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MEDIATING EFFECT OF STUDENTS SELF-EFFICACY ON THE RELATIONSHIP BETWEEN ACADEMIC HARDINESS AND STUDENTS' LEARNING ENGAGEMENT IN SCIENCE

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ABSTRACT

This study aims to determine whether students' self-efficacy significantly mediates the relationship between academic hardiness and students' learning engagement in science among grade 10 junior high school students in Talaingod District, Division of Davao del Norte. This quantitative research utilized descriptive and correlational designs. There were 169 respondents identified through stratified random sampling. Moreover, this study employed three adapted research instruments validated and treated using mean, standard deviation, Pearson-r, regression analysis, and Sobel z-test. The findings revealed high levels of academic hardiness, learning engagement and self-efficacy among the grade 10 respondents. The results also showed a significant relationship between academic hardiness and students' learning engagement. Self-efficacy also found to be moderately positively correlated with students' learning engagement in science. The results also revealed a strong positive relationship between academic hardiness and self-efficacy of students in science. Moreover, the findings indicate that self-efficacy partially mediates the relationship between academic hardiness and students' learning engagement in science. These results encourage schools should employ workshops and active learning strategies for building academic hardiness, self-efficacy, and engagement in science and provide opportunities for their students to gain confidence and overcome challenges in academics. Furthermore, educators should also develop interventions to encourage collaborative learning in science; and equip teachers with strategies to give constructive feedback, manage positive environments, and inspire academic hardiness in students. Furthermore, future research should explore how academic hardiness and self-efficacy can be developed in other subjects and their impact on student outcomes across different educational settings.

KEYWORDS: *Science Education, Academic Hardiness, Learning Engagement, Self-Efficacy, Descriptive And Correlational Designs, Regression Analysis, Sobel Z-Test, Talaingod District, Davao Del Norte, Philippines.*

BACKGROUND OF THE STUDY

Student engagement in science learning is described as the level of enjoyment, interest, motivation, and future aspirations that students have for a subject (Godec et al., 2018). This conceptualization reflects active participation and devotion on the side of the students that can be observed through diverse behavioral and cognitive signals (Bond, 2020). However, teachers who teach science learning face challenges because apart from imparting knowledge, it is also important for them to inspire and engage students in the process to understand the subject. Thus, effectively engaging students and stimulating their interest in science remains a critical and challenging task (Hadzigeorgiou & Schulz, 2019).

Low student engagement in science has been recorded in countries like Brazil (Zimmer & Finn, 2020). Around 11,000 students were surveyed, and almost half admitted that emotions hindered them from being able to learn science effectively, which further affects their involvement in the subject. This finding highlights the extremely low level of student engagement in classroom performance. On the other hand, some countries in Asia are not free from the issues that science teachers face while teaching their subjects. Recent statistics from National STEM Movement show that only 19% of students opt for STEM courses in higher secondary schools. This suggests that in Malaysia, there is less than one high school student out of five to study science classes, which gives an impression that students opt more for non-scientific subjects (Khan, 2020). Second, in Indonesia, Setiawan (2020) cited that students show low science literacy and learning engagement. Similarly, in China, students also report loneliness and an inability to focus during class that interfere with their understanding of science, leading to similarly low levels of learning engagement (Tang et al., 2021).

In the Philippines, level of students' learning engagement in science is also notably low. In Montevista, Davao de Oro, teachers have seen that their students are having difficulties comprehending the lesson, have lack of time management skills in the subject and are unresponsive in submitting their outputs (Rebucas & Dizon, 2020). Additionally, Maranan's (2017) survey findings in Negros Oriental suggest that students are becoming less interested in studying science.
In the Division of Davao del Norte, it was reported that students exhibited a low level of proficiency in science during the school year of 2021-2022, which are attributed to lack of student

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engagement in learning science. Aside from that, based on the School Form 2 report and the class record of the science teacher, students' attendance at the start of school year 2023–2024 already drops and these students have shown inability to finish their assignments and showed lack of diligence in accomplishing their projects. Furthermore, it was seen that only 20% of the students actively engage in the learning process throughout their classes. These students do not engage much in group activities, which would imply that most of the students are passive and do not interact much with their peers or teachers.

