As for the implementation study This started with giving questionnaire pretest about motivation and satisfaction Study participant educate in learning mathematics, then participant educate fill in questionnaire After the questionnaire filled so step next is implementation application statistics in learning mathematics. The applications used is Minitab and data analysis used is forecasting amount passenger ship in the city Batam use Trend analysis. Reason researcher choose field maritime is Because city Batam is one of city in Indonesia which is located in a strategic area on the route cruise international, with sea area reaching 3,675 km² and own potential riches source Power very big sea [12]. Of course, there is a lot of maritime related data that can be processed using statistical applications. Through activity this, it is expected motivation and satisfaction Study participant educate to knowledge mathematics can increased. As for the results implementation application statistics about forecasting amount passenger the ship that has processed with Minitab. It can see in Figure 1 below:

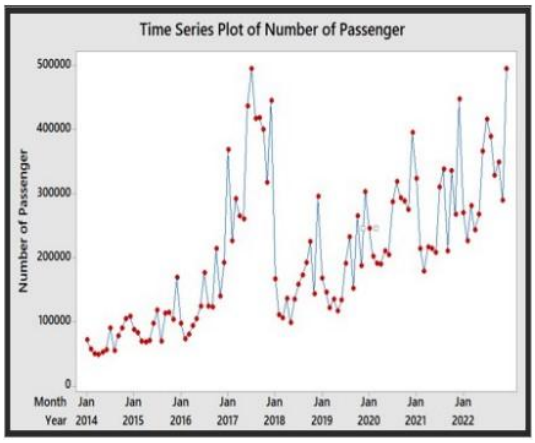


Figure 1. Example Implementation Application Statistics in the Field Maritime

Figure 1 shows the development of ship passenger numbers from 2014 to 2022. In general, passenger numbers experienced a significant upward trend, from around 50,000

passengers at the beginning of the period to over 400,000 passengers in 2022. The graph pattern shows seasonal fluctuations with significant spikes at certain times.

Furthermore, participant educate requested for try process the data that has been provided, after finished participant educate requested fill in questionnaire posttest motivation study and satisfaction learning on learning mathematics after implementation application statistics. In the research the results of the validity test explain that all items are declared valid for student motivation and learning satisfaction, and the result of the reliability test for student motivation with a Cronbach's Alpha value of 0.81 and for student leaning satisfaction is 0.82. This concludes that because the Cronbach's Alpha value > 0.6, the instrument is declared reliable.

After the questionnaire filled then the data is processed and analyzed. As for, the results presenting of data analysis with compare mark pretest and posttest on motivation learning and satisfaction study participant educate in learning mathematics use application statistics. Analysis this done with using the Paired Sample T-Test, and the results can see in Figure 2 below.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Sebelum Diberikan Perlakuan - Setelah Diberikan Perlakuan	-15.90000	7.10946	2.24821	-20.98580	-10.81420	-7.072	9	.000

Figure 2. SPSS Output Results Using the Paired Sample T-Test on Motivation Participant Educate

Figure 2 show Sig. value (2-tailed) is .000 < 0.05 so that H_0 is rejected, which means that There is significant difference between motivation study participant educate use application statistics. Next is the result data analysis mark pretest and posttest satisfaction study participant educating in learning mathematics use application statistics that can seen in Figure 3 below.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Sebelum Diberikan Perlakuan - Setelah Diberikan Perlakuan	-17.60000	3.23866	1.02415	-19.91679	-15.28321	-17.185	9	.000

Figure 3. SPSS Output Results Using the Paired Sample T-Test on Motivation Participant Educate

Figure 3 shows Sig. value (2-tailed) is .000 < 0.05 so that H_0 is rejected, which means that there is significant difference between satisfaction study participant educate in learning mathematics after use application statistics.

Next, the description is as follows about this matter will put forward through average result table pretest and posttest motivation and satisfaction. Study participant educate in learning mathematics before and after implementation application statistics described in Figure 4 below.

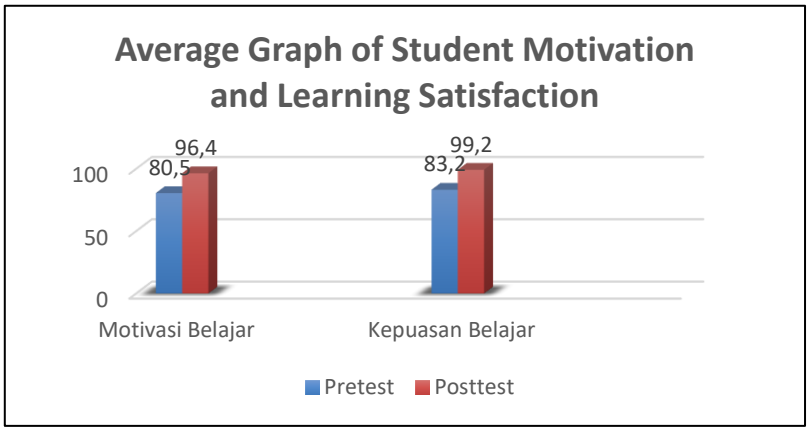


Figure 4. Average Graph of Pretest and Posttest Motivation and Independence Study Participant Educate

