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MOTIVATION TOWARDS SCIENCE AMONG STEM STUDENTS AS PREDICTED BY WELL-BEING AND SCIENTIFIC INQUIRY

Carrebell L. Florito
Graduate School, Holy Cross of Davao College, Inc.

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ABSTRACT

Low motivation in science education is alarming. Motivation toward science, as predicted by well-being and scientific inquiry, was examined. Predictive research design, stratified random sampling, survey technique, and multiple regression analysis were applied. The data from 185 STEM students indicates that the criterion was significantly predicted, fully affirming the Self-Determination Theory. Future researchers may explore additional variables to account for the unexplained 24.1% variance. Educators may enhance student-centered, inquiry-based learning and promote students' well-being and school connectedness.

KEYWORDS: *Motivation Toward Science, Well-Being, STEM Students, Predictive Design, Senior High School.*

INTRODUCTION

The Problem and Its Scope

In recent years, low motivation among students in science has emerged as a critical concern in science education globally. Motivation is widely recognized as a key driver of student engagement, learning persistence, and academic achievement in STEM (science, technology, engineering, mathematics) fields. A systematic review by Bayanova (2023) highlights that motivation remains central in STEM education research, especially in decision-making about continuing in science. Globally, educators and researchers have sounded the alarm over declining or uneven motivation for science, which poses a serious threat to the cultivation of future generations of scientists, engineers, and informed citizens (Fortus & Touitou, 2021; Ramsurrun et al., 2025). In many countries, students struggle to maintain intrinsic motivation toward science, which threatens not only their academic performance but also the future talent pipeline in science.

In **Israel**, Fortus and Touitou (2021) documented a decline in students' motivation to learn science throughout the school year. In **Colombia**, recent large-scale studies report low levels of motivation among students in science classrooms (Suárez-Mesa & Gómez, 2024). In **Indonesia**, research highlights a widespread decline in students' interest and motivation in science (Arifin, Sukarmin, & Saputro, 2024).

In the **Philippine** context, the problem is similarly evident. Toroba (2025) reported low levels of science motivation among junior high school students. Vales (2024) found decreased motivation toward science among Grade 6 learners. Mempin, Lazaro, and Gabriel (2024) also reported low motivation among Grade 11 students in Bulacan.

Low motivation toward science represents a persistent challenge. Addressing motivational deficits is therefore crucial not only for improving immediate academic outcomes but also for building a more robust future workforce in STEM fields. Despite these implications, there is limited research exploring the combined influence of well-being and scientific inquiry on motivation, particularly among Senior High School STEM students in the Philippines. This study aims to fill this gap by investigating how these variables jointly predict students' motivation toward science. This gap prompted this study. Thus, this study was conducted.

Significance of the Study

This study is significant because it contributes to achieving the United Nations Sustainable Development Goal (SDG) 4. By identifying well-being and scientific inquiry as key predictors of students' motivation toward science, the study provides insights that support the Department of Education's efforts to strengthen science education through holistic and learner-centered approaches. The findings also align with the vision and mission of Holy Cross of Davao College by offering empirical evidence that may assist educators and stakeholders in designing more responsive, inclusive, and supportive educational practices that foster both students' well-being and scientific inquiry.

Furthermore, the results of this study may guide school leaders, policymakers, and curriculum developers in creating interventions and instructional strategies that enhance inquiry-based learning, promote positive learning environments, and sustain students' motivation toward science. On a broader scale, the study contributes to the development of scientifically literate, motivated, and well-rounded learners and may serve as a valuable reference for future researchers who intend to replicate or extend this study in similar educational contexts.

