Student Grit in Science and Student Engagement: The Mediating Effect of Student interest

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ABSTRACT

This study investigated the interplay among student grit, interest, and engagement in science education within rural junior high schools aiming to understand how grit and interest jointly influence science learning engagement. Employing quantitative correlational design, data were collected via validated Likert-scale questionnaires measuring grit, student interest, and engagement, administered to a balanced sample of male and female students. Reliability was confirmed through pilot testing, and ethical protocols were strictly followed. Descriptive statistics revealed high levels of grit, interest, and engagement among respondents. Correlational analyses showed significant positive relationships between grit and engagement, grit and interest, and interest and engagement. Mediation analysis using regression and Sobel z-test confirmed that student interest partially mediated the effect of grit on engagement. These results suggest that grit enhances science engagement both directly and indirectly by fostering intrinsic interest, highlighting the importance of addressing both perseverance and motivational factors in educational practice. The findings underscore the pivotal role of supportive teachers, positive classroom experiences, and social encouragement in nurturing sustained interest and active engagement in science learning. Consequently, this study contributes to science education by validating motivational theories like Self-Determination Theory and the Interest Development Model within a rural Philippine context, emphasizing culturally responsive pedagogical approaches that integrate grit development with interest cultivation. The implications advocate for inquiry-based, autonomy-supportive teaching strategies that build resilience and curiosity to promote deeper engagement and scientific literacy, particularly in resource-limited settings.

Keywords*:* education, student grit, student engagement, student interest, mediation effect, Philippines

INTRODUCTION

Student engagement in science education plays a vital role in shaping academic achievement and scientific literacy, both of which are essential for national development and innovation (Belisario & Paglinawan, 2025). Engaged students tend to think critically, solve problems effectively, and persevere through challenges skills that are increasingly important in addressing global issues like climate change, health crises, and sustainability (Johri & Yadav, 2025). However, keeping students meaningfully engaged in science remains a global challenge, particularly in developing countries like the Philippines, where limited resources, educational inequality, and socio-cultural factors continue to hinder motivation and participation.

This problem is evident in the 2018 PISA results, where Filipino junior high students scored well below the global average in science literacy. Factors such as uninspiring classroom environments, limited teacher support, and curricula disconnected from students' daily lives contribute to this gap. In rural areas, these challenges are even more pronounced due to economic hardships and lack of access to educational materials (Santos et al., 2023).

Engagement in science learning involves not only behavior but also emotional and cognitive involvement. When students are curious and emotionally connected to the subject, they are more likely to stay motivated and achieve higher learning outcomes. Studies show that incorporating real-world, hands-on experiences in science lessons enhances both interest and achievement (Means & Neisler, 2023). Positive teacher-student relationships and interest-driven tasks have also been shown to promote grit and sustained focus, especially on difficult science topics (Datu & Valdez, 2024; Wong et al., 2025).

Grit defined as perseverance and passion for long-term goals, was popularized and operationalized by Duckworth et al. (2007). It reflects sustained effort despite obstacles and setbacks. In educational contexts, grit is increasingly recognized as a pivotal non-cognitive factor supporting resilience and academic success. Research shows that grit not only supports direct engagement in science but also enhances interest, which in turn fuels deeper learning (Wong et al., 2025; Alhadabi, 2021).

Interest in science education benefits from an integration of psychological and philosophical perspectives. Trask-Kerr et al. (2019) discuss John Dewey's conceptualization of schooling as an early form of positive education, wherein motivation originates from the development of genuine interest in learning activities. Dewey (1913) posited that interest is not a fixed trait but a dynamic process that evolves through meaningful experiences, which in turn sustain the perseverance required to overcome educational challenges. This philosophical stance aligns with contemporary constructs such as grit, defined by Duckworth et al. (2007) as sustained perseverance and passion toward long-term goals. Combining Dewey's philosophy with grit theory provides a comprehensive framework that emphasizes the mutual reinforcement of evolving interest and persistent effort, which jointly contribute to student engagement and resilience in science learning contexts, particularly within rural educational settings.

Understanding these relationships is especially important in rural Philippine schools, where educational barriers can severely limit student motivation. While grit, interest, and engagement have been studied individually, there is limited research on how they interact particularly how interest mediates the relationship between grit and engagement. Mediation models suggest that grit influences engagement both directly and indirectly through the development of student interest, highlighting the need for integrated motivational strategies (Datu & Valdez, 2024; Durak et al., 2023).

The **Self-Determination Theory (SDT)** by Deci and Ryan (1985) provides a strong foundation for this understanding. SDT emphasizes the importance of satisfying students' psychological needs for autonomy, competence, and relatedness to foster intrinsic motivation and engagement. In this framework, grit reflects a form of self-driven motivation, while interest arises when students find personal value in what they're learning. Together, they drive deeper participation in science.

Three supporting theories further enrich this view. The **Interest Development Model** (Hidi & Renninger, 2006) explains how grit helps transform short-term curiosity into lasting interest. The **Engagement-Motivation Framework** (Fredricks et al., 2004) links motivation with the behavioral, emotional, and cognitive aspects of engagement. Meanwhile, **Bandura's Social Cognitive Theory** (1986) highlights how personal factors, like grit, interact with environmental conditions to influence learning, with interest acting as a self-regulatory factor that deepens engagement.

Incorporating grit-building strategies into science education such as encouraging perseverance, offering student choice, and providing real-world learning tasks can significantly boost motivation. Interest, in turn, makes science more enjoyable and meaningful, helping students invest more time and effort.

In sum, creating supportive, culturally relevant, and inquiry-based science classrooms that nurture both grit and interest is key to sustaining engagement especially in under-resourced and rural settings. These approaches not only improve academic performance but also empower students to become lifelong science learners equipped to face the complex challenges of the future.

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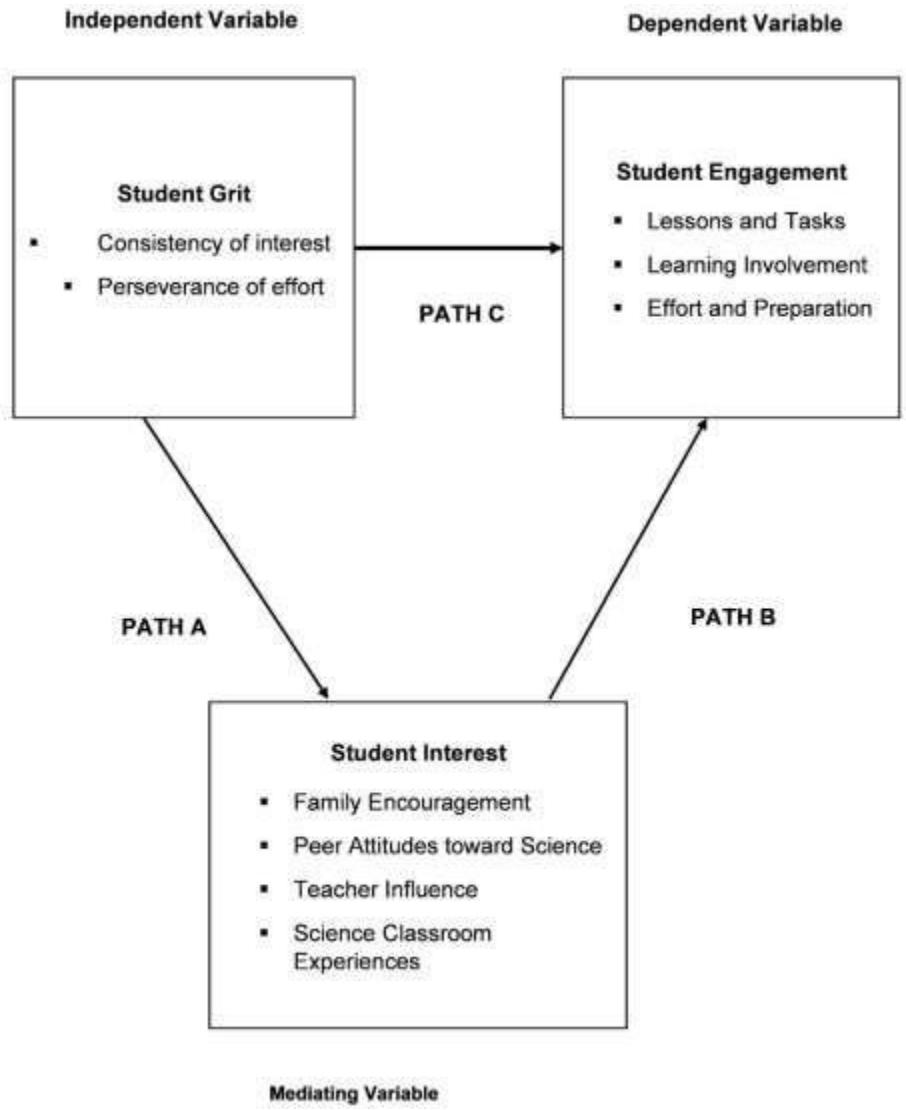

