

Science Performance, Family Profile and Grit Level: An Exploration on Learners' Passion and Perseverance

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Abstract

Science performance stands out as a critical area of focus, given its importance in fostering analytical thinking and problem-solving skills. This study investigated the relationship between learners' grit levels, family profiles, and science performance. The study aimed to determine whether these family factors influence learners' grit and science performance. The study involved 133 Grade 11 learners from Talangan Integrated National High School, distributed across four strands: Science, Technology, Engineering, and Mathematics (STEM) (27 learners), Accountancy, Business, and Management (ABM) (38 learners), General Academic Strand (GAS) (28 learners), and Caregiving (40 learners). Purposive sampling was employed, and participants voluntarily participated. Data were collected using survey questionnaires designed to measure grit levels, family profiles, and science performance. The findings revealed that the number of siblings in a family does not significantly affect learners' grit levels. Similarly, the educational attainment of both the father and the mother showed no significant impact on learners' grit levels. Furthermore, the study found no significant relationship between science performance and grit levels. These results suggest that grit is not influenced by family size or parental education levels, and a learner's performance in science is not linked to their level of grit. Other factors, possibly intrinsic personal characteristics or external influences not examined in this study, may play a more crucial role in developing grit among learners. The lack of significant relationships between family profile, science performance, and grit levels suggests that grit may be more deeply rooted in individual traits or external factors such as school environment and peer influence. It is recommended that educators and school administrators focus on strategies to enhance learners' grit and overall academic performance. These include developing grit through school programs, fostering a growth mindset, creating a supportive learning environment, integrating grit into the curriculum, engaging parents, and regularly evaluating grit-building programs.

Keywords: Science performance; family profile; grit

1. Introduction

1.1. Context and Rationale

In the realm of educational research, understanding the factors that contribute to student success is paramount. Among these factors, science performance stands out as a critical area of focus, given its importance in fostering analytical thinking and problem-solving skills. However, academic achievement in science is not solely determined by cognitive abilities. Non-cognitive factors, such as grit, and familial influences also play a significant role in shaping learners' academic outcomes.

Grit, defined as the passion and perseverance for long-term goals, has emerged as a key predictor of success in various domains. This study aims to delve into the relationship between learners' grit levels and their performance in science. By examining how students' sustained effort and interest in their goals impact their academic achievements, we can gain valuable insights into the role of non-cognitive skills in education.

Additionally, the family environment is a crucial determinant of a child's educational journey. The educational attainment of parents and the family structure, including the number of siblings, can significantly influence a learner's academic performance. This study seeks to explore how these familial factors interact with learners' grit levels to affect their science performance. This study focused on exploring the learners' grit scale, family profile (educational attainment of father, educational attainment of mother, number of siblings), and science performance. By investigating these interconnected elements, we aim to provide a comprehensive understanding of the factors that contribute to academic success in science.

1.2. Related Literature

The performance of learners in science education is influenced by various factors such as educational expectations, academic performance, engagement, access to resources, and teaching methods. Studies have shown that Outdoor Learning Inquiry-Based Activities (OLIBA) significantly improve students' performance in science (Berandoy and Villonez, 2024), while the reciprocal relationship between educational expectations and science learning performance plays a crucial role in students' successful completion of STEM degrees (Yeung, 2024). Grade 8 learners at General Emilio Aguinaldo National High School showed positive engagement and motivation in science during face-to-face classes, with access to resources impacting performance (Gara, 2023). Additionally, the use of drama in science education has been found to deepen students' comprehension of scientific concepts (Anderson, 2023). Moreover, the impact of improvised resources on learner performance has been highlighted, demonstrating a significant improvement in student outcomes when utilizing such resources (Dhurumraj, 2023). Understanding these dynamics can help educators enhance the learning experiences of students and improve their academic achievements in science.

