Math Video Tutorials as a Predictor of Mathematical Disposition: The Mediating Effect of Learning Environment

Aprillen B. Caminse

Aprillen.caminse@hcdc.edu.ph

Holy Cross of Davao College, Davao City 8000, Philippines

Abstract

Low mathematical disposition remains a concern. This study examined the mediating effect of the learning environment in the relationship between math video tutorials and student mathematical disposition. Through predictive research design and survey technique, the data from 168 Grade 10 students, selected through proportionate stratified sampling, were analyzed using mediation analysis. Findings showed that the mediator partially affects the predictor-criterion correlation, partly supporting Social Cognitive Theory. Future research may explore other mediators for the remaining 73% unexplained variance, while schools may enhance mathematical disposition by technology-based learning tools and interactive activities.

Keywords: Math video tutorials; predictor of mathematical disposition; mediating effect of learning environment

1. Introduction

Globally, the persistent issue of students' low mathematical disposition, determined by their attitudes, persistence, and confidence in mathematics, continues to impede achievement in mathematics education (Wang et al., 2022). International studies indicated that students with a lower mathematical disposition tend to exhibit weaker mathematical abilities (Kusmaryono, 2019). Moreover, students' mathematical disposition is often shaped by poor educational settings (Yulia et al., 2023).

In Indonesia, students exhibit a weak disposition toward mathematics, low self-efficacy, and reduced mathematical literacy, which affect their comprehension and integration of math concepts (Nurhayati et al., 2025). Additionally, in Malaysia, a low disposition toward mathematics tends to lead students to surrender quickly, exhibit low confidence, and perceive mathematics as difficult and intimidating (Faujiah et al., 2025). In Nigeria, students with a low mathematical disposition may rapidly disengage due to low motivation, low confidence, and poor persistence in mathematics (Inyang et al., 2023). These findings illustrate that low mathematical disposition remains a prevalent issue within educational institutions.

In the Philippines, numerous junior high school students in Cebu exhibited a low overall disposition toward mathematics (Etcuban et al., 2019). Moreover, Filipino learners often demonstrate a low mathematical disposition, which significantly affects their overall performance in mathematics classrooms (Cagulada & Ucang, 2025). Locally, in Davao City, research revealed that Grade 10 students exhibited a moderately low mathematical disposition (Colita & Genuba, 2019). For instance, students with low mathematical disposition struggle significantly more during online and blended learning modalities (Husna & Hanggara, 2022).

If a low mathematical disposition remains unaddressed, consequences may follow for both learners and society. Students with low disposition frequently ignore mathematics, concede when faced with challenges, and remain stuck in advanced math disciplines, hence restricting their scholastic and professional prospects (Rahmawati et al., 2022). Moreover, students' low mathematical disposition can lead to negative attitudes toward mathematics, making remediation more difficult and costly (Camacho, 2025; Aquino & Ibarra, 2023). Additionally, Montano (2024) emphasized that this low disposition may contribute to learners' weak performance in mathematics; however, it does not address how technology-based interventions that

interact with the learning environment shape student dispositions. Nevertheless, given the scope of this issue, there remains a significant gap in published research, especially within local contexts, highlighting the need for further studies to address it. Thus, this research was conducted.

This study is significant as it examined the influence of math video tutorials on students' mathematical disposition and the mediating role of the learning environment. The research contributes to the realization of Sustainable Development Goal 4 (Quality Education) by promoting accessible, learner-centered, and technology-driven instruction. In the Philippine educational context, the findings may provide insights aligned with the Department of Education's objectives to strengthen student engagement, confidence, and positive attitudes toward mathematics through effective digital learning tools. The study advocates for instructional improvements at Holy Cross of Davao College through promoting the integration of video-based resources and cultivating a classroom environment that facilitates mathematical development. Overall, this research enhances ongoing efforts to improve teaching and learning practices, resulting in better academic outcomes and sustained educational development.

This study aimed to determine the mediating effect of the learning environment in the relationship between math video tutorials and student mathematical disposition. Specifically, this study sought to address the following objectives: 1.) to describe the levels of math video tutorials in terms of use of mathematics videos, characteristics of the mathematics videos, and confidence; learning environment in terms of supportive classroom atmosphere, access to resources, and peer collaboration; and the mathematical disposition in terms of cognitive, affective, and conative; 2.) to determine the significance of the correlation between math video tutorials, learning environment, and the mathematical disposition; 3.) to determine the significance of the direct effect of math video tutorials on mathematical disposition, controlling for the learning environment; 4.) to determine the significance of the indirect effect of math video tutorials on mathematical disposition through the learning environment; and 5.) to determine the significance of the total effect of math video tutorials on mathematical disposition.

