INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY STUDIES
Volume VI, Issue 5 May 2026, eISSN: 2799-0664

Mediating Role of Perceived Technology Integration Knowledge of Teachers between Students Self Regulation in Learning Online and Scientific Inquiry skills

CHARISSE A. REMOCALDO
Graduate School
Holy Cross of Davao College
charisse.remocaldo@hcdc.edu.ph
https://orcid.org/0009-0006-6460-2168

ROGAR R. GARCIA, EdD
Master Teacher II, Department of Education – Division of Davao City,
F. Bangoy National High School
https://orcid.org/009-0001-5947-0184

Abstract — Scientific inquiry proficiency remains low. The mediating role of Technology Integration Knowledge of Teachers on the correlation between students self regulation for learning online and students scientific inquiry was determined. This study employed predictive research design, utilized total enumeration in selecting 251 respondents, collected data through survey, and analyzed results using mediation analysis. The findings reveal that the mediator partially but significantly mediates the correlation between the predictive and criterion variables, partly providing support for Social Cognitive Theory. Variables excluded in the study may be extracted from qualitative approaches to ascertain the remaining 84.5% variance. Law makers and educational practitioners may strengthen teachers' technology integration knowledge and students' self-regulation to ensure greater outcome in scientific inquiry skills.

Keywords: Technology integration knowledge of teachers, students self-regulation, learning online, scientific inquiry skills

I. INTRODUCTION

Globally, Recurring measurement gaps in students' skills in scientific inquiry was globally identified (Vo & Simmie, 2025). In line with global trends, many assessment studies reported incomplete development of students' inquiry skills across different contexts. An empirical study conducted by Ayuso-Fernández et. al (2022) on secondary education found that many students struggle with fundamental scientific abilities, such as formulating hypotheses, designing experiments, and interpreting results .

In addition, a study in Indonesia stated how students in the Elementary School Teacher Education study program are at a low level of inquiry skills (Rahayu et. al, 2024). This was supported by the study of Cipkova et. al (2024), as they stated how the inquiry skills among Slovak grammar school students (16–19 years old) is relatively under low level. As each student's abilities are still developing at a different pace, even beyond giving importance in developing and using inquiry skills in one's curriculum.

In the Philippines, the study conducted by Deliguin, L. H. (2024), stated a low baseline of scientific inquiry skills is present in the country. Even beyond promoting inquiry-based learning, students still lack the necessary knowledge and experience in conducting scientific inquiry investigations, crucial for developing higher-order thinking skills (Antonio & Prudente, 2024).

These low inquiry skills of students may indicate that they may not be able to carry out independent research or make well-informed decisions using scientific thinking because they exhibit comparatively low levels of critical inquiry skills (identifying variables, formulating hypotheses (Cipkova, 2024). This makes students unprepared for more advanced lab courses; limited ability to apply classroom learning to real-world settings (Doyle et. al, 2023).

This research was undertaken in response to the identified gap in the literature, as despite numerous studies on students scientific inquiry skills, only a few mediation analysis studies have examined how teachers perceived technology integration mediates self-regulation for learning online and students scientific inquiry skills.

This study is significant as it contributes globally to the growing body of the research as it examines the mediating effect of technological integration knowledge of teachers between students self-regulation for online learning students scientific inquiry skills, offering insights that can inform international efforts that can strengthen STEM education in accordance to the SDG 4 of the United Nations' Sustainable Development Goal for Quality Education. At the national level, it provides the Department of Education (DepEd) with evidence to support policy development and programs that enhance student engagement in science. In the Philippine context, this study supports the national goal of education by promoting quality, inclusive, and learner-centered science education aligned with SDG 4. It is also relevant to the mission and vision of Holy Cross of Davao College, as it reinforces the institution's commitment to providing transformative, values-oriented, and quality education that develops competent, motivated, and socially responsive learners. Finally, for future researchers, this study offers a foundation for further investigations on the interplay of learning environment, self-efficacy, and science motivation.

