

Application of Game-Based Learning to Increase Interest and Motivation in Learning Physics in High School Students

Ainun Mardiyah ^{1*}, Aslamiyah Rambe ², Fitri Agustina ³, Muhammad Darwis ⁴, Fery Endang Nasution ²

¹ Department of Physics Education, Muhammadiyah University of South Tapanuli

² Department of Physics Education, Muhammadiyah University of South Tapanuli

³ Department of Biology Education, University Muhammadiyah South Tapanuli

⁴ Department of Physics Education, Muhammadiyah University of South Tapanuli

*E-mail: ainun.mardiyah@um-tapsel.ac.id

ABSTRACT

Education is the most important key in the implementation of learning that is carried out in an organized and planned manner. In education, students' interest and motivation play an important role in improving student learning outcomes. The results of research and experiments conducted by experts show that the play model in learning is one of the models that can be used effectively in learning. In this era of development in the 21st century, there is a lot of learning using educational games, where games also offer positive potential to students, this positive effect is also important for students' cognitive development, interest and motivation. This study aims to determine the increase in students' interest and motivation to learn physics. The subjects of this study are students in grade X of SMA Negeri 1 Sayur Matinggi and the object of this research is the application of game-based learning to increase students' interest and motivation, research instruments in the form of questionnaires and questionnaire difficulty analysis techniques which are tested through reliability tests and validity tests. The results of the study showed that based on a simple linear regression test obtained of $0.042 < 0.05$, there was a relationship between variable X and variable Y, and the student's pretest score before treatment was 65.16 while the student's *posttest* score after being given treatment (game-based learning) was 74.16. It can be concluded from this study that the interest and motivation of students of SMA Madrasah MAS Babussalam class X increased after implementing game-based learning.

Keywords: Game-based, Interest, and Motivation

Submitted: 31th July 2025

Published: 31st August 2025

INTRODUCTION

Education is a necessity in life because with one's education (Afrianto, 2012). In the era of development in the 21st

century, the world of education today uses a lot of educational games so that students show more interest in learning (Sindi et al., 2023). Effective with a convenient, engaging, and easy-to-understand learning

system with a hands-on approach to students with games. The results of research and experiments conducted by experts show that the play model in learning is one of the models that can be used effectively in learning (Mardiah Mardiah, 2015) . Games offer positive potential to students, these positive effects are also important for a student's physical development, health, and cognitive abilities (Rambe et al., 2024) .

Physics is a subject that can foster students' thinking skills that are useful for solving problems in daily life (Selvianita Andi, 2017) . The level of interest and motivation to learn physics in students can be a determining factor in their learning success (Rahman, 2021) .

Students' interest in learning can be measured through attention, interest, participation in learning (Pratama et al., 2024) . Learning with games can reduce anxiety and stress while studying (Rambe et al., 2024) . Game-based learning offers an interactive, engaging, and fun learning environment, which can increase student engagement and strengthen understanding (Wulandari & Safitri, 2024) Physical concepts. This study aims to explore the effectiveness of the application of game-based learning in increasing interest and motivation to learn physics in high school students.

Students' interest in learning is a high tendency and enthusiasm or a great desire for something (Sinaga et al., 2025) . Students' interest in learning is a boost, (Jamaluddin, 2020) and According to Crow and Crow quoted from Djaali in his book Educational Psychology says that students' learning interests are related to the movement style that encourages a person to face or deal with people, activities, objects

and experiences that are stimulated by the activity itself (Khoiruddin, 2019) .

Learning motivation is the process that empowers, directs, and sustains students' learning behaviors. Motivation in the learning process plays a very important role because in fact providing good motivation can increase students' enthusiasm for learning (Adha et al., 2023) . According to (Rahman, 2021) motivation drives to achieve something we want (July, 2021) . In his research (Sasmito, 2022) says influence *Smartphone* It is indeed very big in life today. The results of observations of grade X students of SMAN 1 Sayurmatinggi show that student activities in the teaching and learning process are still lacking, due to the lack of students' curiosity about the material to be learned.

