



A Comparative Study of Science Learning Motivation Between Students in Senior High Schools and Madrasah Aliyah

Ogi Danika Pranata^{1*}, Salsabila Dwita Febri Sari², Syairifah Mila Ajani², Nazila Wilia Putri²

¹Tadris Fisika, Institut Agama Islam Negeri Kerinci, Indonesia

²Tadris Biologi, Institut Agama Islam Negeri Kerinci, Indonesia

*e-mail: ogidanika@gmail.com

Info Artikel

Genesis Artikel:

Received: 1 September 2025

Accepted: 21 Oktober 2025

Published: 23 Oktober 2025

Keywords:

Public and Islamic Schools, Science Learning Motivation, Science Learning Value, Secondary Education

Kata Kunci:

Motivasi Belajar Sains, Nilai Pembelajaran Sains, Sekolah Menengah, Sekolah Umum dan Islam

DOI: 10.18592/ak.v5i1.18130

ABSTRACT

The success of science learning depends largely on students' motivation. The purpose of this study is to describe students' motivation to learn science and to compare the levels of motivation between students at a public high school (SMA) and a public Islamic high school (MA) in Sungai Penuh. A descriptive and comparative quantitative approach was used to collect data from 68 11th-grade science students using the validated Students' Motivation Toward Science Learning (SMTSL) instrument. The sample included all eleventh-grade science students from both schools, for a total of 36 SMA students and 32 MA students. Descriptive statistics revealed that the students were motivated to learn science (Mean = 3.58), with the highest scores on the active learning strategies scale. A comparative analysis using an independent samples t-test revealed that SMA students were significantly more motivated than MA students on two scales: science learning value and performance goal. The difference in the value of science learning was particularly evident in how students perceived science as a means of satisfying curiosity, solving problems, and relating to daily life. Meanwhile, some MA students demonstrated extrinsic motivation, such as gaining attention. These findings underscore the importance of fostering intrinsic motivation and meaningful engagement in science learning across different school types to promote equitable educational outcomes in science.

ABSTRAK

Keberhasilan pembelajaran sains sangat bergantung pada motivasi siswa. Tujuan dari penelitian ini adalah untuk mendeskripsikan motivasi siswa dalam belajar sains dan membandingkan tingkat motivasi antara siswa di Sekolah Menengah Atas (SMA) negeri dan Madrasah Aliyah (MA) negeri di Sungai Penuh. Sampel tersebut mencakup semua siswa kelas XI jurusan IPA dari kedua sekolah, dengan total 36 siswa SMA dan 32 siswa MA. Pendekatan kuantitatif dengan metode deskriptif dan komparatif digunakan untuk mengumpulkan data dari 68 siswa kelas XI IPA dengan menggunakan instrumen *Students' Motivation Toward Science Learning* (SMTSL) yang telah divalidasi. Sampel tersebut mencakup semua siswa kelas XI jurusan sains dari kedua sekolah, dengan total 36 siswa SMA dan 32 siswa MA.

Statistik deskriptif menunjukkan bahwa para siswa termotivasi untuk belajar sains (Mean = 3.58), dengan skor tertinggi pada skala strategi pembelajaran aktif. Analisis komparatif menggunakan uji-t sampel independen menunjukkan bahwa siswa SMA secara signifikan lebih termotivasi daripada siswa MA dalam dua skala: nilai pembelajaran sains dan tujuan kinerja. Perbedaan dalam nilai pembelajaran sains terutama terlihat pada persepsi siswa tentang sains untuk memuaskan rasa ingin tahu, memecahkan masalah, dan berhubungan dengan kehidupan sehari-hari. Sementara itu, beberapa siswa MA menunjukkan motivasi ekstrinsik, seperti mendapatkan perhatian. Temuan ini menggarisbawahi pentingnya menumbuhkan motivasi intrinsik dan keterlibatan yang bermakna dalam pembelajaran sains di berbagai jenis sekolah untuk mendorong pemerataan hasil pendidikan sains.

© 2024 Tadris Biologi, Tadris Fisika, Tadris Kimia, FTK UIN Antasari Banjarmasin.

INTRODUCTION

Science education plays a crucial role in providing students with the knowledge and skills necessary for the 21st century. However, the success of science learning depends largely on students' motivation (OECD, 2018; Pranata et al., 2023). Motivation encourages students to work harder to achieve their learning goals. High levels of motivation not only enhance the learning process but also improve competency development and academic achievement (Brookes et al., 2020). Students with high motivation and perseverance tend to perform better academically (Tuan et al., 2005).

