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Influence of the use of Scientific Tools and Inquiry-Based Teaching on Motivation in Learning Science

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Abstract — This study examined the influence of equipment use in science and inquiry-based teaching on learners' science motivation among senior high school students. Science motivation plays a significant role in enhancing students' engagement and interest in science learning. The study employed a descriptive-predictive research design, with 150 respondents selected through cluster random sampling. Data were analyzed using descriptive statistics, correlation analysis, and multiple regression analysis. The findings revealed that equipment use in science significantly predicts learners' science motivation, accounting for approximately 9.6% of the variance. However, inquiry-based teaching was not found to be a significant predictor of learners' science motivation. These results partially support the principles of General Strain Theory, which suggest that certain learning experiences and classroom conditions may influence students' responses and motivation toward academic tasks. The study recommends that future researchers include additional variables to better explain the variance in learners' science motivation. Furthermore, mediation analysis or qualitative approaches may be conducted to explore deeper factors influencing students' motivation in science learning.

Keywords: Equipment use in science, inquiry-based teaching, science motivation, senior high school students, science education

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I. INTRODUCTION

The Problem and Its Setting

Poor motivation in science among students has become a persistent concern in contemporary education, as motivation plays a crucial role in the development of scientific literacy and lifelong learning (OECD, 2019). Motivation influences how students engage with learning tasks, sustain effort, and develop interest in scientific inquiry. When learners exhibit low motivation in science, they are less likely to actively participate in learning activities, which may hinder their ability to apply scientific knowledge to real-world situations. Consequently, this limitation may affect the development of higher-order thinking skills such as critical thinking, creativity, and innovation, which are essential competencies in the 21st century (Pintrich & De Groot, 1990; Glynn, Taasoobshirazi, & Brickman, 2007).

Globally, students' difficulties in science continue to be a major educational concern, as reflected in various international assessments. According to the Trends in International Mathematics and Science Study (TIMSS), several countries in Central Asia and the Caucasus—such as Kazakhstan, Uzbekistan, Armenia, Azerbaijan, and Georgia—have demonstrated relatively low performance in science among secondary school learners (TIMSS, 2019). Similarly, in Lebanon, a study published in the *Eurasia Journal of Science and Mathematics Education* reported that secondary students exhibited very low levels of science motivation, indicating substantial difficulties in applying scientific concepts to practical situations (Baltikian et al., 2024). These findings highlight a global concern regarding students' ability to develop strong problem-solving skills in science, which are essential for addressing real-world challenges and fostering deeper scientific understanding.

In the Philippines, the development of science motivation among senior high school students remains a significant educational concern. Garzon (2023) identified several factors contributing to students' difficulties in science, suggesting that challenges in critical thinking and the application of scientific concepts are prevalent in the classroom. In Davao City, several schools have reported that students struggle to effectively apply scientific concepts when solving science-related problems. Local studies have also revealed weak baseline performance in science motivation and problem-solving tasks among students (Anduyan, Cabrera, & Mangibunong,

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2018). Similarly, Valdez and Bungihan (2019) found that Filipino senior high school students possessed adequate conceptual knowledge but were often unable to translate this knowledge into effective problem-solving. This finding highlights the need for instructional approaches that foster analytical thinking and promote the practical application of scientific concepts.

Low science motivation among junior high students hinders the development of scientific literacy and higher-order thinking skills, which are vital for STEM careers. Despite existing interventions, a research gap remains regarding effective ways to boost motivation and problem-solving. Consequently, this study examines how the use of science equipment and inquiry-based teaching influences student motivation to help bridge this gap and improve academic readiness.

Significance of the Study

This study is significant as it addresses one of the persistent challenges in Philippine science education—the declining motivation of learners to engage meaningfully in scientific learning. By examining the factors that influence students' interest and participation in science, it contributes to the development of pedagogical practices that foster deeper understanding, curiosity, and sustained engagement through hands-on and inquiry-based learning experiences. Moreover, the study aligns with the United Nations Sustainable Development Goal 4 (Quality Education), which promotes inclusive and equitable access to quality education and lifelong learning opportunities for all. It also serves as a valuable reference for future researchers exploring the relationships among instructional strategies, resource utilization, and student motivation in science, thereby supporting the continuous improvement of educational quality and equity in the Philippines.

The findings of this study benefit several stakeholders. Learners may develop a greater appreciation of science as relevant and engaging, which can enhance their academic performance and encourage positive attitudes toward lifelong learning. Science teachers can gain insights to guide the implementation of effective instructional strategies that stimulate student motivation and engagement. Additionally, curriculum developers and policymakers may use the findings as evidence to strengthen the implementation of the K to 12 Science Curriculum by aligning teacher

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training, instructional practices, and resource allocation with the motivational and learning needs of students, particularly in underserved areas.

Statement of the Problem

This study investigated the influence of laboratory equipment use and inquiry-based teaching on learners' science motivation in a small, resource-limited secondary school located in a mountainous area. Specifically, it sought to address the following objectives:

1. To determine the level of laboratory equipment use and its influence on learners' science motivation in terms of interest, enjoyment in learning science, effort, persistence in science activities, confidence, self-efficacy in performing science tasks, and the value and relevance placed on science learning among Grade 12 Senior High School students. In addition, the study aimed to describe the level of inquiry-based teaching in terms of autonomy, curiosity, exploration, and reflection.
2. To examine the significant relationships between laboratory equipment use, inquiry-based teaching, and learners' science motivation among Grade 12 Senior High School students.
3. To determine the combined influence of laboratory equipment use and inquiry-based teaching on learners' science motivation among Grade 12 Senior High School students.

Hypotheses

The following hypotheses were tested at the 0.05 level of significance:

H_{01}: There is no significant relationship between equipment use in science and learners' science motivation.

H_{02}: There is no significant relationship between equipment use in science and inquiry-based teaching.

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H_{03}: Equipment use in science and inquiry-based teaching do not significantly predict learners' science motivation.