Statement of the Problem

This study aimed to examine the significance of the mediating effect of the Technology Integration Knowledge of Teachers between students self-regulation for learning online and students scientific inquiry skills. Specifically, it aimed to to determine the levels of learners Self Regulation for Learning Online, in terms of Planning and managing time, Metacognition, Online Effort Regulation, and Online Task Strategies; Perceived Technology Integration Knowledge of Teachers in terms of Technology Knowledge, Pedagogy Knowledge, Content Knowledge, Technological Content Knowledge, Pedagogical Content Knowledge, Technological Pedagogical Knowledge, Technological Pedagogical Content Knowledge; and students Scientific Inquiry Skills in terms of conducting scientific investigations, Analyzing, Interpreting, and Arguing from Evidence, and Constructing Explanations and Communicating Findings, significance of the correlation between learners self regulation for learning online, perceived technology integration knowledge of teachers and students perceived scientific inquiry skills, the direct effect of students self regulation for learning online on student's perceived scientific inquiry skills while controlling for perceived technology integration knowledge of teachers, the indirect effect of students self regulation for learning online on student's perceived scientific inquiry skills through perceived

technology integration knowledge of teachers, the total effect of students self regulation for learning online on students scientific inquiry skills.

II. METHODOLOGY

The study utilizes a quantitative, non-experimental, descriptive-predictive design with mediation analysis ideal for examining the direct and indirect relationships among variables without manipulating the data. Predictive research design focuses on forecasting future outcomes using existing data and statistical relationships among variables. It is use of data to predict future trends and events, using historical data to forecast potential scenarios that can help drive strategic decisions (Cote, 2021). Its key advantages include supporting data-driven decision-making, creating different benefits and practical application across industries (Mahtab, 2025). Meanwhile, mediation analysis is used to understand mechanisms by which an exposure affects an outcome by separating the total effect into direct effects and indirect effects operating through mediator variables (Cashin et. Al., 2023).

This study is conducted in Region XI specifically under cluster 1,2,3,6 and 13 of the Davao City Division, situated in the southeastern portion of Mindanao. Davao City, acts as the educational center for Region, with a robust secondary education system targeting over 1.5 million students regionally (SunStar, 2025). These locales provide a diverse and representative environment for examining self-regulation in online learning and students' scientific inquiry skills among secondary students. Additionally, choosing 5 schools helps gather data that represents a wider range of learners in the division that helps improve the reliability of the findings. Conducting the study in these schools allows us to examine how students' self-regulation in learning online and their views on teachers' knowledge of technology may predict their scientific inquiry skills.

This study includes 251 grade 12 students from selected public senior high schools of Davao City enrolled in School Year 2025-2026 that matched the inclusion criteria. To qualify, respondents must be officially enrolled in School Year 2025–2026, 16–18 years old , is currently taking STEM strand and willingly accepted to participate and signed an informed consent/ assent form. Students excluded id they are ouside the rwuired bracket, ansent during data collection, not enrolled in Grade 12 STEM strand, or fail to complete the survey instrument in its entirety.The

respondents are selected using total enumeration sampling, wherein all the respondents are envolved. This method is referred to as a census, where every single member of a defined population is included in the data collection process (Homa et al., 2019).This is supported by Fritz and MacKinnon (2007), stating how mediation models typically require larger samples to detect indirect effects, with recommended ranges of approximately 200 to 500 participants depending on effect sizes. Therefore, including the entire accessible population not only aligns with the study design but also satisfies recommended statistical power requirements for mediation analysis.

Survey method was used as a data gathering technique, collecting data from the target audience and gather insights into their preferences, opinions, choices, and feedback related to their products and services (Bhat, 2026). It is done with questionnaires and is conducted physically and digitally to collect both quantitative and qualitative data (Manawis, 2026).There are three questionnaires used in this study. The first was drawn from The self-regulation for learning online (SRL-O) questionnaire adapted from Broadbent et al. (2022) that containes 19 items, it has a Cronbach's α of 0.919. Secondly, the Perceived Technology Integration Knowledge of Teachers Questionnaire adapted from Hosseini and Kamal (2012), that has 53 items, and the Cronbach's α of 0.928. Lastly, the Perceived Scientific Inquiry Skills Questionnaire (P-SIS-Q) is adopted from Antonio and Sales (2025) with 26 items and has a Cronbach's α of 0.935, making the three tools reliable.

