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THE RELATIONSHIP BETWEEN PRIMARY SCHOOL CHILDREN'S INTELLIGENCE QUOTIENT AND THEIR MATHEMATICS ACHIEVEMENT

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Abstract

This study looked at demographic factors and IQ as a correlate of mathematics achievement among students in the v-grade in the Telanga state of India's Adilabad and Medchal Malkajgiri districts. There were two study objectives and four hypotheses presented. This inquiry made use of the survey approach. In total, 200 students in the v-grade of primary schools were polled—200 boys and 200 girls. Both the researcher's competency-based accomplishment test (CBAT) and a standard intelligence quotient tool developed by DWARKA PERSHAD AND NEHA JAIN in 2020 were employed as study tools. Two experts assessed the CBAT instrument on a sample acquired outside the study area. CBAT uses the Cronbach's alpha reliability coefficient, which has a value of 0.809. The study's findings indicate a connection between pupils' mathematical achievement and I.Q. It also found that demographic variables including age, gender, and medium of instruction had no impact on the I.Q. of pupils in the v-grade. The results show that students' I.Q. should be encouraged because it has the ability to raise their achievement.

Keywords: Students' I.Q., Mathematics Achievement.

Introduction

One of the indispensable problems and interests for educators has been how well students acquire the foundational ideas of mathematics. In order to solve issues with the quality of mathematics learning, instructional design is a powerful strategy. Understanding the factors that affect math ability is crucial for selecting the optimal design solutions. . (Tuncay Saritas and Omur Akdemir, 2009.)

Mathematics is an essential tool subject that students study from kindergarten to university and beyond. The professionalization of all occupations requires a strong mathematical foundation, according to studies. It's difficult to participate in mathematical activities, if you don't have a strong mathematical background (Aoxue Su et al, 2021, Wang and Degol, 2017).

According to Tarig Mohamed Ali et,al (2012),Math achievement is integrally tied to future employment options, has an important effect in the degree of students' general knowledge acquisitions, and serves as a valid criterion for categorising students into scientific or literary streams. In addition, success in mathematics can lead to well-paid and high-status professions. As a result, teachers, parents, and researchers found that pupils at all levels were having difficulty with mathematics.

According to Tuncay Saritas and Omur Akdemir, (2009), In terms of demographic characteristics, the data suggested that the educational degree of parents and their socioeconomic situation were two important factors in math achievement. These are the elements that instructional designers should not overlook because they are crucial to math success. Students from various socioeconomic backgrounds and with varying degrees of parental education may have extremely different attitudes, needs, and other traits when it comes to learning and studying arithmetic. As a result, the success of those students in math classes is dependent on instructional design that can effectively convey critical mathematical skills and information to students from various backgrounds.

General intelligence and the capacity to acquire a second language are related (Gardner & Lambert, 1972). According to Pimsleur (1971), a student's overall average grade in school is frequently a reliable indicator of how adept he will be at learning a language. However, it has also become evident that success in learning a second language is tied to a more specialised set of learning skills known as "Language Aptitude," in addition to general cognitive aptitude. What is obvious is that intelligence and acquisition having a close link.

In learning mathematics, the mathematical inclination requires attention. Math disposition is the propensity to assume and behave favourably. This temperament can be seen in students' belief in mathematics, their willingness to investigate and persist in finding solutions to mathematical puzzles, and their willingness to consider their own perspectives as they learn mathematics. One is driven to make decisions and have experiences by nature. Self-worth and values-based attitudes influence disposition. If a student has

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a poor attitude or disposition toward math, it will be difficult for them to learn the subject well. (Joko Sutrisno AB, Gaguk Margono, Wardani Rahayu 2018; 2010; Moenikia and Babelan, 2010;).

The rate of learning mathematics is also correlated with intelligence. With evidence indicating pupils with higher IQ scores show much stronger mathematics success development in reading and writing than those with lower IQ scores, several researchers proved the association between IQ scores and mathematical achievement advancement.

According to Ritu Chandra's (2013) research, intelligence has an impact on a student's academic performance. A child with a high IQ performs better academically than one with low IQ. When compared to an average youngster, a high-Intelligent Quotient child will have higher gripping strength, confinement and memory, as well as superior comprehending ability. As a result, he will undoubtedly improve his academic performance. A bright child will perform well and receive high grades. The study's findings reveal that youngsters with an average IQ outperform those with a low IQ. In opposed to a slow learner, a child with an average IQ will be a better learner. As a result, an average-IQ child's academic accomplishment will be higher than that of a low-IQ child.