Family profiles of learners can vary based on factors such as family functioning, participation in education, use of technology for schooling, and family-related risks of dropping out. Research has identified distinct family functioning profiles among nonhandicapped and learning handicapped adolescents, emphasizing the importance of considering both parent and adolescent perspectives (Morrison and Zetlin, 1992). Additionally, family profiles in education can be categorized into participative and non-participative groups based on involvement in the educational process, with differences observed in Spanish and non-Spanish families (Parra et al., 2017). The impact of family learning programs on family dynamics and educational outcomes has been highlighted, emphasizing the need for well-informed policies and strategies (Brassett-Grundy and Hammond, 2003). Moreover, family characteristics and life situations, including the use of Information and Communication Technology, play a role in educational outcomes, especially during challenging times like the COVID-19 pandemic (Miguel et al., 2022). Finally, family-related factors such as gender, family structure, community support, and individual challenges like inferiority complex and child labor contribute significantly to learners being at risk of dropping out, necessitating intervention programs for early identification and support (Trivino et al., 2017).

Several research papers provide valuable insights into learners' grit scale. They have highlighted the significance of grit, defined as perseverance and passion for long-term goals, in enhancing academic achievement (Wang et al., 2023; Abbas et al., 2023). Various scales have been developed to measure grit, such as the Grit Scale adapted from Duckworth's work (Babiera and Quirap (2024), the Domain-Specific Grammar Grit Questionnaire (DSGGQ) for English grammar learning (Pawlak et al., 2024), and the L2-Grit Scale in Turkish for language education (Uştuk and Erarslan, 2023). These scales assess learners' consistency of interest, perseverance of effort, and motivation levels, showcasing the importance of grit in educational settings. The research emphasizes the need to cultivate grit among learners to improve their engagement, academic performance, and overall success in their educational endeavors.

1.3. Research Questions

This study delved into the grit profile of grade 11 learners of Talangan Integrated National High School (TINHS), their science performance and family profile, shedding light into the connection and influence of these factors to each other.

Specifically, it sought to answer the following questions:

- a. What is the family profile of the grade 11 learners of TINHS in terms of the following:
 - i. number of siblings in a family;
 - ii. educational attainment of father;
 - iii. educational attainment of mother;
- b. What is the mean level of science performance of grade 11 learners in TINHS?
- c. What is the mean level of grit scale of the grade 11 learners of TINHS?
- d. Does the mean level of grit scale significantly differ across family profile of grade 11 learners of TINHS?
- e. Is there a significant relationship between grit scale and science academic performance of grade 11 learners of TINHS?

2. Materials and Methods

2.1. Participants

A total of 133 Grade 11 learners from Talangan Integrated National High School participated in the study. The participants were distributed across various strands as follows:

- Science, Technology, Engineering, and Mathematics (STEM) strand: 27 learners
- Accountancy, Business, and Management (ABM) strand: 38 learners
- General Academic Strand (GAS): 28 learners
- Caregiving strand: 40 learners

The sampling technique employed in this study was purposive sampling. All learners from the aforementioned strands voluntarily decided, with their free will, to be participants in this study.

2.2. Data Gathering Technique

Technique To gather pertinent data needed to answer the questions posted at the beginning of the study, this exploration involved the administration of printed survey questionnaires. These questionnaires were distributed to the learners before their daily session with the teacher-author of the study. The learners were provided with ample time to complete the survey, ensuring that all items were answered honestly and with utmost care.

2.3. Data Gathering Instrument

The data gathering instrument for this study was a printed survey questionnaire consisting of two parts: family profile & science performance, and the 8-item grit scale. Part 1, a researcher-made questionnaire, required information on the number of siblings in a family, educational attainment of the father, educational attainment of the mother, and the science general average during the Grade 10 level. Part 2 utilized a standardized test by Duckworth et al. (2007), containing 8 items where participants selected one of the following choices that best described them: much like me, mostly like me, somewhat like me, not much like

me, and not like me at all. For some items, these choices were scaled from 5 to 1, while for others, the scale was reversed to prevent participants from guessing or presuming their responses. Scores were summed and divided by 8 to obtain the grit scale level. The collected data were recorded, processed, interpreted, and analyzed.