Studies have shown that higher academic hardiness and self-efficacy can both be factors in enhancing students' engagement in learning science (Yi et al., 2024; Bae & DeBusk-Lane, 2019). Furthermore, scholars have already explored various aspects of these factors, including the effect of self-efficacy on students' learning engagement in science (Kurt & Taş, 2023), the correlation between academic hardiness and students' learning engagement (Abdollahi et al., 2020), and the linkage between self-efficacy and academic hardness (Tan et al., 2020). However, the researcher has encountered a lack of literature on the mediating effect of students' self-efficacy on the relationship between academic hardiness and students' learning engagement in science. Therefore, the purpose of this study is to examine such relationship among the students who are the respondents.

Under these circumstances, the researcher identifies a pressing need to investigate how students' self-efficacy mediates the relationship between their academic hardiness and their learning engagement in science. The findings of this study will be made use as a foundation for an intervention plan as well as implementation of additional training sessions on new teaching methods to tackle issues related to students' learning engagement in science. This study can potentially provide the basis for future investigations which will be conducted by other researchers who intends to study the same variables. Upon completion of this study, a furnished copy of it will be shared to the Division office of Davao del Norte, research committee and may opt to present this work during LAC sessions in the school, in DepEd Region XI research congress and even in the national and international conferences.

STATEMENT OF THE PROBLEM

This study aimed to investigate whether self-efficacy mediates the relationship between academic hardiness and learning engagement in science among Grade 10 students in Talaingod District, Division of Davao del Norte. In this regard, the study sought to answer the following questions:

1. What is the level of academic hardiness of students in science:
   1.1 commitment;
   1.2 control; and
   1.3 challenge?
2. What is the level of students' learning engagement in science in terms of:
   2.1 engagement in science lessons and tasks;
   2.2 science learning involvement; and
   2.3 science effort and preparation?
3. What is the level of students' self-efficacy in learning science:
   3.1 confidence in science ability;
   3.2 coping with difficulties in science; and
   3.3 confidence in performing science tasks?
4. Is there a significant relationship between:
   4.1 academic hardiness and learning engagement of students in science?
   4.2 self-efficacy and learning engagement of students in science?
   4.3 Students' academic hardiness and self-efficacy in science?
5. Does students' self-efficacy significantly mediate the relationship between academic hardiness and learning engagement of students in science?

METHODOLOGY

RESEARCH DESIGN

This quantitative research employed descriptive and correlational approach with mediation analysis in the treatment of data. According to Adedoyin (2020), quantitative research involves systematically analyzing phenomena using numerical data and mathematical, statistical, or computational methods that can be gathered through surveys, questionnaires, and polls. As a result, quantitative research design is suitable in this study, as the findings and outcomes were based on the numerical data obtained using a survey questionnaire.

Descriptive design is a study design that depicts traits, circumstances, or a particular state in terms of particular variables (Loeb et al., 2017). It is also a manner of gathering data from a sample population that can be analyze statistically (Boru, 2018). This design is suitable in this study since it intended to explain the students' level of learning engagement, self-efficacy and academic hardiness in science subjects.
Furthermore, Apuke (2017) described correlational design as a study design employed to ascertain whether and how much of a link between the variables naturally occurs. This design is appropriate for this study because it ascertained the link between the variables of this study. Specifically, the study aimed to determine whether academic hardiness and students' self-efficacy are significantly correlated with their learning engagement in science, and whether students' self-efficacy is significantly influenced by academic hardiness.

On the other hand, mediation analysis was utilized in this study. According to MacKinnon and Valente (2019), mediation analysis is a statistical technique for measuring the causal sequence of events by which an antecedent variable causes a mediating variable that causes a dependent variable. Hence, mediation analysis was being employed in this study to determine whether students' self-efficacy explains the relationship between academic hardiness and students' learning engagement in science.

STATISTICAL TREATMENT OF DATA

The following statistical tools were utilized to analyze and interpret the data in greater depth according to the objectives of the study.

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Mean. It is also known as the arithmetic mean and is the most often used measure of central tendency. The mean condenses the entire dataset into a single number that represents the central point or typical value. Commonly referred to as the average (Frost, 2023). The mean was used alongside the standard deviation, to ascertain the level of students' learning engagement in science, students' academic hardiness and students' self-efficacy in science. This statistical analysis was employed to answer the 1st, 2nd and 3rd research questions.