Many studies and models have been developed, according to Maher Abu-Hilal and Intisar Nasser (2012), to better understand accomplishment behaviour. To identify the correlates of accomplishment, researchers have examined a range of factors, from demographic factors like age, gender and socioeconomic factors to personal and psychological concerns. In earlier studies, several psychological and pedagogical presumptions and theories were employed. Ability is one of the psychological and personal traits that are used to forecast academic performance.

According to Tatiana Tikhomirova et al., (2016), A number of measures of high school students' mathematics proficiency are significantly predicted by nonverbal intelligence. For different metrics of math achievement, the role of nonverbal intelligence differs.

Review of related literature

1. The findings of Aoxue Su et al. (2021), contribute to our understanding of the underlying mechanisms through which intelligence mind sets effect arithmetic achievement, which is important for students' progress and current educational practise.
2. Nutritional status, socioeconomic position, and age were found to be connected with children's intelligence quotients (IQ) by Singhvi SD et al. (2020), but gender was not. Children's cognitive development is crucial to their future success; it should be given more attention, as should early prevention strategies for its linked problems.
3. According to Ana Costa and LuIsa Faria (2018), current evidence confirms the direct link between Implicit Theories of Intelligence (ITI) and student achievement and recognises unique implications that ITI may have on academic performance.
4. According to Reza Falahati's study from 2010, "The relationship between students' I.Q. and their ability to use transitional words and expressions in writing," there is no connection between language learners' IQ and their capacity to effectively use transitional words and expressions in writing.
5. According to Dr. Daller and Dr. Zehra's (2018) research, "It is simpler to form notions at a young age in a first language and then learn a new name for it later in a different language." Bilingual children who speak their original language at home have better IQ. The youngsters in our study who had done this had lower IQ scores as a result. Children who have to learn to grasp things for the first time in a less familiar language will find it much difficult.
6. According to Joko Sutrisno AB et al, (2018), study discovered that IQ, self-regulated learning, and logical thinking ability all have a positive direct effect on geometry problem-solving ability, but that mathematical inclination has no positive direct effect on geometry problem-solving ability.
7. Surajudeen o bello et al., (2017), study found that the average IQ of students in private schools was much higher than in public institutions. Private school students had a higher IQ than public school students, whereas public school students had a lower IQ and more intellectual disability.
8. Ana Hernández et al, (2017), study revealed that parents' level of education was found to be a strong predictor of their children's full scale I.Q. (FSIQ), with substantial increases in mean FSIQ and primary index scores as the parents' educational level rose. Although sex was not proven to be a significant predictor of children's FSIQ, there were minor sex variations in the Processing Speed Index (PSI). Although family structure was a strong predictor of FSIQ, it had a little role in the overall model.
9. Archita Makharia et al. (2016) found that in their study, environmental factors that affected children's IQ included their residence, level of physical activity, family income, parental education, and father's work.
10. According to a study by Kpolovie, P. J. (2016), IQ and academic achievement in mathematics at Junior Secondary School III (JSS III) have a correlation and partial correlations (influence of English controlled). There is a link and partial association between IQ and mathematics academic ability in Senior Secondary Schools III (SSS III) (English Language influence

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controlled). There is a link between English Language academic accomplishments in JSS III and SSS III. With four-year intervals, students' IQ in JSS III and SSS III is.702.

11. According to Oommen A (2014), a person's IQ is multifactorial, which means that a range of things may affect it. An individual's level of intelligence is influenced by both nature and nurture. While a person's IQ is greatly determined by inherited predisposition, there are a variety of modifiable environmental factors that can also have an impact, such as education, early delivery, food, pollution, drug and alcohol misuse, mental health problems, and diseases. These changeable elements could increase or decrease a person's genetic predisposition.
12. Maher M. Abu-Hilal (2012) studied how cognitive constructs (such as I.Q. and mathematics achievement) and affective constructs are related structurally. It was stated that regardless of gender, the relationships are not valid. The structural model's gender-neutrality was examined. Both the measuring model and the structural model turned out to be gender-neutral. The gender-specific disparities in the structural relationships between the variables are supported by the non-constrained model.
13. M. Moenikia & Zahed-Babelan A, (2010), the study found that there is a strong association between all of the variables, suggesting that mathematical aptitude, academic aspiration, and IQ are statistically significant predictors of mathematics achievement.