2.4. Data Analysis

Laid down in this part of the study is the data analysis strategy employed for the data obtained in this study:

- For research question number 1: Frequency and Percentage - To describe the distribution of the number of siblings, and the educational attainment of both parents.
- For research question number 2: Mean and Standard Deviation - To determine the average science performance and the variability among the learners.
- For research question number 3: Mean and Standard Deviation - To determine the average grit level and the variability among the learners.
- For research question number 4: ANOVA (Analysis of Variance) - To compare the mean grit levels across different categories of family profiles.
- For research question number 5: Pearson Correlation (Pearson-R) - To assess the strength and direction of the relationship between grit scale scores and science performance scores.

2.5. Ethical Considerations

In the conduct of this study, the following ethical considerations were adhered to:

- a. Permission and Consent
 - Institutional Approval: Prior to the commencement of the study, permission was sought and obtained from the school head of TINHS. The school head reviewed the study's objectives and methodology and provided formal consent for the research to be conducted within the institution.
 - Informed Consent: Informed consent was obtained from all participating learners. The learners were fully informed about the purpose of the study, the procedures involved, and their rights as participants. They were explicitly given the option to participate voluntarily and were assured that they could withdraw from the study at any time without any negative consequences.
- b. Anonymity and Confidentiality
 - Anonymity: To protect the privacy of the participants, no names or identifying information were collected or revealed in the study. Each participant was assigned a unique code to ensure that their responses remained anonymous.
 - Confidentiality: All data collected during the study were kept confidential and were only accessible to the researchers. The data were stored securely, and any reports or publications resulting from the study did not include any information that could identify individual participants.
- c. Voluntary Participation
 - Free Will: Participants were given the freedom to choose whether or not to answer the survey questions. They were informed that their participation was entirely voluntary and that there would be no repercussions for choosing not to participate.
- d. Beneficence and Non-Maleficence
 - Primary Beneficiaries: The salient findings of the study were disseminated to the learners, who are the primary beneficiaries of this research. The results were shared in a manner that was accessible and understandable to them, with the aim of enhancing their educational experience and personal development.

- **Minimizing Harm:** The study was designed to minimize any potential harm or discomfort to the participants. The survey questions were carefully crafted to avoid any sensitive or intrusive topics.

- e. **Integrity and Transparency**

- **Honesty in Reporting:** The researchers committed to reporting the findings of the study honestly and transparently. Any limitations or potential biases in the study were acknowledged and addressed in the final manuscript.

- **Ethical Conduct:** Throughout the research process, the researchers adhered to ethical guidelines and standards to ensure the integrity of the study and the well-being of the participants. By adhering to these ethical considerations, the study aimed to uphold the highest standards of research integrity and respect for the participants' rights and well-being.

3. Results

3.1. Number of siblings in a Family

Number of Siblings	Frequency	Percentage
5 and above	19	14.29
4	10	7.52
3	23	17.29
2	35	26.32
1	31	23.31
0	15	11.28
Total	133	100

The table provides a detailed breakdown of the distribution of siblings among a sample population of 133 individuals. The data reveals that the most common family size in this sample is having two siblings, with 35 individuals (26.32%) falling into this category. This is followed closely by those with one sibling, comprising 31 individuals (23.31%). The third most common category is having three siblings, with 23 individuals (17.29%). Interestingly, a significant portion of the sample, 19 individuals (14.29%), comes from larger families with five or more siblings. On the other end of the spectrum, 15 individuals (11.28%) have no siblings, and 10 individuals (7.52%) have four siblings. This distribution suggests a trend towards smaller family sizes, with the majority of individuals having one to three siblings. The relatively high percentage of individuals with no siblings or only one sibling could indicate a shift towards nuclear family structures in the broader society from which this sample was drawn. Conversely, the presence of larger families with five or more siblings, though less common, highlights the diversity in family size preferences or cultural norms within the population. Overall, the data reflects a varied landscape of family sizes, with a notable inclination towards smaller families.