In the Indonesian education system, both general (Sekolah Menengah Atas, SMA) and religious (Madrasah Aliyah, MA) offer upper secondary education. However, the two differ in their curriculum emphasis and institutional culture (Kerangka Dasar San Struktur Kurikulum. Sekolah Menengah Atas/Madrasah Aliyah, 2013). SMA follows a curriculum oriented toward general academic preparation for higher education, while MA integrates national standards with a stronger emphasis on Islamic studies. These structural and cultural differences can influence student motivation, particularly in subjects such as science (Khine, 2024; Masjutina & Stearns, 2025). Students in SMA programs may be more exposed to science-oriented career paths, while MA students may experience science education through a religiously informed lens and different pedagogical approaches (Zuhaida, 2019).

Recent studies on motivation have explored various aspects and perspectives. These include comparisons of students' motivation to learn science across different grade levels (Fadilah et al., 2025), different schools at the same level (Hermiati et al., 2024; Saputri et al., 2025) and different school levels (Satrianti et al., 2024). Previous studies have also focused on factors related to science learning motivation, such as peer influence, performance, (Yulisna et al., 2024) and learning outcomes (Pranata et al., 2023; Tuan et al., 2005). However, little is known about the differences between students in general (SMA) and religious (MA) secondary schools.

Though many studies have examined science education and learning motivation, few have explored how motivation to learn science varies among different types of secondary schools in Indonesia. Most existing studies treat student populations as homogeneous, ignoring the potential influence of school type and educational orientation. Although a study compared

student motivation in general and religious schools, the comparison was made at the junior high school level between Sekolah Menengah Pertama (SMP) and Madrasah Tsanawiyah (MTs) (Hermiati et al., 2024). There is limited empirical evidence comparing the science learning motivation of SMA and MA students, particularly regarding how institutional characteristics and socio-religious contexts shape students' attitudes and engagement in science learning. Closing this gap is essential for developing inclusive science education strategies that consider the diversity of students' backgrounds and educational environments. This study is also important because it can influence their preference to continue their studies at university (Putri et al., 2025).

Although prior studies have examined students' motivation in science learning, limited research has compared motivation levels between SMA and MA students. Few studies have explored how learning context influences students' views on the value of science, particularly in satisfying curiosity, solving problems, and connecting with daily life. Moreover, there is little evidence on whether students' motivation is more intrinsically or extrinsically oriented across different school types. These gaps highlight the need for comparative studies that describe and analyze science learning motivation in SMA and MA contexts.

Therefore, this study aims to compare students' motivation in learning science between public high schools or Senior High Schools (SMA) and public Islamic high schools or Madrasah Aliyah (MA) in Indonesia. The findings are expected to contribute to the development of inclusive and context-sensitive instructional strategies that support science learning motivation across diverse school environments.

METHODS

The study employed a descriptive and comparative quantitative approach (Creswell, 2019). This design helped achieve two research objectives. First, it revealed and described the general state of students' motivation to learn science. Second, it compared the motivation to learn science between two schools with different characteristics: public high schools or Senior High Schools (SMA) and public Islamic high schools or Madrasah Aliyah (MA).

The study population consisted of eleventh-grade science students at SMA and MA schools in Sungai Penuh. Due to the limited number of Madrasah Aliyah schools in the region (only two), one was selected using cluster sampling. One SMA was similarly selected for comparison. Both schools have been accredited as excellent. The sample included all eleventh-grade science students from both schools, for a total of 36 SMA students and 32 MA students. Eleventh-grade students were chosen because they had sufficient exposure to science subjects within the secondary curriculum.

Data on the students' motivation to learn science was collected using the Students' Motivation Toward Science Learning (SMTSL) scale, a previously developed and validated instrument (Tuan et al., 2005). The instrument includes 35 items across six scales, with Cronbach's alpha values ranging from 0.66 to 0.84 and an overall reliability of 0.89, as shown in Table 1.

Table 1. Detail on Motivation Scales

Scales (Cronbach Alpha)	Detail	Number of Statement
Self-efficacy (0.78)	Students believe in their own ability to succeed in science learning tasks.	7
Active Learning Strategies (0.84)	Students actively engage in learning by using a variety of strategies to construct new knowledge based on their prior understanding.	8
Science Learning Value (0.66)	Science learning helps students develop problem-solving skills, engage in inquiry-based activities, stimulate critical thinking, and recognize the relevance of science in everyday life. When students perceive these values, they become more motivated to learn science.	5
Performance Goal (0.79)	Students aim to outperform their peers and gain recognition from the teacher.	4
Achievement Goal (0.78)	Students feel a sense of satisfaction as they improve their competence and achieve success in science learning.	5
Learning Environment Stimulation (0.69)	The classroom environment (including the curriculum, teaching practices, and peer interactions) significantly influences students' motivation in learning science.	6

Source: (Tuan et al., 2005)

The instrument contains 35 statements, and each scale has a different number of them. It uses a five-point scale ranging from "strongly disagree" to "strongly agree." The response data were converted into numerical data, with positive statements ranging from 1 to 5 and negative statements ranging from 5 to 1 in reverse order. Descriptive statistics were used to summarize students' motivation levels across the two school types. An independent samples t-test was then conducted at the 5% significance level to identify statistically significant differences in motivation between SMA and MA students at both the overall scale level and within each of the six motivation scales.