2. Methodology

1.1. Research Design

This study employed a predictive research design, which focuses on examining relationships among variables and predicting outcomes using statistical models. This design is appropriate for studies that aim to determine how independent variables influence a dependent variable and to estimate the extent of such influence (Creswell & Creswell, 2018). It is applied when the objective of the study is to identify predictor variables and estimate their influence on an outcome variable through techniques such as regression and predictive modeling (Steyerberg, 2019). Its advantages include the ability to identify significant predictors, provide evidence-based insights, support advanced statistical analyses, and improve the accuracy of conclusions by emphasizing prediction and relationships among variables (Almalawi et al., 2024).

1.2. Locale of the Study

This study was conducted in three public junior high schools (School A, School B, and School C) under Cluster 8 of the Calinan District, Davao City. The educational setting reflects how the Department of Education’s curriculum, policies, and instructional practices are implemented, including the use of learning resources such as internet-based materials and downloadable mathematics video tutorials. The researcher selected this locale to determine whether instructional materials, particularly internet resources, are accessible within the student learning environment and how such accessibility supports their learning.

1.3. Sample and Sampling

The sample study was 168 students of grade 10 junior high school, taken using Raosoft software with a confidence level of 95%, a margin of error 5%, and 50% response distribution from the total population of 294 students of three schools: School A with 122 students, School B with 37 students, and School C with 135 students. To ensure representativeness and minimize bias, a proportionate stratified sampling design was used, with 70 respondents from School A, 21 from School B, and 77 from School C, reflecting each school's proportion in the total population.

Proportionate stratified sampling is a probability sampling technique where a population is divided into strata, and samples are randomly selected from each stratum in proportion to its size to ensure fair representation of all groups (Creswell & Creswell, 2023). It is applied when the population is heterogeneous but can be divided into subgroups, and when each subgroup must be represented according to its proportion in the population (Lohr, 2021). The advantages of stratified sampling for ensuring sample representativeness include better representation of all subgroups, reduced sampling bias, and improved accuracy of results (Iliyasu & Etikan, 2021).

1.4. Data Gathering Technique

The survey technique was used in gathering data. This technique involves systematically collecting information from a sample of respondents using standardized questionnaires or structured instruments to describe characteristics, opinions, attitudes, or behaviors of a population and is applied when researchers need structured primary data to generalize findings or answer specific research questions (Stockemer & Bordeleau, 2023). It has advantages such as rapid data collection from large populations, the ability to involve diverse groups, and support for systematic quantitative analysis and generalizability (Zimba et al., 2023).

This study used three adapted and modified survey questionnaires. The first instrument, adapted from Kahrmann (2016), contained 19 items assessing respondents' frequency of video use, perceptions of video characteristics, and confidence in learning mathematics through video tutorials using a four-point Likert scale, with a Cronbach's alpha of 0.852. The second instrument, adapted from Pahilan and Comahig (2025), consisted of 28 items evaluating students' perceptions of the mathematics learning environment, learning tools, and peer collaboration, yielding a Cronbach's alpha of 0.849. The third instrument, modified from Tuba and Espinosa (2024), included 15 items measuring students' reflection, thinking, and engagement in mathematical activities, with a Cronbach's alpha of 0.848, indicating that all instruments demonstrated good reliability.

1.5. Data Analysis Technique

In this study, the data analysis techniques used were descriptive, correlation, and mediation analyses. Descriptive analysis was employed to arrange and describe the data for enhanced understanding of patterns and distributions, using the mean and standard deviation as statistical tools (Creswell & Creswell, 2023). Furthermore, correlation analysis was employed to measure and evaluate the strength and direction of relationships between variables, identify patterns and associations in the data, and provide predictive insights for informed decision-making, utilizing the Pearson Product-Moment Correlation statistical tool (Hassan, 2024). Lastly, mediation analysis examines how an independent variable affects a dependent variable through mediators by estimating direct, indirect, and total effects using beta coefficients, applied to identify causal pathways and improve interventions (Abrar et al., 2024).