Pearson r. To determine the linear correlation between two variables, this statistical measure is a widely used. It provides insights into the strength and direction of correlation between two variables (Libretexts, 2024). This statistical tool was utilized to ascertain the significance of the relationships among the variables: academic hardiness and students' learning engagement in science; self-efficacy and students' learning engagement in science; and students' academic hardiness and self-efficacy in science. To address research question no. 4., this statistical treatment was used by the researcher.

Regression Analysis. It is a statistical method used to assess the relationship between two or more variables and how they influence one another (Hassan, 2024). This statistical tool was used to determine if there are connections between the independent variables and the dependent variable.

Sobel test. It is primarily a specialized T-test that offers a way to determine whether the impact of the independent variable has significantly decreased after the mediator was included to the model, and whether the effect of mediation is statistically significant (Zach, 2020). In this mediation analysis, Sobel Test was employed in order to ascertain the significant mediation of students' self-efficacy in science on the relationship between academic hardiness and students' learning engagement. Hence, to answer the 5th research question, this tool was utilized.

RESEARCH RESPONDENTS

In this study, the subjects were the junior high school students officially enrolled in public secondary schools in Talaingod District, Davao del Norte, for school year 2024-2025. To determine the sample size of the respondents, Raosoft Sample Size Calculator was being used, setting the confidence level at 95%, and the margin of error at 5%. Stratified random sampling was applied by the researcher to ensure that the sample accurately represented the whole population. This is a method whereby researchers first stratify a population into smaller subgroups, or strata, based on characteristics common among the members of such strata. Then, randomly select students from each stratum to constitute the final sample, where all relevant subgroups are represented in the sample (Simkus, 2023).

The total populations for each selected school to show illustration of the sampling process are as follows: 36 grade 10 students in both School A and School B, 15 students in School C, 30 students in School D, 87 students in School E, and 95 students in School F. Thus, based on the computation, the study involved 169 sample respondents that were determined through stratified random sampling technique. Furthermore, using ratio and proportion, the researcher allocated the number of respondents per school as follows: 20 respondents each for School A and School B, 8 respondents for School C, 17 respondents for School D, 49 respondents for School E, and 55 respondents for School F. To randomly select the respondents, the researcher used a draw of lots using paper.

RESULTS AND DISCUSSION

The following are the results of the study.

Table 1
Summary of the Level of Students' Academic Hardiness in Science

Indicators	Mean	SD	Description
Commitment	4.18	0.976	High
Challenge	4.01	1.017	High
Control	4.17	0.945	High
Category Mean	**4.12**	**0.979**	**High**

The overall mean for students' academic hardiness is 4.12, which corresponds to a high descriptive equivalent, suggesting that students' academic hardiness in science is highly manifested. Meanwhile, it is clearly shown that respondents share similar levels of academic hardiness in science as suggested by the computed standard deviation of 0.979. This result reflects a strong overall sense of resilience and determination among the students in this domain.

This fact is corroborated by Setyowati et al. (2024), who found through descriptive testing that students' level of academic hardiness is classified within the high category. As a result, students are able to cope with stressors in a positive way, and remain productive and effective in their performance, due to their high level of academic hardiness. Consequently, they are not easily overwhelmed by unexpected occurrences (Kurnia & Ramadhani, 2021). This also resonates with the study by Bakar et al. (2021), where commitment is found as the most prevalent component of academic hardiness, followed by control. The challenge was found as the least emphasized component in their study. It simply means that even though students can be very resilient on managing academic tasks, yet there are still those with low academic resilience, requiring more development. Therefore, the promotion of commitment, control, and challenge enhances further development of students' academic hardiness.

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Table 2
Summary of the Level of Students' Learning Engagement in Science

Indicators	Mean	SD	Description
Engagement on Science Lessons and Tasks	4.06	1.075	High
Science Learning Involvement	4.10	1.093	High
Science Effort and Preparation	4.11	0.991	High
Over-all Mean	**4.09**	**1.053**	**High**

This variable obtained an overall mean of 4.09, described as high, indicating that the learning engagement of students in science is highly evident. With a standard deviation of 1.053, data suggests that a high level of consistency in the responses, implying that most respondents exhibit similar levels of learning engagement. This consistency points to uniform degree of students learning engagement in science across the respondents.

The findings of Mohamad (2024) support this conclusion, revealing a high level of students' learning engagement in science. Students who enjoy science lessons and hands-on investigations in an encouraging learning environment led to greater engagement in the subject. In addition, highly engaged students in science studies tend to find the subject enjoyable (Lau & Ho, 2022), which is often linked to higher performance on science examinations (Long et al., 2022). Moreover, these students are more inclined in pursuing science-related careers (Wang et al., 2021).