RESULTS AND DISCUSSION

Descriptive statistical data analysis focusing on the mean, standard deviation, and skewness for all students is shown in Table 2. Furthermore, to facilitate comparison of the mean values for each motivation scale and the distribution of motivation for each student, the analysis results are also represented by diagrams as shown in Figures 1 and 2.

Table 2. Descriptive Statistics Results

Data on Motivation	Mean		Std. Deviation	Skewness	
	Statistic	Std. Error		Statistic	Std. Error
All Students	3.58	0.05	0.38	-0.11	0.29
Self-efficacy	3.57	0.08	0.64	-0.31	0.29
Active Learning Strategies	3.98	0.06	0.46	-0.10	0.29
Science Learning Value	3.79	0.08	0.67	-0.52	0.29
Performance Goal	2.78	0.10	0.81	0.09	0.29
Achievement Goal	3.63	0.09	0.76	0.13	0.29
Learning Environment Stimulation	3.40	0.08	0.63	0.20	0.29

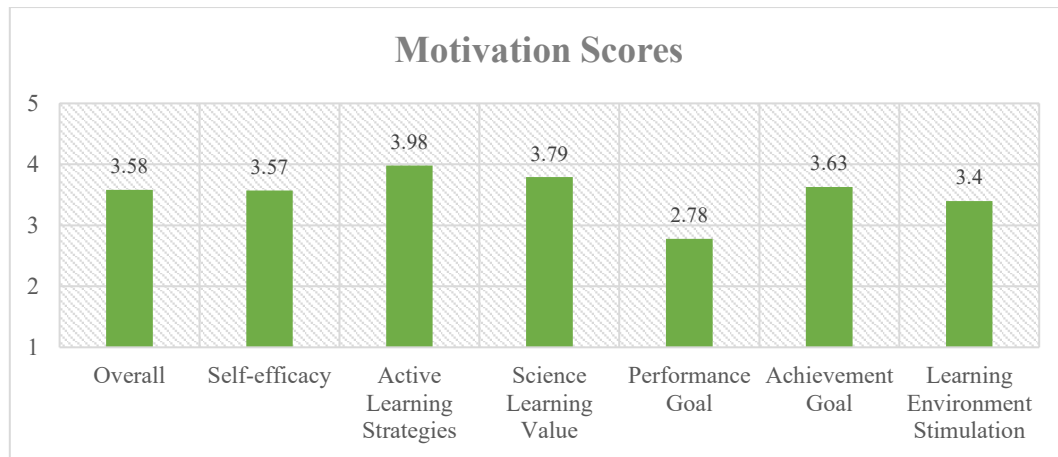


Figure 1. Motivation Scores

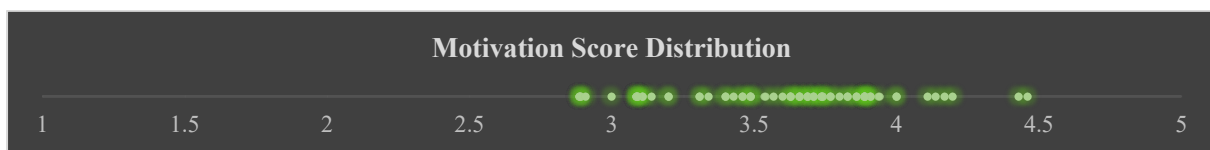


Figure 2. Students' Motivation Scores Distribution

In general, students are highly motivated to learn, with an average score of 3.58 on a scale of 5. The average score on each motivation scale indicates that active learning strategies contribute the most to motivation, with an average score of 3.98 on a scale of 5 (Figure 1). The next largest contributions are science learning value, achievement goal, self-efficacy, and learning environment stimulation, all averaging above 3.00. Previous studies showed that achievement goal orientation as motivation students have to accomplish a specific task became a predictor of student engagement in active learning strategies (Miller et al., 2021). One of the learning approach that focus on learning environment and students' motivation is investigative science learning environment (ISLE) (Etkina et al., 2020). The the motivation scale with the lowest average was performance goal, at 2.78. Performance test is one of the challenging aspect of learning science for teachers and students (Etkina et al., 2008).

