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General mental ability and its influence on the academic performance of elementary school students in north Tripura: A quantitative study

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Abstract
This study examines the correlation between general mental ability and academic performance among elementary school students in North Tripura, using a sample of 200 learners (92 male and 108 female) chosen through stratified random sampling. Data were collected using a general mental ability test by Dr. R.P. Srivastava & Dr. Kiran Saxena and the students' academic scores from their most recent examinations. Descriptive and inferential statistical methods, including t-tests and correlation coefficient(r), were employed to interpret the data. The outcomes reveal a notable positive connection in the middle of general mental ability and academic performance. Furthermore, no significant dissimilarities in general mental ability and academic performance irrespective of gender. However, the results highlight significant disparities between urban and rural students, with urban students outperforming their rural counterparts in both general mental ability and academic performance. The study's outcomes have practical implications for educators, parents, and policymakers. They underscore the importance of addressing cognitive and contextual disparities through targeted interventions to improve educational outcomes. The findings also advocate for integrating innovative pedagogical strategies and psychological principles to foster cognitive and academic development among students. This research contributes to the broader understanding of the interplay between cognitive abilities and academic success, providing a foundation for future studies aimed at enhancing education systems in diverse socio-economic and geographical contexts.

Keywords: General mental ability, academic performance, elementary school students, north Tripura, Tripura

Introduction

In the age of technological advancements, the world is evolving rapidly, and people's lives are becoming increasingly complex. Every individual is born with inherent cognitive abilities that enable them to interact and adapt effectively to their environment. As individuals grow within society, they acquire new abilities through their own efforts. These abilities allow them to learn, understand instructions, make decisions, and solve problems independently. The innate abilities endowed at birth are often referred to as general mental ability (GMA), though there remains some debate around its precise definition. These abilities can be nurtured to support a child's future development, making the role of schools pivotal in fostering GMA to prepare students for lifelong learning and adaptation to their environment and society.

General mental ability is broadly defined as the capacity to learn, recall knowledge, process information, and solve real-life problems effectively. The concept of GMA was pioneered by Charles Spearman, who in 1904 [21] introduced the notion of a general intelligence factor, "g," responsible for the correlations between various measures of intelligence. As Spearman (1904) [21] stated, "The 'g' factor underpins the shared variance across diverse cognitive tasks." Similarly, Stern (1914) [22] defined intelligence as a general ability of an individual to deliberately modify their thinking to meet new demands and adapt to emerging challenges and life situations.

Academic achievement, on the other hand, is a measure of the extent to which a student has acquired knowledge, understood facts, and solved problems as a result of training and education. While high academic achievement often correlates with high GMA, the presence of high GMA does not guarantee academic success. Numerous factors, both direct and indirect, influence academic performance, with GMA being one of the critical contributors. Research supports this association. For instance, Mittal (2017) [16] found significant differences in general intelligence between rural and urban students, though male and female students did not differ significantly. Rohde and Thompson (2007) [19] demonstrated that high school students' academic performance strongly correlates with intelligence scores. Similarly, Laidra, Pullman, and Allik (2007) [13] suggested that cognitive abilities are the strongest predictors of academic performance across grade levels.

This study seeks to explore the association in the middle of general mental ability and academic performance among elementary school students in North Tripura. Understanding this relationship is significant, as previous studies have consistently highlighted the profound influence of GMA on academic achievement. By focusing on this relationship, the study strives to provide revelation about the role of cognitive abilities in shaping educational outcomes, thereby informing strategies to enhance student performance and overall development.

Rational of the Study

The key objective of the current investigation is to ascertain the general mental ability and academic success of elementary school learners in relation to their gender (lingam), school type, and location. Schools play a pivotal role in fostering the general mental ability of students, enabling them to solve problems independently and adapt better to a complex and evolving society. This study aims to examine the academic performance of rural and urban students in relation to their general mental ability. It seeks to

identify whether there is an association in the middle of general mental ability and academic performance. If such a relationship exists, the study will explore its extent; if not, it will investigate the reasons behind the absence of a correlation. Additionally, comparing the academic performance of both the gender is an essential aspect, as gender differences often warrant exploration in various contexts. The outcomes of this study will assist in the development of the education system at the elementary level. It will provide valuable insights for teachers, parents, and policymakers to take informed steps toward improving the educational framework and enhancing students' general mental abilities. Thus, the study holds significant importance for fostering overall student progress.