Table 3
Summary of the Level of Students' Self- Efficacy in Science

Indicators	Mean	SD	Description
Confidence in Science Ability	4.00	0.999	High
Coping with Difficulties in Science	4.01	1.120	High
Confidence in Performing Science Tasks	3.99	1.053	High
Over-all Mean	**4.00**	**1.057**	**High**

Furthermore, students' self-efficacy in science obtained an overall mean of 4.00 with a descriptive equivalent of high, which indicates that self-efficacy in science is highly manifested among the students. The responses also were being clustered around the mean as depicted by the standard deviation of 1.057.

These results agree with findings obtained by Sabanal et al. (2023), who also observed a high level of self-efficacy among students. Indeed, they argued that such high self-efficacy portrays the positive belief that the students may hold about their capabilities to understand the science content regardless of how difficult it may be. Schunk and DiBenedetto (2021) further emphasized that self-efficacy is an essential inward motivational factor which is influenced both by personal influences as well as environmental stimuli. These factors subsequently influence the most important motivational outputs, such as decisions, effort, persistence, and achievement.

Table 4
Significance of the Relationship Between the Variables

Variables Correlated	R	p-value	Decision on H_o	Decision on Relationship
Academic Hardiness & Learning Engagement of Students in Science	.690	.000	Reject	Significant
Self-Efficacy & Learning Engagement of Students in Science	.669	.000	Reject	Significant
Students' Academic Hardiness & Self-Efficacy in Science	.735	.000	Reject	Significant

Table 4 presents the significant relationships between students' academic hardiness, learning engagement, and self-efficacy in science. The correlation between academic hardiness and learning engagement shows a moderate positive relationship (r=0.690, p value=0.000), meaning that higher academic hardiness is associated with higher learning engagement. Similarly, self-efficacy is significantly related to learning engagement (r=0.669, p value=0.000), indicating that increased self-efficacy leads to greater engagement in science. Additionally, academic hardiness and self-efficacy are strongly

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positively correlated (r=0.735, p value=0.000), suggesting that higher academic hardiness is linked to higher self-efficacy in science. In summary, as students' academic hardiness and self-efficacy increases, so does their learning engagement in science.

The findings of this study are supported by previous research highlighting the positive relationship between academic hardiness, learning engagement, and self-efficacy. Kuo et al. (2021) confirmed that academic hardiness and learning engagement are positively related, with Yi et al. (2024) emphasizing that increasing academic hardiness enhances student engagement. Marôco et al. (2020) further explained that students with low academic hardiness often perceive challenges as insurmountable, leading to disengagement. In terms of self-efficacy, Wand and Tambi (2024) found a moderate positive relationship between self-efficacy and learning engagement, with more confident students showing greater commitment to their studies. Bae and DeBusk-Lane (2019) also noted that self-efficacy is a strong predictor of science learning engagement. Similarly, Membiela et al. (2023) highlighted the importance of self-efficacy in promoting engagement in science education, especially in secondary schooling. Furthermore, research by Wong et al. (2019) showed that academic hardiness and self-efficacy are strongly interconnected, with students who possess high academic hardiness also demonstrating higher self-efficacy in science learning. Tan et al. (2020) supported this by stating that academic hardiness is essential for fostering self-efficacy in science education. Overall, these studies reinforce the importance of academic hardiness and self-efficacy in enhancing students' engagement and success in learning science.

Table 5

Sobel Test on the Type of Mediation

Type of Mediation: Partial			
Sobel z-value	**Significant** 4.281873		p= 0.000019
95% Symmetrical Confidence Interval	Lower Higher	0.14784 0.39745	
Unstandardized Indirect Effect	a*b se	0.27265 0.06367	
Effective Size Measures			
	Standardized Coefficients		**R^2 Measures (Variance)**
Total:	0.69		0.475
Direct:	0.43		0.085
Indirect:	0.259		0.390
Indirect to Total Ratio:	0.376		0.820

As all three steps (paths A, B, and C) were found to be significant, a mediation analysis was carried-out to assess the relevance of the mediation effect. The results of the mediation effect calculation are presented in Table 5. The Sobel test produced a z-value of 4.281873. In a typical hypothesis testing, a z-value above 1.96 is considered significant at the 0.05 level. In this case, with a z-value of 4.281873, it is well above this threshold, indicating a highly indirect effect. This result led to the rejection of the fourth null hypothesis, indicating that students' self-efficacy serves as mediator in the relationship between academic hardiness and students' learning engagement in science. Furthermore, the unstandardized indirect effect (a*b) and the corresponding standard error (SE) provide information about the strength and precision of the meditated (indirect) relationship in a mediation model. The unstandardized indirect effect (a*b) of 0.2726 and a standard error (SE) of 0.06367 suggest that the mediation effect is present and relatively precise.