Data collection was carried out through observation, interviews, and online documentation. This study provides an overview that in *Mobile Legends: Bang Bang* There is a concept related to physics, namely vectors. *Mobile Legends: Bang Bang* (MLBB) is a free online game inspired by League of Legends, (Nawawi et al., 2021) , the researcher uses games as an attraction of students' interest and motivation in learning physics. The concept of a two-line vector that has a large direction is found in the use of the ability in the form of a rope launch on a character *Fanny*. Where vector is a quantity that has a value and a direction (Xigbylacmcg et al., 2019) . The magnitude of the Resultant vector is determined using two methods, namely graphical and analytical methods. The results of this study are expected to explain the concept of physics in *Mobile Legends Bang Bang game* and can be applied as physics learning materials. Before researchers conduct further research on a problem, researchers need to limit what problems will be researched. The

limitation of the research problem here is only limited to the application of game-based learning to increase the interest and motivation of students in Physics learning at SMA Negeri 1 Sayurimatinggi on vector materials. Based on the above explanation, the researcher is interested in conducting research on **"The Application of Game-Based Learning to Increase Interest and Motivation in Learning Physics in High School Students"**.

RESEARCH METHODS

This research will be carried out at SMA Negeri 1 Sayurimatinggi which is located at Jl. Tano Tombangan Aek Garugur Sayurimatinggi, Sayurimatinggi District in class X 1 of the 2024 school year. The time of this research will be carried out since the issuance of a valid research letter from the Faculty of Teacher Training and Education, University of Muhammadiyah South Tapanuli. The researcher uses a qualitative research method with a descriptive approach, namely this research is guided by the facts found during the research. (Widiatmika, 2015) . Data collection was carried out through observation, interviews, and online documentation on grade X students of SMA Mas Babussalam. The purpose of this study is to find out the increase in interest and motivation to learn physics of grade X students at SMA Negeri 1 Sayur Matinggi using game-based learning.

The research population of X MIA 1 was 30 students, X MIA 2 was 30 students, X IIS 1 was 30 students, The sampling techniques used in this study are *Simple random sampling*. deep (Hilyati et al., 2023) *Simple random sampling* That is, the way sampling from a population is done

randomly regardless of the strata that exist in that population. The data used to increase students' interest and motivation to learn physics is data from filling out a questionnaire of students' interest and motivation to learn physics at the time of *Pretest* and *posttest*.

Before being tested in the experimental class, the questionnaire had been validated first by Mrs. Elisa, M.Pd as a lecturer in Physics Education UM-Tapsel Padangsidimpuan, then the instrument was tested in class X MIA 1, after being tested for validity using SPSS, with 10 statements that had been tested so that 10 valid statements were obtained. The final results of the validation produced statement data on the physics learning interest and motivation questionnaire that is suitable for use as a data collection instrument. The research instrument was used to measure the value of the variables studied. The instruments used in this study are test instruments and analysis techniques. The instruments include the level of difficulty, differentiation, validity of the question items, and reliability. Next, each of the research instruments analyzes its instruments.

1. Test Sheet

The test given to students is in the form of an essay test with a total of 20 questions. After conducting a test of the questions to find out the level of validity and reliability. So that 15 questions were obtained that were valid and suitable to be used to find out the critical thinking skills of students.

2. Interest Questionnaire Sheet

The interest questionnaire sheet in this study is to find out the implementation of the model applied during the research.

3. Motivational Questionnaire Sheet

The interest questionnaire sheet in this study is to find out the implementation of the model applied during the research.

Criteria for the Implementation of the Learning Model

Table 1

Average percentage (%)	Category
0.00-24.90	Very less
25.00-37.50	Less
37.60-62.50	Keep
62.60-87.50	Good
87.60-100.00	Excellent

RESULTS AND DISCUSSION

Research Results

The final results of the validation produced statement data on the physics learning interest and motivation questionnaire that is suitable for use as a data collection instrument;

1. Data Analysis of Preliminary Grade Questionnaire Results for Experimental Class (*Pretest*)

Before the treatment is given, students are given an initial questionnaire (*pretest*) to get an idea of the student's interest in learning physics. The following is a list of

student pretest results in the experimental class.