Objectives of the study

1. To understand the role of demographic factors in intelligence quotient among v-grade students.
2. To investigate the relationship between intelligent quotient and mathematics performance among v-grade students.

Statement of hypotheses

1. There is no statistically significant variation in the intelligence quotient of V-grade students according to age.
2. There is no significant difference in the intelligence quotient of V-grade students with respect to gender.
3. There is no significant difference in the intelligence quotient of V-grade students with respect to medium of instruction.
4. There is a relationship between students' intelligence quotient and mathematics achievement among v-grade students.

Methodology

Research Design

This study used a survey method to satisfy the objectives and hypotheses. The study used a correlational design. This kind of design aims to ascertain the relation between two or more variables. As a consequence, it was utilised to establish a link between one independent variable (students' intelligence quotient) and one dependent variable (students' mathematical achievement). This study also discovered a link between intelligence quotient and demographic characteristics such as age, gender, and medium of instruction.

Procedure

The researcher administered the instruments with the help of 10 assistants. The study's objectives and the need to react objectively were explicitly presented to the participants. The children's intelligence quotient questionnaire (IQ) was administered during the first 45 minutes. Following the retrieval of the first, an hour passed before the competency-based achievement test (CBAT) was administered and recovered. In preparation for analysis, the responses to the two instruments were scored and collated. The children's intelligence quotient questionnaire had a maximum rating score of 165 and the CBAT had a maximum score of 24, with each correct item earning one point and the incorrect answer receiving zero (0).

Instruments for data collection

1. Intelligence scale for 6 to 15 years students

It is a standardized scale. This children's intelligence scale was developed by DWARKA PERSHAD AND NEHA JAIN in 2020.It consists of six subsets divided into two broad groups as follows:

a) Performance group of tests:
1) Picture completion subset
2) Block design subset
b) Verbal group of tests:
1) Information
2) Comprehension
3) Arithmetic
4) Digit span

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These six subsets were further classified into three indexes based on Cattell's fluid-crystallize, and Thurston's primary abilities. It was hypothesized that discrepancy amongst indexes would be of clinical significance and might indicate parenting style, obstructing wholesome development of the child.

1. Abstract index, akin to fluid intelligence
2. Concrete index, akin to crystallized intelligence
3. Numerical index, akin to working memory

2. **A competency-based mathematics achievement test for v-grade students**

Competency based achievement test items prepared by the researcher by adopting mathematics questionnaire from SCERT Telangana's summative and formative assessment tests. The sole objective of this tool is to assist in the study of mathematics at the primary level. It evaluates fifth-grade arithmetic students' abilities in five areas: problem solving, reasoning-proof, communications, connections, representation, and visualisation. It also tests the ability of fifth-graders to answer word problems. It distinguishes between numerical and verbal problem-solving abilities. This tool had a reliability of 0.809.

Data analysis

To determine whether there was a relationship between students' I.Q. and demographic factors, this study used a one-way ANOVA and a t-test. The research study objectives were met using the Pearson Product Moment Correlation Coefficient, and the significant values were used to evaluate the hypotheses at a 0.01 level of significance.

Results

This section discusses outcomes in relation to the objectives and hypotheses. Thus, this study, it is looked into the significance of the disparity between children's IQ and demographic traits. This study sought to determine whether there was a relationship between V-grade pupils' math proficiency and their level of child intelligence.

Table 1: showing distribution of age wise Intelligence Quotient and one-way ANOVA of primary school children.

Age	N	% of N	Mean	Std.dev.	f	Sig.
9 years	32	8.0%	98.59	7.5	9.287	0.000
10 years	163	40.80%	95.68	7.3		
11 years	147	36.80%	92.79	6.6		
12 years	58	14.50%	92.88	6.0		
Total	400	100%	94.44	7.1		

The lowest number of students (32 out of 400) is over the age of nine, accounting for only 8% of the overall sample. Their average intellectual quotient is 98.50 (standard deviation: 7.5), which is higher than the average intelligence quotient of the entire sample, which is 94.44.

Ten-year-old pupils made up the largest percentage of the total sample, accounting for 40.8 present of the total. This number was 163 (standard deviation 7.3) out of 400 students. They had a little higher average intelligence quotient (95.68) than the rest of the group (94.44).

With 36.8% of the entire sample, 11-year-old students were the second most common age group. There are 147 11-year-olds among the 400 students. When compared to the mean of the entire sample, their maths intelligence quotient of 92.79 is poor (standard deviation 6.6).