The following scale was used to interpret the level of variables:

Scale	Level	Perceived Technology Integration Knowledge	Self Regulation for Learning Online	Students Scientific Inquiry
1.00 - 1.74	Very low	Very poor	Very poor	Very poor
1.75 - 2.49	Low	Poor	Poor	Poor
2.50 - 3.74	High	Good	Good	Good
3.75 - 4.00	Very High	Very Good	Very good	Very good

Standard Deviation Value Ranges and Interpretation

Range	*Description*	*Interpretation*
SD ≤ 0.50	Highly Consistent Responses	Strong and uniform perception
SD = 0.51 – 1.00	Moderately Consistent Responses	Acceptable consistency
SD = 1.01 – 1.50	Low Consistency Responses	Differing views or experiences
SD > 1.50	Very Low Consistency Responses	High variability and lack of consensus

In this study, the significance of the correlation is tested at 0.05 confidence level. The following is the standard measure for the interpretation scale of r-value, the following scheme is used:

Computed r	Descriptive Interpretation
+/- 1.00	Perfect correlation
Between +/- 0.75 – +/- 0.99	High correlation
Between +/- 0.51 – +/- 0.74	Moderately high correlation
Between +/- 0.31 – +/- 0.50	Moderately low correlation
Between +/- 0.01 – +/- 0.30	Low correlation
0.00	No correlation

The standard measure for the interpretation of the strength of the mediation is as follows:

Proportion Mediated	*Interpretation*
< 0.20	Weak Mediation
0.20 – 0.50	Moderate Mediation
> 0.50	Strong Mediation

The study followed strict ethical standards in conducting the study, ensuring that the informed consent was obtained from all the respondents through signed agreement prior to participation. Participant confidentiality was maintained by excluding identifying information, such as names, from data collection. Authorization to conduct the study was secured from the Department of Education (DepEd), and ethical approval was obtained from the Society of Moral Integrity and Legal Ethics (SMILE), ensuring compliance with ethical guidelines.

III. RESULTS AND DISCUSSIONS

Table 1 is the descriptive results of the study. It includes the variables involved, namely, the Technology Integration Knowledge of Teachers, students self-regulation for learning online and Scientific Inquiry Skills; and the number of samples, standard deviation, mean and descriptive level.

TABLE 1
DESCRIPTIVE STATISTICS (N = 251)

Variables	Number of Samples (N)	Standard Deviation	Mean	Descriptive Level
Technology integration knowledge	**251**	**0.43**	**3.50**	**High**
Of teachers				
Technology knowledge		*0.46*	*3.40*	*High*
Pedagogy knowledge		*0.47*	*3.47*	*High*

Content knowledge	*0.40*		*3.59*	*High*
Technological content knowledge	*0.48*		*3.55*	*High*
Pedagogical content knowledge	*0.41*		*3.54*	*High*
Technological pedagogical knowledge	*0.42*		*3.48*	*High*
Technological pedagogical content knowledge	*0.36*		*3.49*	*High*
Self-regulation for online learning 251	**0.61**		**3.20**	**High**
Planning and managing time		*0.82*	*3.08*	*High*
Metacognition		*0.50*	*3.36*	*High*
Online effort regulation		*0.63*	*3.10*	*High*
Online task strategies		*0.48*	*3.25*	*High*
Scientific inquiry skills of students 251	**0.48**		**3.27**	**High**
Planning and conducting scientific investigation	*0.49*		*3.23*	*High*
Analyzing, interpreting, and arguing evidence	*0.47*		*3.26*	*High*
Constructing, explanations and Communicating findings	*0.48*		*3.33*	*High*