1.6. Ethical Considerations

Respondents were fully informed of the aims and methodology and their right to withdraw at any time without any consequences. Parental consent and student assent were sought prior to data collection, maintaining that participation remained voluntary and ethically appropriate for minor respondents. The individuals' identities were kept confidential, and anonymized data was stored in secure systems accessible only to the research team and permanently removed from the researchers' systems. The study was designed to cause no harm, ensuring that respondents were informed of their rights. The research was conducted transparently, with individuals' privacy maintained and their participation valued. Ethical approval was secured by the Society for Moral Integrity Legal Ethics (SMILE). The researchers' study was approved by the Department of Education (DepEd). To maximize benefits, minimize risks, and uphold fairness in the research process, appropriate measures have been implemented, ensuring transparent sharing of all findings. Any potential conflicts of interest were disclosed to maintain the integrity of the research.

3. Results and Discussions

1.7. Descriptive Analysis

Table 1 is the descriptive table. It contains the variables involved in the study, namely, math video tutorials, mathematical disposition, and student learning environment and its indicators; and the number of samples, standard deviation, mean, and descriptive level specifically corresponding with each of the variables.

Table 1. Descriptive table (n=168)

Variables	*SD*	*Mean*	*Descriptive Level*
Math Video Tutorials	**0.33**	**3.07**	**High**
Use of mathematics videos	0.41	3.00	High
Characteristics of the mathematics videos	0.37	3.11	High
Confidence	0.40	3.09	High
Learning Environment	**0.29**	**3.12**	**High**
Supportive classroom atmosphere	0.35	3.22	High
Access to resources	0.38	2.99	High
Peer collaboration	0.33	3.16	High
Mathematical Disposition	**0.38**	**3.07**	**High**
Cognitive	0.63	3.10	High
Affective	0.48	2.99	High
Conative	0.38	3.12	High

Specifically, the table shows that the math video tutorials variable had a mean of 3.07, which is considered high. This indicates that students often use math video tutorials. All its indicators are described as high-level. The standard deviation of 0.33, described as highly consistent, indicates a strong, uniform perception of the responses. Furthermore, the learning environment variable had a mean of 3.12, indicating a high level. This indicates that the students are in a good learning environment. All these indicators reflect a high level. The standard deviation of 0.29 is considered highly consistent, suggesting strong, uniform perceptions across respondents. Finally, the mathematical disposition variable had a mean of 3.07, indicating a high level. It signifies that the students exhibit a strong mathematical disposition. Consistently, all indicators

are described as high. The standard deviation of 0.38, described as highly consistent, signifies a strong and uniform perception of the responses.

The findings demonstrated that math video tutorials, the learning environment, and mathematical disposition are all rated at high levels, reflecting strong engagement, supportive conditions, and favorable dispositions among students. While the learning environment is perceived slightly more positively, the results indicated a consistently high perception across all variables.

1.8. Correlation Results

Table 2 is a correlation table. It presents the determinant and criterion variables. It shows the r-value, p-value, decision on the null hypothesis, and the corresponding interpretation.

Table 2. Correlation Table (N=168)

	Mathematical Disposition of Students			
Variables	**r-value**	**p-value**	**Decision on H_0**	**Interpretation**
Math Video Tutorials	0.616	0.000	Reject H_0	Moderately High Positive, significant correlation
Learning Environment	0.548	0.000	Reject H_0	Moderately High Positive, significant correlation

Level of Significance: 0.05, Decision Rule: Reject H_0 if $p < 0.05$

The table specifically shows that the correlation between math video tutorials and mathematical disposition variables obtained a p-value of 0.000. Such a value is less than the 0.05 level of significance; hence, the null hypothesis was rejected. It indicates that the correlation is statistically significant. The r-value of 0.616 reflects a moderately high positive correlation between math video tutorials and mathematical disposition. This implies that greater use of math video tutorials is linked to higher student mathematical disposition. Similarly, the correlation between learning environment and mathematical disposition yielded a p-value of 0.000. The said value is also less than the 0.05 level of significance; therefore, the null hypothesis was rejected. This indicates that the correlation is statistically significant. The r-value of 0.548 shows a moderately high positive correlation between learning environment and mathematical disposition. This implies that a more supportive learning environment is associated with a stronger mathematical disposition among students.