Meanwhile, standardized coefficients and R^2 Measures help to understand the magnitude and strength of relationships between variables, as well as how much of the variability in the dependent variable can be explained. As shown in Table 5, the results suggest that Academic Hardiness has a strong total effect on Students' Learning Engagement in Science (β=0.69), considering both direct and indirect effects (through Self-Efficacy). The direct effect shows that while Academic Hardiness has a direct impact on Students' Learning Engagement in Science, part of the effect is mediated by Self-Efficacy (β=0.43). The indirect effect of 0.259 indicates that Self-Efficacy partially mediates the relationship between Academic Hardiness and Students' Learning Engagement in Science. The indirect to total ratio of 0.376 means that Self-Efficacy explains 37.6% of the effect of Academic Hardiness on Students' Learning Engagement in Science, while the remaining 62.4% is explained directly by Academic Hardiness, indicating that Self- Efficacy is an important mediator, but the direct influence of Academic Hardiness remains stronger.

To sum up the results in Table 5 it can be said that academic hardiness, which includes traits like commitment, emotional control, and resilience, strongly predicts both self-efficacy and learning engagement. Students with high academic hardiness approach challenges with confidence, view setbacks as growth opportunities, and remain motivated in their studies. This, in turn, enhances their self-efficacy, as they believe in their ability to succeed. Higher self-efficacy fosters greater engagement in learning, leading to active participation and persistence in difficult tasks. Together, academic hardiness and self-efficacy

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create a positive cycle, boosting students' overall engagement and success in science education.

RECOMMENDATIONS

In light of the data and conclusions presented, the following recommendations are offered to further enhance educational practices and support student success.

1. Students should focus on developing academic hardiness by building resilience and perseverance in the face of challenges, at the same time boosting their self-efficacy by setting achievable goals and participating actively in science activities.
2. Teachers can play a pivotal role by fostering resilience through a growth mindset, encouraging perseverance, and creating a supportive environment that enhances students' self-confidence in science. They should also employ interactive teaching methods to further engage students.
3. Parents should support their children's academic journey by encouraging them to face challenges positively, promoting their self-belief, and motivating them to participate in extracurricular activities that foster engagement in science.
4. School administrators should provide train teachers to enhance their ability to cultivate academic hardiness and self-efficacy in students and create programs that foster student engagement in science, such as science fairs or workshops. Additionally, they should ensure that a supportive learning environment is in place.
5. DepEd officials should consider integrating resilience training into the curriculum for students, that focuses on developing skills and mindsets that may help them manage challenges, setbacks, and stress in a constructive way. This resilience training can include emotional regulation, growth mindset development and stress management. Also, DepEd officials should support teacher development programs, and prioritize initiatives that increase student engagement in science, such as competitions and research opportunities.
6. Future researchers could explore the mediation effects of self-efficacy further, conduct longitudinal studies to assess the impact of academic hardiness over time, and design intervention studies to test effective methods for enhancing student engagement in learning. These collective efforts can help create an environment where students are supported in developing the academic skills and mindset necessary for long-term success.

CONCLUSIONS

Based on the findings of this study, several key conclusions can be drawn.

1. Academic hardiness among Grade 10 students is highly manifested.

2. Students' learning engagement in science is highly evident among Grade 10 students.

3. Self-efficacy is highly manifested among Grade 10 students.

4. The results show that all the relationships were found to be significant. It also indicates that academic hardiness and self-efficacy are both linked to greater engagement in science. This means that higher academic hardiness and self-efficacy lead to greater student engagement in learning the subject. Moreover, academic hardiness is strongly connected to self-efficacy, implying that higher academic hardiness is associated with higher self-efficacy among students.

5. Students' self-efficacy significantly mediates the relationship between academic hardiness and students' learning engagement in science.