Objectives of the Study

1. To identify the level of general mental ability and academic performance of students of elementary schools in the North district of Tripura.
2. To analyse the relationship (if any) between general mental ability and academic performance of students of elementary schools in the North district of Tripura.
3. To analyse the general mental ability of boys and girls of elementary schools in the North district of Tripura.
4. To analyse the academic performance of boys and girls of elementary schools in the North district of Tripura.
5. To analyse the general mental ability of elementary school students in the North district of Tripura based on their locality.
6. To analyse the academic performance of elementary school students in the North district of Tripura based on their locality.
7. To estimate the impact of general mental ability on academic performance of students of elementary schools in the North district of Tripura.

Hypotheses of the Study

H_{01}: There is no considerable relationship between general mental ability and academic performance of students of elementary schools in the North district of Tripura.

H_{02}: There is no significant difference in the general mental ability of boys and girls of elementary schools in the North district of Tripura.

H_{03}: There is no significant difference in the academic performance of boys and girls of elementary schools in the North district of Tripura.

H_{04}: There is no significant difference in the general mental ability of elementary school students in the North district of Tripura based on their locality.

H_{05}: There is no significant difference in the academic performance of elementary school students in the North district of Tripura based on their locality.

H_{06}: There is no significant impact of general mental ability on academic performance.

Definition of the Important Terms

1. **General mental ability (GMA):** General mental ability refers to the overall capacity of an individual to acquire knowledge, process and analyse information, develop intellectual skills, and solve real-life problems effectively and accurately.
2. **Academic Performance (AP):** Academic performance represents the level of a student's achievement in acquiring knowledge, understanding concepts, and demonstrating problem-solving abilities, as assessed through structured educational training and evaluation.
3. **Elementary School:** Elementary school is an educational institution catering to students aged 6 to 14 years, providing foundational education that prepares them for progression to secondary education.

Methodology of the Study

Descriptive survey method was adopted to verify the objectives and hypotheses.

Sample & Sampling

The study was conducted in the North Tripura district. Schools were selected using a random sampling method, ensuring a diverse and representative selection of institutions. A total of 200 elementary school students were picked using stratified random sampling techniques.

Tools of the Study

As per the nature of the variables of the study the General Mental Ability Test developed by Dr. R.P. Srivastava and Dr. Kiran Saxena was utilized.

Data Collection Process

The data collection was carried out systematically over a predefined period. First of all, Permissions were obtained from the school authorities to conduct the study, ensuring adherence to ethical standards and minimizing disruptions to academic schedules. The General Mental Ability Test was administered to the selected students under controlled conditions in their respective schools, ensuring uniformity in the testing environment. Academic performance data were collected from school records, verified with the help of class teachers to ensure accuracy. All responses and academic records were treated confidentially, ensuring the anonymity of participants.

Data Analysis Procedures

Data were interpreted through descriptive & inferential statistical approaches.

Analysis and Interpretation of Data

Objective 1

To identify the level of general mental ability & academic performance of students of elementary schools in the North district of Tripura.

Table 1: Showing the level of general mental ability (GMA)

Range of score	N	Level of general mental ability
29.0above	2	Very Superior
22.79-29.08	56	Superior
10.21-22.79	116	Average
3.29-10.21	24	Below Average
Below3.29	2	Dull

As per objective number one, 'Level of general mental ability of elementary school students in the North District of Tripura,' it is found that, out of a sample of 200 students, 2 learners have a very superior level, 56 learners have a superior level, 116 learners have an average level, and 24 learners have a below-average level of general mental ability. Only 2 learners fall under the 'dull' level. This analysis leads to the inference that the majority of elementary students have an average level of general mental ability.

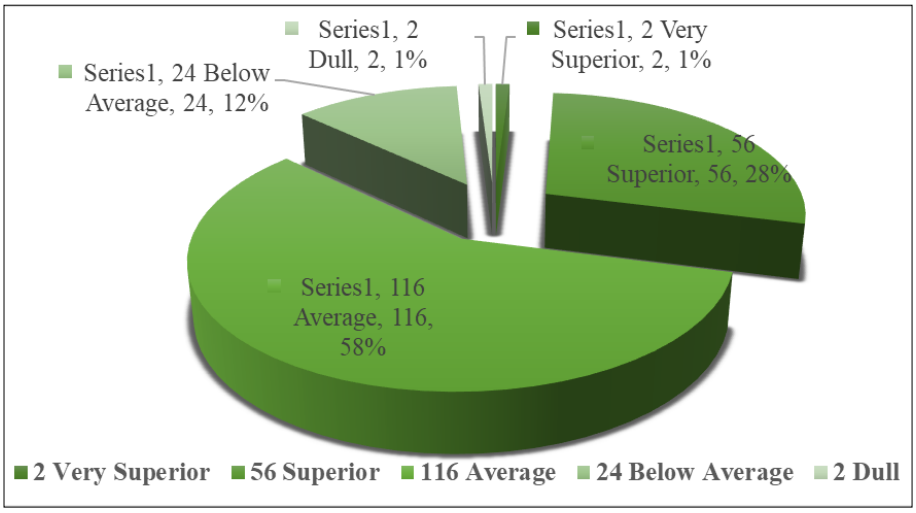

Fig 1: Visual depiction of the level of general mental ability

Table 2: Showing the level of academic performance (AP)