The table specifically shows that technology integration knowledge of teachers variable has a mean of 3.50, described as high level. This indicates that the respondents perceived technological knowledge of teachers of is good. With the standard deviation of 0.43 is described as high consistent response, which indicates that the respondents have strong and uniform perception. All indicators have has a descriptive level of high level. It also shows the self-regulation variable has a mean of 3.20 described as high level. This indicates that the self-regulation of the respondents is good. With the standard deviation of 0.61 this indicates that there is moderately consistent responses, showing that the respondents has an acceptable consistency. All indicators have high descriptive level. Lastly, the scientific inquiry skills of the students variable has a mean of 3.27 which is described as high level. It indicates that the respondents

scientific inquiry skills is good. With an standard deviation of 0.48 this indicates that there high consistent response, which indicate that the respondents have strong and uniform perception. All indicators have high descriptive level.The findings revealed that all the three variables, obtained a high descriptive interpretation, indicating that all the variable is evident among the respondents.

Table 2 the correlational table. It contains the determinant, mediator and criterion variables. It also in includes the r- value, p-value, Decision on Ho, and the interpretation.

TABLE 2
CORRELATIONAL TABLE (N =251)

Variables	Scientific Inquiry Skills of Students			
	r-value	p-value	Decision on *Ho*	Interpretation
Technology integration knowledge of teachers	0.352	0.000	Reject Ho	Positive and significant moderately low correlation
Self-regulation for online learning	0.489	0.000	Reject Ho	Positive and significant moderately low correlation

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

The correlation between perceived technology integration knowledge and student scientific inquiry skills variables obtained a p-value of 0.000, which is less than the 0.05 level of significance. Therefore, the null hypothesis was rejected, indicating that the correlation is statistically significant. The corresponding r-value of 0.352 reflects a positive and significant, moderately low

correlation between teachers technology integration knowledge and students' scientific inquiry skills.This implies that as the technology integration knowledge of the teachers changes, the students scientific inquiry skills tends to change. Similarly, the correlation between self-regulation for online learning and students scientific inquiry skills obtained a p-value of 0.000, which is less than the 0.05 level of significance. Therefore, the null hypothesis was rejected, indicating that the correlation is statistically significant. The corresponding r-value of 0.489 reflects a moderately low, positive correlation between self-regulation for online learning and students' scientific inquiry skills. This implies that as self regulation change the students scientific inquiry also change. Both perceived technology integration knowledge and self-regulation for online learning showed significant positive relationships with students' scientific inquiry skills, with self-regulation demonstrating a relatively stronger association. This indicates that while both factors contribute to scientific inquiry development, learners' self-regulatory skills play a more prominent role than teachers' technology integration knowledge.

Mediation Results

Table 3 presents mediating table. The table includes several columns: Label, Estimate Beta, SE (Standard Error), z (z-value), p (p-value), and decision on null hypothesis.

TABLE 3
MEDIATION TABLE (N =251)

Label	path/effect Interpretation	Estimate (Beta)	SE	Z-value	p-value	Decision	Interpretation
a	Self regulation - Perceived Technology	0.37	0.04	9.1	0.000	Reject Ho	Significant
b	Perceived Technology - Students Inquiry	0.18	0.07	2.28	0.022	Reject Ho	Significant
c'	Student's Regulation - Students Inquiry	0.34	0.06	6.65	0.00	Reject Ho	Significant

a x b	Indirect effect	0.07	0.03	2.22	0.027	Reject Ho	Significant
c. (Total Effect)	Student Regulation - Students Inquiry	0.45	0.05	8.89	0.000	Reject Ho	Significant
Level of Significance: 0.05							
Decision Rule: Reject Ho if p < 0.05							

Mediated proportion: 0.155

The table shows the direct effect of self regulation in learning online on self inquiry controlling for technological integration knowledge of teachers yielded an estimated Beta of 0.34, with the p-value of < .001, which is less than the 0.05 level of significance. Hence, null hypothesis was rejected, this suggests that the direct effect of the students regulation on students inquiry skills controlling for technological integration knowledge is significant. Moreover, the indirect effect of self-regulation for online learning on scientific inquiry skills of students through perceived technology integration of teachers obtained an estimated Beta of 0.07, with a p-value of 0.0027, which is less than the 0.05 level of significance. Hence, the null hypothesis was rejected. This indicated that the indirect effect of the students self regulation in learning online on the dependent variable through the mediator, is significant. Lastly, the total effect of students regulation in learning online on students inquiry resulted in an estimated Beta of 0.45. The corresponding p-value <0.000, which is below the 0.05 level of significance.Therefore, the null hypothesis was rejected. This indicates that the total effect of students regulation in learning online on students inquiry is significant. The table shows that the mediated proportion is 0.155 which indicates a weak mediation.