Theoretical Framework Conceptual Framework

This study was anchored on the Expectancy-Value Theory (EVT) proposed by Eccles and Wigfield (2002), which posits that learners' motivation is influenced by two key components: expectancy, or their belief in their ability to succeed, and task value, or the importance, usefulness, and interest they attribute to a task. When students believe that they can perform well and perceive a task as meaningful, their willingness to engage in and persist with the task increases. In the context of science education, the use of appropriate laboratory equipment—whether standard or improvised—can support students' expectancy of success by providing structured, hands-on experiences that allow them to test ideas and verify scientific concepts. Similarly, inquiry-based learning can enhance task value by making science more relevant, engaging, and connected to real-world phenomena. Through exploration, questioning, and investigation, students may perceive science learning as more meaningful and personally significant. Additionally, this study was grounded in Self-Determination Theory (SDT) developed by Deci and Ryan (2000), which asserts that motivation develops when three basic psychological needs are satisfied: autonomy, competence, and intrinsic interest. Inquiry-based learning naturally supports these needs. Autonomy is promoted when students are given opportunities to formulate questions, design solutions, and make decisions throughout the investigation process. Competence is strengthened through the hands-on use of laboratory equipment, allowing students to apply scientific procedures, manipulate materials, and develop confidence in their practical skills. Intrinsic interest—a key driver of self-motivated learning—emerges as students engage in meaningful, curiosity-driven investigations that encourage discovery and deeper understanding. Furthermore, collaborative inquiry enhances motivation by fostering interaction, discussion, and shared problem-solving among learners.

Together, Expectancy-Value Theory and Self-Determination Theory explain how inquiry-based learning, supported by accessible laboratory equipment, can enhance students' belief in their capability to succeed while also strengthening their internal motivation through autonomy, competence, and intrinsic interest. This theoretical integration helps explain how such instructional

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approaches may improve learners' engagement, persistence, and overall motivation in science learning.

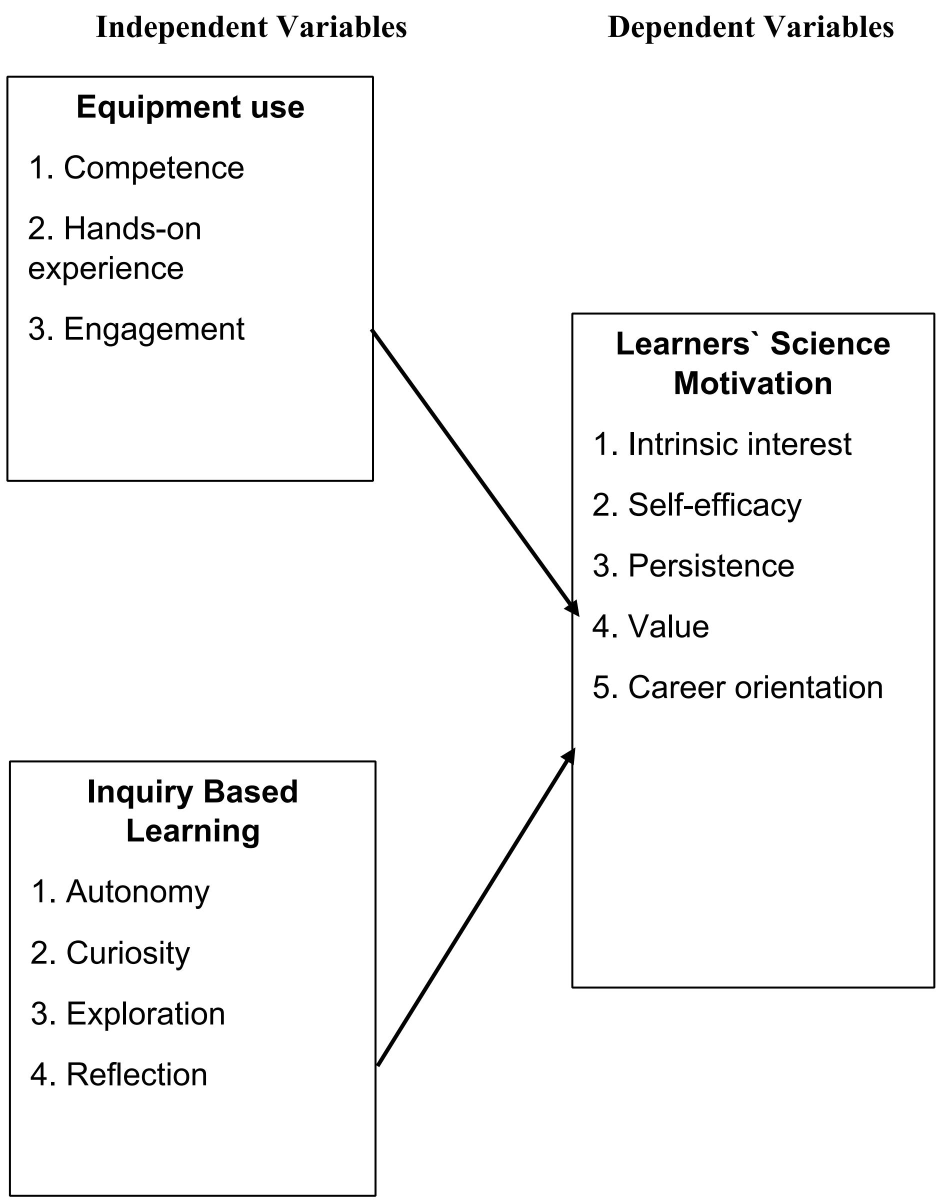

FIGURE 1
CONCEPTUAL FRAMEWORK OF THE STUDY

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II. METHODOLOGY

Research Design

This research employed a descriptive-predictive correlational research design to determine the relationship between equipment use, inquiry-based teaching, and learners' science motivation. A quantitative approach was appropriate because it allowed for the collection of numerical data that could be statistically analyzed to identify relationships among variables (Creswell & Creswell, 2018). The correlational design was used to examine whether the independent variables—equipment use and inquiry teaching—predicted or influenced the dependent variable, learners' science motivation, without manipulating any condition. This design provided insights into the strength and direction of associations among variables (Fraenkel, Wallen, & Hyun, 2019).