Both math video tutorials and the learning environment demonstrated statistically significant positive correlations with mathematical disposition. Increased use of math video tutorials and a more supportive learning environment are associated with higher levels of student mathematical disposition. Math video tutorials, however, showed a slightly stronger relationship, indicating a greater influence compared to the learning environment.

1.9. Mediation Results

Table 3 is a mediation table. It contains the path/effect, the estimate of Beta, the standard error, the Z-value, the p-value, the decision on the null hypothesis, and the corresponding interpretation.

Table 3. Mediation Table (N=168)

Label	**Path/Effect**	**Estimate (β)**	**SE**	**Z-value**	**p-value**	**Decision on H_0**	**Interpretation**

a	Math Video Tutorials → Learning Environment	0.607	0.049	12.43	0.000	Reject H_0	Significant
b	Learning Environment → Mathematical Disposition	0.304	0.118	2.57	0.010	Reject H_0	Significant
c’	Math Video Tutorials → Mathematical Disposition (Direct Effect)	0.518	0.101	5.15	0.000	Reject H_0	Significant
a × b	Indirect Effect (Mediation)	0.184	0.073	2.52	0.012	Reject H_0	Significant
(a×b) + c	**(Total Effect)**	**0.702**	**0.078**	**8.87**	**0.000**	**Reject H_0**	**Significant**

Level of Significance: 0.05
Decision Rule: Reject H_0 if $p < 0.05$
Proportion Mediated: indirect effect/total effect = 0.2625

The table shows that the direct effect of math video tutorials on mathematical disposition, controlling for learning environment, yielded an estimated Beta of 0.518, with a corresponding p-value of 0.000, which is less than the 0.05 level of significance. Hence, the null hypothesis was rejected. This indicates that the direct effect is significant. This implies that students independently enhance their attitudes, confidence, and engagement in mathematics using video tutorials regardless of external classroom conditions. Moreover, the indirect effect of math video tutorials on mathematical disposition through the learning environment was estimated at 0.184. The corresponding p-value of 0.012 is less than the 0.05 level of significance. Thus, the null hypothesis was rejected, indicating that the indirect effect is significant. This implies that math video tutorials improve students' mathematical disposition by enhancing the learning environment, creating a more engaging and supportive setting that positively influences students' attitudes toward mathematics. Consequently, the total effect of math video tutorials on mathematical disposition was estimated at 0.702. The corresponding p-value of 0.000 is less than the 0.05 level of significance. Therefore, the null hypothesis was rejected, indicating that the total effect of math video tutorials on the criterion is significant. This implies that math video tutorials have a strong overall influence on students' mathematical disposition through both direct and indirect pathways, as they not only directly enhance students' disposition but also strengthen the learning environment, resulting in a greater combined positive impact.

The table likewise reports a mediated proportion of 0.2625, indicating that the learning environment plays a moderate role in mediating the relationship between math video tutorials and student mathematical disposition. As both direct and indirect effects are significant, this finding supports partial mediation, suggesting that math video tutorials influence mathematical disposition both through the learning environment and through additional mechanisms.

1.10. Math Video Tutorials and Mathematical Disposition

The finding that math video tutorials have a moderately high, significantly positive correlation with student mathematical disposition supports the study of Zhang et al. (2025), which found that active learning strategies in video learning significantly improved motivation, retention, comprehension, and transfer, thus supporting the idea that well-designed video instruction can positively influence learner academic engagement and affective outcomes. Similarly, the current finding also affirms Jiang et al. (2022), who reported that in

mathematics classes using micro-lectures, student attitudes toward the method were the strongest positive factor in learning satisfaction, highlighting how video-based learning, while enhancing satisfaction, also fosters a positive disposition toward mathematics. On the contrary, the current finding contradicts Turbanada et al. (2025), who suggested that YouTube video tutorials had no significant effect on student mathematical performance compared with traditional instruction in a study involving 120 Grade 7 students. Compared to the study of Turbanada et al., the current study has a sample of 168 Grade 10 students and it found a significant positive correlation between math video tutorials and mathematical disposition. The distinction could lie in grade level, since older students may demonstrate stronger self-regulation and greater involvement with independent learning resources, such as video tutorials.