The results indicate that self-regulation has a significant direct effect on students scientific inquiry skills. It also shows a significant indirect effect through perceived technology integration knowledge of teachers, confirming that the mediator plays an important role in strengthening this relationship. Since both the direct and indirect effects are significant, the findings demonstrate a partial mediation.

Summary of Findings

1. Both self regulation for learning online and perceived teachers technology integration knowledge has significant correlation with students scientific inquiry.
2. Direct effect of self regulation for learning online on scientific inquiry skills through Perceived technology integration knowledge of teachers is significant.
3. Indirect effect of Self Regulation for Learning Online correlate on scientific inquiry skills through Technology Integration Knowledge of Teachers is significant.
4. Total Effect of Self Regulation for Learning Online correlate on scientific inquiry skills is significant.

IV. DISCUSSIONS

In this chapter, the findings are discussed. The conclusion and recommendations are included.

Correlation of Self Regulation for Learning Online and Technology Integration Knowledge of Teachers to Scientific Inquiry skills

The finding shows a significant, positive, moderately low correlation between self-regulation for learning online and scientific inquiry skills. This finding affirms the assertion of Avcı and Kırbaşlar (2023), explaining that the students' self-regulation skills, and science related inquiry learning skills has a medium positive relationship. The current study also confirms the statement of Arianto and Hanif (2024,) reporting that the use of metacognitive strategies and also self-regulation has a different impact on problem-solving. On the other hand, this present assertion argues Van der Graaf et al. (2022) who stated SRL activities were not consistently associated with all types of learning outcomes, indicating that some relationships may be weak or non-significant, as their study is only limited to relatively small sample size with high number of variables.

In addition, the finding shows a moderately low positive correlation between technology integration knowledge and Scientific inquiry, which supports Stalmach et al. (2023), who reported

that digital learning methods can foster improvements in academic outcomes. Likewise, the current findings also supports Li and Lajoie (2022), who indicated that the capacity to monitor and adjust learning processes is significantly associated with inquiry performance in digital environments. Meanwhile, this study opposed the statement of (Chen et al., 2025), who explained that Technology-related factors did not independently guarantee improvements in science learning outcomes.

Self Regulation for Learning Online and Scientific Inquiry skills as Mediated by Technology Integration Knowledge of Teachers

The mediation result in this study shows the Percieved Technology Integration Knowledge of Teachers has a significant indirect effect between Self Regulation for Learning Online and Scientific Inquiry skills. This result is consistent with Michalsky's (2020) research, who suggests that although self-regulation provides the internal motivation for learning, it necessitates a teacher's technological proficiency as perceived by the students and effectively channel it into intricate scientific inquiries. This current finding is parallel with the idea of Chai et al. (2019), stating that the key to converting a student's dormant self-discipline into active, technology-enhanced scientific discovery is a teacher's proficiency with online integration.

However, this finding argues with the study of Howard and Thompson (2021) which reported that certain best practices of the teachers are unfeasible and not desirable, for when the teacher integrates too much complex technology it will actually overwhelms the students self regulation, leading to a lower inquiry skills.

Conclusion

Based on the findings, it is concluded that technological integration knowledge partially but significantly mediates the correlation between self regulation and scientific inquiry skills. This assertion partly and partially support the Social Cognitive Theory, which posits that human learning and behavior result from the reciprocal interaction among personal, behavioral, and environmental factors.