Figure 1. Conceptual Framework showing the variables of the study

This study takes on a critical but often overlooked issue in science education: how students' grit, interest, and engagement connect and interact, especially in rural areas of the Philippines like Don Carlos II District in Bukidnon. While there's already a lot of research on these motivational factors, most of it focuses on urban or western settings. Rural schools particularly in countries like the Philippines face very different challenges, including limited resources, economic hardships, and cultural differences that are not the only reflected in much of the existing literature.

The need for this research is urgent. According to the 2018 PISA results, Filipino students especially in rural areas continue to struggle in science, and many are losing motivation altogether. Many earlier studies treat these variables as separate, without digging into how they influence each other in a real-world. There is also a lack of tools that are adapted to the realities of Filipino students' lives, making this study even more timely and necessary. This is not just a classroom problem; it is a national issue. Science education is essential not just for academic success but for preparing young people to solve problems, think critically, and contribute to their communities. To improve science outcomes, it is needed to first understand what drives or hinders students' motivation to learn, especially those who face more barriers than most.

This study addresses these gaps by focusing on junior high science students in Don Carlos II District, Bukidnon. The study specifically aimed to respond to the following objectives: (1) To determine the levels of student grit, student interest and student engagement in science; (2) To measure the level significance of the relationship between student grit and student engagement, significance of the relationship between student grit and student

interest, and significance of the relationship between student interest and student engagement; (3) To ascertain the correlation of student grit on student engagement as mediated by student interest; and (4) To evaluate presence (or absence) of mediating effect. Through these objectives, the study provides a comprehensive understanding of how perseverance and intrinsic interest jointly contribute to meaningful engagement in science education.

The study is built on the following hypotheses: (1) There is no significant correlation between student grit, interest, and engagement, and (2) interest does not significantly mediate the relationship between student grit and student engagement. These hypotheses are tested through data collected from real classrooms, using reliable and context-sensitive tools that reflect students' actual experiences.

The study by Law, Sharif, and Han (2021) highlights that rural secondary students exhibit a high level of motivation toward science learning, which significantly correlates with their academic achievement in science. The research also points out notable gender differences in motivation levels, emphasizing that student motivation is a crucial factor influencing engagement and performance in rural science education. By identifying grit and interest fuel engagement, this study provides practical insights that teachers and policymakers can use to design learning experiences that are both culturally relevant and genuinely motivating.

On a global level, this study contributes something that has long been missing grounded, empirical evidence from an underserved population. It enriches popular motivational theories like Self-Determination Theory and the Interest Development Model by showing how these concepts work in real-life rural school settings.

This localized study speaks to a global need making science education more inclusive and effective for all students, no matter where they live or what challenges they face. In doing so, it helps build a foundation for broader efforts to close educational gaps, support resilience, and create opportunities for young people in underserved communities. Ultimately, it is about making sure that all students regardless of background have the chance to succeed, stay curious, and engage in meaningfully with science.

METHODOLOGY

The research respondent, the materials and instrument, and the research design and procedure are being presented in this part.

Research Respondent

The respondents were all coming from public junior high school students from Don Carlos II District, Don Carlos, Bukidnon. A primarily rural area in Northern Mindanao, the district was home to agrarian communities with few educational opportunities and below average household incomes compared to urban areas. Respondents were predominantly between 12–16 years of age and in Grades 7 through 10. They came from diverse social class backgrounds alike in rural Filipino context and experienced some constraints that include the scarcity of materials, limited access to sophisticated science facilities, and varied levels of familial and community support factors all intertwined together in shaping their modulation with science education. These respondents were conforming to the national science curriculum that is adapted locally whereas, their grittiness, interest and engagement in science were all socially constructed by different social factors such peer attitudes; teacher influence; family encouragement and the classroom environment.

The sample consisted of 300 respondents from the junior high level selected from three public schools in the district: Kiara National High School, Bocboc National High School, and New Nongnongan National High School. Each school contributed an equal number of 100 respondents which in total represented about 16 percent of the total district junior high enrollment which was 1,863 students. The adequacy of the sample size and proportion of respondents from each school increased the representativeness and validity of the study's findings.

To guarantee proportional representation of all grade levels in each junior high school, the respondents were chosen through stratified random sampling. This approach assigning each respondent into strata based on school and grade, then randomly selecting within strata. Stratified random sampling is applicable in this study given the

difference in the respondent experiences and sampling bias. This method, which takes into consideration the previous respondents' experiences, resources, socio-demographic variables, and learning levels, sharpens the reliability and validity of the findings (Creswell, 2014).

Respondents needed to be currently enrolled junior high school students from one of the public schools in the Don Carlos II District and had to give informed consent. For respondents who were minors, appropriate parental or guardian consent was obtained. Respondents also needed to be present at the time of data collection, and to have the ability to complete the instruments on their own.

Exclusion criteria included respondents who were not present during the data collection period, individuals with cognitive or learning disabilities that made it hard for them to fill out the questionnaire, and those who chose not to participate. This approach helped maintain the integrity and reliability of the data by including only those who could provide valid responses.

Participants were free to withdraw from the study at any point, without any consequences. This respected their right to make informed decisions and ensured that their participation was completely voluntary. Any responses that were incomplete, partially answered, or withdrawn were excluded from the final analysis to maintain the reliability and integrity of the data. Importantly, choosing not to continue with the study had no effect on the students' grades, academic standing, or relationships within their schools.

The study also made sure to include a balanced number of male and female respondents, reflecting the actual gender distribution of junior high school students in the district. This helped the researcher explore whether motivational patterns in science learning differed by gender and ensured that the findings were more inclusive. By representing a diverse group of students, the study aimed to produce results that were not only statistically sound but also meaningful and applicable to a wider educational context.

The Don Carlos II District, like many rural areas in the Philippines, experiences a typical tropical climate with clear wet and dry seasons. These weather patterns do not just shape farming routines they also affect students' ability to attend school regularly, especially during heavy rains or harvest periods when families need extra help in the fields. Access to educational resources in the district is noticeably limited compared to what's available in cities. Many schools operate with outdated or insufficient learning materials, and science laboratories, if present at all, often lack the tools needed for meaningful experiments. Teachers do their best with what they have, but the lack of equipment and proper facilities makes it difficult to provide interactive and engaging science lessons. For many students, learning science becomes more about reading from textbooks than exploring concepts through hands-on activities, which can make it harder for them to stay interested and motivated.

In a place like this rural district, students' experiences with science can be very different from one another. Some show up eager to learn, doing their best even when things are not ideal, like when the lab is missing equipment or books are outdated. Others start to lose interest, not because they do not care, but because real-life responsibilities or lack of support at home make school feel like a second priority. Here, it is not just about what is taught in the classroom, but about what students are dealing with outside of it. That is what makes this community an important setting for this kind of study. It gives a clearer picture of how things like persistence, curiosity, and motivation play out when students are navigating both learning and life. The goal is not just to collect data, but to better understand what these students go through and maybe offer something useful for other schools in similar situations.