Furthermore, as shown in Figure 2, the distribution of each students' motivation score is represented by point. The brightness of the points in the motivation score distribution indicates the amount of data at that point and vice versa. The right-skewed distribution of motivation scores, as shown in Figure 2, further confirms that most students demonstrated moderately high to high levels of motivation, with an average motivation of 3.58. The highest and lowest scores of motivations scores were 4.46 and 2.89, respectively. This result aligns with Saputri et al. (2025), who found a mean motivation score of 3.45 among chemistry students in SMA, suggesting that motivation levels in Sungai Penuh are relatively consistent with students from nearby region trends (Kerinci). However, our study provides a more granular view by comparing institutional types.

Additionally, a descriptive statistical analysis focusing on the mean, standard deviation, and skewness is presented for each group of students from different schools (Table 3). Following this pattern, to facilitate comparison between schools, the analysis results are represented by diagrams in Figures 3 and 4, showing the distribution of student motivation based on school.

Table 3. Descriptive Statistics Results for Average and Each Scale

Data on Motivation	Mean		Std. Deviation	Skewness	
	Statistic	Std. Error		Statistic	Std. Error
SMA Students	3.67	0.06	0.38	-0.64	0.39
Self-efficacy	3.71	0.10	0.62	-0.61	0.39
Active Learning Strategies	4.02	0.08	0.45	-0.20	0.39
Science Learning Value	3.94	0.09	0.56	-0.41	0.39
Performance Goal	3.03	0.14	0.85	-0.25	0.39
Achievement Goal	3.52	0.12	0.74	0.15	0.39
Learning Environment Stimulation	3.48	0.09	0.54	-0.21	0.39
MA Students	3.49	0.07	0.37	0.47	0.41
Self-efficacy	3.41	0.11	0.63	-0.03	0.41
Active Learning Strategies	3.94	0.08	0.47	0.02	0.41
Science Learning Value	3.62	0.13	0.76	-0.30	0.41
Performance Goal	2.50	0.12	0.68	0.16	0.41
Achievement Goal	3.75	0.14	0.77	0.09	0.41
Learning Environment Stimulation	3.31	0.13	0.71	0.57	0.41