Figure 4 shows that posttest mean score motivation study participant educate by 96,4 experienced significant improvement compared to with average value of motivation pretest study participant educate that is by 80,5. A similar increase also occurred in satisfaction study participant educate, where posttest mean score satisfaction study participant educate is 99,2 more tall compared to with average pretest satisfaction score study participant educate of 83,2.

The application of statistical applications in mathematics learning today is one of the innovations that has a significant impact on improving the quality of the teaching and learning process in the classroom. This application not only functions as a technical aid, but also becomes a pedagogical bridge that connects abstract mathematical concepts with concrete learning experiences. Amid the rapid development of digital technology, students are now more familiar with various data-based devices and applications, so that the application of statistical applications in learning is in line with their learning styles. This provides a great opportunity for teachers to present mathematical materials in a more contextual and relevant way to everyday life.

One of the main benefits of using statistical applications is their ability to present complex mathematical concepts through attractive visual displays. Concepts such as data distribution, regression, correlation, and variance analysis that were previously considered difficult to understand can now be visualized in the form of interactive graphs, dynamic diagrams, and real-time data-based simulations. This visualization allows students to see the relationship between variables, patterns in data, and changes in statistical values directly, thus accelerating their process of understanding the material. As stated by [10] data representation in visual format can clarify information and increase students' absorption of abstract concepts taught in class.

With increased understanding of the material, students become more confident in facing math problems and assignments. They feel they have the ability to solve problems based on logic and analysis supported by the applications used. This self-confidence is one of the important factors that encourages increased learning motivation, especially intrinsic motivation, which is the drive from within students to learn because they feel interested and capable. When students feel successful in understanding and doing exercises through the help of the application, they are encouraged to continue learning, explore further, and not give up easily when faced with difficulties. This shows that technology is not just a tool, but also a psychological driving factor in learning [11].

On the other hand, from the teacher's perspective, the use of statistics applications makes it easy to monitor student learning progress. The analytical features of this application allow teachers to analyze student performance individually and in groups in real time. For example, teachers can view graphs of achievement scores, detect recurring error patterns, or identify parts of the material that cause the most difficulty for students. This information can then be used to provide personalized and constructive feedback, so that learning becomes more adaptive and responsive to student needs [12].

Data-based feedback delivered in a timely manner makes students feel more cared for and supported in their learning process. When students know specifically where their weaknesses lie, they have the opportunity to improve themselves in a more targeted way. On the other hand, recognition of the achievements they have achieved also helps strengthen their self-confidence and motivation to continue learning. Transparency in the assessment and learning process provides a sense of fairness and openness, which ultimately increases student learning satisfaction significantly. As explained by [13], learning that is tailored to individual needs and takes place openly will create a positive atmosphere and encourage active student participation in class.

Student learning satisfaction is greatly influenced by their learning experiences during the learning process, as positive experiences can foster self-confidence and interest in the subject matter being studied. Through the implementation of statistics applications, the learning process is no longer monotonous or solely focused on verbal presentation of material and written exercises, as in conventional methods. These applications create more lively learning environment by giving students the opportunity to interact directly with data, process information, and view analysis results visually. Students can conduct various data experiments, test hypotheses, and explore various statistical scenarios, both individually and collaboratively in groups. These activities not only train analytical thinking skills but also foster curiosity and stronger problem-solving skills. Thus, learning becomes more interactive, dynamic, challenging, and enjoyable. Students' active involvement in the learning process makes them feel that the activities are meaningful, as they not only receive information but also play an active role in constructing their own knowledge. As a result, motivation and enthusiasm for learning naturally increase as students feel valued and fully engaged in the learning process.

More than simply helping students understand statistical concepts academically, the use of statistics applications also plays a crucial role in creating a holistic learning environment oriented toward character development. This technology-based learning provides a contextual experience, where students are confronted with real-world problems that require them to think logically, systematically, and critically. Furthermore, when working in groups, students learn to communicate effectively, respect the opinions of others, and take responsibility for assigned tasks. Statistics applications also encourage students to be more creative in finding solutions and interpreting data analysis results, ultimately fostering a scientific attitude and independent learning. Thus, the application of statistics applications in mathematics learning has a broad and profound impact, not only in improving students' conceptual understanding, motivation, and learning satisfaction, but also in strengthening the social, collaborative, and positive character skills needed to face the challenges of today's digital era.