Table 1.1

Value = 85
Lowest score = 47.5
Average = 65.16
Total Value = 782

Frequency distribution of initial score (*pretest*) scores

Table 1.2

Interval	Frequency	Percentage
47.5-54.5	7	23%
55.5-62.5	7	23%
63.5-70.5	6	20%
71.5-78.5	7	23%
79.5-86.5	3	10%
Sum	30	100%

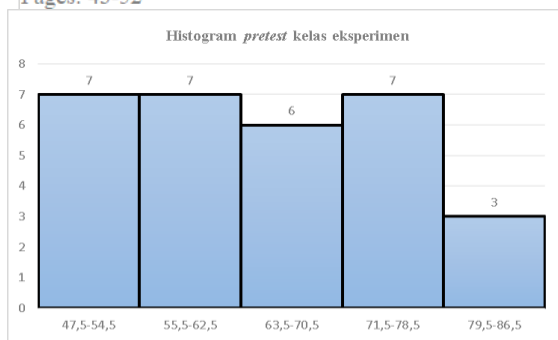
Distribution of data Frequency before treatment

Table 1.3

Characteristic	Value
Highest Score	85
Lowest Score	47.5
Mood	52.5
Median	66.25
Mean	65,16666667
Variance	114.6264368
Standard Deviation	10.70637365
Sum	30

Based on the data obtained from the results of *the students' pretest* before being given *treatment*, the average is 65.16, which does not yet meet the achievement indicator of 70.

Histogram of student performance results (*Pretest*)



2. Data Analysis of Results of Questionnaire Final Score of Experimental Class (*posttest*)

Table 2.1

Highest score = 87.5
Lowest score = 60
Average = 74.16
Total Score = 890

Frequency distribution of final values (*posttest*)

Table 2.2

Interval	Frequency	Percentage
60-65	7	23%
66-71	4	13%
72-77	7	23%
78-83	6	20%
84-89	6	20%
Sum	30	100%

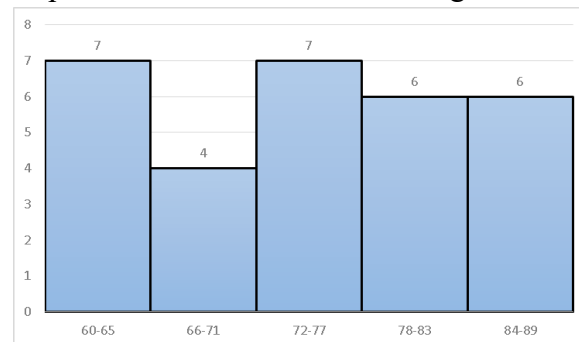
Frequency Data Distribution After Treatment (*Posttest*)

Table 2.3

Characteristic	Value
Highest Score	87.5
Lowest Score	60
Mood	75
Median	75
Mean	74,1667
Variance	82,4713
Standard Deviation	9.08137
Sum	30

It can be concluded that the average value of *Posttest* students in experimental classes with the application of learning-based *Game* is 74.16

Experimental Class *Posttest* Histogram



3. Data Analysis of Control Class Initial Score Questionnaire Results (*pretest*)

Table 3.1

Highest Score = 85
Lowest score = 47.5
Average = 64.75
Total Score = 777

Initial Value Frequency Distribution (*pretest*)

Table 3.2

Interval	Frequency	Percentage
47-54	7	23%
55-62	4	13%
63-70	9	30%
71-78	7	23%
79-86	3	10%
Sum	30	100%

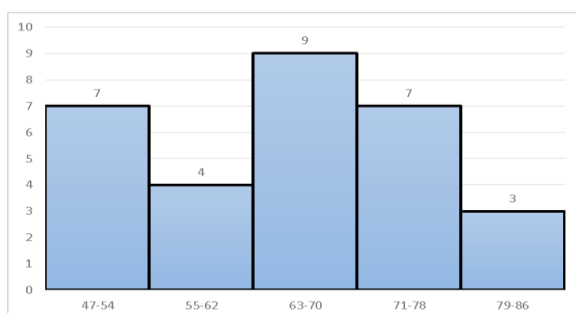
Distribution of Frequency Data Before Treatment (*Pretest*)

Table 3.3

Characteristic	Value
Highest Score	85
Lowest Score	47.5
Mood	72.5
Median	66.25
Mean	64.75
Variance	109,203
Standard Deviation	10.45
Sum	30

From the table above, it is known that the *pretest score* in the control class before applying conventional learning with an average score of 64.75 and the highest score of 85 and the lowest score of 47.5. With a variance of 109.20 and a standard deviation of 10.45.