Locale of the Study

The study was conducted in a selected public senior high school offering Grade 12 in Don Marcelino, Davao Occidental, during the 2025–2026 school year. The chosen locale was deemed appropriate for the study, as the academic strands offered foster critical thinking, inquiry, and student engagement through varied instructional approaches. These learning environments support the development of students' scientific attitudes and curiosity, making them suitable for examining their influence on science engagement.

Furthermore, the setting ensures that the data gathered reflect authentic and meaningful learning experiences. The school was specifically selected because the study aimed to examine an ideal learning environment that integrates laboratory activities and inquiry-based teaching strategies, both of which are central to this research. Additionally, the school's accessibility and the support of its administration made it a suitable site for conducting the study.

Sample and Sampling Procedure

The study utilized a sample of public Senior High School students from the General Academic Strand (GAS) and Information and Communication Technology (ICT) strands. A

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stratified sampling technique was employed to select participants who had experience in both laboratory-based and inquiry-oriented instruction. According to Etikan, Musa, and Alkassim (2016), stratified sampling enables researchers to select respondents who are most capable of providing relevant and rich information about the topic.

The sample size consisted of the total number of students enrolled in the selected classes and was expected to be around 150 respondents, which is adequate for correlational analysis. Participation was voluntary and required parental consent. Students who were not enrolled in the selected strands, frequently absent, had transferred, or did not provide consent were excluded from the study.

Data Gathering Procedure

The researcher began the data gathering procedure by securing the necessary permissions to conduct the study. A certificate of approval was first obtained from the Society for Moral Integrity and Legal Ethics (SMILE) of the Holy Cross of Davao College, followed by an endorsement letter from the Dean of the Graduate School and authorization from the thesis adviser. The study, including the survey questionnaire and supporting references, was submitted to SMILE for validation to ensure its ethical integrity. Upon approval, a formal request to conduct the study was submitted to the Division Office of Davao Occidental through the Schools Division Superintendent (SDS), along with the endorsement letter. Permission was also sought from the principals of the participating schools to allow data collection. Once approved, the researcher personally administered the survey questionnaires during science classes, explained the purpose and procedures of the study, and ensured voluntary participation. Respondents were given approximately 20–30 minutes to answer the survey, after which all questionnaires were retrieved. Prior to data collection, informed consent was obtained through a face-to-face process to ensure participants' full understanding of the study and their rights. Respondents reviewed and signed the informed consent forms, which were then securely stored to maintain confidentiality and privacy. During the survey administration, the researcher translated questions into the local dialect as needed to ensure clarity and accuracy of responses. After all completed questionnaires were

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collected, the researcher carefully organized, collated, and tabulated the data for analysis and interpretation using appropriate statistical tools.

Data Analysis

This study utilized a survey questionnaire technique as the primary data-gathering method (Creswell, 2014). The survey employed a standardized set of questions to collect self-reported information from respondents regarding their knowledge, opinions, attitudes, behaviors, and experiences (Fink, 2017). It was commonly used when the researcher required systematic and comparable data from a large group of respondents in a practical, economical, and efficient manner (Best & Kahn, 2016).

Three sets of questionnaires were utilized to measure the levels of laboratory equipment use, inquiry-based teaching practices, and learners' science motivation (Gall et al., 2015). The second instrument was adapted from existing validated tools to ensure alignment with the research objectives (Fraenkel et al., 2018). The survey questionnaires underwent expert validation and pilot testing to establish accuracy and effectiveness (Polit & Beck, 2017). Validity was defined as the extent to which an instrument measured what it was intended to measure (DeVellis, 2017). Data obtained from the pilot test were subjected to reliability analysis using Cronbach's alpha to assess internal consistency of the items (Gliem & Gliem, 2003).

The Mean ($\bar{x}$) was employed to determine the average levels of laboratory equipment use, inquiry teaching practices, and learners' science motivation among Grade 12 Senior High School students (Hinkle et al., 2003). Computed mean scores were interpreted according to predetermined descriptive ranges as follows:

Range of Means	**Description**
3.26 – 4.00	Very High
2.50 – 3.25	High
1.75 – 2.49	Moderate
1.00 – 1.74	Low
Below 1.00	Very Low

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The Standard Deviation (SD) was used to measure the degree of variation in students' responses regarding their perceptions of laboratory equipment use, inquiry teaching, and science motivation (Field, 2013). A smaller SD indicated consistent responses among students, whereas a larger SD suggested a wider spread of opinions (Gravetter & Wallnau, 2017).

The Pearson Product–Moment Correlation (Pearson r) was employed to determine the strength and direction of the linear relationship between laboratory equipment use, inquiry teaching, and learners' science motivation (Dancey & Reidy, 2017). Correlation analysis examined whether changes in one variable were associated with changes in another variable without implying a cause-and-effect relationship (Akoglu, 2022; Schober et al., 2022). The significance of the correlation was tested at a 0.05 confidence level. The interpretation of r-values followed the standard scale proposed by Guilford (1956):

Computed r	**Descriptive Interpretation**
±1.00	Perfect correlation
±0.75 – ±0.99	High correlation
±0.51 – ±0.74	Moderately high correlation
±0.31 – ±0.50	Moderately low correlation
±0.01 – ±0.30	Low correlation
0.00	No correlation

Multiple Linear Regression Analysis was conducted to examine the influence of laboratory equipment use and inquiry teaching (independent variables) on learners' science motivation (dependent variable) (Tabachnick & Fidell, 2013). This statistical technique allowed the researcher to examine the combined and individual effects of the predictor variables while controlling for the influence of other variables (Ju et al., 2023; Xu et al., 2023). Stepwise regression was applied to identify the most significant predictors and refine the model by eliminating non-contributing variables, ensuring a more accurate and interpretable predictive model (Hair et al., 2010).