Materials and Instruments

In this study, three sets of instruments were utilized to measure the key variables of student grit, interest, and engagement in science among junior high school students. The first instrument, measuring student engagement as the dependent variable, was adapted from Baraquia's (2019) "Students' Science Engagement Scale (SSES)," which captures engagement through 15 items organized into three indicators: science lessons and tasks, science learning environment, and science effort and preparation. The independent variable, student grit, was assessed using a 10-item scale adapted from Duckworth et al. (2009) "Short Grit Scale (Grit–S)," which includes equal items reflecting two facets—consistency of interest and perseverance of effort—tailored to the science learning

context. The third instrument, designed to measure the mediating variable of student interest, was adapted from Lamb et al.'s (2011) "Science Interest Survey," consisting of 16 items divided among four indicators: family encouragement, peer attitudes toward science, teacher influence, and science classroom experiences. All questionnaires employed a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree).

Reliability analysis via Cronbach's alpha showed acceptable to excellent internal consistency across the instruments: 0.750 for the grit scale, 0.928 for the engagement scale, and 0.856 for the interest scale. The overall high Cronbach's alpha of 0.943 for the combined 41-item instrument reflects strong reliability, supported by a pilot test that confirmed clarity, validity, and consistency. Moreover, a panel of five expert validators in science education rated the instruments highly, with an average score of 4.69 out of 5, affirming their content validity and suitability for the student population studied. Following final revisions, the researcher secured permission from the school principal to implement the study.

Research Design and Procedure

The study employed a quantitative correlational research design, appropriate for examining the relationships among student grit, student interest, and student engagement in science without manipulating variables (Creswell, 2014). It is a statistical analysis method to determine whether a variable is a high mediator of another variable. This study also aims to determine the mediating effect of student interest, specifically examining the significant relationship between the student grit and student engagement.

Data collection occurred in April 2025 after obtaining formal approvals from the District Education Office and administrators of three public junior high schools in Don Carlos II District, Bukidnon: Kiara National High School, Bocboc National High School, and New Nongnongan National High School.

During this research, the researcher carefully followed ethical rules to keep the study honest and reliable. Here are the main steps taken: First, the researcher worked on the questionnaire by exploring, translating, and showing it to evaluators. The researcher checked and analyzed it carefully to make sure it would work well for the study. After making corrections suggested by the evaluators, the researcher prepared it for official validation. To make the questionnaire even better, the researcher also hired an outside expert to review it. Second, once the questionnaire was finished, the researcher organized everything needed to meet UMERC's validation standards. Third, the researcher sent a letter to the school asking for permission to carry out the study.

The statistics used in this study are as follows: To determine the levels of student girt, student engagement and student interest, the researcher computed the mean scores. Meanwhile, the researcher used the correlation coefficient (r) to identify significant relationships between student interest, student grit, and student engagement. Finally, linear regression analysis was employed to examine the influence of the independent variables' student grit and student engagement on the dependent variable, student interest, and to identify which serves as the better mediating effect.

The researcher submitted a manuscript to UMERC, Protocol No. UMERC-2025-080, requesting a review and ethical evaluation based on the following considerations: Throughout the study, the researcher prioritized the ethical treatment and safety of all participants. Participation was entirely voluntary, with no coercion involved. Respondents' confidentiality was carefully maintained regardless of the study's outcomes. Participants could choose whether to provide their names when answering questions, and they were free to withdraw from the study at any point without penalty, with assurances that their grades would remain unaffected. The researcher fully protected any confidential information obtained.

Potential benefits of the research were clearly communicated to participants. Data collection was conducted face-to-face, and no anticipated issues were foreseen. Participants were explicitly informed, both verbally and in writing, about their voluntary involvement and their right to withdraw at any time without consequence. For participants under 18, informed consent and assent were obtained from their parents or legal guardians prior to participation.

All privacy and confidentiality protocols were strictly followed to protect participants from risks such as

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psychological distress, social consequences, or legal issues. Data were securely stored in password-protected digital files and locked physical cabinets, accessible only to the researcher. Personal identifiers were anonymized, and no personally identifiable information was disclosed. Any sharing of anonymized data with school officials or policymakers required prior ethics board approval and compliance with data protection laws.

The researcher provided clear information on the study's purpose and properly outlined inclusion and exclusion criteria. Permission was obtained from the school administration or principal before participant recruitment, which followed predetermined criteria to ensure the inclusion of qualified individuals. The researcher collaborated with school personnel, such as advisers, teachers, and academic coordinators to identify potential participants, ensuring recruitment remained voluntary and unbiased.

Potential risks, physical, psychological, social, and economic were carefully evaluated and disclosed before consent was sought. Some questions might cause discomfort or anxiety; thus, the researcher emphasized that there were no right or wrong answers, reinforced that responses were confidential, allowed participants to skip questions or take breaks, and coordinated with school guidance counselors to provide support if needed.

Participants were informed that they would indirectly benefit from the study's findings, which could improve educational strategies and student support, though no direct monetary incentives were provided. Small tokens of appreciation were given as a gesture of thanks for their time.

To avoid plagiarism, the researcher accurately cited sources in APA format, paraphrased appropriately, and used plagiarism detection tools to confirm originality. The researcher thoroughly understood and acknowledged all sources and provided clear definitions of key terms and the appropriate model used.

Digital records were securely deleted following the study, following ethical guidelines for data retention and disposal. The researcher-maintained data integrity by avoiding any fabrication, falsification, manipulation, or misrepresentation, ensuring that findings were accurate and supported by evidence. All contributors who significantly influenced the research were properly acknowledged, including the research adviser, who was credited as co-author for their guidance and expertise.

The researcher confirmed that no conflicts of interest existed. Measures were taken to uphold objectivity and ethical standards, including transparent data collection and analysis based solely on objective evidence. Any personal relationships with participants, facilitators, or the school were disclosed to the ethics committee, with precautions taken to reduce bias, such as independent data collection and validation.

RESULTS AND DISCUSSION

The analyses and interpretations of the data gathered in relation to the study's objectives are presented in this chapter.

Level of Student Grit

As shown in Table 1, the results yielded an overall mean score of 3.55 with the standard deviation of 0.50, indicating a high level of student grit in science. Among the indicators, consistency of interest achieved the highest mean score of 3.56, categorized as high.

Table 1

Indicators	**SD**	**Mean**	**Descriptive Level**
Consistency of Interest	0.57	3.56	High
Perseverance of Effort	0.65	3.55	High
Overall	**0.50**	**3.55**	**High**

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Level of Student Grit

The data reveals that a student indicates that most students consistently show both perseverance and sustained interest in their science learning. Specifically, the highest mean score is observed in the consistency of interest with the weighted mean of 3.56, suggesting that students maintain a steady and enduring passion for science over time. Similarly, perseverance of effort with the weighted mean of 3.55 reflects students' strong determination to overcome challenges and persist in science-related tasks. Together, these indicators highlight a robust motivational foundation that supports students' long-term engagement and success in science education.

Educators should recognize and nurture both facets of grit, consistency of interest and perseverance of effort to sustain students' motivation and achievement in science. Designing curricula and instructional strategies that foster sustained curiosity while providing manageable challenges can help maintain students' consistent interest and simultaneously encourage persistence despite difficulties. Findings underscore the critical role of sustained effort in overcoming learning challenges, especially in distance education settings where autonomy and self-regulation are vital.

The study of Amistad-Sarzadilla (2025), supports a positive correlation between grit and science academic performance, particularly among students at risk of dropping out. Additionally, Datu and Valdez (2024) highlighted the importance of relatedness and engagement in sustaining science interest, suggesting that supportive learning environments can bolster both grit and motivation. Moreover, Bazelais et al. (2023) confirmed that grit serves as a significant non-academic predictor of achievement among undergraduate science students, reinforcing the necessity of integrating grit development within science curricula to promote scientific literacy and academic success. Complementing these findings, the narrative review by Allen et al. (2021) emphasizes that perseverance of effort is the component of grit most strongly linked to academic success and recommends that educational interventions focus primarily on enhancing this facet to maximize outcomes. Collectively, these studies support the emphasis in your data on perseverance as a key driver of student grit in science learning.

Level of Student Engagement

This section presents the students' engagement toward science based on the statistical results. The data presented in Table 2 indicates a high level of student engagement toward science, with an overall mean score of 3.87 and a standard deviation of 0.62, suggesting consistent and high involvement among students. Among the indicators, "Science Lesson and Tasks" received the highest mean score of 3.96, reflecting students' positive perception and active participation in science lessons and related tasks. "Learning Involvement" and "Effort and Preparation" also scored highly, with means of 3.87 and 3.77 respectively, indicating that students are not only engaged cognitively and behaviorally but also put considerable effort into preparing and participating in science activities. The relatively low standard deviations across all indicators suggest that these engagement levels are fairly uniform across the student population.