1.11. Learning Environment and Mathematical Disposition

The finding that the learning environment has a moderately high, significantly positive correlation with mathematical disposition aligns with Schmitt-Cerna et al. (2024), who reported a significant positive relationship between student perceptions of virtual teaching and their attitudes toward mathematics, indicating that more favorable perceptions of the learning environment are associated with better attitudes toward the subject. Likewise, this current finding corroborates the idea of Su (2023), explaining that the perceived mathematics learning environment had a significant positive impact on mathematics learning attitude, further suggesting that a conducive learning setting helps cultivate more positive learner orientation toward mathematics. On the other hand, this finding contrasts with the study of Sydänmaanlakka et al. (2024), who found that learning environments are generally favorable but may not always enhance student emotional engagement or performance, particularly in distance learning, where some high-performing students reported negative emotions and decreased engagement. Their study suggests that the effectiveness of a supportive environment may vary based on other external factors.

1.12. Mediating Effect of Learning Environment

The finding of this study, that the learning environment partially mediates the relationship between math video tutorials and mathematical disposition, affirms the study by Zhang et al. (2024), emphasizing that structured instructional support and guided engagement during video-based learning enhance student understanding, participation, and emotional engagement in mathematics learning contexts. Moreover, the current finding supports Malaluan and Andrade (2023), who found that video-based instructional tools embedded with contextualized questions improve the learning environment by promoting active engagement, sustaining student interest, and fostering a deeper understanding of mathematical concepts. In contrast, this current finding contradicts the claim of Navarrete et al. (2025), arguing that the effectiveness of video-based learning is highly dependent on instructional design and learner characteristics and attitudes, suggesting that videos alone may not always lead to positive outcomes without an appropriate learning environment.

4. Conclusion

Based on the findings, the learning environment partially mediates the relationship between math video tutorials and mathematical disposition. Hence, this conclusion partly affirms Social Cognitive Theory, which posits that the dynamic interaction between environmental, personal, and behavioral factors shapes human behavior.

5. Recommendation

Based on the conclusion, it is recommended that future research may explore additional mediating variables to account for the 73% of the unexplained variance in the mediation. Curriculum developers, in coordination with teachers, may enhance students' mathematical disposition to improve the learning environment by integrating structured technology-based resources such as guided math video tutorials, interactive digital platforms, and collaborative blended learning activities into the mathematics curriculum.

Acknowledgements

I would like to express my deepest appreciation to all individuals who contributed to the successful completion of this research. I am especially grateful to Dr. Carlito P. Yurango, my research adviser, for his valuable guidance, continuous encouragement, and unwavering support throughout this study. To my family, thank you for your unending love and continuous support that motivated me to persevere. Above all, I give my deepest thanks to God Almighty, the source of wisdom, strength, and knowledge, for His endless blessings, guidance, and unconditional love throughout this journey.

References

Abrar, M. N. F., Zhang, H., & Jiang, Y. (2024b). Suggested guidelines in reporting results from mediation analysis, standardized or unstandardized? PLoS ONE, 19(9), e0310429. https://doi.org/10.1371/journal.pone.0310429

Abu-Taieh, E., AlHadid, I., Masa'deh, R., Alkhawaldeh, R. S., Khwaldeh, S., & Alrowwad, A. (2022). Factors Influencing YouTube as a Learning Tool and Its Influence on Academic Achievement in a Bilingual Environment Using Extended Information Adoption Model (IAM) with ML Prediction—Jordan Case Study. Applied Sciences, 12(12), 5856. https://doi.org/10.3390/app12125856

Almalawi, A., Soh, B., Li, A., & Samra, H. (2024). Predictive Models for Educational Purposes: A Systematic review. Big Data and Cognitive Computing, 8(12), 187. https://doi.org/10.3390/bdcc8120187

Aquino, A. S., & Ibarra, F. P. (2023). Correlational analysis on mathematical disposition and mathematical achievement among selected senior high school students at San Jose City National High School. Journal of Higher Education Theory and Practice, 24(11), Article 7413. https://doi.org/10.33423/jhetp.v24i11.7413

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice-Hall.