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Statement of the Problem

This study investigated the significance of forecasting motivation towards science using well-being and scientific inquiry as predictors. Specifically, it pursued the following objectives:

1. To determine the levels of well-being towards science in terms of joy in learning, school connectedness, and educational purposes. The scientific inquiry towards science in terms of analytical skills, planning skills, interpretation skills, and science knowledge. And motivation towards science in terms of self-efficacy, active learning strategies, Science learning value, performance goal, achievement goal, and Learning environment stimulation among Senior high school students.
2. To determine the significance of the correlation between well-being and scientific inquiry and motivation towards science among senior high school students.
3. To determine the significance of the model for well-being and scientific inquiry as predictors of motivation towards science among Senior high school students.

Research Hypotheses

The following were tested at a 0.05 level of significance.

H_{01}: Well-being and scientific inquiry do not significantly correlate with motivation toward science

H_{02}: The model for well-being and scientific inquiry as predictors of motivation towards science is not significant.

Theoretical Framework

This study is anchored on Self-Determination Theory (SDT) by Deci and Ryan (1985, 2000), a psychological framework that posits that individuals' motivation is shaped by the satisfaction of three basic psychological needs: autonomy, competence, and relatedness. Where autonomy refers to the feeling of having control and choice in one's actions, competence pertains to the sense of effectiveness and ability to perform tasks successfully, while relatedness involves feeling connected and supported by others.

In this study, well-being was indicated by joy in learning, school connectedness, and educational purposes, which are considered important personal factors in this theory. Students who experience positive emotions and feel connected to their school are more likely to become actively engaged in learning (Bowles et al., 2022; Datu et al., 2022). Meanwhile, the scientific inquiry includes analytical, planning, and interpretive skills, as well as scientific knowledge, all of which are key components of this theory. Inquiry-based learning helps students strengthen these scientific skills and encourages active participation in science learning (Toma, 2022; Ješková et al., 2022).

Consequently, the motivation toward science encompasses students' self-efficacy, active learning strategies, the value of science learning, performance goals, achievement goals, and stimulation of the learning environment, which represent the core elements of this theory. Active and supportive learning environments are also associated with students' confidence, motivation, and engagement in science education (Idula & Carob, 2022). Thus, this study is fully anchored in the theory.