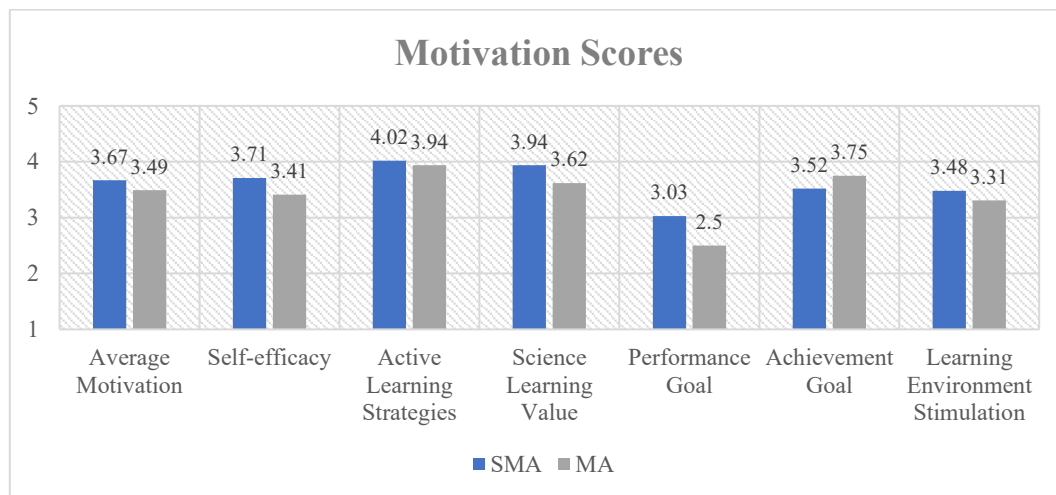


Figure 3. Motivation Scores for Each School

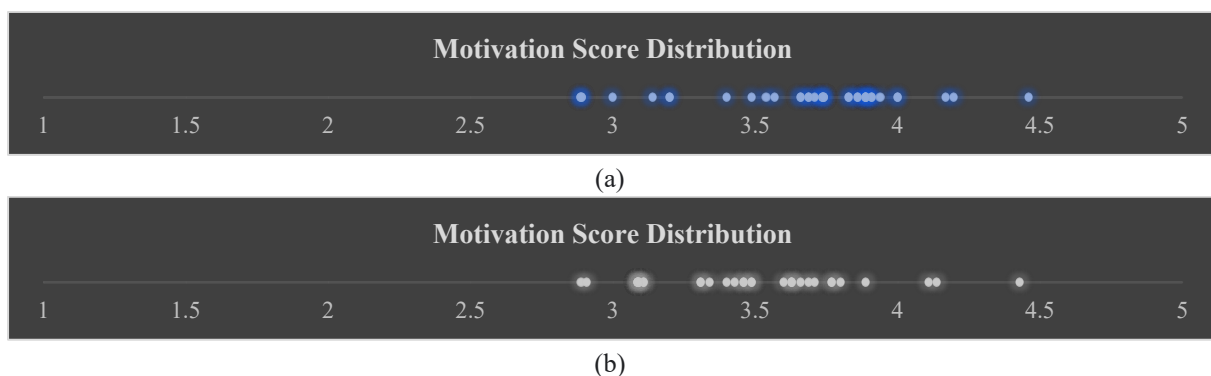


Figure 4. Motivation Scores Distribution: (a) SMA and (b) MA

Based on average motivation scores, SMA students are moderately motivated to learn science, with an average score of 3.67 on a scale of 5. This score is slightly higher than that of MA students, who have an average motivation to learn science of 3.49. The standard deviation values are nearly identical, at 0.38 and 0.37 for SMA and MA students, respectively. Furthermore, the averages on each scale show that SMA students are more motivated to learn than MA students, except for achievement goal. The difference in averages ranges from 0.08 to 0.53 on a scale of 5. A significant difference is shown by the performance goal scale, where the average score is 3.03 for SMA students and 2.50 for MA students. Interestingly, this scale has the lowest average score for both types of schools and all students. The smallest average difference was found in active learning strategies. The data distribution trend confirmed the average difference in student motivation between the two schools. The average distribution of SMA students (Figure 4a) appeared more skewed to the right than the average distribution of MA students (Figure 4b). Although the minimum score was the same for both schools (2.89), the maximum scores differed. The maximum scores were 4.46 and 4.43 for SMA and MA, respectively.

Although differences in average motivation and on each scale can be identified, it cannot yet be concluded whether these differences are significant. A comparison test was conducted to determine if the differences were significant. There are two options for the comparison test, depending on whether the data are normally distributed and homogeneous. If the data are normally distributed and homogeneous, an independent samples t-test is used. Conversely, if the data are not normally distributed or homogeneous, a nonparametric test (Mann-Whitney U test) is used. Therefore, normality and homogeneity assumption tests are required before the comparison test (Goss-Sampson, 2024).

Based on the descriptive analysis results in Table 3, each data group can be confirmed as normally distributed based on their skewness valued falls within the range of -1 to 1 (Goss-Sampson, 2024; Morgan et al., 2004). Furthermore, data homogeneity can be determined using Levene's test, as shown in Table 4. The significance values of all the data were greater than 0.05. This indicates that all data are homogeneous.

Table 4. Levene's Test Results

Data	F	Sig
Average Motivation	0.001	0.975
Self-efficacy	0.444	0.508
Active Learning Strategies	0.169	0.682
Science Learning Value	3.229	0.077
Performance Goal	1.712	0.195
Achievement Goal	0.013	0.908
Learning Environment Stimulation	2.197	0.143

All data met the assumptions of normal distribution and homogeneity. Therefore, an independent sample t-test was performed for the comparison test. The results are shown in Table 5.

Table 5. Results of Independent Samples T-Test

Data	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Average Motivation	2.001	66	0.049*	0.182	0.091	0.001	0.363
Self-efficacy	1.971	66	0.053	0.299	0.152	-0.004	0.603
Active Learning Strategies	0.759	66	0.451	0.085	0.112	-0.138	0.307
Science Learning Value	2.035	66	0.046*	0.326	0.160	0.006	0.645
Performance Goal	2.844	66	0.006*	0.535	0.188	0.159	0.910
Achievement Goal	-1.273	66	0.207	-0.233	0.183	-0.599	0.133
Learning Environment Stimulation	1.087	66	0.281	0.165	0.152	-0.138	0.468

*Significant different (sig.<0.05)

Overall, there was a difference in science learning motivation between SMA and MA students ($t = 2.001$, $\rho = 0.049$). SMA students had better science learning motivation. Furthermore, significant differences were found in two motivation scales: science learning value ($t = 2.035$, $\rho = 0.046$) and performance goal ($t = 2.884$, $\rho = 0.006$). However, no significant differences were found in the other four motivation scales.