Control Class *Pretest* Histogram



4. Data Analysis of the Final Score Questionnaire for Control Class (*Posttest*)

Table 4.1

Highest Score = 85
Lowest score = 47.5

Average = 65.42

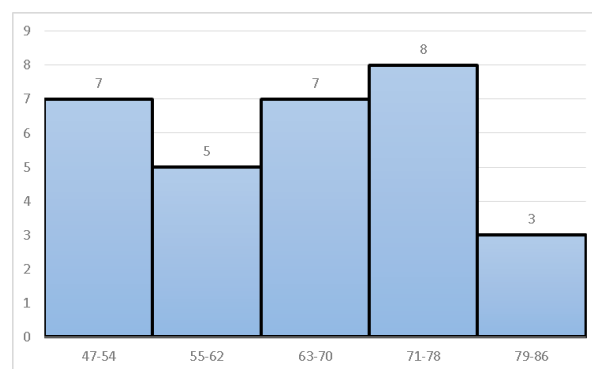
Total score = 785

Frequency Data Distribution After Treatment (*Posttest*)

Karakteristik	Nilai
Skor Tertinggi	85
Skor Terendah	47,5
Modus	75
Median	66,25
Mean	65,4167
Variansi	119,001
Standar Deviasi	10,9088
Jumlah	30

From the table above, it is known that the *posttest score* in the control class by applying conventional learning with an average score of 65.41 and the highest score of 85 and the lowest score is 47.5. With a variance of 119.001 and a standard deviation of 10.90.

Control Class *Posttest* Histogram



5. Analysis of Student Response Questionnaire Data for Game-Based Learning

From the table above, the value of the student response questionnaire to game-based

learning can be classified as follows:

Frequency Distribution of Student Response Questionnaire Scores

Table 5.1

Interval	Frequency	Percentage
60-65	7	23%
66-71	5	17%
72-77	6	20%
78-83	7	23%
84-89	5	17%
Sum	30	100%

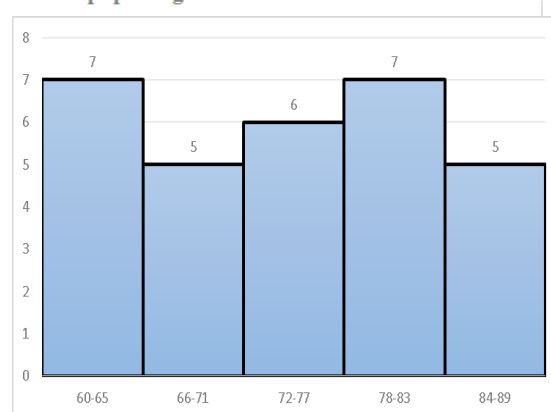
The distribution of data on the frequency of student response questionnaires can be seen in the following table.

Data Distribution

Table 5.2

Characteristic	Value
Highest Score	87.5
Lowest Score	60
Mood	75
Median	75
Mean	73.66667
Variance	80.05747
Standard Deviation	8.947484
Sum	30

Histogram of Student Response to Games



a. Normality Test

Data normality testing was calculated using SPSS V.24 (Appendix V) with *Shapiro-Wilk* test with a significant level of 5% or 0.05. The data used were the *posttest* values of the experimental class and the control class.

Tests of Normality							
	Class	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistics	Df	Sig.	Statistics	Df	Sig.
Posttest	Experiment	.102	30	.200 *	.936	30	.070
	Control	.115	30	.200 *	.955	30	.234

Based on the results of the analysis of the *posttest* normality of data, the sig value for the *experimental posttest* was 0.070 and the sig value for the control *posttest* was 0.234. This shows that the final data analysis uses *Shapiro-wilk data analysis* >0.05 so that it can be concluded that the *posttest* data is normally distributed.