Table 2

Indicators	**SD**	**Mean**	**Descriptive Level**
Science Lesson and Tasks	0.73	3.96	High
Learning Involvement	0.70	3.87	High
Effort and Preparation	0.70	3.77	High
Overall	**0.62**	**3.87**	**High**

Level of Student Engagement

High engagement in science lessons and tasks underscores the effectiveness of interactive and meaningful instructional strategies that capture students' interest and encourage active participation. Teachers should

continue to design science curricula that are hands-on, inquiry-based, and relevant to students' everyday lives to sustain this high level of engagement. Datu and Valdez (2024) found that fostering a sense of relatedness and meaningful involvement significantly enhances science engagement among Filipino students, highlighting the importance of social connectedness. Similarly, Means and Neisler (2023) further stress that student engagement is a multidimensional construct, comprising behavioral, emotional, and cognitive components, all of which should be addressed comprehensively through deliberate and inclusive teaching approaches.

Collaborative learning plays a crucial role in sustaining engagement in science education. Additionally, Amistad-Sarzadilla (2025) highlights that sustained engagement, especially when coupled with grit, is critical for enhancing academic performance, notably among students at risk of dropping out. These findings collectively suggest that integrating strategies promoting both active engagement and perseverance is essential to fostering scientific literacy and academic success.

Level of Student Interest

This part of the study summarizes students' level of science interest based on the collected data. The data in Table 4 reveals that students exhibit a high level of interest in science, with an overall mean score of 3.80 and a relatively low standard deviation of 0.61, indicating consistent enthusiasm across the student population. Among the specific indicators, "Teacher Influences" stands out with the highest mean score of 4.09, highlighting the critical role that teachers play in fostering and maintaining students' interest in science. This is closely followed by "Science Classroom Experiences" with a mean of 3.91, suggesting that engaging and positive classroom environments significantly contribute to sustaining students' curiosity and motivation. Additionally, "Peer Attitudes" and "Family Encouragement" also received high mean scores of 3.67 and 3.63, respectively, underscoring the importance of social support systems in nurturing students' interest in science.

Table 3Level of Student Interest

Indicators	**SD**	**Mean**	**Descriptive Level**
Family Encouragement	0.81	3.63	High
Peer Attitudes	0.74	3.67	High
Teacher Influences	0.79	4.09	High
Science Classroom Experiences	0.79	3.91	High
Overall	**0.61**	**3.80**	**High**

The strong influence of teachers on student interest suggests that educators must adopt instructional strategies that are not only informative but also inspiring and supportive. Teachers can foster interest by creating interactive lessons, providing timely feedback, and encouraging inquiry-based learning that connects scientific concepts to real-world applications. Positive classroom experiences, as noted by Hafizoglu and Yerdelen (2020), promote student motivation by creating learning environments where students feel valued and intellectually stimulated. Such environments encourage active participation and deeper cognitive engagement, which are critical for sustaining students' interest in science. Furthermore, teachers who demonstrate enthusiasm and consistently provide encouragement significantly impact student interest and curiosity.

Beyond the classroom, the role of family and peers also plays a vital part in nurturing student interest. Family encouragement and positive peer attitudes serve as crucial social motivators that reinforce students' favorable perceptions of science. Nuraysha et al. (2024) emphasize that students who receive support from family and peers are more likely to develop and maintain a genuine interest in science, as these social influences provide emotional backing and model positive attitudes toward learning.

Science educators should therefore consider involving families and fostering constructive peer interactions through collaborative projects, science clubs, and community engagement. Integrating these social factors into

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science curricula can create a holistic support system that nurtures student interest, ultimately leading to improved engagement and academic achievement.

Significance of the Relationship between Grit and Engagement of Students

The data in Table 4 demonstrates significant positive correlations between students' grit and various dimensions of engagement in science, with all correlation coefficients ranging from moderate to strong and p-values indicating high statistical significance ($p < .001$). Notably, perseverance of effort shows the highly relationships with engagement indicators such as science lessons and tasks ($r = .505$), learning involvement ($r = .558$), effort and preparation ($r = .511$), and overall engagement ($r = .602$). Consistency of interest also positively correlates with these engagement measures, though with somewhat lower coefficients. The overall grit score similarly shows moderate to high positive associations with student engagement. These results suggest that students who demonstrate higher levels of grit especially perseverance are more likely to be actively involved, put forth effort, and engage meaningfully in science learning activities.

Table 4Significance of the Relationship between Grit and Engagement of Students

Grit	**Engagement**			
	Science Lesson and Tasks	**Learning Involvement**	**Effort and Preparation**	**Overall**
Consistency of Interest	.275** .000	.270** .000	.186** .001	.281** .000
Perseverance of Effort	.505** .000	.558** .000	.511** .000	.602** .000
Overall	**.480**** **.000**	**.511**** **.000**	**.434**** **.000**	**.546**** **.000**

The analysis showed a **high positive relationship** between student grit and engagement in science. This indicates that students who exhibit greater perseverance and sustained effort tend to be more actively involved and persistent in their science learning activities. Educators should therefore focus on cultivating both perseverance of effort and consistency of interest to enhance student engagement. Perseverance, which involves sustained effort despite challenges, can be nurtured by creating learning environments that encourage persistence through scaffolded tasks and constructive feedback.

Moreover, the relationship between grit and engagement is influenced by contextual and psychological factors such as perceived teacher support and classroom climate. As discussed by Yau and Shu (2023), teachers' emotional support and a positive classroom environment can strengthen grit's positive impact on engagement by providing students with the resources and encouragement needed to persist. Therefore, science educators should adopt holistic approaches that combine fostering grit with creating supportive, motivating environments to maximize student engagement and ultimately academic achievement.

Significance of the Relationship between Grit and Interest of Students

Table 5 presents statistically significant positive correlations between students' grit and various dimensions of their science interest, including family encouragement, peer attitudes, teacher influences, and science classroom experiences. Perseverance of effort consistently shows higher correlations across all indicators (ranging from .242 to .402, $p < .001$) compared to consistency of interest, which has lower but still significant relationships (ranging from .117 to .240). The overall grit score also positively correlates with all interest indicators, with the highly association seen with science classroom experiences ($r = .362$) and teacher influences ($r = .278$). These results indicate that students who exhibit higher grit, particularly perseverance, tend to report greater interest in science supported by social and instructional contexts.

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Table 5 Significance of the Relationship Grit and Interest of Students

Grit	Interest				
	Family Encouragement	**Peer Attitudes**	**Teacher Influences**	**Science Classroom Experiences**	**Overall**
Consistency of Interest	.240** .000	.117* .043	.129* .026	.223** .000	.231** .000
Perseverance of Effort	.312** .000	.242** .000	.320** .000	.367** .000	.402** .000
Overall	**.336** .000**	**.222** .000**	**.278** .000**	**.362** .000**	**.389*000**

Fostering students' perseverance of effort can enhance their interest in science by strengthening their engagement with family, peers, teachers, and classroom experiences. Perseverance reflects sustained effort and resilience, which help students remain motivated despite challenges. Teachers can support this by designing challenging yet achievable science tasks and providing consistent encouragement to build students' persistence. Moreover, the positive correlations with teacher influences and classroom experiences underscore the critical role of educators and learning environments in nurturing science interest. This aligns with Qiao's (2022) theoretical analysis emphasizing that positive social environments, including teacher support and peer collaboration, are crucial for enhancing both grit and engagement in students. And the study of Mudana et al. (2024) supports students who possess stronger foundational science skills tend to exhibit higher levels of perseverance, which supports their sustained engagement in science learning despite challenges. Therefore, science educators should cultivate nurturing, interactive, and collaborative classrooms that encourage perseverance and sustained interest, while also involving families and peers to create a comprehensive support system for students.