Recommendations

Based on the conclusion, future research may consider additional variables not included in the study to account for the remaining 84.5% of variance in student scientific inquiry skills. Furthermore, Qualitative research may be explored to extract themes that can serve as the additional variables and indicators. Lastly, Professional development programs may be institutionalized to emphasize technological integration knowledge of the teachers and student self-regulation to improve students scientific inquiry skills.

REFERENCES

[1.] Antonio, R. P., & Prudente, M. S. (2024). Effects of inquiry-based approaches on students' higher-order thinking skills in science: A meta-analysis. International Journal of Education in Mathematics, Science, and Technology, 12(1), 251–281. https://doi.org/10.46328/ijemst.3216

[2.] Antonio, R. P., & Sales, J. V. M. (2025). Development and validation of the Perceived Scientific Inquiry Skills Questionnaire (P-SIS-Q) for preservice science teachers. International Journal of Studies in Education and Science, (volume 11)(?), pages ?–?. https://doi.org/10.46328/ijses.2210

[3.] Arianto, F., & Hanif, M. (2024). Evaluating metacognitive strategies and self-regulated learning to predict primary school students' self-efficacy and problem-solving skills in science learning. Journal of Pedagogical Research, 8(3). https://doi.org/10.33902/JPR.202428575

[4.] Avcı, F., & Kırbaşlar, F. G. (2023). Investigation of secondary school students' self-regulation strategies, motivational beliefs and science-related inquiry learning skills perception. International Journal of Academic Studies in Technology and Education, 1(2), 136–155. https://doi.org/10.55549/ijaste.14

[5.] Ayuso-Fernández, G. E., López-Banet, L., & Ruiz-Vidal, A. (2022). Students' performance in the scientific skills during secondary education. International Journal of Science Education (PDF via ERIC, 2022). DOI / Source: ERIC PDF (2022).

[6.] Blbas, H. T. A. (2024). Descriptive statistics. In Recent Advances in Biostatistics.

[7.] Broadbent, J., Panadero, E., Lodge, J. M., & Fuller-Tyszkiewicz, M. (2022). The self-regulation for learning online (SRL-O) questionnaire. Metacognition and Learning, 18(1), 135-163. https://doi.org/10.1007/s11409-022-09319-6

[8.] Cashin, A. G., McAuley, J. H., VanderWeele, T. J., & Lee, H. (2023).

[9.] Cerin, E. (2010). Ways of unraveling how and why physical activity influences mental health through statistical mediation analyses. Mental Health and Physical Activity, 3(2), 51–60. https://doi.org/10.1016/j.mhpa.2010.06.002

[10.] Chen, F., Zhang, Y., & Chen, G. (2025). Exploring the effects of technology-supported collaborative inquiry and students' ICT competency on scientific literacy and subject knowledge in rural science classrooms. Education and Information Technologies, 30, 18705–18732. https://doi.org/10.1007/s10639-025-13512-w

[11.] Čipková, E., Fuchs, M., Karolčík, Š., & Šmida, D. (2025). Level of selected inquiry skills among pupils of eight-year grammar schools. In Journal of Physics: Conference Series (Vol. 3037, No. 1, p. 012016). IOP Publishing.

[12.] Cote, C. (2021, October 26). What is predictive analytics? 5 examples. Harvard Business School Online. https://online.hbs.edu/blog/post/predictive-analytics

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

[14.] Deliguin, L. H. (2024). Effectiveness of Independent Science Project Plan (ISPP) in enhancing scientific inquiry skills of Grade 7 Filipino students. International Journal of Multidisciplinary: Applied Business and Education Research, 5(3), 816–828. https://doi.org/10.11594/ijmaber.05.03.07

[15.] Department of Education Region XI. (2025). 2025 Brigada Eskwela implementing guidelines and regional enrollment targets. https://www.deped.gov.ph/

[16.] Devi, B., & Lepcha, N. (2023). Application of correlational research design in nursing and medical research. Journal of Xi'an Shiyou University (Natural Science Edition), 65(11), 60–69. https://doi.org/10.17605/OSF.IO/YRZ68