3.2. Educational Attainment of Father

Educational Attainment	Frequency	Percentage
Elementary Graduate	26	19.55
High School Graduate	80	60.15
College Undergraduate	10	7.52
College Graduate	17	12.03
Total	133	100

The table provides a comprehensive overview of the educational levels achieved by fathers within a sample population of 133 individuals. The data reveals that the majority of fathers, 80 in total, are High School Graduates, representing 60.15% of the sample. This significant proportion suggests that high school education is the most common level of attainment among fathers in this group, potentially reflecting the accessibility and emphasis on secondary education within the community. Elementary Graduates account for 19.55% of the sample, with 26 fathers falling into this category. This indicates that a notable portion of the population did not pursue education beyond the elementary level, which could be due to various socio-economic factors or generational differences in educational opportunities. College Graduates make up 12.03% of the sample, with 17 fathers having completed higher education. This relatively smaller percentage highlights the challenges or barriers to attaining a college degree, yet also underscores the value placed on higher education by those who achieved it. College Undergraduates, those who attended college but did not graduate, constitute 7.52% of the sample, with 10 fathers in this category. This group may reflect individuals who faced obstacles in completing their education, such as financial constraints or the need to enter the workforce early. Overall, the table illustrates a diverse range of educational backgrounds among fathers, with a predominant trend towards high school education and a smaller, yet significant, representation of higher education achievements. This distribution provides insights into the educational landscape and socio-economic conditions influencing educational attainment within this population.

3.3. Educational Attainment of Mother

Educational Attainment	Frequency	Percentage
Elementary Graduate	14	10.53
High School Graduate	87	65.41
College Undergraduate	12	9.02
College Graduate	18	13.53
Masters Graduate	2	1.50
Total	133	100

The table provides a detailed breakdown of the educational levels achieved by a group of mothers, highlighting significant trends and disparities. The data reveals that the majority of mothers, 65.41%, are high school graduates, indicating that secondary education is the most common level of attainment within this group. This is followed by college graduates at 13.53%, suggesting that a smaller yet notable portion of mothers have pursued higher education to completion. Interestingly, only 9.02% of mothers have some college education without graduating, which might reflect various socio-economic or personal factors that hindered their ability to complete their degrees. Elementary graduates make up 10.53% of the group, showing that a minority of mothers have only completed primary education. The smallest category is mothers with a master's degree, comprising just 1.50% of the total, highlighting the rarity of advanced educational attainment among these mothers. Overall, the table underscores the predominance of high school education and the relatively low levels of higher education attainment, which could be indicative of broader socio-economic patterns, access to educational resources, and cultural factors influencing educational pursuits among mothers in this sample. This data can be crucial for policymakers and educators aiming to design targeted interventions to support educational advancement for mothers, potentially leading to improved socio-economic outcomes for their families.

3.4. Science Performance

Performance Category	Frequency	Mean	SD
Outstanding (90 and above)	41	92.37	1.36
Above Average (85 – 89)	52	87.60	1.76
Average (80 – 84)	36	82.50	1.38
Below Average (75 – 79)	4	77.50	1.73
Total/Average	133	87.38	4.42

The table provides a comprehensive overview of student performance in science, categorized by score ranges and accompanied by statistical measures such as mean scores and standard deviations. The data reveals that the majority of students fall into the “Above Average” category (85-89), with 52 students achieving a mean score of 87.60 and a standard deviation of 1.76. This indicates a relatively consistent performance among these students. The “Outstanding” category (90 and above) includes 41 students with a higher mean score of 92.37 and a lower standard deviation of 1.36, suggesting that these top-performing students have less variability in their scores, reflecting a more uniform level of high achievement. The “Average” category (80-84) comprises 36 students with a mean score of 82.50 and a standard deviation of 1.38, indicating moderate performance with some consistency. The “Below Average” category (75-79) has only four students, with a mean score of 77.25 and a notably higher standard deviation of 4.42, highlighting greater variability and potential challenges in this group. Overall, the data suggests that while a significant portion of students perform above average, there is a small group struggling with lower scores, which may require targeted educational interventions. The relatively low standard deviations in the higher performance categories indicate consistent achievement levels, whereas the higher standard deviation in the below-average category points to a need for additional support and resources to address the diverse needs of these students. This analysis can inform educators and policymakers about the distribution of science performance and help in designing strategies to improve overall academic outcomes.