Significance of the Relationship between Interest and Engagement of Students

The data presented in Table 6 reveals high and statistically significant positive correlations between various dimensions of student interest and engagement in science. The overall correlation between interest and engagement is particularly high ($r = .714$, $p < .001$), indicating that students who exhibit higher interest in science are also more actively engaged in science lessons, learning involvement, and effort and preparation. Among the specific indicators, teacher influences (ranging from .500 to .620) and science classroom experiences (ranging from .506 to .618) show especially high relationships with engagement components, underscoring the critical role of instructional and environmental factors in linking interest to active participation. Family encouragement and peer attitudes also demonstrate moderate to strong correlations with engagement, highlighting the importance of social support in fostering student involvement in science.

Table 6Significance of the Relationship between Interest and Engagement of Students

Interest	Engagement			
	Science Lesson and Tasks	**Learning Involvement**	**Effort and Preparation**	**Overall**
Family Encouragement	.389** .000	.457** .000	.505** .000	.516** .000
Peer Attitudes	.402** .000	.438** .000	.334** .000	.449** .000

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Teacher Influences	.553** .000	.566** .000	.500** .000	.620** .000
Science Classroom Experiences	.506** .000	.572** .000	.540** .000	.618** .000
Overall	**.598** .000**	**.658** .000**	**.610** .000**	**.714** .000**

These findings suggest that science educators should prioritize creating learning environments that not only spark students' interest but also actively engage them. Such strategies enable learners to connect theoretical knowledge with practical applications, thereby increasing their effort and involvement in science learning.

Moreover, the influence of family and peers on student engagement highlights the importance of the broader social context that supports science education. The study of Victorino et. al., 2025 support that students from supportive home settings demonstrated strong motivation, effective study habits, and academic resilience despite financial or socio-economic challenges. This underscores the value of involving families through science-related events and encouraging collaborative peer learning to strengthen students' engagement. By integrating these social factors into science curricula, educators can foster a more holistic and motivating learning experience, which supports sustained interest and academic success.

Correlation of Student Grit on Student Engagement as Mediated by Student Interest

Table 7 presents the results of a regression analysis examining the influence of student grit on student engagement in science, with student interest acting as a mediating variable. The total effect of grit on engagement (path c) is high and significant (B = 0.670, β = 0.546, $p < 0.001$), indicating that grit positively mediates engagement. The path from grit to interest (path a) is also significant (B = 0.468, β = 0.389, $p < 0.001$), showing that grit enhances students' interest in science. The path from interest to engagement (path b) is notably high (B = 0.604, β = 0.591, $p < 0.001$), suggesting that increased interest significantly boosts engagement. Importantly, the direct effect of grit on engagement controlling for interest (path c') remains significant but reduced (B = 0.388, β = 0.316, $p < 0.001$), indicating that interest partially mediates the relationship between grit and engagement.

Table 7 Correlation of Student Grit on Student Engagement as Mediated by Student Interest

Step	Path	B	S.E.	β
1	C	.670	.060	.546***
2	A	.468	.064	.389***
3	B	.604	.041	.591***
4	c'	.388	.049	.316***

* p<0.05, **p<0.01, ***p=0.000

These findings imply that grit influences science engagement both directly and indirectly through its effect on interest. This highlights the importance of fostering not only perseverance and passion but also cultivating students' intrinsic interest in science to maximize engagement. Science educators should therefore design learning experiences that build students' resilience and sustained effort while simultaneously making science content engaging and personally meaningful. Consistent with this, Wong et al. (2025) found that grit significantly mediates academic engagement, and that its effect is strengthened when combined with curiosity, emphasizing the importance of fostering both perseverance and intrinsic interest to maximize student engagement.

Additionally, the partial mediation effect suggests that while grit is crucial, interest serves as a key motivational mechanism translating grit into active participation and effort in science learning. Durak et al. (2023) highlight that science teaching interest among teachers is positively influenced by inquiry-based learning approaches, which in turn enhance their motivation and attitudes toward science teaching. Their study emphasizes that higher interest is linked to greater confidence in creating engaging and effective learning environments, fostering student interest and engagement. This supports the notion that interest and grit are intertwined and together promote deeper engagement and achievement in science education.

Presence (or Absence) of Mediating Effect

Table 8 presents the results of a Sobel z-test examining whether student interest mediates the relationship between student grit and student engagement in science learning. The Sobel z-value of 6.53 with a p-value less than 0.05 indicates a statistically significant mediation effect. Specifically, the analysis confirms that interest partially mediates the relationship between grit and engagement, meaning that grit influences engagement both directly and indirectly through its effect on interest.

Table 8 Presence (or Absence) of Mediating Effect

Combination of Variables	Sobel z	p-value	Mediation
grit àinterestàengagement	6.533654	p<0.05	Partial mediation

* p<0.05

The study of support Kotsis (2024) that educators should strive to create learning environments and experiences that not only build students' resilience and persistence but also actively foster their curiosity and intrinsic motivation. Their study also revealed that perseverance of effort and consistency of interest positively relate to intrinsic motivation and mastery-approach goals, which in turn foster higher engagement and goal-directed behaviors among pre-service physical education teachers.

The study for Areepattamannil (2023) support a large-scale study applying Self-Determination Theory in science education found that students' science self-concept significantly positively relates to intrinsic motivation, which fully mediates the relationship between self-concept and science achievement. Intrinsic motivation fosters perseverance and deep engagement in science learning by increasing students' sense of competence and autonomy. The study underscores that students with higher intrinsic motivation demonstrate greater resilience and sustained effort in science activities, leading to higher achievement and more persistent engagement despite challenges.

Mediation Analysis

Sobel z 6.533654, $p<0.05$***

Percentage of the total effect that is mediated 42.133439%

Ratio of the indirect to direct effect 0.728114

Effect Size Measures

Unstandardized Coefficients

Total: 0.670

Direct: 0.388

Indirect: 0.468

Ratio Index: 0.699

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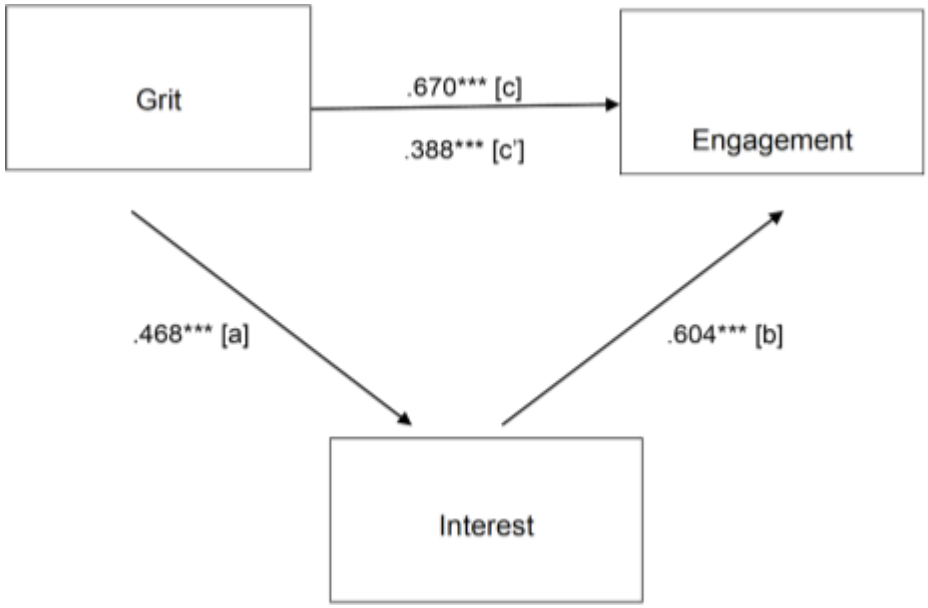

Figure 2. Medgraph Showing the Variables of the Study

The partial mediation implies that grit alone is not sufficient to maximize student engagement; interest acts as a catalyst that transforms perseverance into meaningful involvement. This aligns with Durmus (2025), who demonstrated that science interest serves as a key mediator, amplifying the effect of grit on students' engagement and academic outcomes in science education. Therefore, science educators should integrate strategies that simultaneously nurture grit and stimulate interest, such as goal setting, reflective practices, and collaborative learning.