The unstandardized and standardized beta coefficients (β) were used to assess the degree of influence and the overall predictive effect of the independent variables (Cohen, 1988; Hair et al., 2019; Hair et al., 2022). The interpretation of β-values followed the scale below:

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β Value Range	Strength of Influence
0.00 – 0.09	Very Low
0.10 – 0.29	Low
0.30 – 0.49	Moderate
0.50 – 0.69	High
0.70 and above	Very High

Through these statistical tools, the study generated empirical evidence on how laboratory practices and inquiry-based teaching contributed to enhancing science motivation among Grade 12 Senior High School students (Ormrod, 2017).

Ethical Considerations

This study observed the ethical principles of institutional approval, informed consent, voluntary participation, confidentiality, anonymity, and data protection. Prior to data collection, approval was secured from the Holy Cross of Davao College – Society for Moral Integrity and Legal Ethics (HCDC-SMILE), the Department of Education Division Research Committee, and the school heads of the participating schools. All respondents were informed of the purpose and procedures of the study and were assured that participation was voluntary and that they could withdraw at any time without penalty. Confidentiality, anonymity, and privacy were strictly maintained by excluding identifying information from the report and using the data solely for academic purposes. All research procedures were guided by the American Educational Research Association Code of Ethics (2011) to ensure the protection of the participants' rights, dignity, and welfare.

III. RESULTS

In this chapter the results of the descriptive, correlation, and regression analyses are presented. Likewise, the summary of findings is presented as well.

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Descriptive Analysis

Table 1 presents an overview of the levels of the variables, namely, equipment use in science, inquiry-based learning, and learners' science motivation, together with their corresponding indicators. The variables and their indicators also correspond to the number of samples, standard deviation (SD), mean, and descriptive level.

TABLE 1
DESCRIPTIVE STATISTICS (N = 150)

Variables	Standard Deviation	Mean	Descriptive Level
Equipment Use in Science	**0.32**	**3.32**	**Very High**
Competence	*0.50*	*3.37*	Very High
Hands-on Experience	*0.39*	*3.22*	High
Engagement	*0.36*	*3.37*	Very High
Inquiry-Based Teaching	**0.19**	**3.37**	**Very High**
Autonomy	0.23	3.38	Very High
Curiosity	0.33	3.38	Very High
Exploration	0.32	3.39	Very High
Reflection	0.30	3.32	Very High
Learner`s Science Motivation	**0.24**	**3.26**	**Very High**
Intrinsic Interest	*0.34*	*3.46*	Very High
Self-Efficacy	*0.31*	*3.66*	Very High
Persistence	*0.43*	*3.01*	High
Value	*0.42*	*3.01*	High
Career Orientation	*0.31*	*3.17*	High

3:26-4:00 Very High, 2:50-3:25 High, 1.75-2:49 Low, 1:00-1:74 Very Low

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Table 1 presents the descriptive statistics of the variables including Equipment Use in Science, Inquiry-Based Teaching, and Learners' Science Motivation among the respondents (n = 150).

The results show that Equipment Use in Science obtained a mean score of 3.32 with a standard deviation of 0.32, indicating that the respondents generally perceive that science equipment is frequently utilized in science instruction, based on the interpretation of the scale used in the study. Among its indicators, Competence recorded the highest mean of 3.37 (SD = 0.50), suggesting that learners feel capable when using science equipment during activities. This is followed by Engagement with a mean of 3.37 (SD = 0.36), implying that students are actively involved in science learning when equipment is used. Meanwhile, Hands-on Experience obtained a mean of 3.22 (SD = 0.39), indicating that learners are provided opportunities to interact directly with science materials during lessons.

For Inquiry-Based Teaching, the overall mean score is 3.37 with a standard deviation of 0.19, which indicates that inquiry-based strategies are commonly practiced in the classroom. Among its indicators, Exploration obtained the highest mean of 3.39 (SD = 0.32), followed closely by Autonomy and Curiosity, both with a mean of 3.38 (SD = 0.23 and 0.33, respectively). These findings suggest that students are encouraged to explore concepts, ask questions, and independently investigate scientific ideas. On the other hand, Reflection recorded a mean of 3.32 (SD = 0.30), indicating that learners are also guided to reflect on their learning experiences during inquiry activities.

In terms of Learners' Science Motivation, the overall mean score is 3.26 with a standard deviation of 0.24, suggesting that students generally demonstrate a positive level of motivation toward learning science. Among its components, Self-Efficacy obtained the highest mean of 3.66 (SD = 0.31), indicating that learners have strong confidence in their ability to perform science-related tasks. This is followed by Intrinsic Interest with a mean of 3.46 (SD = 0.34), showing that students have genuine interest in science learning. Meanwhile, Persistence and Value both recorded the lowest mean scores of 3.01 (SD = 0.43 and 0.42, respectively), suggesting that although students are motivated, there may still be challenges in maintaining sustained effort and recognizing the long-term value of science learning. Lastly, Career Orientation obtained a mean

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of 3.17 (SD = 0.31), indicating a moderate inclination of students toward pursuing science-related careers.

Correlation Analysis

Table 2 presents the correlation among the variables of the study, namely equipment use in science, inquiry-based learning, and learners' science motivation. Furthermore, the table includes the r-value, p-value, the decision on the null hypothesis (Ho), and the interpretation of the results.