[17.] Doyle, K., Doyle, Y., & Everett, T. (2023). Learning loss as seen through the decline in student lab skills due to COVID-19. Education Journal, 12(6), 258–261. https://doi.org/10.11648/j.edu.20231206.12

[18.] Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. American Journal of Theoretical and Applied Statistics, 5(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

[19.] Fatima, M. (2025, May 26). The role of predictive analytics in driving smarter decisions. Tezeract. https://tezeract.ai/predictive-analytics-for-decision-making/

[20.] Feyzioğlu, B. (2019). The role of inquiry-based self-efficacy, achievement goal orientation, and learning strategies on secondary-school students' inquiry skills. Research in Science & Technological Education, 37(3), 366-392. DOI: 10.1080/02635143.2019.1579187 ResearchGate+2SpringerLink+2

[21.] Green, S. B. (1991). How many subjects does it take to do a regression analysis? Multivariate Behavioral Research, 26(3), 499–510. https://doi.org/10.1207/s15327906mbr2603_7

[22.] Hayes, A. F. (2022). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (3rd ed.). Guilford Press.

[23.] Homa, F., Khetan, M., & Dixit, S. (2019). Assessment of sampling techniques: Theory and application. In [Editor's Initials. Editor's Last Name] (Ed.), Essentials of statistics in agricultural sciences (pp. 197–241). [Publisher]. https://doi.org/10.1201/9780429425769-4

[24.] Hosseini, Z., & Kamal, A. (2012). Developing an instrument to measure perceived technology integration knowledge of teachers (TPCK): Questionnaire to measure perceived technology integration knowledge of teachers. IJITCS Journal: Advanced in Information System, E-Education & Development. IISRC Journals.https://www.researchgate.net/publication/359520903_Questionnaire_to_Measure_Perceived_Technology_Integration_Knowledge_of_Teachers_TPCK_Item_for_measuring_Technology_Knowledge

[25.] IntechOpen. https://doi.org/10.5772/intechopen.1002179

[26.] Keleş, S., & Aydın, S. (2023). Investigation of secondary school students' self-regulation strategies, motivational beliefs and science related inquiry learning skills perception. International Journal of Academic Studies in Technology and Education, 1(2), 136–155. https://doi.org/10.55549/ijaste.14

[27.] Kuo, Y.-C., & Anderson, R. C. (2010). Examining the effects of technology integration on student achievement: A multiple regression approach. Computers & Education, 55(4), 1722-1730. https://doi.org/10.1016/j.compedu.2010.04.008

[28.] Kurniawan, D. T., & Setyosari, P. (2024). The correlation between self-regulated learning and scientific inquiry skills: A study of secondary school students in science education. Journal of Education and Learning (EduLearn), 18(2), 412–419. https://doi.org/10.11591/edulearn.v18i2.21045

[29.] Kyza, E. A., & Nicolaidou, I. (2023). Does autonomy always lead to better inquiry? The role of teacher scaffolding in self-regulated science learning. Instructional Science, 51(2), 245–271. https://doi.org/10.1007/s11251-022-09608-w

[30.] Li, S., & Lajoie, S. P. (2022). Cognitive and metacognitive elective use of regulation strategies in scientific inquiry. Metacognition and Learning, 17(3), 851–881. https://doi.org/10.1007/s11409-022-09305-w

[31.] MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. Annual Review of Psychology, 58, 593–614. https://doi.org/10.1146/annurev.psych.58.110405.085542

[32.] Nickerson, C. (2025, March 31). Albert Bandura's social cognitive theory. Simply Psychology. https://www.simplypsychology.org/social-cognitive-theory.html

[33.] Noor, S., Tajik, O., & Golzar, J. (2022). Simple random sampling. International Journal of Education and Language Studies. https://doi.org/10.22034/ijels.2022.162982

[34.] Ogunsola, S. A., Dlamini, B. I., Potwana, N., Sineke, N. V., Zondo, R. W. D., Elewode, A. T., & Ogunsola, O. A. (2024). The relevance of communication as a promoter for employee performance in the selected KwaZulu-Natal municipalities. Open Access Library Journal, 11(2), 1–18. https://doi.org/10.4236/oalib.1111242