Percentile range	Total number of students	Level of Academic performance
Above P 95	11	Very high
P81-P95	27	High
P66-P80	30	Above average
P35-P65	58	Average
P20-P34	34	Below average
P5-P19	31	Low
Below P5	9	Very low

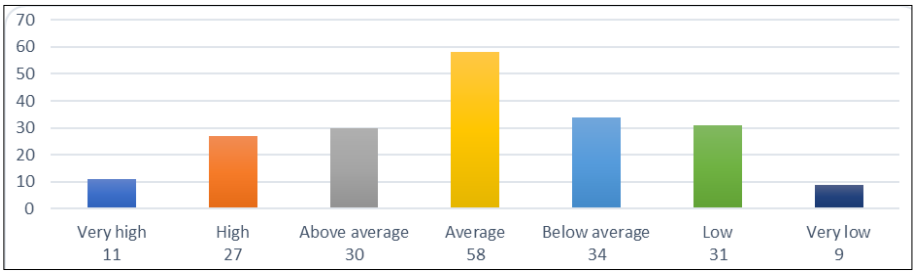

Fig 2: Visual depiction of the level of academic performance (AP)

As per objective number one, 'Level of academic performance of elementary school students in the North District of Tripura,' it is found that, out of a sample of 200 students, 11 students are very high achievers, 27 students are high achievers, 30 students are above average achievers, 58 students are average achievers, 34 students are below average achievers, 31 students are low achievers, and 9 students are very low achievers.

Objective 2

To analyze the relationship (if any) between general mental ability & academic performance of students of elementary schools in the North district of Tripura.

Analysis: Using a two-tailed test at the 0.05 level with 198 df, it is observed that the computed 't'-value **(29.45)** exceeds the critical t-value (1.98). Therefore, the result can be considered significant, and the null hypothesis (H_{01}) is rejected. Hence, we can reliably infer that there is a marked association in the middle of general mental ability and academic success. The results also indicate that students with high general mental ability tend to achieve high academic performance.

Objective 3

To analyze the general mental ability of boys &girls' students of elementary schools in the North district of Tripura.

Table 3: Comparing boys and girls in terms of GMA

Variables	Category	N	Mean	SD	t	df	Level of significance
GMA	Boys	92	16.22	5.71	0.67	198	Not significant at 0.05
	Girls	108	16.82	6.76			

Analysis: A close view of table 3 reflects that the computed t-value **(0.67)** is much smaller to the critical 't'-value (1.97)

for 198 df at the 0.05 level of significance, and thus the finding is not significant. Therefore, the conjectural statement (H_{O2}) is accepted. Hence, it can be concluded with certainty that boys and girls do not differ significantly in terms of general mental ability.

Objective 4

To analyze the academic performance of boys & girls' students of elementary schools in the North district of Tripura.

Analysis: The calculated 't'-value **(1.83)** is smaller than the critical t-value (1.97) for 198 df at the 0.05 level of significance, and thus the finding is not significant. Therefore, the conjectural statement (H_{O3}) is accepted. Hence, it can be concluded with certainty that boys and girls do not differ significantly in terms academic performance.

Objective 5

To analyze the general mental ability of elementary schools' students in the North district of Tripura based on their locality.

Table 4: Showing the General Mental Ability of elementary students by locality

Variable	Category	N	Mean	SD	t	df	Level of significance
General Mental Ability	Rural	140	14.2	5.58	9.78	198	significant at 0.05
	Urban	60	22.02	4.09			

Analysis: From table 4, It is revealed that the computed 't'-value (9.78) is markedly bigger than the critical t-value (1.97) for 198 df at the 0.05 level of significance, and thus the finding is significant. Therefore, the conjectural statement (H_{O4}) is rejected. Hence, it can be concluded with certainty that the students differ significantly in terms of general mental ability based on their locality.

Objective 6

To analyze the academic performance of elementary schools' students in the North district of Tripura based on their locality.

Analysis: It turns out that the calculated t-value **(7.04)** is much larger than the critical t-value (1.97) for 198 df at the 0.05 level of significance, and thus the finding is significant. Therefore, the conjectural statement (H_{O5}) is rejected. Hence, it can be concluded with certainty that the students differ significantly in terms of academic performance based on their locality.

Objective7

To estimate the impact of general mental ability on Academic performance of students of elementary schools in the north Tripura.