TABLE 2
CORRELATION TABLE (N=150)

Variables	Learner`s Science Motivation			
	r-value	p-value	Decision on *H0*	Interpretation
Equipment Use in Science	0.31	<.001	Reject *H0*	Moderate Low Positive, Significant
Inquiry-Based Teaching	0.27	<.001	Reject *H0*	Low Positive, Significant

Level of Significance: 0.05

Decision Rule: Reject H_0 *if* $p < 0.05$

The correlation analysis revealed statistically significant positive relationships between the independent variables and learners' science motivation. Equipment use in science demonstrated a moderately low positive correlation with learners' science motivation ($r = .31$, $p < .001$), indicating that greater use of science equipment is associated with higher levels of learners' motivation in

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science. Similarly, inquiry-based teaching showed a low positive and statistically significant relationship with learners' science motivation ($r = .27$, $p < .001$), suggesting that the use of inquiry-based teaching approaches is associated with increased motivation among learners in science. Since both relationships were significant at the .05 level, the null hypotheses were rejected, confirming that equipment use in science and inquiry-based teaching are meaningfully associated with learners' science motivation.

Regression Analysis

Table 3 presents the regression analysis. The predictors included are equipment use in science and inquiry-based teaching, while the criterion variable is learners' science motivation. Both the standardized and unstandardized regression coefficients are shown, along with their corresponding p-values, hypothesis test decisions, and interpretations.

TABLE 3
REGRESSION TABLE (N=150)

	Learner`s Science Motivation						
	Unstandardized Coefficients		Standardized Coefficients				
Variables	**B**	**Std. Error**	**Beta**	**t**	**Sig.**	**Decision on H_0**	**Interpretation**
(Constant)	2.00	0.33	–	6.03	<.001	–	–
Equipment Use in Science	0.17	0.06	0.22	2.54	0.012	Reject	Positive Significant Influence
Inquiry-Based Teaching	0.20	0.11	0.16	1.81	0.072	Failed to Reject	Not Significant

$R = 0.33$ | $R^2 = 0.12$ | $F = 9.55$ | $p = <.001$

Level of Significance: 0.05

Decision Rule: Reject H_0 if $p < 0.05$

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The regression analysis indicates that the combined predictors significantly explained variations in learners' science motivation ($R^2 = .12$, $p < .001$), suggesting that 12% of the variance in learners' science motivation is accounted for by equipment use in science and inquiry-based teaching. The unstandardized coefficient for equipment use in science ($B = 0.17$, $\beta = 0.22$, $p = .012$) indicates that greater use of science equipment exerts a positive and statistically significant influence on learners' science motivation. In contrast, inquiry-based teaching ($B = 0.20$, $\beta = 0.16$, $p = .072$) does not significantly influence learners' science motivation. The overall model demonstrated a low positive relationship between the predictors and learners' science motivation ($R = .33$), and the regression model was statistically significant ($F = 9.55$, $p < .001$). Since only equipment use in science was statistically significant, the null hypothesis was rejected for equipment use in science but failed to be rejected for inquiry-based teaching, indicating that equipment use in science is the significant contributing variable influencing learners' science motivation.

Summary of Findings

Based on statistical results, it specifically was found that:

1. Equipment Use in Science significantly correlates with Learner`s Science Motivation.
2. Inquiry-Based Teaching significantly correlates with Learner`s Science Motivation.
3. Equipment Use in Science has a positive (22%) significant influence on Learner's Science Motivation.
4. Inquiry-Based Teaching has no significant influence on Learner's Science Motivation.
5. Equipment Use in Science and Inquiry-Based Teaching have a positive significant combined influence (12%) on Learners' Science Motivation. However, only Equipment Use in Science emerged as the significant contributing variable influencing learners' science motivation.

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IV. DISCUSSIONS

The discussions of the results are provided in this chapter. Specifically, the findings included are the discussions on equipment use in science, inquiry-based teaching, and learners` science motivation among grade 12 students. Moreover, the discussions on the correlation between equipment use in science and inquiry-based teaching, and learners` science motivation is also presented. Additionally, the discussions on the combined significant influence of equipment use in science and inquiry-based teaching. These findings are used to affirm or deny the assertions of the previous literatures. Lastly, the conclusion and recommendations drawn from the result of this study were presented.

Equipment Use in Science among Grade 12 Students

The finding stating that equipment use in science enhances learners' science motivation among Grade 12 students affirms the study of Hofstein and Lunetta (2004). According to Hofstein and Lunetta, the use of laboratory equipment and practical activities in science classes improves students' interest and engagement in learning scientific concepts. Through hands-on interaction with laboratory tools, learners develop deeper understanding and curiosity toward scientific investigations.

Moreover, this finding also supports the study of Abrahams and Millar (2008), who emphasized that laboratory equipment and practical work in science classrooms help students connect theoretical knowledge with real-life applications. The authors explained that when students actively manipulate scientific equipment, they become more motivated and engaged in the learning process.

In addition, the positive level of inquiry-based teaching observed in this study supports the assertion of Hmelo-Silver, Duncan, and Chinn (2007), who explained that inquiry-based learning promotes student-centered exploration and critical thinking. According to them, when students are encouraged to ask questions, investigate problems, and construct their own understanding, their intrinsic motivation in learning science increases.

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Similarly, the findings of this study conform to the study of Prince and Felder (2006), who stated that inquiry-based teaching strategies stimulate learners' curiosity and encourage active participation in science learning. Through inquiry activities such as experimentation, questioning, and investigation, students become more interested and motivated to explore scientific phenomena.

Furthermore, the significant relationship between equipment use in science and learners' science motivation corroborates the study of Freeman et al. (2014), which highlighted that active learning environments, including laboratory-based activities, improve students' engagement and motivation in science subjects. The study explained that when students are actively involved in hands-on activities using scientific tools, their motivation and learning outcomes significantly improve.

Lastly, the finding that equipment use in science and inquiry-based teaching significantly influence learners' science motivation when combined supports the assertion of National Research Council (2000), which emphasized that effective science education integrates hands-on laboratory experiences and inquiry-based instructional strategies. Such integration allows students to actively construct knowledge, thereby increasing their motivation and interest in learning science.

Inquiry-Based Teaching among Grade 12 Students

The findings of this study reveal that inquiry-based teaching is evident in the science learning experiences of Grade 12 students. This suggests that students are provided opportunities to explore concepts through questioning, investigation, and discovery, which are key elements of inquiry-based learning. Through this approach, learners are encouraged to actively participate in the learning process rather than passively receiving information from the teacher.