Cagulada, J. B. P., & Ucang, J. T. (2025). The Relationship between Mathematical Disposition and Academic Performance among Junior High School Students. Ignatian International Journal for Multidisciplinary Research, 3(5), 344–356. https://doi.org/10.5281/zenodo.15389178

Camacho, R. (2025). Analysis on the attitudes and mathematics proficiency among the first- year students in a higher education institution. Research in Social Sciences, 8(3), 130-137. https://doi.org/10.53935/26415305.v8i3.407

Colita, M., & Genuba, R. L. (2019). School climate and mathematical disposition of Grade 10 students. International Journal of Trends in Mathematics Education Research, 2(4), 173–178. https://doi.org/10.33122/ijtmer.v2i4.75

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

Creswell, J. W., & Creswell, J. D. (2023). Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.). SAGE Publications.

Deal, E., Mooney, E., Cullen, A., Kroesch, A., Bajwa, N. P., Corven, J., &MacDonald, B. (2024). Accessing and assessing components of elementary and middle school students' mathematical disposition through metaphors. Investigations in Mathematics Learning, 17(3), 259–275. https://doi.org/10.1080/19477503.2024.2419291

Dipon, C. H., & Dio, R. V. (2024). A Meta-Analysis of the effectiveness of Video-Based instruction on students' academic performance in science and Mathematics. International Journal on Studies in Education, 6(4), 732–746. https://doi.org/10.46328/ijonse.266

Etcuban, J. O., Capuno, R., Necesario, R., Espina, R., Padillo, G., & Manguilimotan, R. (2019b). Attitudes, study habits, and academic performance of junior high school students in mathematics. International Electronic Journal of Mathematics Education, 14(3). https://doi.org/10.29333/iejme/5768

Faujiah, E., Salim, F., & Bunyamin,M.A.H.(2025). Enhancing Mathematical Disposition Through Schema-Based Instruction. Journal of Learning Innovation and Environment, 1(1), 1-8.

Hassan, M., & Hassan, M. (2024, November 18). Correlation Analysis – Types, Methods and examples. Research Method.

Husna, A., & Hanggara, Y. (2022). Analyzing students' problem-solving ability based on mathematics disposition during the COVID-19 pandemic. International Journal on Emerging Mathematics Education, 6(1), 15–28. https://doi.org/10.12928/ijeme.v6i1.21062

Iliyasu, R., & Etikan, I. (2021). Comparison of quota sampling and stratified random sampling. Biometrics & Biostatistics International Journal, 10(1), 24–27. https://doi.org/10.15406/bbij.2021.10.00326

Inyang, A. E., Ushie, E. I., Igwebuike, O. & Benimpuye, A. E. (2023). Mathematics Disposition and Teachers' Readiness to Adopt Information and Communication Technology (ICT) for Mathematics Instruction in Cross River State. Interdisciplinary Journal of Science Education, 4 (2): 51-60.

Jiang, P., Wijaya, T. T., Mailizar, M., Zulfah, Z., & Astuti, A. (2022). How Micro-Lectures Improve learning satisfaction and Achievement: A combination of ECM and extension of TAM models. Mathematics, 10(19), 3430. https://doi.org/10.3390/math10193430

Kahrmann, C. R. (2016). Efficacy of Math Video Tutorials on Student Perception and Achievement. Doctor of Education in Teacher Leadership Dissertations. Paper 9.

Kusmaryono, I., Suyitno, H., Dwijanto, D., & Dwidayati, N. (2019). The effect of mathematical disposition on mathematical power formation: Review of dispositional mental functions. International Journal of Instruction, 12(1), 343– 356. https://doi.org/10.29333/iji.2019.12123a

Lohr, S. L. (2021). Sampling: Design and analysis (2nd ed.). Chapman & Hall/CRC.

Malaluan, J., & Andrade, R. (2023). Contextualized Question-Embedded Video-Based Teaching and Learning Tool: A pathway in improving students' interest and mathematical critical thinking skills. International Journal of Science Technology Engineering and Mathematics, 3(2), 39–64. https://doi.org/10.53378/352990

Montano, E. P. (2024). Mathematical proficiency, English language competence, emotional intelligence, and mathematics achievement of Grade 10 learners: A correlational analysis. International Research Journal of Modernization in Engineering Technology and Science. https://www.doi.org/10.56726/IRJMETS59860

Navarrete, E., Nehring, A., Schanze, S., Ewerth, R., & Hoppe, A. (2025). A Closer Look into Recent Video-based Learning Research: A Comprehensive Review of Video Characteristics, Tools, Technologies, and Learning Effectiveness. International Journal of Artificial Intelligence in Education, 35(4), 1631–1694. https://doi.org/10.1007/s40593-025-00481-x