These significant differences in performance goal and science learning value align with the previous explanation (Table 4) because these scales demonstrate the greatest average motivation discrepancies between the two schools: 0.535 and 0.326, respectively, on a scale of 5. A comparison of student responses related to performance goal revealed that the main factor causing the difference was the reason for active participation in learning. Unexpectedly, both groups of students considered grades a reason to be active in science learning. Interestingly, MA students also reported being motivated to participate in science learning for less academically constructive reasons—such as gaining attention or appearing more intelligent than their peers (statements 23 & 22 in SMTSL). These results align with the constructivist view of science motivation, where intrinsic value and epistemic curiosity play central roles in sustaining engagement beyond extrinsic rewards such as grades (Bybee & Fuchs, 2006; Demaree & Li, 2009; OECD, 2018; Pranata et al., 2017).

Furthermore, five statements related to science learning value can serve as a basis for exploring the factors causing significant differences. As shown in Figure 5, although students from both groups had relatively high perceptions of all science learning value statements (with an average of at least 3.50 for each item), SMA had higher averages for all items compared to MA students.

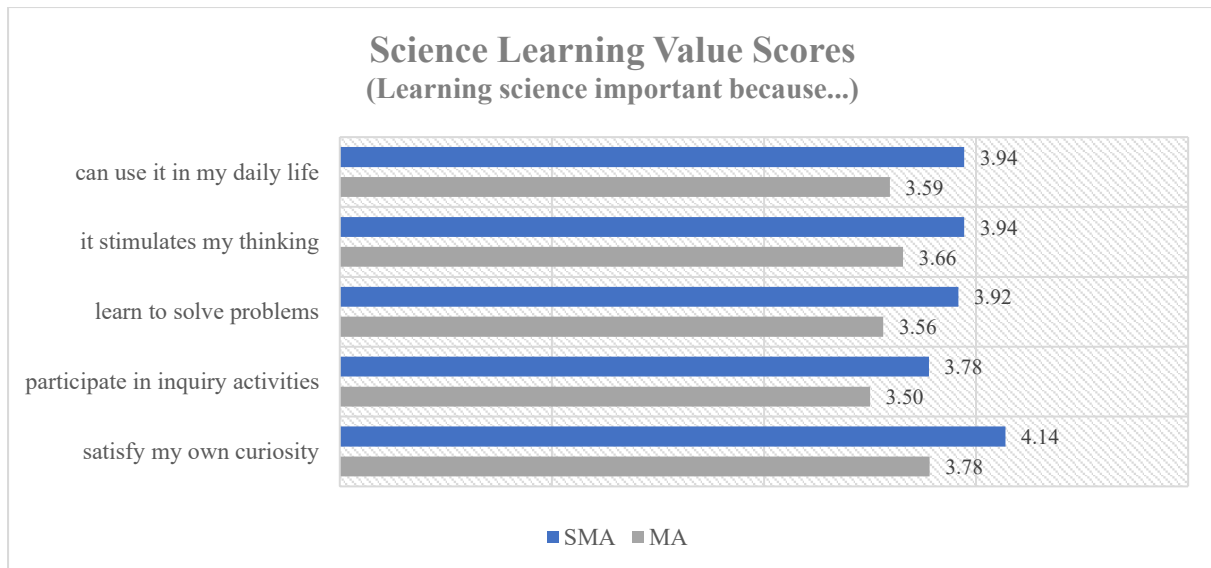


Figure 5. Science Learning Value Scores for Each School

The greatest mean difference (0.36) was observed in students' agreement with the item stating that science learning satisfies curiosity, suggesting that SMA students may engage more with science as a tool for personal exploration than MA students. Then, a difference of 0.35 was found in two statements: 1). learning science important to learn to solve problem solving, and 2) science learning related to daily life. Additionally, a difference of 0.28 was also found in two statements: 1). Learning science stimulates thinking and 2) encourage participation in inquiry activity.

These findings indicate that SMA students generally perceive science learning as more meaningful and engaging compared to their MA counterparts. The largest difference, related to curiosity, highlights the role of science as a medium for personal exploration among SMA students. Curiosity has become an important part of science learning. In line with Aktulun et al., (2024), stated that learning journeys are meant to spark curiosity. Even the science curriculum framework also makes curiosity the most fundamental part of science learning from an early age (National Research Council, 2012). Meanwhile, the consistent differences in problem-solving, relevance to daily life, stimulation of thinking, and inquiry participation suggest that SMA students may experience a stronger connection between science learning and their cognitive as well as practical development. The aspects that trigger these differences have become an important part of supporting successful science learning (Contant et al., 2018; Docktor & Mestre, 2014; Etkina et al., 2020; Pranata et al., 2024). This pattern emphasizes the importance of designing science learning in all types of schools, especially in MA, to enhance curiosity, problem-solving orientation, and inquiry engagement.