This finding confirms the study of Hmelo-Silver, Cindy E., Clark A. Chinn, and Richard G. Duncan (2007), who explained that inquiry-based teaching promotes deeper conceptual understanding because students construct knowledge through investigation and problem-solving. According to them, inquiry learning environments encourage students to ask questions, analyze evidence, and develop explanations, which significantly improve engagement in science learning.

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Moreover, the findings of this study support the assertion of Michael Prince and Richard M. Felder (2006), who stated that inquiry-based instructional strategies help learners become more active participants in the classroom. When students are given opportunities to investigate scientific problems and perform experiments, they tend to develop greater curiosity and motivation toward learning science.

Similarly, the results of this study conform to the study of Norman G. Lederman (2014), which emphasized that inquiry-based science teaching enhances students' scientific thinking skills by allowing them to formulate hypotheses, conduct investigations, and interpret data. Such learning experiences enable students to develop a deeper appreciation of the nature of science.

Furthermore, the presence of inquiry-based teaching in science classes suggests that students are exposed to learning environments that promote critical thinking, collaboration, and problem-solving. These conditions are essential in helping students understand complex scientific concepts and apply their knowledge to real-life situations.

Overall, the results imply that inquiry-based teaching plays an important role in fostering active learning and intellectual engagement among Grade 12 students, particularly in science education. By encouraging exploration and investigation, inquiry-based approaches help students develop meaningful learning experiences and strengthen their motivation in studying science.

Learners' Science Motivation among Grade 12 STEM Students

The findings of this study indicate that Grade 12 STEM students exhibit a moderate level of science motivation, which suggests that learners are generally engaged in science learning but may experience occasional fluctuations in effort or interest depending on various academic demands. This level of motivation appears to influence students' behaviors in academic settings, including their tendency toward mild academic dishon esty.

This finding is supported by the study of Awosoga, Oluwaseun et al. (2021), conducted in a medium-sized Canadian university. According to Awosoga and colleagues, the promotion of academic integrity positively influences students' motivation to perform well while minimizing

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dishonest behaviors. The emphasis on ethical academic conduct encourages learners to approach tasks with diligence and fosters intrinsic motivation in learning.

Moreover, this study affirms the findings of Liu, Jing and Alias, Nor (2023), who reported that a significant proportion of Chinese undergraduate students had never engaged in academic dishonesty. However, the study also noted that more than half of the respondents (55.97%) had been involved in dishonest behaviors at least once during the previous academic year. Similarly, in this study, the mild occurrence of academic dishonesty among STEM students may reflect situational pressures, such as high workloads, complex scientific concepts, or performance expectations, which can challenge students' motivation and ethical decision-making.

These results suggest that learners' science motivation is closely linked to their approach to academic tasks and integrity. Motivated students are more likely to engage actively in learning, utilize inquiry and equipment effectively, and exhibit responsible academic behavior. Conversely, even mild lapses in motivation could increase the risk of academic dishonesty when students encounter high-pressure scenarios. Therefore, fostering consistent science motivation through engaging instruction, practical activities, and supportive learning environments is essential for reducing academic dishonesty and enhancing overall learning outcomes.

Combined Influence of Equipment Use in Science and Inquiry-Based Teaching on Learners' Science Motivation

The regression analysis of this study revealed that equipment use in science and inquiry-based teaching, when combined, significantly influence learners' science motivation among Grade 12 STEM students. This suggests that while each variable individually contributes to motivation, their integration creates a more powerful effect on students' engagement, interest, and persistence in science learning.

This finding affirms the assertion of National Research Council, which emphasizes that effective science education integrates hands-on laboratory experiences with inquiry-based instructional strategies. According to the NRC, students develop meaningful understanding and stronger motivation when they are actively engaged in exploring scientific phenomena, constructing knowledge through experimentation, and reflecting on their learning.

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The result also aligns with the study of Hofstein, Avi and Lunetta, Vincent N. (2004), who reported that the use of laboratory equipment enhances students' interest and self-efficacy in science. By directly interacting with scientific tools, learners gain confidence in performing experiments, which strengthens their intrinsic motivation to learn.

Moreover, the finding corroborates Hmelo-Silver, Cindy E., Duncan, Richard G., and Chinn, Clark A. (2007), who emphasized that inquiry-based teaching encourages students to engage in questioning, problem-solving, and evidence-based reasoning. When inquiry strategies are paired with proper equipment use, students not only learn scientific concepts but also experience motivation through active discovery and achievement.

This study further suggests that the combined approach may help alleviate academic stress, as students feel more competent in completing experiments and tackling scientific problems. By promoting mastery and understanding, the integration of equipment use and inquiry-based teaching indirectly supports positive academic behaviors, reducing the risk of academic dishonesty and enhancing learners' motivation.

In conclusion, the results indicate that integrating hands-on laboratory experiences with inquiry-based teaching provides a synergistic effect that maximizes learners' science motivation. This underscores the importance of designing science curricula that balance practical skills with active learning strategies, ensuring that STEM students remain engaged, confident, and ethically responsible learners.

Inquiry-based Teaching and Learners Science Motivation

The findings of this study indicate a positive correlation between inquiry-based teaching and learners' science motivation among Grade 12 senior high school students. This suggests that when teachers implement inquiry-based strategies, students tend to exhibit higher engagement and intrinsic motivation in learning science. These results align with the study of Akcay and Yager (2016), which emphasized that inquiry-based learning fosters curiosity and encourages students to take ownership of their learning process, thereby enhancing motivation.

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Inquiry-based Teaching Influences Learners Science Motivation

The results of this study show that inquiry-based teaching significantly influences learners' science motivation. Specifically, inquiry-based teaching was found to be a significant predictor of science motivation among Grade 12 students, indicating that the more inquiry-based strategies are implemented, the higher the students' motivation to learn science. This finding is consistent with the study of Akcay and Yager (2016), which highlighted that inquiry-based approaches enhance students' curiosity, engagement, and active participation in science learning.