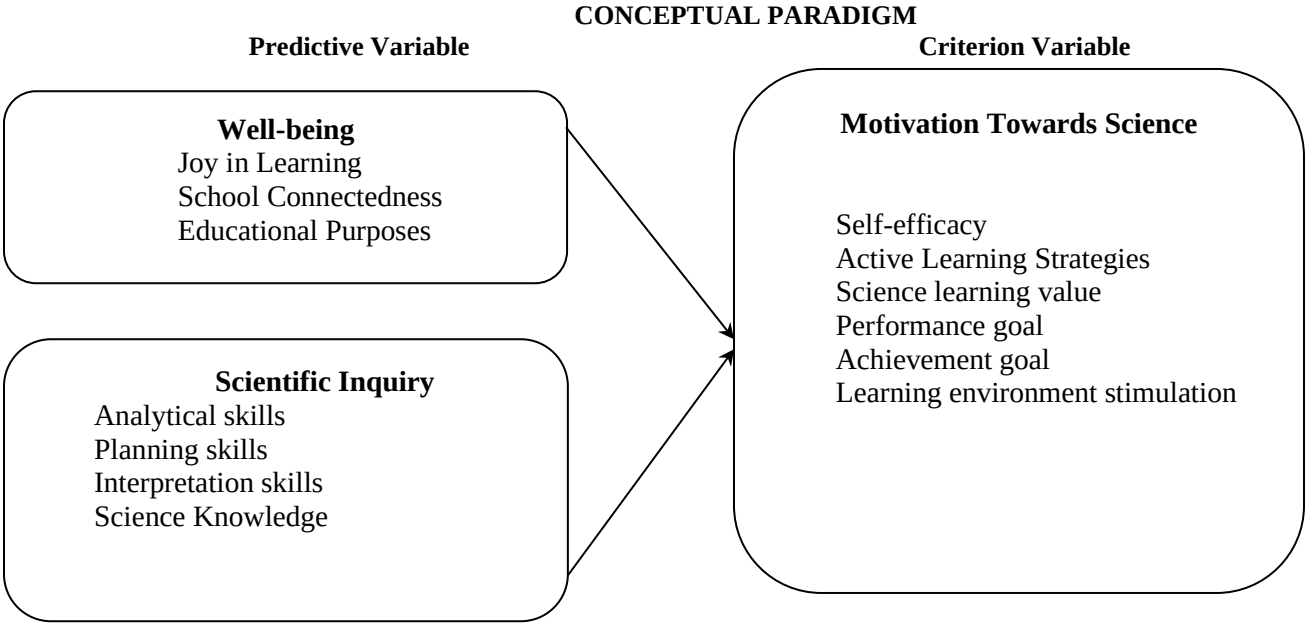


Figure 1. Conceptual Framework. Deci, E. L., & Ryan, R. M. (2000).

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METHODOLOGY

Included in this chapter are the research design, the locale of study, the sample and sampling technique, the data-gathering technique, the data-analysis technique, and ethical considerations.

Research Design

This study employed a predictive research design to determine the significance of well-being and scientific inquiry as predictors of motivation towards science. A predictive research aspect examined whether students' well-being and scientific inquiry significantly predict their motivation towards science using regression analysis.

Predictive research is particularly useful when the objective is to identify variables that predict specific outcomes, enabling the researcher to make informed inferences about future or related behaviors (Johnson & Christensen, 2017). Thus, integrating predictive approaches ensured that the study not only measured current levels of the variables but also tested their predictive power, aligning with the research objectives.

Locale of Study

This study was conducted in the private institutions in Davao City that offer senior high school, specifically the STEM strand. The chosen institutions were deemed appropriate for this research because they accommodated a diverse group of students from different socio-economic and academic backgrounds, thereby providing a broader understanding of how well-being and scientific inquiry predicted the students' motivation toward science.

Sample and Sampling Technique

The respondents in this study comprised 185 Senior High School STEM students currently enrolled in the 2025–2026 school year. Senior High School STEM students were chosen because they were at a critical transition stage from junior high to senior high, when they began specializing in academic strands. At this stage, they developed more advanced cognitive, academic, and inquiry skills while also developing stronger motivation to learn, including science.

This study employed stratified random sampling, a probability sampling technique that divides a heterogeneous population into homogeneous subgroups. Stratified sampling was appropriate for this study because it ensured that important subgroups within the population were adequately represented, thereby improving the accuracy and reliability of the results (Moore et al., 2018). Moreover, resources such as Raosoft, as highlighted by Krejcie and Morgan (1970), were used to determine appropriate sample sizes based on population size, thereby enhancing the study's validity and minimizing sampling errors.

The inclusion criteria included Senior High School STEM students officially enrolled in School Year 2025–2026 who provided informed consent (and parental consent where applicable). Students on extended leave or those who declined participation were excluded from the study.

Data Gathering Technique

The survey technique was used in gathering data. It is a method for collecting data through questionnaires or interviews (Creswell & Creswell, 2023) to obtain standardized information about respondents' attitudes, perceptions, or behaviors (Cohen et al., 2018). It is particularly useful in descriptive and correlational studies, as it enables researchers to describe trends and examine relationships among variables (Lawrence Neuman, 2014; Creswell & Creswell, 2023). It is advantageous for data collection from large, diverse populations, produces quantifiable data for analysis, supports generalization, enables rapid data collection, and ensures replicability through standardized procedures (Fowler, F. J. 2014).

Three survey questionnaires were adapted and modified for this study, and the validators used a 4-point Likert scale to assess the instruments. The first questionnaire for the Well-Being Scale was adapted from Percales & Tan (2024), consisting of 12 items with a Cronbach's alpha of 0.883 (88.3%). The second questionnaire for Scientific Inquiry was adapted from Pedaste, Baucal, & Reisenbuk, E. (2021), consisting of 21 items with a Cronbach's alpha of 0.937. The third Motivation questionnaire was adapted from Albalate, Larcia, Jaen, Pangan, & Garing (2018) and consisted of 28 items, with a Cronbach's alpha of 0.930. The overall instrument, composed of 61 items, obtained a Cronbach's alpha of 0.92.3, indicating excellent reliability across the instruments. These instruments were selected for their established reliability and suitability for measuring Well-being, Scientific Inquiry, and Motivation.