REFERENCES

1. *Abdollahi, A., Maleki Farab, N., Panahipour, S., & Allen, K. A. (2020). Academic hardiness as a moderator between evaluative concerns perfectionism and academic procrastination in students. The Journal of Genetic Psychology, 1–10. https://doi.org/10.1080/00221325.2020.1783194*
2. *Adedoyin, O. (2020). Understanding quantitative research: A practical guide. Journal of Educational Research, 113(4), 235-245. https://doi.org/10.1080/00220671.2020.1789225*
3. *Apuke, O.D. (2017). Quantitative research methods: A sypnosis approach. Kuwait Chapter of Arabian Joural of Business and Management Review, 6(11), 40-47. https://doi.org/10.12816/0040336*
4. *Bae, C. L., & DeBusk-Lane, M. (2019). Middle school engagement profiles: Implications for motivation and achievement in science. Learning and Individual Differences, 74, 101753. https://doi.org/10.1016/j.lindif.2019.101753*
5. *Bakar, A., & Marsela, F. (2021, September). The Profile of Students' Academic Hardiness: A Descriptive Study. In 2nd International Conference on Science, Technology, and Modern Society (ICSTMS 2020) (pp. 495-499). Atlantis Press. https://doi.org/10.2991/assehr.k.210909.105*
6. *Bond, M. (2020). Facilitating student engagement through the flipped learning approach in K-12: A systematic review. Computers & Education, 151, 103819.*
7. *Boru, T. (2018). Chapter five: Research design and methodology. In Chapter five research design and methodology.*
8. *Frost, J. (2023). What is the mean and how to find it: Definition & formula. Statistics by Jim. https://statisticsbyjim.com/basics/mean_average/*
9. *Godec, S., King, H., Archer, L., Dawson, E., & Seakins, A. (2018). Examining student engagement with science through a Bourdieusian notion of field. Science Education, 27, 501–521. https://doi.org/10.1007/s11191-018-9988-5*
10. *Hadzigeorgiou, Y., & Schulz, R. M. (2019). Engaging Students in Science: The potential role of "Narrative Thinking" and "Romantic Understanding." Frontiers in Education, 4. https://doi.org/10.3389/feduc.2019.00038*
11. *Hassan, M. (2024, March 25). Regression analysis – Methods, types, and examples. Research Method. https://researchmethod.net/regression-analysis/*
12. *Khan, F. (2020, May 29). Hanya 19 peratus pilih aliran Sains. Berita Harian.Kurniawan,*
13. *Kuo, T. M., Tsai, C. C., & Wang, J. C. (2021). Linking web-based learning self- efficacy and learning engagement in MOOCs: The role of online academic hardiness. The Internet and Higher Education, 51, 100819. https:// doi.org/10.1016/j.iheduc.2021.100819*