4. Conclusion

Based on the results of quantitative data analysis through questionnaires, the application of statistical applications in mathematics learning has been proven to significantly increase student motivation and learning satisfaction. Before the intervention,

the average value of learning motivation (pretest) was 80.5%, increasing to 96.4% after the application application (posttest), indicating an increase in student interest and engagement. Similarly, the value of learning satisfaction increased from 83.2% to 99.2%, indicating that learning has become more interesting, relevant, and meaningful. The results of the Paired Sample t-Test showed a significance value of 0.000 (<0.05), so there was a significant difference between the values before and after the application application. Thus, the use of statistical applications has been proven effective in increasing motivation and learning satisfaction and shows that technology integration can be an innovative and adaptive learning strategy in mathematics.

References

[1] S. S. Ramadhania and M. Saputro, "Analisis kemampuan berpikir kritis matematis siswa pada materi pecahan kelas VII SMP," *SIGMA: Jurnal Pendidikan Matematika*, vol. 15, no. 1, pp. 137–144, 2023.

[2] K. Kamarullah, "Pendidikan matematika di sekolah kita," *Al Khawarizmi: Jurnal Pendidikan dan Pembelajaran Matematika*, vol. 1, no. 1, pp. 21–28, 2017, doi: 10.22373/jppm.v1i1.1729.

[3] E. P. Nurrawi, A. T. Zahra, D. Aulia, G. Greis, and S. Mubarok, "Motivasi belajar siswa terhadap hasil belajar matematika," *Plusminus: Jurnal Pendidikan Matematika*, vol. 3, no. 1, pp. 29–38, 2023, doi: 10.31980/plusminus.v3i1.1220.

[4] D. S. Sitorus and T. N. B. Santoso, "Pemanfaatan Quizizz sebagai media pembelajaran berbasis game pada masa pandemi COVID-19," *Scholaria: Jurnal Pendidikan dan Kebudayaan*, vol. 12, no. 2, pp. 81–88, 2022, doi: 10.24246/j.js.2022.v12.i2.p81-88.

[5] N. Hafizhah, A. R. Amalia, and D. A. Uswatun, "Upaya peningkatan motivasi belajar siswa pada pembelajaran tematik melalui media Jumping on Worms Game di sekolah dasar," *Pendas: Jurnal Ilmiah Pendidikan Dasar*, vol. 9, no. 1, pp. 1275–1286, 2023, [Online]. Available: https://ejournal.stitpn.ac.id/index.php/nusantara

[6] D. A. Simaremare and A. Juniadi, "Analisis tingkat kepuasan mahasiswa pengguna e-learning menggunakan End User Computing Satisfaction," *Jurnal Infortech*, vol. 2, no. 2, pp. 250–257, 2020, doi: 10.31294/infortech.v2i2.9257.

[7] A. Syahri, "Statistika pendidikan," *SIGMA: Suara Intelektual Gaya Matematika*, vol. 6, no. 2, pp. 121–129, 2014.

[8] R. Zuliani and C. Puspita Rini, "Analisis kesulitan belajar matematika pada siswa kelas V SDN Karawaci 11," *Nusantara: Jurnal Pendidikan dan Ilmu Sosial*, vol. 3, no. 3, pp. 478–488, 2021, [Online]. Available: https://ejournal.stitpn.ac.id/index.php/nusantara

[9] N. S. Bina, "Penerapan statistika dalam sistem informasi," *Jurnal Matematika dan Pendidikan Sains*, vol. 6, no. 1, pp. 48–55, 2020.

[10] B. Mardhotillah, R. Asyhar, and E. Elisa, "Filosofi keilmuan statistika terapan pada era Smart Society 5.0," *Multiproksima: Jurnal Statistika Universitas Jambi*, vol. 1, no. 2, pp. 57–70, 2022.

[11] M. Yolanda and S. Q. Ain, "Kesulitan membaca permulaan siswa kelas II di Sekolah Dasar Negeri 83 Pekanbaru," *Jurnal Pendidikan Dasar Indonesia*, vol. 9, no. 1, pp. 45–53, 2022.

[12] N. Auliya, Y. Katminingsih, and S. Widodo, "Upaya meningkatkan motivasi belajar pada pembelajaran matematika: Systematic literature review," *Jurnal Ilmiah Pendidikan Citra Bakti*, vol. 11, no. 3, pp. 808–819, 2024.

[13] Indarti, U. Wahyuningsih, R. Suhartini, and Y. I. Prihatina, "Faktor-faktor yang mempengaruhi kepuasan belajar jarak jauh mahasiswa vokasi di masa pandemi COVID-19," *Jurnal Pendidikan Teknologi dan Kejuruan*, vol. 18, no. 2, pp. 226–236, Jul. 2021.