The mediation analysis reveals that student interest partially mediates the relationship between grit and science engagement, indicating that perseverance alone is insufficient to maximize engagement. According to Dewey (1913), interest is a crucial motivational factor that promotes active involvement and outperformance in learning. Findings align with this view, emphasizing that grit's effectiveness depends significantly on the learner's intrinsic interest, which serves as a motivational catalyst transforming perseverance into active science engagement (Trask-Kerr et al., 2019). This conceptualization supports the notion that fostering student interest alongside perseverance can create a synergistic effect leading to higher engagement and academic outcomes, confirming that motivation and effort are intertwined components critical for success in science education.

CONCLUSION AND RECOMMENDATION

The study revealed that junior high school students in the Don Carlos II District exhibited high levels of grit, interest, and engagement in science education. Specifically, descriptive statistics showed that both the perseverance of effort and consistency of interest dimensions of grit scored highly, indicating students' great perseverance and sustained passion toward science learning. Similarly, students demonstrated high overall interest in science, influenced notably by teacher support, classroom experiences, peer attitudes, and family encouragement. Engagement measures reflected a high degree of involvement in science lessons, tasks, and preparation efforts, highlighting the effectiveness of instructional strategies and the supportive learning environment within these rural schools.

Inferential analyses indicated significant positive correlations among the key variables; grit was highly associated with both student interest and engagement. Regression and mediation analyses further elucidated the relationships, confirming that student interest partially mediated the effect of grit on engagement. Path analysis showed that grit positively mediated science interest, which in turn significantly boosted engagement, while grit also had a direct but reduced influence on engagement when controlling for interest. The Sobel test supported this partial mediation effect, with approximately 42% of the total effect of grit on engagement being transmitted

through interest. These findings collectively underscore the intertwined roles of perseverance and intrinsic motivation in fostering active and sustained participation in science learning.

This study's findings also resonate with the Interest Development Model (Hidi & Renninger, 2006), which explains how situational interest evolves into well-developed individual interest through ongoing engagement and supportive educational experiences. The model underscores the importance of educational environments that spark initial curiosity and then nurture it through sustained, meaningful learning activities. Integrating this approach with grit-building strategies may offer a holistic framework for enhancing student motivation and engagement in science. Educators are encouraged to design culturally responsive, autonomy-supportive, and inquiry-based science instruction that cultivates both grit and intrinsic interest, thereby fostering deeper, more resilient scientific engagement, especially in resource-limited rural contexts.

RECOMMENDATION

Based on the study's findings, several specific and viable recommendations are proposed to address the indicators with relatively lower ratings, such as effort and preparation, family encouragement, and consistency of interest. Science teachers and school administrators should strengthen students' effort and preparation by designing activities that foster gradual skill-building, incorporate formative assessments, and encourage self-discipline through tools like learning contracts and peer study groups. To sustain consistency of interest, educators are encouraged to relate science lessons to real-life, local contexts, regularly rotate topics to maintain novelty, and use inquiry-based learning even with limited resources. Enhancing teacher-student engagement through informal check-ins linking students' goals to science content is also crucial. Families and community partners should increase involvement by providing accessible guidance on supporting science learning at home, organizing family science activities, and emphasizing science's relevance to local livelihoods. Schools can collaborate with local experts for practical learning experiences that reinforce community connections. Policymakers and educational leaders ought to prioritize investments that improve science resources, update curricula with culturally relevant materials, and expand professional development focused on student-centered and inquiry-based instructional strategies. Establishing stronger home-school communication systems with actionable feedback will further encourage consistent student effort. These targeted recommendations aim to bridge motivational gaps and enhance science engagement and literacy, particularly within rural and resource-limited educational settings, by supporting all stakeholders in fostering resilient, curious, and actively involved learners.

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Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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REFERENCES

1. Alhadabi, A. (2021). Science interest, utility, self-efficacy, identity, and science achievement among high school students: An application of SEM Tree. Frontiers in Psychology, 12, Article 634120. https://doi.org/10.3389/fpsyg.2021.634120
2. Allen, R. E., Kannangara, C., & Carson, J. (2021). True grit: How important is the concept of grit for education? A narrative literature review. *International Journal of Educational Psychology*, *10*(1), 73–87. https://doi.org/10.17583/ijep.2021.4578

3. Amistad-Sarzadilla, K. M. (2025). Grit level and academic performance in science of students at risk of dropping out (SARDO). *Philippine Journal of Education*. https://ejournals.ph/article.php?id=25364
4. Areepattamannil, S., Abu Khurma, O., Ali, N., Al Hakmani, R., & Kadbey, H. (2023). Examining the relationship between science motivational beliefs and science achievement: A self-determination theory approach. Large-Scale Assessments in Education, 11, Article 17. https://largescaleassessmentsineducation.springeropen.com/articles/10.1186/s40536-023-00175-7
5. Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
6. Baraquia, L. G. (2019). Students' Science Engagement Scale (SSES): Developing the constructs to measure science engagement. *PANAGDAIT Multidisciplinary Research Journal*, *1*(1), 99–110.
7. Bazelais, P., Lemay, D. J., & Doleck, T. (2023). Grit predicts academic achievement among undergraduate science students. *Qeios*. https://doi.org/10.32388/MMPITX
8. Celik, O. C., & Taspinar, M. (2024). Preparing pre-service primary teachers to facilitate students' key competences for lifelong learning. *Issues in Educational Research*, *34*, 843–860. http://www.iier.org.au/iier34/celik.pdf
9. Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*(4th ed.). Sage Publications.
10. Datu, J. A. D., & Valdez, J. P. M. (2024). Sense of relatedness and science engagement among Filipino high school students. *Psychology in the Schools*. Advance online publication. https://doi.org/10.1002/pits.23224
11. Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.
12. Dewey, J. (1913). *Interest and Effort in Education*. Houghton Mifflin.
13. Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, *92*(6), 1087–1101. https://doi.org/10.1037/0022-3514.92.6.1087
14. Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (Grit–S). *Journal of Personality Assessment*, *91*(2), 166–174. https://doi.org/10.1080/00223890802634290
15. Durak, G., Yerdelen, S., & Aşkar, P. (2023). Enhancing pre-service teachers' science teaching efficacy beliefs through inquiry-based learning approaches. *Frontiers in Education*, *8*, Article 1512320. https://doi.org/10.3389/feduc.2025.1512320
16. Durmus, E. (2025). The mediating effect of science interest on the relationship between students' engagement and attitudes toward science. *International Journal of Educational Research*, *112*, Article 102345. https://doi.org/10.1016/j.ijer.2023.102345
17. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109. https://doi.org/10.3102/00346543074001059
18. Gray, R., Rogan-Klyve, A., & Canipe, M. M. (2022). Investigating the impact of eliciting and being responsive to students' initial ideas on productive disciplinary engagement across a unit. Science Education, 106(1), 45–62. https://doi.org/10.1002/sce.21701
19. Hafizoglu, A., & Yerdelen, S. (2020). The role of students' motivation in the relationship between learning environment and science achievement in Science: A Mediation Analysis. *Science Education International*, *30*(4), 256–269. https://files.eric.ed.gov/fulltext/EJ1236386.pdf
20. Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. Educational Psychologist, 41(2), 111–127. https://doi.org/10.1207/s15326985ep4102_4
21. Johri, A., & Yadav, R. (2025). Student engagement and challenges in Web 2.0-based learning. International Journal of Teaching, Learning and Education, 4(3), 10-20. https://doi.org/10.22161/ijtle.4.3.2
22. Kotsis, K. T. (2024). The significance of experiments in inquiry-based science teaching. Educational Journal, 12(3), 45-56. https://mail.ej-edu.org/index.php/ejedu/article/view/815
23. Lamb, R. L., Vallett, D. B., & Annetta, L. A. (2011). Measuring science interest: Rasch validation of the science interest survey. *International Journal of Science and Mathematics Education*. https://www.researchgate.net/publications/257570594
24. Law, H. H., Sharif, S. B., & Han, C. G. K. (2021). Science learning motivation in rural schools. Scholars

Journal of Arts, Humanities and Social Sciences, 9(5), 188–193. https://doi.org/10.36347/sjahss.2021.v09i05.007