3.5. Grit Level

Grit Level	Frequency	Percentage
Very Gritty (3.41 – 4.20)	38	28.57
Moderately Gritty (2.61 – 3.40)	88	66.17
Lowly Gritty (1.81 – 2.60)	7	5.26
Total	133	100

The table provides a detailed breakdown of the grit levels among a sample population, categorized into three distinct levels: Very Gritty, Moderately Gritty, and Lowly Gritty. The data reveals that the majority of individuals, 66.17%, fall into the Moderately Gritty category, indicating that most people in this group

possess a moderate level of perseverance and passion for long-term goals. This is followed by 28.57% of individuals who are classified as Very Gritty, suggesting a significant portion of the population exhibits high levels of resilience and determination. The smallest group, comprising only 5.26%, is categorized as Lowly Gritty, indicating a minority with lower levels of grit. The distribution of grit levels can provide valuable insights into the overall character strengths of the population, highlighting areas where interventions or support might be needed to enhance resilience and perseverance. For instance, the relatively small percentage of Lowly Gritty individuals suggests that while most people have at least a moderate level of grit, there is still a need to address the factors that contribute to lower grit levels. This could involve targeted programs to build resilience and support long-term goal achievement. Additionally, the high percentage of Moderately Gritty individuals suggests that there is potential for many people to further develop their grit with appropriate encouragement and resources. Overall, this table serves as a useful tool for understanding the distribution of grit within a population and can inform strategies to foster greater resilience and determination across different groups.

3.6. Difference of Grit Level Across Number of Siblings in a Family

Number of Siblings	n	Mean	SD	f-value	f-crit	p-value	Decision
5 and above	19	3.16	0.36	1.3494	2.29	0.2479	Not Significant
4	10	3.29	0.40				
3	23	3.10	0.40				
2	35	3.23	0.38				
1	31	3.20	0.55				
0	15	3.36	0.28				
	133	3.22	0.39				

alpha = 0.05

The table titled provides a detailed statistical analysis of how grit levels vary among individuals based on the number of siblings they have. The data includes the sample size (n), mean grit levels, standard deviations (SD), t-values, critical t-values (t-crit), p-values, and the resulting decision on statistical significance. The mean grit levels range from 3.10 to 3.36, with standard deviations between 0.28 and 0.55, indicating some variability in grit levels across different sibling groups. Notably, the highest mean grit level of 3.36 is observed in families with five or more siblings, suggesting that individuals from larger families might exhibit higher levels of grit. However, the standard deviation for this group is relatively low at 0.28, indicating consistent grit levels among these individuals.

3.7. Difference of Grit Level Across Educational Attainment of Father

Father's Educational Attainment	n	Mean	SD	f-value	f-crit	p-value	Decision
Elementary Graduate	26	3.11	0.47	0.9284	2.68	0.4291	Not Significant
High School Graduate	80		0.35				

College Undergraduate	10	3.24	0.55				
College Graduate	17	3.21	0.36				
	133	3.22	0.39				

alpha = 0.05

The table provides a detailed statistical analysis of how grit levels vary among individuals based on their father's educational attainment. The data includes sample sizes (n), mean grit levels, standard deviations (SD), f-values, critical f-values (f-crit), p-values, and the resulting decision on statistical significance. The mean grit levels range from 3.11 to 3.32, with standard deviations between 0.35 and 0.55, indicating some variability in grit levels across different educational attainment groups. Notably, the highest mean grit level of 3.32 is observed among individuals whose fathers are college graduates, suggesting that higher paternal education might be associated with slightly higher levels of grit. However, the standard deviation for this group is relatively low at 0.36, indicating consistent grit levels among these individuals.

3.8. Difference of Grit Level Across Educational Attainment of Mother

Mother's Educational Attainment	n	Mean	SD	f-value	f-crit	p-value	Decision
Elementary Graduate	14	3.26	0.42	0.3573	2.44	0.8385	Not Significant
High School Graduate	87	3.22	0.41				
College Undergraduate	12	3.18	0.37				
College Graduate	18	3.25	0.31				
Masters Graduate	2	2.94	0.44				
	133	3.22	0.39				

alpha = 0.05

The table presents a comparative analysis of grit levels among individuals based on their mothers' educational attainment. The table includes four categories: Elementary, High School, College Undergraduate, and College Graduate. Each category lists the sample size (n), mean grit level, standard deviation (SD), F-value, critical value of F (F-crit), p-value, and the decision regarding statistical significance.