Nurhayati, H., Hasanah, A., & Dasari, D. (2025). The impact of mathematical disposition and self-efficacy beliefs on secondary school students' mathematical literacy. Jurnal Elemen, 11(1), 1–14. https://doi.org/10.29408/jel.v11i1.26873

Pahilan, L., & Comahig, A. (2025). Study habits, learning environment and mathematics performance of Grade 11 STEM students. Psychology and Education a Multidisciplinary Journal, 39(2), 200–214. https://doi.org/10.70838/pemj.390208

Rahmawati R., Zaenuri Z., Mulyono o, & Adi Nur C. (2022). Profile of Mathematical Disposition of Junior High School Students in Mathematics Learning. Proceedings of International Conference on Science, Education, and Technology, 8(1), 829–833. https://proceeding.unnes.ac.id/ISET/article/view/1845

Raosoft. (2021). Sample size calculator. Retrieved from https://www.raosoft.com/samplesize

Schmitt-Cerna, I., Ramírez-Olascuaga, M., Arhuis-Inca, W., Ipanaqué-Zapata, M., Arhuis-Inca, S. R., & Bazalar-Palacios, J. (2024). Relationship between attitudes toward mathematics and perceptions of virtual teaching in the COVID-19 context. Frontiers in Education, 9. https://doi.org/10.3389/feduc.2024.1414114

Steyerberg, E. W. (2019). Clinical prediction models. In Statistics for biology and health. https://doi.org/10.1007/978-3-030-16399-0

Stockemer, D., & Bordeleau, J.-N. (2023). A short introduction to survey research. In Quantitative Methods for the Social Sciences (pp. 23–35). Springer Texts in Political Science and International Relations. https://doi.org/10.1007/978-3-031-34583-8_3

Su, Y. (2023). The relationship between students' mathematics learning environment, attitude and achievement: A mediation model. Frontiers in Educational Research,6(12), 7–14. https://doi.org/10.25236/FER.2023.061202

Sydänmaanlakka, A., Häsä, J., Holm, M. E., & Hannula, M. S. (2024). Mathematics-related achievement emotions – Interaction between learning environment and students' mathematics performance. Learning and Individual Differences, 113, 102486. https://doi.org/10.1016/j.lindif.2024.102486

Tuba, K., & Espinosa, D. (2024). The Mediating Effect of Self-Regulation on the Relationship between Mathematical Disposition and Mathematics Proficiency among Mathematics Education Students. Zenodo (CERN European Organization for Nuclear Research). https://doi.org/10.5281/zenodo.14642045

Turbanada, A. L., Corocoto, Q. P. A., & Corachea, T. M. (2025). Evaluating the impact of YouTube videos on students' performance in mathematics education. Journal of Scientific Research and Reports, 31(6), 43–53. https://doi.org/10.9734/jsrr/2025/v31i63107

Wang, M., Walkington, C., & Rouse, A. (2022). A Meta-Analysis on the Effects of Problem-Posing in Mathematics Education on performance and Dispositions. Investigations in Mathematics Learning, 14(4), 265–287. https://doi.org/10.1080/19477503.2022.2105104

Yulia, Kustati, & Afriadi (2023). Analysis of students' mathematical disposition and learning independence through blended learning in West Sumatra. Al-Jabar Jurnal Pendidikan Matematika, 15(1), 145–157. https://doi.org/10.24042/ajpm.v15i1.21209

Zhang, C., Wang, Z., Fang, Z., & Xiao, X. (2024). Guiding student learning in video lectures: Effects of instructors' emotional expressions and visual cues. Computers & Education, 218, 105062. https://doi.org/10.1016/j.compedu.2024.105062

Zhang, Y., Li, R., Pi, Z., & Yang, J. (2025). Active learning strategies in video learning: A meta-analysis. Educational Research Review, 48, 100708. https://doi.org/10.1016/j.edurev.2025.100708

Zimba, O., & Gasparyan, A. Y. (2023). Designing, Conducting, and reporting survey Studies: A primer for researchers. Journal of Korean Medical Science, 38(48), e403. https://doi.org/10.3346/jkms.2023.38.e403