Test of Homogeneity of Variance

		Living Statistics	df1	df2	Sig.
Posttest	Based on Mean	1,227	1	58	.273
	Based on Median	1,267	1	58	.265
	Based on Median and with adjusted df	1,267	1	56,591	.265

Based on trimmed mean	1,231	1	58	.272
-----------------------	-------	---	----	------

Based on the results of the analysis of the final value data homogeneity test (*posttest*) with SPSS v.24, a sig value of 0.272 was obtained, where the sig value > 0.05. So it can be concluded that the samples after being treated are normally or homogeneously distributed.

Hypothesis test 1 on simple linear regression analysis can be seen in the results of SPSS V.24 (Appendix V) below

Coefficient

Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8,593	4,039		2,127	.042
	Game	.715	.136	.705	5.255	.000

a. Dependent Variable: motivation

In the coefficients table, we get a constant value (a) of 8.593 while the game-based learning value is 0.705

So that in this hypothesis test, it was concluded that H_1 was accepted and H_0 was rejected by decision-making there was an increase in students' motivation to learn physics by implementing game-based learning at Madrasah MAS Babussalam.

For more details, the average posttest of the experimental class and the control class can be seen in the following statistical table.

Group Statistics

	Class	N	Mean	Standard Deviation	Std. Error Mean
--	-------	---	------	--------------------	-----------------

Posttest	Experiment	30	29.66 67	3.63255	.66321
	Control	30	26.16 67	4.36351	.79666

By implementing game-based learning, the average student is 29.66 while the average student applying conventional learning is 26.16.

CONCLUSION

There is an increase in students' motivation to learn physics by implementing game-based learning at Madrasah MAS Babussalam. Based on a simple linear regression test, $0.042 < 0.05$ was obtained, so it can be concluded that there is a relationship between the variable (X) of game-based *learning t* and the variable of the level of motivation to learn physics of students (Y). Where the constant value of 8.593 means that the consistent value of the variable of the student's physics learning motivation level is 8.593. And the *regression* coefficient of and *the pretest score of students before treatment was 65.16 while the posttest score of students after being given treatment (game-based learning) was 74.16*. It can be concluded that students' motivation to learn increases after implementing game-based learning.

Based on the results of data analysis using SPSS V.24, the results of the independent sample test were obtained, namely the value of sig. (2-tailed) is 0.001, this is in accordance with the results of the hypothesis test where the value of sig. (2-tailed) < 0.05 . With a total average score of the experimental class was 29.66 and the total score of the control class was 26.16. For this reason, based on the results of the

hypothesis 2 test decision-making, H_0 was rejected and H_1 was accepted.

This in the results of sig. (2-tailed) < 0.05 , it can be concluded that the motivation to learn physics students by applying game-based learning is better than conventional learning at Madrasah MAS Babussalam. Through this research, it is hoped that it can be useful for teachers, students, schools and future researchers.