For mothers with an Elementary education, the sample size is 14, with a mean grit level of 3.26 and an SD of 0.42. High School graduates have a sample size of 87, a mean grit level of 3.25, and an SD of 0.40. College Undergraduates have a sample size of 12, a mean grit level of 3.18, and an SD of 0.37. College Graduates have the largest sample size of 233, with a mean grit level of 3.22 and an SD of 0.39.

3.9. Relationship of Grit Level and Science Performance

Factors	Mean	SD	r-value	r-crit	p-value	Decision
Grit Level	3.22	0.39	0.1501	0.171	0.084621	Not

Science Performance	87.42	4.41				Significant
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alpha = 0.05

The table presents an analysis of the correlation between grit levels and science performance. The table includes two factors: 'Grit Level' and 'Science Performance,' with their respective means, standard deviations (SD), t-values, critical t-values (t-crit), p-values, and the decision regarding statistical significance. The mean grit level is 3.22 with an SD of 0.39, while the mean science performance is 87.42 with an SD of 4.41.

4. Discussion

4.1. On Grit Level and Number of Siblings in a Family

The presence of f-value of 1.3494 being lower than the f-critical (2.29), and a p-value of 0.2479, signifies non-statistical significance at the alpha level of 0.05. This suggests that there is no significant difference in grit levels when comparing individuals with two siblings to another unspecified group. The overall mean grit level across all groups is 3.22 with a standard deviation of 0.39, indicating a moderate level of grit on average. This analysis can provide insights into family dynamics and how the number of siblings might influence the development of perseverance and passion for long-term goals. The lack of significant differences in most comparisons suggests that while family size may have some impact on grit, other factors are likely more influential in determining an individual's grit level. This information can be valuable for educators and psychologists aiming to understand and foster grit in various family contexts. The number of siblings in a family does not significantly affect the grit scale level of learners, as family functioning and other related factors play a more crucial role in shaping educational outcomes (Morrison and Zetlin, 1992; Parra et al., 2017; Brassett-Grundy and Hammond, 2003; Miguel et al., 2022; Trivino et al., 2017). This finding aligns with research emphasizing the importance of non-cognitive skills like grit, which are influenced by various family dynamics and educational environments rather than the number of siblings (Wang et al., 2023; Abbas et al., 2023).

4.2. On Grit Level and Educational Attainment of Father

The f-value of 0.9284 and the p-value of 0.4291, which is not statistically significant at the alpha level of 0.05, suggest that there is no significant difference in grit levels based on the father's educational attainment. This lack of significant difference implies that while there may be slight variations in grit levels, these differences are not substantial enough to be considered statistically meaningful. This analysis can provide insights into the potential influence of parental education on the development of grit, but it also highlights that other factors are likely more influential in determining an individual's grit level. The overall mean grit level across all groups is 3.22 with a standard deviation of 0.39, indicating a moderate level of grit on average. This information can be valuable for educators and psychologists aiming to understand and foster grit in various family contexts. The findings in this present study is similar with the findings of Morrison and Zetlin (1992), Parra et al. (2017), Brassett-Grundy and Hammond (2003), Miguel et al. (2022) and Trivino et al. (2017), implying that the educational attainment of the father does not significantly affect the grit scale level of learners, as family functioning and other related factors are more influential in shaping educational outcomes.

4.3. On Grit Level and Educational Attainment of Mother

The f-value is 0.3573, with an F-crit of 2.44 and a p-value of 0.8385, indicating that the differences in grit levels across educational attainment categories are not statistically significant ($p > 0.05$).

This analysis suggests that there is no significant variation in grit levels based on the educational attainment of mothers. The mean grit levels are relatively similar across all categories, with only minor differences. The high p-value further supports the conclusion that any observed differences are likely due to chance rather than a true effect of educational attainment. This finding implies that factors other than a mother's educational level may play a more critical role in determining an individual's grit. The consistency in grit levels across different educational backgrounds highlights the potential universality of this trait, suggesting that grit may be influenced by a broader range of environmental and personal factors rather than solely by parental education. The findings in this present study support the findings of previous study that the educational attainment of the mother does not significantly affect the grit scale level of learners, as family functioning and other related factors are more influential in shaping educational outcomes (Morrison and Zetlin, 1992; Parra et al., 2017; Brassett-Grundey and Hammond, 2003; Miguel et al., 2022; Trivino et al., 2017).