25. Means, B., & Neisler, J. (2023). Bridging theory and measurement of student engagement: A practical approach. *Online Learning*, *27*(4), 26–47. https://doi.org/10.24059/olj.v27i4.4034
26. Mudana, M. A., et al. (2024). Generic science skills with student learning perseverance in Natural Sciences education at junior high school. Jurnal Ilmiah Pendidikan dan Pembelajaran, 8(3). https://ejournal.undiksha.ac.id/index.php/JIPP/article/download/79852/31193/254064
27. Nuraysha, A. D., Winarno, N., Fadly, W., Hakim, L., & Emiliannur. (2024). Analyzing student's motivation towards science learning in junior high school. *Jurnal Penelitian Pendidikan IPA*, *10*(7), 4139–4148. https://doi.org/10.29303/jppipa.v10i7.7297
28. Qiao, R. (2022). A theoretical analysis of approaches to enhance students' grit and academic engagement. *Frontiers in Psychology*, *13*, Article 889509. https://doi.org/10.3389/fpsyg.2022.889509
29. Roberts, T., Bignall, O., & Moore, S. (2022). Increasing STEM grit among underrepresented groups: Lessons from our fathers. Open Access Library Journal, 9, e9418. https://doi.org/10.4236/oalib.1109418
30. Santos, J. M., Pacheco, J. A., & Santos, L. J. (2023). The significance of experiments in inquiry-based science teaching. European Journal of Education Studies, 10(4), 88–99. https://www.ej-edu.org/index.php/ejedu/article/view/815
31. Soleymani, M., et al. (2025). Where Dewey's Philosophy Meets Positive Psychology: Interest, Effort, and Grit in Education.
32. Trask-Kerr, C., Quay, J., & Slemp, G. R. (2019). A Deweyan positive education: Psychology with philosophy. International Journal of Children's Spirituality, 24(2), 146–161. https://doi.org/10.1080/1364436X.2019.1619490
33. United Nations Educational, Scientific and Cultural Organization. (2021). Global education monitoring report 2021/2: Non-state actors in education: Who chooses? Who loses?https://doi.org/10.18356/13887f99-en
34. Victorino, R. D. C., Manalang, C. G. A., Marcelo, T. M. R., Moldes, G. C., Gabatino, M. C. S., & Santos, J. M. (2025). Exploring the influence of family environment and family values on the academic performance of students. International Journal of Research and Innovation in Social Science (IJRISS). https://doi.org/10.47772/IJRISS.2025.906000139
35. Wang, X., & Degol, J. L. (2021). Science interest, utility, self-efficacy, identity, and achievement: A serial mediation model. *Frontiers in Psychology*, *12*, Article 634120. https://doi.org/10.3389/fpsyg.2021.634120
36. Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology*, *25*(1), 68–81. https://doi.org/10.1006/ceps.1999.1015
37. Wong, K. W., Tang, S. Y. F., & Alhadabi, A. (2025). Driven by grit, inspired by curiosity: Enhancing students' academic engagement in physical education in higher education. *Sportis*, *11*(1), 1–23. https://doi.org/10.17979/sportis.2025.11.1.11204
38. Yau, J., & Shu, Y. (2023). Grit, self-efficacy, achievement orientation goals, and academic performance: A mediation model. *Educational Psychology*, *43*(1), 1–15. https://doi.org/10.1080/02673843.2019.1679202

APPENDICES

APPENDIX A

SPECIFIC ITEMS PER INDICATOR

Table 1 Level of Student Grit

Indicators	**SD**	**Mean**	**Descriptive Level**
Consistency of Interest	0.57	3.56	High
Perseverance of Effort	0.65	3.55	High
Overall	**0.50**	**3.55**	**High**

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Table 2 Level of Student Grit in terms of Consistency of Interest

Items	**SD**	**Mean**	**Descriptive Level**
I enjoy setting goals and being open to new paths that match my changing interests.	0.93	4.01	High
I have been obsessed with a certain idea or project for a short time but later lost interest.	0.99	3.18	Moderate
I have maintained my focus on projects that take more than a few months to complete.	1.09	3.56	High
I sometimes get distracted by new ideas and projects, which takes my focus away from the ones I was previously working on.	1.12	3.48	High
I find that my interests change from year to year.	1.22	3.59	High
Overall	**0.57**	**3.56**	**High**

Table 3 Level of Student Grit in terms of Perseverance of Effort

Items	**SD**	**Mean**	**Descriptive Level**
I am a hard worker.	1.14	3.53	High
I finish whatever I begin.	1.09	3.75	High
I am not discouraged by setbacks.	1.12	3.22	Moderate
I have achieved a goal that took years of work.	1.06	3.64	High
I have overcome setbacks to conquer an important challenge.	1.06	3.60	High
Overall	**0.65**	**3.55**	**High**

Table 4 Level of Student Engagement

Indicators	**SD**	**Mean**	**Descriptive Level**
Science Lesson and Tasks	0.73	3.96	High
Learning Involvement	0.70	3.87	High
Effort and Preparation	0.70	3.77	High
Overall	**0.62**	**3.87**	**High**

Table 5 Level of Student Engagement in terms of Science Lesson and Tasks

Items	**SD**	**Mean**	**Descriptive Level**
My science lessons and performance tasks are important and relevant to my life.	0.95	4.24	Very High
My science lessons and performance tasks are interesting and meaningful.	0.97	4.04	High
My science lessons and performance tasks are realistic and contextualized.	1.02	3.86	High
My science lessons and performance stimulate my curiosity.	1.14	3.76	High

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My motivation to learn new things in science class is strong.	1.16	3.92	High
Overall	**0.73**	**3.96**	**High**

Table 6 Level of Student Engagement in terms of Learning Involvement

Items	**SD**	**Mean**	**Descriptive Level**
I am having fun during collaborative learning activities in science.	1.03	4.04	High
I am confident that I can ask my science teacher or classmates for help, either in person or online, whenever I do not understand a lesson.	1.08	3.84	High
I participate and interact during small-group discussions in science.	1.01	3.99	High
I appreciate the nature of the scientific method or process.	1.07	3.88	High
I consult and share my views and knowledge with my classmates and science teacher.	1.10	3.62	High
Overall	**0.70**	**3.87**	**High**

Table 7 Level of Student Engagement in terms of Effort and Preparation

Items	**SD**	**Mean**	**Descriptive Level**
I do and finish my science tasks on time.	1.03	3.89	High
I raise my hand to participate in science class discussions.	1.05	3.66	High
I read and review my class notes, handouts, and textbook between classes to make sure that I learn from these science learning materials.	1.07	3.75	High
I prepare thoroughly before the summative test or exam in science.	1.03	3.66	High
I always pay attention to my teacher and classmates who communicate during science class.	1.05	3.87	High
Overall	**0.70**	**3.77**	**High**

Table 8 Level of Student Interest

Indicators	**SD**	**Mean**	**Descriptive Level**
Family Encouragement	0.81	3.63	High
Peer Attitudes	0.74	3.67	High
Teacher Influences	0.79	4.09	High
Science Classroom Experiences	0.79	3.91	High
Overall	**0.61**	**3.80**	**High**

Table 9 Level of Student Interest in terms of Family Encouragement

Items	**SD**	**Mean**	**Descriptive Level**
I have been encouraged by my family to study science.	1.15	3.67	High

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I have a family that is interested in the science courses I take.	1.11	3.39	Moderate
I have a family that is enthusiastic about me pursuing a science career.	1.10	3.35	Moderate
I appreciate that my family members have diverse interests, which allows me to explore and enjoy science on my own.	1.11	3.70	High
Overall	**0.81**	**3.53**	**High**

Table 10 Level of Student Interest in terms of Peer Attitudes

Items	**SD**	**Mean**	**Descriptive Level**
My friends like science.	1.15	3.69	High
My friends see science as exciting.	1.05	3.75	High
My friends prefer watching other types of programs on TV instead of science shows.	1.17	3.41	High
My friends enjoy conducting science experiments.	1.06	3.84	High
Overall	**0.74**	**3.67**	**High**

Table 11 Level of Student Interest in terms of Teacher Influences

Items	**SD**	**Mean**	**Descriptive Level**
My teachers encourage me to do my best.	0.89	4.32	Very High
My science teachers have encouraged me to learn about science.	1.02	4.15	High
My science teachers make science interesting.	1.10	4.02	High
My science teachers are enthusiastic about science.	1.07	3.88	High
Overall	**0.79**	**4.09**	**High**