Conclusions

Based on the findings of the study, it is concluded that Inquiry-based Teaching is a significant predictor of learners' Science Motivation. Additionally, the study indicates that science learners' motivation is related to their use of equipment in science among Grade 12 students. However, inquiry-based learning was not found to be a significant predictor of equipment use in science.

Hence, this study partially affirms the Experiential Learning Theory by David Kolb, which states that learning through active engagement and experiences can enhance motivation and skill acquisition. Strenuous and hands-on experiences, such as conducting experiments and using scientific equipment, can lead to higher motivation and deeper understanding of scientific concepts. In turn, these motivated learners are more likely to actively participate in science activities and develop practical skills necessary for scientific inquiry.

Recommendations

Based on the conclusion, future researchers may replicate this study by including additional potential variables to determine the percentage of variance in Grade 12 senior high students' science motivation. Future studies may also conduct mediation analyses, utilizing equipment use in science as a mediating variable to better understand its role in influencing learners' motivation. Likewise, qualitative research may be conducted to explore emerging themes and sub-themes, which could uncover deeper insights into the factors affecting science learners' motivation.

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REFERENCES

[1.] Abrahams, I., & Millar, R. (2008). Does practical work really work? A study of the effectiveness of practical work as a teaching and learning method in school science. *International Journal of Science Education, 30*(14), 1945–1969. https://doi.org/10.1080/09500690701749305

[2.] Abungu, H. O., Okere, M., & Wachanga, S. W. (2014). The effect of science process skills teaching approach on secondary school students' achievement in chemistry in Kenya. *International Journal of Education and Research, 2*(1), 1–12.

[3.] Akçay, H., & Yager, R. E. (2016). Effects of guided inquiry and applications of science knowledge on students' academic achievement and motivation. *Journal of Education and Practice, 7*(20), 62–71.

[4.] Anduyan, M. R. B., Cabrera, A. J. A., & Mangibunong, J. A. (2018). Baseline performance in science motivation and problem solving tasks among junior high school learners in Davao City. [Unpublished study].

[5.] Awosoga, O., et al. (2021). Promotion of academic integrity and student motivation at a Canadian university. *Journal of Academic Ethics, 19*(4), 435–453.

[6.] Baltikian, M., Tohme, N., & Obeid, V. (2024). Science motivation among secondary students in Lebanon: An analysis of motivation levels and application of scientific concepts. *Eurasia Journal of Science Education, 16*(1), 45–62.

[7.] Bell, R. L., Smetana, L., & Binns, I. (2005). Simplifying inquiry instruction. *The Science Teacher, 72*(7), 30–33.

[8.] Crawford, B. A. (2007). Learning to teach science as inquiry in the secondary school: A critical review of the literature. *Journal of Science Teacher Education, 18*(1), 1–25. https://doi.org/10.1007/s10972-006-9022-5

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

Copyright © 2026 IJAMS, All right reserved

[10.] Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

[11.] Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*, 109–132. https://doi.org/10.1146/annurev.psych.53.100901.135153

[12.] 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

[13.] Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to design and evaluate research in education* (10th ed.). McGraw-Hill Education.

[14.] Freeman, S., et al. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences, 111*(23), 8410–8415. https://doi.org/10.1073/pnas.1319030111

[15.] Garzon, B. (2023). Factors contributing to science learning difficulties among junior high school students in the Philippines. *Philippine Journal of Education Research, 8*(2), 112–130.

[16.] Glynn, S. M., Brickman, P., Armstrong, N., & Taasoobshirazi, G. (2011). Science Motivation Questionnaire II: Validation with science majors and nonscience majors. *Journal of Research in Science Teaching, 48*(10), 1159–1176. https://doi.org/10.1002/tea.20442

[17.] Glynn, S. M., Taasoobshirazi, G., & Brickman, P. (2007). Science motivation questionnaire: Construct validation with nonscience majors. *Journal of Research in Science Teaching, 44*(8), 400–422. https://doi.org/10.1002/tea.20158

[18.] Hackett, G., & Betz, N. E. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. *Journal of Research in Mathematics Education, 20*(3), 261–273. https://doi.org/10.2307/749455

Copyright © 2026 IJAMS, All right reserved

[19.] Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist, 42*(2), 99–107. https://doi.org/10.1080/00461520701263368

[20.] Hofstein, A., & Lunetta, V. N. (2004). The laboratory in science education: Foundations for the twenty-first century. *Science Education, 88*(1), 28–54. https://doi.org/10.1002/sce.10106

[21.] Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.

[22.] Komarraju, M., Karau, S. J., & Schmeck, R. R. (2009). Role of the Big Five personality traits in predicting college students' academic motivation and achievement. *Learning and Individual Differences, 19*(1), 47–52. https://doi.org/10.1016/j.lindif.2008.07.001

[23.] Lederman, N. G. (2014). Nature of science: Past, present, and future. In S. K. Abell & N. G. Lederman (Eds.), *Handbook of Research on Science Education* (2nd ed., pp. 1–15). Routledge.

[24.] Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading & Writing Quarterly, 19*(2), 119–137. https://doi.org/10.1080/10573560308223

[25.] Liu, J., & Alias, N. (2023). Academic dishonesty and contributing factors among Chinese undergraduate students. *Journal of Academic Ethics, 21*(2), 145–160.

[26.] Marshall, J. C., Smart, J. B., & Horton, R. M. (2010). Inquiry teaching inventory: Measuring teacher practice in inquiry-based science instruction. *Journal of Science Teacher Education, 21*(5), 521–541. https://doi.org/10.1007/s10972-010-9193-8

[27.] Minner, D. D., Levy, A. J., & Century, J. (2010). Inquiry-based science instruction—What is it and does it matter? Results from a research synthesis years 1984 to 2002. *Journal of Research in Science Teaching, 47*(4), 474–496. https://doi.org/10.1002/tea.20347

Copyright © 2026 IJAMS, All right reserved

[28.] National Research Council. (2000). *Inquiry and the National Science Education Standards: A guide for teaching and learning*. National Academy Press.