4.4. On Grit Level and Science Performance

The r-value is 0.1501, the r-crit is 0.171, and the p-value is 0.084621. Given that the p-value exceeds the alpha level of 0.05, the decision is "Not Significant," indicating that there is no statistically significant relationship between grit levels and science performance in this study.

This analysis suggests that grit, defined as perseverance and passion for long-term goals, does not have a significant impact on science performance among the individuals studied. The high p-value indicates that any observed differences in science performance relative to grit levels are likely due to chance rather than a true effect of grit. This finding challenges the notion that grit is a universal predictor of academic success, at least in the context of science performance. It implies that other factors, such as cognitive abilities, teaching quality, or even interest in the subject, might play a more critical role in determining science performance. The lack of a significant relationship also suggests that interventions aimed solely at increasing grit may not be sufficient to improve science performance. Instead, a more holistic approach that considers multiple factors influencing academic success might be necessary. This analysis underscores the complexity of educational outcomes and the need for comprehensive strategies to enhance student performance. The science performance of learners is not significantly related to their grit scale level, as various factors such as educational expectations, engagement, and access to resources play a more crucial role in shaping science outcomes (Berandoy and Villonez, 2024; Yeung, 2024; Gara, 2023; Anderson, 2023; Dhurumraj, 2023). This finding aligns with research emphasizing that while grit is important for long-term goals, it does not directly predict academic performance in specific subjects like science (Wang et al., 2023; Abbas et al., 2023).

5. Conclusion and Recommendations

5.1. Conclusion

This study aimed to investigate the relationship between various family profile factors and the grit level of learners, as well as the connection between grit and science performance. The findings revealed that the number of siblings in a family does not significantly affect the grit level of learners. Similarly, the educational attainment of both the father and the mother showed no significant impact on the learners' grit

levels. Furthermore, the study found no significant relationship between science performance and the grit level of learners. These results suggest that grit, defined as passion and perseverance for long-term goals, is not influenced by family size or parental education levels. Additionally, a learner's performance in science does not appear to be linked to their level of grit. This indicates that other factors, possibly intrinsic personal characteristics or external influences not examined in this study, may play a more crucial role in developing grit among learners. Future research could explore these other potential factors to gain a more comprehensive understanding of what contributes to grit in educational settings.

5.2. Recommendations

Given the findings of this study, it is recommended that educators and school administrators focus on the following strategies to enhance learners' grit and overall academic performance:

- a. **Developing Grit through School Programs:** Implement programs that specifically aim to build perseverance and passion in students. Activities such as long-term projects, goal-setting workshops, and resilience training can help students develop grit.

- b. **Fostering a Growth Mindset:** Encourage a growth mindset among students by praising effort rather than innate ability. This can be achieved through classroom practices that emphasize learning from mistakes and viewing challenges as opportunities for growth.

- c. **Creating a Supportive Learning Environment:** Establish a supportive and inclusive school culture where students feel safe to take risks and persist through difficulties. This includes providing emotional and academic support through counseling services and peer mentoring programs.

- d. **Integrating Grit into the Curriculum:** Incorporate lessons on grit and perseverance into the curriculum. Subjects like Science can include discussions on famous scientists who overcame obstacles to achieve success, thereby inspiring students to develop similar traits.

- e. **Parental Involvement:** Engage parents in the process by providing them with resources and strategies to support their children's development of grit at home. Workshops and informational sessions can help parents understand the importance of grit and how to foster it.

- f. **Monitoring and Evaluation:** Regularly assess the effectiveness of grit-building programs and interventions. Use surveys, interviews, and academic performance data to evaluate progress and make necessary adjustments.

By focusing on these areas, educators and school administrators can help students develop the grit needed to succeed academically and in life, regardless of their family background or Science performance.

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