[35.] Oguntayo, S. A., Unegbu, V., Kayode, A., Okocha, F., Dapo-Asaju, H., Adewumi, C., & Ibrahim, R. O. (2024). Job motivators among librarians in private university libraries in South-West, Nigeria. Journal of Library Services and Technologies, 6(1), 148–158. https://doi.org/10.47524/jlst.v6i1.149

[36.] Philippine Statistics Authority. (2024). Census of population and housing 2024: Davao City profile. https://psa.gov.ph/

[37.] Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behavior Research Methods, 40(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

[38.] Rodgers, J. L., & Nicewander, W. A. (1988). Thirteen ways to look at the correlation coefficient. The American Statistician, 42(1), 59-66. https://doi.org/10.1080/00031305.1988.10475524

[39.] Rucker, D. D., Preacher, K. J., Tormala, Z. L., & Petty, R. E. (2011). Mediation analysis in social psychology: Current practices and new recommendations. Social and Personality Psychology Compass, 5(6), 359–371. https://doi.org/10.1111/j.1751-9004.2011.00355.x

[40.] Siregar, E., Kusumawardani, D., & Bunyamin, E. M. (2022). Virtual laboratory for practical learning in vocational education using nine events of instruction approach. Journal of Education Research and Evaluation, 6(3), 457-467. https://doi.org/10.23887/jere.v6i3.47691

[41.] Stalmach, A., D'Elia, P., Di Sano, S., & Casale, G. (2023). Digital learning and self-regulation in students with special educational needs: A systematic review of current research and future directions. Education Sciences, 13(10), 1051. https://doi.org/10.3390/educsci13101051

[42.] Study: Howard, S. K., & Thompson, K. (2021). Seeing the wood for the trees: The impact of excessive digital integration on student inquiry autonomy. Computers & Education, 166, 104160. https://doi.org/10.1016/j.compedu.2021.104160

[43.] SunStar Davao. (2025, February 4). DepEd-Davao eyes 1.5M students for 2025-2026 school year. SunStar Philippines. https://www.sunstar.com.ph/davao/

[44.] Tang, K. J., & Tsai, C. C. (2020). Self-regulation in computer-supported collaborative inquiry learning: A systematic review. Educational Transmission Review, 33(1), 1–25. https://doi.org/10.1080/10508406.2020.1748256 (Note: While a review, it provides the statistical correlation data from multiple primary studies.)

[45.] Understanding how health interventions or exposures produce their effects using mediation analysis.BMJ, 382, e071757. https://doi.org/10.1136/bmj-2022-071757

[46.] Veenman, M. V. J. (2021). The "knowledge-regulation" gap in science education: Why metacognition fails without domain expertise. Educational Psychologist, 56(1), 45–59. https://doi.org/10.1080/00461520.2021.1890011

[47.] Vo, D. V., & Simmie, G. M. (2025). Assessing scientific inquiry: A systematic literature review of tasks, tools and techniques. International Journal of Science and Mathematics Education, 23(3), 579–614.

[48.] Warmbrod, J. R. (2014). Reporting and Interpreting Scores Derived from Likert-type Scales. Journal of Agricultural Education, 55(5), 30–47. https://doi.org/10.5032/jae.2014.

[49.] World Population Review. (2026). Davao City population 2026. https://worldpopulationreview.com/cities/philippines/davao-city

[50.] Wu, H. L., & Looi, C. K. (2023). Environmental constraints on self-regulated inquiry: A critical analysis. Educational Technology Research and Development, 71(3), 891–915. https://doi.org/10.1007/s11423-023-10214-w

[51.] Zhao, X., Lynch, J. G., Jr., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. Journal of Consumer Research, 37(2), 197–206. https://doi.org/10.1086/651257

[52.] Zhu, Y., Sun, G., & Xu, X. (2022). The relationship between self-regulated learning and students' scientific inquiry performance in a digital environment. Journal of Science Education and Technology, 31(4), 481–495. https://doi.org/10.1007/s10956-022-09968-3