Data Analysis Technique

This study employed three data analysis techniques: descriptive statistics, correlation analysis, and multiple linear regression analysis.

Descriptive data analysis is a statistical method used to summarize and describe data using measures such as mean and standard deviation (Field, 2018)., as statistical treatment. Correlation analysis was used to determine the strength and direction of relationships between variables without implying causation. Pearson's r was utilized as the statistical measure (Schober et al., 2023). Multiple linear regression was used to examine the relationship between a single dependent variable and multiple independent variables. It was used to predict outcomes and assess the influence of predictors simultaneously. Beta (β) coefficients were interpreted to determine the strength and direction of each predictor (Hair et al., 2023). The unstandardized beta coefficient was used to interpret the regression results.

The succeeding page presents the matrix showing the scale, descriptive level, and corresponding interpretation for each variable included in this study.

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Scale	Level	Well- Being	Scientific Inquiry	Motivation towards science
3.26-4.0 0	Very High	Very Strong	Very Strong	Very Strong
2.50-3.2 5	High	Strong	Strong	Strong
1.75-2.4 9	Low	Weak	Weak	Weak
1.00-1.7 4	Very Low	Very Weak	Very Weak	Very Weak

Standard Deviation Value of Ranges and Interpretation

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

For the interpretation scale of r- value, the following scheme is used as proposed by Guilford (1956):

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
0.0	No correlation

The following guidelines for interpreting the Beta (β) coefficient strength, as proposed by Cohen (1998) and Hair et al. (2019), were used:

β Value Range	Predictive Strength
±0.00 – ±0.09	Very Weak
±0.10 – ±0.29	Weak
±0.30 – ±0.49	Moderate
±0.50 – ±0.69	Strong
±0.70 and above	Very Strong

Ethical Considerations

The study adhered to ethical standards to protect respondents and ensure the accuracy and reliability of the results, while demonstrating utmost respect for the policies and authority of the Department of Education (DepEd) and school administrators. It complied with the guidelines of the Holy Cross of Davao College – Society for Moral Integrity and Legal Ethics Board and the Data Privacy Act of 2012, ensuring proper safeguarding of all collected information. Informed consent and assent were obtained from all respondents, with a clear explanation of the study's purpose, procedures, and their right to voluntary participation and to withdraw at any time. Confidentiality and anonymity were strictly maintained by avoiding the collection of personally identifiable information, and all responses were handled of with privacy, honesty, and objectivity. Permission to conduct the study was secured from all concerned school authorities, with coordination from school heads to ensure smooth implementation. Ethical clearance was obtained prior to data collection, and validated and reliable instruments were used to ensure consistency and accuracy of data gathered.

RESULTS

Included in this chapter are the descriptive, correlation, and regression tabular presentation, and the corresponding analysis and interpretation of the statistical results. This chapter is ended with the summary of findings.

Descriptive Results

Shown in Table 1 is the descriptive table of the study and the standard deviation, mean and its Interpretation specifically corresponding for each of the variables.