[29.] Organisation for Economic Co-operation and Development. (2019). *Measuring student motivation: Insights from PISA*. OECD Publishing. https://doi.org/10.1787/motivation-2019

[30.] Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*(1), 33–40. https://doi.org/10.1037/0022-0663.82.1.33

[31.] Prince, M., & Felder, R. (2006). Inductive teaching and learning methods: Definitions, comparisons, and research bases. *Journal of Engineering Education, 95*(2), 123– 138. https://doi.org/10.1002/j.2168-9830.2006.tb00884.x

[32.] Reyes, A. M., & Dela Cruz, M. P. (2024). Ethical compliance and data privacy practices in Philippine educational research. *Journal of Educational Ethics, 3*(1), 22–35.

[33.] Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

[34.] Sawyer, R. K. (Ed.). (2006). *The Cambridge handbook of the learning sciences*. Cambridge University Press.

[35.] Schunk, D. H., Pintrich, P. R., & Meece, J. L. (2014). *Motivation in education: Theory, research, and applications* (4th ed.). Pearson.

[36.] Tai, R. H., Liu, C. Q., Maltese, A. V., & Fan, X. (2006). Planning early for careers in science. *Science, 312*(5777), 1143–1144. https://doi.org/10.1126/science.1128690

[37.] Taşar, M. F. (2008). Development of an inquiry-based teaching scale and investigation of teachers' inquiry classroom practices. *European Journal of Teacher Education, 31*(2), 161–176. https://doi.org/10.1080/02619760801979531

[38.] Tejada, M. A., & Punzalan, R. S. (2012). *Sampling techniques: Determining sample size using Slovin's formula*. Polytechnic University Press.

Copyright © 2026 IJAMS, All right reserved

[39.] TIMSS & PIRLS International Study Center. (2019). *TIMSS 2019 International results in science*. Boston College, Lynch School of Education. https://timssandpirls.bc.edu/timss2019/international-results/

[40.] Valdez, C. J. B., & Bungihan, M. M. (2019). Relationship of conceptual knowledge and problem solving ability in science among Filipino junior high school students. *Asia Pacific Journal of Multidisciplinary Research, 7*(2), 23–30.

[41.] Marshall, J. C., Smart, J., & Horton, R. M. (2010). *The inquiry teaching inventory: Measuring teacher practice in inquiry-based science instruction*. Journal of Science Teacher Education, 21(5), 521–541. https://doi.org/10.1007/s10972-010- 9193-8

[42.] Taşar, M. F. (2008). *Inquiry-based teaching scale (IBTS) for science education*. Eurasia Journal of Mathematics, Science & Technology Education, 4(3), 265–274. https://doi.org/10.12973/ejmste/75302

[43.] Bell, R. L., Smetana, L., & Binns, I. (2005). Simplifying inquiry instruction. *The Science Teacher, 72*(7), 30–33.

[44.] Crawford, B. A. (2007). Learning to teach science as inquiry in the secondary school: A critical review of the literature. *Journal of Science Teacher Education, 18*(1), 1–25. https://doi.org/10.1007/s10972-006-9022-5

[45.] Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist, 42*(2), 99–107. https://doi.org/10.1080/00461520701263368

[46.] Marshall, J. C., Smart, J. B., & Horton, R. M. (2010). Inquiry teaching inventory. *School Science and Mathematics, 110*(2), 60–70. https://doi.org/10.1111/j.1949-8594.2010.00005.x

Copyright © 2026 IJAMS, All right reserved

[47.] Minner, D. D., Levy, A. J., & Century, J. (2010). Inquiry-based science instruction—What is it and does it matter? Results from a research synthesis years 1984 to 2002. *Journal of Research in Science Teaching, 47*(4), 474–496. https://doi.org/10.1002/tea.20347

[48.] Sawyer, R. K. (Ed.). (2006). *The Cambridge handbook of the learning sciences.* Cambridge University Press.

[49.] Taşar, M. F. (2008). Development of an inquiry-based teaching scale. *Journal of Baltic Science Education, 7*(2), 76–84.

[50.] Tobin, K., & McRobbie, C. J. (1996). Reforming science education: Social constructivism and the science classroom. *Studies in Science Education, 27*(1), 1–38. https://doi.org/10.1080/03057269608560093

[51.] Byrne, B. M. (1996). *Measuring self-concept across the life span: Issues and instrumentation.* American Psychological Association.

[52.] Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*(1), 109–132. https://doi.org/10.1146/annurev.psych.53.100901.135153

[53.] Glynn, S. M., Taasoobshirazi, G., & Brickman, P. (2007). Science motivation questionnaire: Construct validation with nonscience majors. *Journal of Research in Science Teaching, 44*(8), 127–146. https://doi.org/10.1002/tea.20158

[54.] Hackett, G., & Betz, N. E. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. *Journal of Research in Mathematics Education, 20*(3), 261–273. https://doi.org/10.2307/749455

[55.] Komarraju, M., Karau, S. J., & Schmeck, R. R. (2009). Role of the Big Five personality traits in predicting college students' academic motivation and achievement. *Learning and Individual Differences, 19*(1), 47–52. https://doi.org/10.1016/j.lindif.2008.07.001

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[56.] Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading & Writing Quarterly, 19*(2), 119–137. https://doi.org/10.1080/10573560308223

[57.] Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*(1), 33–40. https://doi.org/10.1037/0022-0663.82.1.33

[58.] Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

[59.] Schunk, D. H., Pintrich, P. R., & Meece, J. L. (2014). *Motivation in education: Theory, research, and applications* (4th ed.). Pearson.

[60.] Tai, R. H., Liu, C. Q., Maltese, A. V., & Fan, X. (2006). Planning early for careers in science. *Science, 312*(5777), 1143–1144. https://doi.org/10.1126/science.1128690

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