This finding may reflect differences in academic culture between SMA and MA settings. SMA students may encounter a more inquiry-oriented curriculum or have greater access to motivating science instruction. However, these results should be interpreted with caution. The study was limited to a small sample size in one region, so it may not represent the diversity of SMA and MA schools across Indonesia. Additionally, the data were obtained only through self-reported questionnaires (SMTSL), which may not accurately reflect students' actual engagement and classroom practices. Future studies could employ larger, more diverse

samples, as well as mixed methods, such as classroom observations or interviews, to gain a more comprehensive understanding of the motivational differences between SMA and MA students.

CONCLUSION

This study revealed that, overall, students exhibited a moderate to high level of motivation toward science learning. The highest motivation was found when active learning strategies were used. A comparative analysis of SMA and MA students revealed that SMA students generally demonstrated higher motivation, with significant differences observed in the science learning value and performance goal scales. These higher SMA student scores suggest stronger intrinsic engagement and a greater alignment of science learning with personal interests and curiosity. In contrast, some MA students reported extrinsic or less constructive reasons for engagement, such as seeking peer recognition. These findings underscore the need to cultivate more meaningful, curiosity-driven science learning experiences across school types.

Future research should explore the qualitative dimensions behind the observed motivational differences. For example, researchers could examine how teacher practices, school culture, and religious or institutional values influence students' learning goals. Longitudinal studies could provide insight into how science motivation evolves over time and the impact of interventions such as inquiry-based learning models or value-oriented instruction on various motivational dimensions. Including a broader sample of schools and incorporating additional psychological or contextual variables, such as students' prior experiences with science, teacher support, and classroom climate, is also recommended.

REFERENCES

- Aktulun, Ö. U., Kaya, Ü. Ü., Gözümlü, A. İ. C., Kalogiannakis, M., & Papadakis, S. (2024). Igniting Curiosity: The Role of STEAM Education in Enhancing Early Academic, Language Skills and Motivation for Science. *International Journal of Modern Education and Computer Science*, 16(5), 1–20. <https://doi.org/10.5815/ijmeecs.2024.05.01>
- Brookes, D. T., Ektina, E., & Planinsic, G. (2020). Implementing an epistemologically authentic approach to student-centered inquiry learning. *Physical Review Physics Education Research*, 16(2). <https://doi.org/10.1103/PhysRevPhysEducRes.16.020148>
- Bybee, R. W., & Fuchs, B. (2006). Editorial - Preparing the 21st century workforce: A new reform in science and technology education. *Journal of Research in Science Teaching*, 43(4), 349–352. <https://doi.org/10.1002/tea.20147>
- Contant, T. L., Tweed, A. A., Bass, J. E., & Carin, A. A. (2018). *Teaching Science Through Inquiry- Based Instruction* (13th Editi). Pearson Education, Inc.
- Creswell, J. W. (2019). *Educational Research : Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (Sixth Edit). Pearson.
- Demaree, D., & Li, S. (2009). Promoting productive communities of practice: An instructor's perspective. In *AIP Conference Proceedings* (Vol. 1179, pp. 125–128).