Table 12 Level of Student Interest in terms of Science Classroom Experiences

Items	**SD**	**Mean**	**Descriptive Level**
The topics taught in my science class are important in the real world.	1.06	4.08	High
The topics taught in my science class are exciting.	1.01	3.97	High
The equipment in my science classroom is interesting.	1.05	3.90	High
The equipment in our science classroom is used by us most of the time.	1.10	3.68	High
Overall	**0.79**	**3.91**	**High**

Table 13 Significance of the Relationship Between Grit and Engagement of Students

Grit	**Engagement**			
	Science Lesson and Tasks	Learning Involvement	Effort and Preparation	**Overall**
Consistency of Interest	.275**	.270**	.186**	**.281****
	.000	.000	.001	**.000**

Perseverance of Effort	.505** .000	.558** .000	.511** .000	**.602**** **.000**
Overall	**.480**** **.000**	**.511**** **.000**	**.434**** **.000**	**.546**** **.000**

Table 5 Significance of the Relationship Between Grit and Interest of Students

Grit	**Interest**				
	Family Encouragement	Peer Attitudes	Teacher Influences	Science Classroom Experiences	Overall
Consistency of Interest	.240** .000	.117* .043	.129* .026	.223** .000	.231** .000
Perseverance of Effort	.312** .000	.242** .000	.320** .000	.367** .000	.402** .000
Overall	**.336**** **.000**	**.222**** **.000**	**.278**** **.000**	**.362**** **.000**	**.389**** **.000**

Table 14 Significance of the Relationship Between Interest and Engagement of Students

Interest	**Engagement**			
	Science Lesson and Tasks	Learning Involvement	Effort and Preparation	**Overall**
Family Encouragement	.389** .000	.457** .000	.505** .000	**.516**** **.000**
Peer Attitudes	.402** .000	.438** .000	.334** .000	**.449**** **.000**
Teacher Influences	.553** .000	.566** .000	.500** .000	**.620**** **.000**
Science Classroom Experiences	.506** .000	.572** .000	.540** .000	**.618**** **.000**
Overall	**.598**** **.000**	**.658**** **.000**	**.610**** **.000**	**.714**** **.000**

Table 15 Regression analysis showing the influence of grit on engagement as mediated by interest

Step	Path	B	S.E.	β
1	c	.670	.060	.546***
2	a	.468	.064	.389***
3	b	.604	.041	.591***
4	c’	.388	.049	.316***

* p<0.05, ** p<0.01, *** p=0.000

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Table 16 Results of statistical analysis on the presence (or absence) of mediating effect

Combination of Variables	Sobel z	p-value	Mediation
grit à interestàengagement	6.533654	p<0.05	Partial mediation

* $p<0.05$

APPENDIX B RESEARCH QUESTIONNAIRE

Research Instrument

UNIVERSITY OF MINDANAO

Davao City

STUDENT GRIT IN SCIENCE AND STUDENT ENGAGEMENT: THE MEDIATING EFFECT OF STUDENT INTEREST

Dear Student,

The undersigned is conducting a study entitled, "STUDENT GRIT IN SCIENCE AND STUDENT ENGAGEMENT: THE MEDIATING EFFECT OF STUDENT INTEREST", as part of the fulfillment of academic requirements. You have been selected as a participant in this study.

With this, I kindly request your participation and ask that you answer the questionnaire sincerely. Please be assured that your responses will be treated with the utmost confidentiality. Your participation will greatly assist the researcher in providing valuable insights that may contribute to the improvement of educational practices and outcomes in our institution.

Each section of the questionnaire includes instructions for answering. Please read them carefully and select the response that best applies to you by marking it with a [√]. The same scale will be used throughout the questionnaire, as indicated on the following page. Thank you very much for your cooperation. God bless you.

Respectfully yours,

DELAIDA M. PIAMONTE

SURVEY QUESTIONNAIRE FOR STUDENT GRIT, STUDENT ENGAGEMENT AND STUDENT INTEREST

Name (optional): _____Age: _____ Sex: _____

School: _____Grade Level & Section: _____

Thank you for sparing some of your time to fill this questionnaire. It is being distributed to you purely for academic purpose and all the responses will be confidential. Your unbiased choices will be highly appreciated. Please indicate how much you agree or disagree with the following statement by put check on the appropriate responses.

Rating	**Scale and Description:**	
5	Strongly Agree	(The statement is always true to me)
4	Agree	(The statement is often true to me)
3	Neutral	(The statement is sometimes true to me)

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2	Disagree (The statement is seldom true to me)
1	Strongly Disagree (The statement is almost never true to me)

Part 1 Student Grit

This questionnaire aims to determine the student's level of interest in Science.

STATEMENTS		5	4	3	2	1
Consistency of Interest						
1	I enjoy setting goals and being open to new paths that match my changing interests.					
2	I have been obsessed with a certain idea or project for a short time but later lost interest.					
3	I have maintained my focus on projects that take more than a few months to complete.					
4	I sometimes get distracted by new ideas and projects, which takes my focus away from the ones I was previously working on.					
5	I find that my interests change from year to year.					
Perseverance of Effort						
6	I am a hard worker.					
7	I finish whatever I begin.					
8	I am not discouraged by setbacks.					
9	I have achieved a goal that took years of work.					
10	I have overcome setbacks to conquer an important challenge.					

Source: The following items have been adapted from

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (Grit–S). *91*(2), 166–174. https://doi.org/10.1080/00223890802634290

Part 2 Student Engagement

This questionnaire aims to determine the level of student's engagement in science.

STATEMENTS		5	4	3	2	1
Engagement in Science Lessons and Tasks						
1	My science lessons and performance tasks are important and relevant to my life.					
2	My science lessons and performance tasks are interesting and meaningful.					
3	My science lessons and performance tasks are realistic and contextualized.					
4	My science lessons and performance stimulate my curiosity.					
5	My motivation to learn new things in science class is strong.					
Science Learning Involvement						
6	I am having fun during collaborative learning activities in science.					
7	I am confident that I can ask my science teacher or classmates for help, either in person or online,					

	whenever I do not understand a lesson.					
8	I participate and interact during small-group discussions in science.					
9	I appreciate the nature of the scientific method or process.					
10	I consult and share my views and knowledge with my classmates and science teacher.					
Science Effort and Preparation						
11	I do and finish my science tasks on time.					
12	I raise my hand to participate in science class discussions.					
13	I read and review my class notes, handouts, and textbook between classes to make sure that I learn from these science learning materials.					
14	I prepare thoroughly before the summative test or exam in science.					
15	I always pay attention to my teacher and classmates who communicate during science class.					

Source: The following items have been adapted from

Baraquia, L. G. (2019). Students' Science Engagement Scale (SSES): Developing the constructs to measure science engagement. *PANAGDAIT Multidisciplinary Research Journal, 1*(1), 99–110.

Part 3 STUDENT INTEREST

This questionnaire aims to determine the level of student's interest in Science.

STATEMENTS		5	4	3	2	1
Family Encouragement						
1	I have been encouraged by my family to study science.					
2	I have a family that is interested in the science courses I take.					
3	I have a family that is enthusiastic about me pursuing a science career.					
4	I appreciate that my family members have diverse interests, which allows me to explore and enjoy science on my own.					
PEER ATTITUDES						
5	My friends like science.					
6	My friends see science as exciting.					
7	My friends prefer watching other types of programs on TV instead of science shows.					
8	My friends enjoy conducting science experiments.					
TEACHER INFLUENCE						
9	My teachers encourage me to do my best.					
10	My science teachers have encouraged me to learn about science.					
11	My science teachers make science interesting.					
12	My science teachers are enthusiastic about science.					

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Science Classroom Experiences						
13	The topics taught in my science class are important in the real world.					
14	The topics taught in my science class are exciting.					
15	The equipment in my science classroom is interesting.					
16	The equipment in our science classroom is used by us most of the time.					

Source: The following items have been adapted from

Lamb, R. L., Annetta, L., Meldrum, J., & Vallett, D. (2011). Measuring science interest: Rasch validation of the Science Interest Survey. *International Journal of Science and Mathematics Education, 10*(3), 391– 410. https://doi.org/10.1007/s10763-011-9314-z