The study confirms that higher mental ability levels are associated with better academic achievement, supporting the objective of assessing this relationship. The Chi-Square test disclosed a **notable association** in the middle of mental ability and academic performance **(χ^2=136.67, p<0.05p)** in terms of statistical perspective. This indicates that the observed differences in academic performance across levels of mental ability are unlikely to have occurred by chance. Thus, conjectural statement (H_{O6}) is rejected.

Discussion

The outcomes of this study point out several critical aspects of the association in the middle of general mental ability & academic success among elementary school students in North Tripura. It was observed that the majority of students exhibited an average level of general mental ability, with only a small percentage falling into very superior or superior categories. These results align with the concept of normal distribution of intelligence, as described by Terman and Merrill (1937) [25], who emphasized that most individuals tend to fall within the average range of cognitive abilities. However, the presence of students at extreme ends indicates the need for tailored instructional strategies, reflecting Gardner's (1983) [9] perspective on differentiated approaches based on multiple intelligences.

In terms of academic performance, the study revealed a wide variation, with a significant number of students achieving average or below-average results. This pattern aligns with the findings of Rohde and Thompson (2007) [19], who reported that academic achievement is strongly correlated with cognitive abilities. The observed variation also underscores the influence of socio-environmental factors, including access to quality education and home support, on students' academic outcomes. Furthermore, the significant relationship observed between general mental ability and academic performance supports earlier findings by Laidra, Pullmann, and Allik (2007) [13], who demonstrated that cognitive abilities are strong predictors of educational success across different grade levels. Similarly, Deary, Strand, Smith, and Fernandes (2007) [8] emphasized the role of intelligence as a robust determinant of academic achievement.

The absence of significant gender differences in both general mental ability and academic performance is consistent with the findings of Mittal (2017) [16], who concluded that boys and girls do not exhibit substantial disparities in cognitive abilities. This challenge historical notions of intellectual differences based on gender and highlights the importance of equal opportunities in education for both genders. However, the significant differences observed between urban and rural students in both general mental ability and academic performance warrant attention. Urban students' superior performance could be attributed to better resource availability, exposure to enriched learning environments, and higher quality of educational infrastructure, as identified by studies like Coleman *et al.* (1966) [7] and Muralidharan and Kremer (2009) [18]. Addressing these disparities requires targeted policy interventions to enhance educational opportunities in rural areas.

Additionally, the study found that general mental ability significantly impacts academic performance, reinforcing the importance of fostering cognitive skills for educational success. This observation aligns with Sternberg and Kaufman's (1998) [24] triarchic theory of intelligence, which underscores the role of analytical intelligence in academic problem-solving. Overall, the findings underscore the need for schools to implement contextually relevant teaching strategies and interventions to address urban-rural disparities and enhance cognitive development among students. By addressing these challenges, the education system can contribute meaningfully to students' holistic development and academic achievement.

Implications for Policy and Practice

The outcomes of this study point out the significant influence of general mental ability on academic performance among elementary school students in Tripura, emphasizing the need for targeted strategies to address individual cognitive needs. These insights align with the goals of child-centered education and offer actionable solutions to enhance student outcomes. Policymakers and educators can leverage this knowledge to design interventions that support students across varying ability levels, particularly those with below-average cognitive skills. Addressing disparities in performance, especially between rural and urban students, requires region-specific strategies. Equitable resource distribution, improved infrastructure, and technology access in rural areas can bridge these gaps. Teachers can adopt innovative, engaging methods that promote critical thinking and problem-solving over rote learning, while parents are encouraged to actively support their children's educational journeys.

The findings reveal no significant gender differences in general mental ability and academic performance, suggesting that interventions can focus on universally benefiting all students. Additionally, psychological and therapeutic support systems, such as school-based counseling and personalized learning plans, are crucial for aiding students with lower cognitive abilities. These insights also have implications for curriculum planners, advocating for the integration of innovative teaching approaches and inclusive practices. By addressing cognitive and contextual challenges, the study provides a foundation for evidence-based policy and practice improvements in Tripura's education system.

Conclusion

The study underscores the critical role of general mental ability in shaping academic performance, revealing a positive correlation between the two. It finds no significant gender-based differences in general mental ability or academic performance but highlights marked differences between urban and rural students, with urban students outperforming their rural counterparts. These outcomes suggest the necessity for precise action to address cognitive disparities & contextual challenges. The results also affirm the enduring influence of general mental ability throughout life, emphasizing its importance in educational outcomes. This research provides a basis for integrating educational psychology principles into school practices to foster cognitive development and improve academic achievements. The study serves as a stepping stone for further exploration into enhancing education systems, particularly in under-resourced settings.

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