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Table 1. Descriptive Analysis Results (n=185)

Variables	SD	Mean	Interpretation
Well - Being	**0.46**	**3.36**	**Very High**
Joy In Learning	0.53	3.33	Very High
School Connectedness	0.60	3.24	Very High
Educational Purposes	0.47	3.52	Very High
Scientific Inquiry	**0.50**	**3.08**	**High**
Analytical Skills	0.54	3.06	High
Planning Skills	0.54	3.10	High
Interpretation Skills	0.58	3.05	High
Science Knowledge	0.55	3.13	High
Motivation	**0.46**	**3.24**	**High**
Self-Efficacy	0.58	3.08	High
Active Learning Strategies	0.48	3.29	Very High
Science Learning Value	0.47	3.32	Very High
Performance Goal	0.63	3.21	High
Achievement Goal	0.46	3.41	Very High
Learning Environment	0.58	3.22	High

Legend: 1.00-1.74 Very Low, 1.75-2.49 Low, 2.50-3.24 High, 3.25-4.00 Very High

Specifically, the table shows that the well-being variable had a mean of 3.36, indicating very high well-being. It indicates that respondents' well-being is very strong. All indicators were likewise rated as very high. The corresponding standard deviation of 0.46 reflects highly consistent responses among the respondents. Meanwhile, the scientific inquiry variable obtained a mean of 3.08, indicating a high level. It suggests that the respondents' scientific inquiry is strong. All indicators were likewise rated as high. The corresponding standard deviation of 0.50 reflects highly consistent responses among the respondents. Furthermore, the motivation toward science variable had a mean of 3.24, indicating that respondents believe motivation toward science is strong. All indicators were likewise rated as high. The corresponding standard deviation of 0.46 reflects highly consistent responses among the respondents.

The results indicate that students exhibit very high well-being, while scientific inquiry and motivation toward science are both at high levels, indicating generally positive and consistent responses across all variables.

Correlation Results

Table 2 shows a correlation table, the determinant and criterion variable. It includes r-value, p-value and its interpretation.

Table 2. Correlation Analysis Results

Variables	Motivation		
	r-value	p-value	Interpretation
Well-Being	0.746	0.000	Positive, Strong and Significant Relationship
Scientific Inquiry	0.814	0.000	Positive, Strong and Significant Relationship

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

Table 2 specifically shows that the correlation between well-being and motivation variables yielded a p-value of 0.000. This value is below the 0.05 significance level. Thus, the null hypothesis was rejected. It indicates a statistically significant correlation between the variables mentioned. The corresponding r-value of 0.746 indicates a strong, positive correlation.

This implies that when students' well-being increases, their motivation also increases. Similarly, the correlation between scientific inquiry and motivation toward science variables also obtained a p-value of 0.000. This value is below the 0.05 significance level. Hence, the null hypotheses were likewise rejected. It denotes a significant correlation. The corresponding r-value of 0.814 indicates a strong, positive correlation. This implies that greater scientific inquiry is associated with higher levels of motivation.

Well-being and scientific inquiry show a strong, positive, and significant correlation with motivation towards science, indicating that improvements in these variables are associated with higher levels of motivation among students.

Regression Results

Presented in Table 3 is the regression analysis of the predictive variables on the criterion variable. Also, it has the unstandardized beta coefficient, standard error, t-value, p-value, decision on null hypothesis, and its interpretation.

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Table 3. Regression Analysis Results

Motivation toward science							
	Unstandardized Coefficients		Standardized Coefficients				
Variables	**Estimate**	**Std. Estimate**	**SE**	**t**	**p**	**Decision on Ho**	**Interpretation**
Intercept	0.327		0.127	2.58	0.011		
Well-Being	0.388	0.395	0.045	8.55	0.000	Reject Ho	Significant Influence
Scientific Inquiry	0.522	0.571	0.042	12.37	0.000	Reject Ho	Significant Influence
Model Summary: R= 0.871, R^2= 0.759, Adjusted R^2=0.756, F=286.0, Sig.= 0.000 *Decision Rule: Reject H_0 if* $p < 0.05$ *Regression Formula: MTS* = 0.388 SSI + 0.522 SI – 0.327							

Specifically, the table shows that the model outcome for motivation towards science, using the predictive variables well-being and scientific inquiry, is MTS = 0.388 SSI + 0.522 SI – 0.327. The R-squared was 0.759, indicating that the model has a very strong ability to predict motivation towards science. Furthermore, the corresponding p-value obtained is 0.000. Such a value is less than 0.05 degrees of confidence. Hence, the null hypothesis was rejected. This indicates that the model to predict motivation towards science is statistically significant. This implies that for every unit change in the predictors' values in the model, there corresponds a 0.759-unit change in the criterion.