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14. *Kurnia, A., & Ramadhani, A. (2021). Pengaruh hardiness dan dukungan sosial terhadap stres akademik mahasiswa. Psikoborneo Jurnal Ilmiah Psikologi, 9(3), 657–666. https://doi.org/10.30872/psikoborneo*
15. *Kurt, U., & Taş, Y. (2023). Students Engagement in Science during Covid-19 Pandemic: Role of Self-Efficacy Beliefs and Achievement Goals. Journal of Science Learning, 6(1), 23–33. https://doi.org/10.17509/jsl.v6i1.51104*
16. *Lau, K. C., & Ho, S. C. (2022). Attitudes towards science, teaching practices, and science performance in PISA 2015: Multilevel analysis of the Chinese and Western top performers. Research in Science Education, 52(2), 415–426. https://doi.org/10.1007/s11165-020-09954-6*
17. *Libretexts. (2024, January 8). 12.4: Pearson's r. Statistics LibreTexts. https://stats.libretexts.org/Bookshelves/Applied_Statistics/An_Introduction_to_Psychological_Statistics_(Foster_et_al.)/12/12.04/Pearsons_r*
18. *Loeb, S., Dynarski, S.m McFarland, D., Morris, P., Reardon, S. & Reber, S. (2017). Descriptive analysis in education: A guide for researchers (NCEE 2017- 4023). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance. https:/files.eric.ed.gov/fulltext/ED573325.pdf*
19. *Long, H., Gao, S., Yang, L., & Chen, J. (2022). Do teaching practices and enjoyment of science matter to science achievement? Psychology in the Schools, 59(2), 334-355. https://doi.org/10.1002/pits.22611*
20. *MacKinnon, D. P., & Valente, M. J. (2019). Mediation analysis. Psychology. https://doi.org/10.1093/obo/9780199828340-0245*
21. *Maranan, V. M. (2017). Basic process skills and attitude toward science: Inputs to an enhanced students' cognitive performance (Launa State Plytechnic University) {Master's Thesis}. https://files.eric.ed.gov/fulltext/ED579181.pdf*
22. *Marôco, J., Assunção, H., Harju-Luukkainen, H., Lin, S. W., Sit, P. S., Cheung, K. C., & Campos, J. A. (2020). Predictors of academic efficacy and dropout intention in university students: Can engagement suppress burnout? PLoS ONE, 15(10), e0239816.*
23. *Membiela, P., Acosta, K., Yebra, M. A., & González, A. (2023). Motivation to learn science, emotions in science classes, and engagement towards science studies in Chilean and Spanish compulsory secondary education students. Science Education. https://doi.org/10.1002/sce.21793*
24. *Mohamad, S. L. (2024). Learning environment and academic engagement in science of junior high school students. International Journal of Research in Education and Practice, 141(1), 233–240. https://doi.org/10.47119/IJRP1001411120246031*
25. *Rebucas, E. M., & Dizon, D. M. (2020). Teaching Outside Science Specialism: Plight of Public- School Science Major Teachers in Montevista District. International Journal of Science and Research, 9(2), 944-949.https://doi.org/10.21275.SR20210092826*
26. *Sabanal, G. J. A., Reputana, K. G. D., Palwa, S. S., Labandero, C. L. H., & Alimbon, J. A. (2023). Motivation and academic performance of secondary students in science: a correlational study. Asian Journal of Science Education, 5(2), 20-29.*
27. *Setiawan, S., Setyyaningrum, R. W., Anam, S., & Retnaningdyah, P. (2020). Content And Language Integrated Learning (CLIL) in science class during covid - 19 outbreak: A narrative inquiry. English Review: Journal of English Education, 9(1), 35-46. DOI: 10.30653/001.202481.306*
28. *Setyowati, A., Fauziah, M., Farozin, M., Astuti, B., & Rifqoh, F. (2024). Academic Hardiness Level of Guidance and Counseling Study Program Students Post Covid 19 Pandemic. Indonesian Journal of Educational Counseling, 8(1), 75-79.*
29. *Simkus, J. (2023). Stratified Random Sampling: Definition, Method & Examples. Simply Psychology. https://www.simplypsychology.org/stratified-random-sampling.html*
30. *Tan, A.-L., Liang, J.-C., & Tsai, C.-C. (2020). Relationship among high school students' science academic hardiness, conceptions of learning science, and science learning self-efficacy in Singapore. International Journal of Science and Mathematics Education, 19(2), 313–332. https://doi.org/10.1007/s10763-019-10040-1*
31. *Tang, X., Salmela-Aro, K., Symonds, J., & Upadyaya, K. (2021). Student engagement in adolescence: A scoping review of longitudinal studies 2010–2020. Journal of Research on Adolescence, 31(2), 256–272. https://doi.org/10.1111/jora.12627*
32. *Wang, H. H., Lin, H. S., Chen, Y. C., Pan, Y. T., & Hong, Z. R. (2021). Modelling relationships among students' inquiry-related learning activities, enjoyment of learning, and their intended choice of a future STEM career. International Journal of Science Education, 43(1), 157-178. https://doi.org/10.1080/09500693.2020.1860266*
33. *Wang, Y., & Tambi, F. B. (2024). Correlation between students' perceived parental expectations and students' academic engagement: The intermediary effect of academic self-efficacy. Journal of Pedagogical Research, 8(3). https://doi.org/10.33902/JPR.202427683*
34. *Yi, S., Zhang, Y., Lu, Y., & Shadiev, R. (2024). Sense of belonging, academic self-efficacy and hardiness: Their impacts on student engagement in distance learning courses. British Journal of Educational Technology, 00, 1–25. https://doi.org/10.1111/bjet.13421*
35. *Zach. (2020, March 25). How to conduct a Sobel test in R. Statology. https://www.statology.org/sobel-test-in-r/*
36. *Zimmer, K. S. & Finn, J. D. (2020). Student Engagement: What is it? Why does it matter? In Handbook of research on student engagement (pp. 97-131). Springer, Boston, MA.*