BIBLIOGRAPHY

- [1] I. Afrianto, "Collaborative learning system," vol. VI, no. 1, pp. 69–76, 2012.
- [2] S. L. B. Sindi, Sofyan Iskandar, and Dede Trie Kurniawan, "Optimalisasi Penerapan Model Pembelajaran Berbasis Permainan dalam Pembelajaran Abad 21 di Sekolah Dasar," *J. Lensa Pendas*, vol. 8, no. 1, pp. 9–16, 2023, doi: 10.33222/jlp.v8i1.2504.
- [3] Mardiah Mardiah, "Metode Permainan Dalam Pembelajaran Bahasa Indonesia Di Madrasah Ibtidaiyah," *MITRA PGMI J. Kependidikan MI*, vol. 1, no. 1, pp. 61–77, 2015, doi: 10.46963/mpgmi.v1i1.33.
- [4] A. H. Rambe *et al.*, "PEMANFAATAN MEDIA BERBASIS GAME DALAM DASAR ELSE (Elementary School Education)," *ELSE (Elementary Sch. Educ. Journal)*, vol. 8, no. 3, pp. 11–12, 2024.
- [5] U. M. M. Selvianita Andi, "Jurnal Pendidikan Fisika Universitas Muhammadiyah Makassar Kelas XII IPA SMA Barrang Lompo," *J. Pendidik. Fis. Univ. Muhammadiyah Makassar*, vol. 5, no. 2, pp. 205–214, 2017.
- [6] S. Rahman, "PASCASARJANA
- [7] UNIVERSITAS NEGERI GORONTALO PROSIDING SEMINAR NASIONAL PENDIDIKAN DASAR 'Merdeka Belajar dalam Menyambut Era Masyarakat 5.0' PENTINGNYA MOTIVASI BELAJAR DALAM MENINGKATKAN HASIL BELAJAR," *Merdeka Belajar dalam Menyambut Era Masy.*, vol. 05, no. November, p. 298, 2021.
- [8] C. E. Pratama, S. Suryanti, and S. Rini, "Upaya Peningkatan Minat Belajar Siswa Melalui Pembelajaran Berdiferensiasi Berbantuan Media Konkret," *Proceeding Int. Conf. Lesson Study*, vol. 1, no. 1, p. 475, 2024, doi: 10.30587/icls.v1i1.7396.
- [9] S. A. Wulandari and S. Safitri, "Penerapan Metode Game Based Learning Dalam Materi Sejarah Bandung Lautan Api Di Kelas XI IPS SMA Negeri 4 Pagar Alam," *JIPSOS J. Inov. Pendidik. dan Ilmu Sos.*, vol. 2, no. 1, pp. 334–41, 2024.
- [10] D. Y. Sinaga *et al.*, "Mengembangkan Minat Belajar Siswa untuk Meningkatkan Pembelajaran Matematika SD Kelas Tinggi," *Edu Cendikia J. Ilm. Kependidikan*, vol. 4, no. 03, pp. 1550–1560, 2025, doi: 10.47709/educendikia.v4i03.5430.
- [11] J. Jamaluddin, *Minat Belajar*, vol. 8, no. 2, 2020. doi: 10.47435/al-qalam.v8i2.232.
- [12] M. Khoiruddin, "Analisis Sikap dan Minat Peserta Didik Belajar di SMP Muhammadiyah 15 Surabaya," *Metaf. Educ. Soc. Sci. Humanit. J.*, vol. 3, no. 1, p. 35, 2019, doi: 10.26740/metafora.v3n1.p35-44.
- [13] Adha, Neviyarni, and Nirwana, "Studi Literatur : Peran Motivasi dalam Proses Belajar Mengajar," *Eductum J. Literasi Pendidik.*, vol. 1, no. 2, pp. 433–445, 2023.

- [13] E. Julyanti, “Pengaruh Motivasi Terhadap Hasil Belajar Siswa Sekolah Menengah Pertama,” *J. Pembelajaran Dan Mat. Sigma*, vol. 7, no. 1, pp. 7–11, 2021, doi: 10.36987/jpms.v7i1.1942.
- [14] L. F. Sasmito, “Pengaruh Penggunaan Smartphone Terhadap Prestasi Belajar Siswa Kelas VI SD Negeri 06 Kendari,” *J. Sultra Elem. Sch.*, vol. 2, no. 1, pp. 31–41, 2022.
- [15] M. I. Nawawi *et al.*, “Pengaruh Game Mobile Legends terhadap Minat Belajar Mahasiswa/i Fakultas Sains dan Teknologi UIN Alauddin Makassar,” *AL MA'ARIEF J. Pendidik. Sos. dan Budaya*, vol. 3, no. 1, pp. 46–54, 2021, doi: 10.35905/almaarief.v3i1.2039.
- [16] D. Xigbylacmcg *et al.*, “Fisika Vektor,” *Univ. Pas.*, no. Direktorat Pembinaan SMA-Kementrian Pendidikan dan Kebudayaan, pp. 1–14, 2019.
- [17] K. P. Widiatmika, *No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析Title*, vol. 16, no. 2. 2015.
- [18] I. Hilyati, L. Hakim, and E. Yulaini, “Pengaruh Metode Pembelajaran Outdoor Study Terhadap Hasil Belajar IPA Di SD Negeri 232 Palembang,” *J. Dunia Pendidik.*, vol. 4, no. 1, p. 2023, 2023.