The model demonstrates a statistically significant positive relationship, indicating that both well-being and scientific inquiry meaningfully contribute and that they reflect strong predictive capacity for students' motivation toward science.

Summary of Findings

Based on the results of the statistical analyses, the following findings were obtained:

1. Well-being and scientific inquiry show positive, strong and significant correlation with motivation towards science.
2. The model to predict well-being and scientific inquiry as predictors of motivation towards science students is significant.

DISCUSSIONS

In this chapter, the findings are discussed. Likewise, the conclusion and recommendation are presented.

Correlation of Well-Being and Scientific Inquiry with Motivation Toward Science This study found that well-being and scientific inquiry significantly correlate with the motivation towards science. Bochiș et al. (2022) found that students with better mental and emotional well-being are more motivated and more active in their learning. Likewise, these findings align with Toma (2022), who reported that inquiry-based teaching increases students' motivation in science by making them more curious and engaged in activities. These findings support the present study, as they show that both well-being and involvement in scientific inquiry help improve students' motivation.

In contrast, this study's findings are inconsistent with Famero's (2022) study, which found that external factors, such as teacher support and the learning environment, have a strong effect on students' motivation. This implies that even if students have good well-being and inquiry skills, their level of motivation may still depend on the support they receive from teachers and their school environment. The differing results may also be partly explained by sample size variation, with 150 respondents in the earlier study compared to 185 in the present study, providing more robust evidence for the observed correlations between well-being, scientific inquiry, and motivation towards science.

Motivation Toward Science as a Predictive Model of Well-Being and Scientific Inquiry in Students'

This study found that the model predicting motivation towards science, well-being, and scientific inquiry is significant. These findings support those of Yang et al. (2022), who found that students' emotional and psychological conditions, such as stress and well-being, are significantly related to their level of motivation to learn, with better well-being associated with higher motivation. Similarly, Fitri and Hasbi (2025) noted that students' interest in science is closely related to their motivation, particularly in active participation-based learning environments. This indicates that when learners are exposed to engaging, interactive science activities, their curiosity and interest increase, thereby strengthening their motivation to learn.

However, the present finding contrasts with Paumier and Chanal (2022), who found that motivation can vary depending on situational and contextual conditions, indicating that it is not always stable or directly linked to internal factors alone. Similarly, a study by Lin et al. (2022) showed that well-being is often shaped by external factors such as environment and lifestyle, suggesting that motivation may also be indirectly influenced by these conditions rather than by well-being alone. With 314 respondents in the earlier study compared to 185 in the present study, the larger sample size further strengthens the evidence for the predictive value of motivation towards science for well-being and scientific inquiry.

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Conclusion

Based on the findings, it was concluded that the motivation towards science is significantly predicted by well-being and scientific inquiry. This conclusion fully affirms Self-Determination Theory (SDT), positing that individuals' motivation is shaped by the satisfaction of three basic psychological needs: autonomy, competence, and relatedness. Where autonomy refers to the feeling of having control and choice in one's actions, competence pertains to the sense of effectiveness and ability to perform tasks successfully, while relatedness involves feeling connected and supported by others.

Recommendations

Based on the study's findings, it is recommended that future researchers examine additional variables not included in this study to account for the remaining 24.1% of unexplained variance in the model. Exploratory studies may also be conducted to identify emerging themes, which can be developed into potential variables, with corresponding subthemes serving as their indicators. And curriculum developers, school administrators, and teachers may work together to strengthen inquiry-based, student-centered, and real-life learning to improve students' scientific skills and motivation. They may also support programs and environments that promote students' well-being and school connectedness.

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