<https://doi.org/10.1063/1.3266694>

- Docktor, J. L., & Mestre, J. P. (2014). Synthesis of discipline-based education research in physics. *Physical Review Special Topics - Physics Education Research*, 10(2), 1–58. <https://doi.org/10.1103/PhysRevSTPER.10.020119>
- Etkina, E., Brookes, D. T., & Planinsic, G. (2020). Investigative Science Learning Environment: Learn Physics by Practicing Science. In *Active Learning in College Science: The Case for Evidence-Based Practice* (pp. 359–383). https://doi.org/10.1007/978-3-030-33600-4_23
- Etkina, E., Karelina, A., & Ruibal-Villasenor, M. (2008). How long does it take? A study of student acquisition of scientific abilities. *Physical Review Special Topics - Physics Education Research*, 4(2), 1–15. <https://doi.org/10.1103/PhysRevSTPER.4.020108>
- Fadilah, R., Sastria, E., & Pranata, O. D. (2025). Analisis Motivasi Belajar Siswa dalam Pembelajaran IPA di Madrasah Tsanawiyah Kawasan Industri. *Konstruktivisme : Jurnal Pendidikan Dan Pembelajaran*, 17(1), 37–50. <https://doi.org/10.35457/konstruk.v17i1.4025>
- Goss-Sampson, M. A. (2024). *Statistical Analysis in JASP. A Guide for Students. JASP 2024* (6th Editio). University of Greenwich.
- Hermiati, D., Pranata, O. D., & Lardiman, H. (2024). Motivasi Belajar Siswa Pada Pembelajaran Sains : Studi Komparasi Pada Tiga Sekolah. *PENDIPA Journal of Science Education*, 8(1), 17–26. <https://doi.org/https://doi.org/10.33369/pendipa.8.1.17-26>
- Khine, M. S. (2024). Motivation Science: A Machine-Generated Literature Overview. In *Motivation Science: A Machine-Generated Literature Overview*. <https://doi.org/10.1007/978-981-97-9247-4>
- Masjutina, S., & Stearns, E. (2025). A qualitative investigation of the influences of gender among low-socioeconomic status students' motivations to study biology. *International Journal of STEM Education*, 12(1). <https://doi.org/10.1186/s40594-025-00531-9>
- Miller, A. L., Fassett, K. T., & Palmer, D. L. (2021). Achievement goal orientation: A predictor of student engagement in higher education. *Motivation and Emotion*, 45(3), 327–344. <https://doi.org/10.1007/s11031-021-09881-7>
- Morgan, G. A., Leech, N. L., Gloeckner, G. W., & Barret, K. C. (2004). *SPSS for Introductory Statistics. Use and Interpretation*. Lawrence Erlbaum Associates, Inc. All.
- National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. The National Academies Press.
- OECD. (2018). The Future of Education and Skills: Education 2030. In *OECD Education Working Papers*. <https://www.oecd.org/education/2030-project/>
- Kerangka Dasar san Struktur Kurikulum. Sekolah Menengah Atas/Madrasah Aliyah, Pub. L. No. Nomor 69 Tahun 2013, 253 (2013).
- Pranata, O. D., Sastria, E., Ferry, D., & Zebua, D. R. Y. (2023). Analysis of Students' Emotional Intelligence and Their Relationship with Academic Achievement in Science. *Proceedings of the International Conference on Social Science and Education, ICoeSSE*, 395–410. <https://doi.org/10.2991/978-2-38476-142-5>
- Pranata, O. D., Seprianto, S., Dewi, M. S., & Gusvina, F. (2024). Exploring Students' Beliefs About Physics and Learning Physics in Their First Year of High School: A Comparative Study. *Thabiea : Journal of Natural Science Teaching*, 7(2), 167–180.
- Pranata, O. D., Yuliati, L., & Wartono. (2017). Concept Acquisition of Rotational Dynamics by Interactive Demonstration and Free-Body Diagram. *Journal of Education and Learning (EduLearn)*, 11(3), 291–298. <https://doi.org/10.11591/edulearn.v11i3.6410>

- Putri, C. I., Ferry, D., & Pranata, O. D. (2025). An Analysis of Science Major High School Students' Preferences for Pursuing Higher Education. *Jurnal Pena Sains*, 12(1), 12–20. <https://doi.org/10.21107/jps.v12i1.28805>
- Saputri, U. A. T., Pranata, O. D., & Zebua, D. R. Y. (2025). Analysis of Students ' Motivation in Learning Chemistry : Descriptive and Comparative Studies. *Jurnal Pendidikan Sains Universitas Muhammadiyah Semarang*, 13(1), 32–43. <https://doi.org/https://doi.org/10.26714/jps.13.1.2025.32-43>
- Satrianti, E., Pranata, O. D., & Tiara, T. (2024). Science Learning Motivation Among Students at Junior and Senior High Schools in Sungai Penuh : A Comparative Study. *Jurnal Pijar MIPA*, 19(1), 20–26. <https://doi.org/10.29303/jpm.v19i1.6101>
- Tuan, H. L., Chin, C. C., & Shieh, S. H. (2005). The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education*, 27(6), 639–654. <https://doi.org/10.1080/0950069042000323737>
- Yulisna, G., Angela, L., & Pranata, O. D. (2024). Analisis Peer Influence dalam Pembelajaran dan Korelasinya dengan Kinerja dan Motivasi. *BIOSFER: Jurnal Biologi Dan Pendidikan Biologi*, 9(2), 126–135. <https://journal.unpas.ac.id/index.php/biosfer/article/view/19155>
- Zuhaida, A. (2019). Integrative Scientific Madrasah In Indonesia: New Developments in Integrating Science and Religion in the Learning Processes. *Jurnal Ilmiah Islam Futura*, 18(1), 34. <https://doi.org/10.22373/jiif.v18i1.2868>