12-year-olds have a mean intelligent quotient of 92.88 (standard deviation of 6.0) with 14.5 per cent, which is nearly equivalent to the lowest mean intelligent quotient.

The value of F is 1.717, and the p-value of 0.163 indicates that it is significant (this value is more than the.05 alpha level). This suggests there is a statistically there is no discernible difference between elementary school children's intelligence quotient and their age.

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That means our hypothesis-1 is proved in this case.

There is no statistically significant difference in the intelligence quotient of V-grade children with respect to age.

Table 2: showing distribution of gender wise Intelligence Quotient of primary school children

Gender	N	Mean	Std.deviation	t-value	Sign. p	Df
Boys	200	94.55	6.971	0.293	0.723	398
Girls	200	94.34	7.362			

The average IQ of 200 boys (N = 200) was 94.55, which was somewhat higher than the average IQ of 200 girls (N = 200). (94.34). There is no difference in the observed mean values of boys' and girls' IQ in this situation.

The p value in this case is 0.526, which is higher than 0.05. This suggests that the differences between the variances are not substantial. That is, there is no substantial variation in primary school children's intellectual quotients based on their gender.

Therefore, our hypothesis-2 is proved in this case.

There is no significant difference in the intelligence quotient of V-grade students with respect to gender.

Table 3: showing Intelligence Quotient of primary school children with respect to medium of instruction

Medium	N	Mean	Std.deviation	t-value	Sign. p	Df
English	200	95.22	7.113	2.174	0.921	398
Telugu	200	93.67	7.143			

There are 200 English-medium students out of 400 totals. The remaining 200 students were Telugu medium students, with an average I.Q. of 93.67, which is poor when compared to English medium students' I.Q.

The p-value in this case is 0.256, which is higher than the threshold of 0.05. This indicates that the variances are not statistically significant. That is, there is no substantial variation in elementary school children's intellectual quotients based on their learning medium.

As a result, in this case, hypothesis - 3 is proven.

There is no significant difference in the intelligence quotient of V-grade students with respect to medium of instruction.

According to these three hypotheses, there is no significance difference between demographic factors (age, gender medium of instruction) and I.Q. of primary school children.

Therefore, our objective-1 is "To understand the role of demographic factors in intelligence quotient among v-grade students" proven.

Table 4: showing correlation between students' intelligence quotient (I.Q.) and achievement in mathematics (CBAT).

		Student IQ	CBAT
Students' IQ	Pearson correlation	1	0.240
	Sign(2 tailed)		0.00
	N	400	400
CBAT	Pearson correlation	0.240	1
	Sign(2 tailed)	0.00	
	N	400	400

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The correlation coefficient is 0.240, which is lower than +0.29. That is to say, there is a small correlation between a student's IQ and their math achievement.

As a result, we can accept hypothesis - 4.

"There is a relationship between pupils' IQ and their achievement in mathematics competence."

We also stated that our objective-2 is proven based on this premise.

Hence our objective-2 is "To study the relationship between intelligent quotient and mathematics achievement among v-grade students" Proved.

Discussions

The findings of this study suggest that there is no statistically significant relationship between the I.Q. of pupils in the fifth grade and their age. This outcome deviates from that of the Singhvi SD et al. (2020) study.

Additionally, it was discovered that there is no appreciable gender difference in the I.Q. of v-grade students. In contrast to Singhvi SD et al. (2020) study, the findings of Ana Hernández et al. (2017) and Maher M Abu-Hilal (2012) studies are substantially supported by the findings of this investigation.

According to this study, there are no appreciable differences between V-grade pupils' intelligence levels regardless of the medium of instruction. Reza Falahati's (2010) study provided support for this conclusion, while Dr. Daller and Dr. Zehra's (2018) investigation found something different.

Finally, it shows how students' performance in proving their mastery of mathematics correlates with their IQ. This conclusion was backed up by research from Aoxue Su et al. (2021), Ana Costa and Luisa Faria (2018), Joko Sutrisno AB et al. (2018), Kpolovie, P. J. (2016), M Abu-Hilal (2012), M. Moenikia and A. Zahed-Babelan, and others (2010).

Recommendations

The Directorate of School Education and SCERT Telangana are urged to support the campaign on the significance of raising students' I.Q. through the inclusion of Activities involving memory, executive function, spatial reasoning, and use of musical instruments, learning new languages and continuing education in the school curriculum.

If it hasn't already been done, get a qualified instructor to administer an official IQ test to the kid. Every week, teachers are required to evaluate students' achievement. To develop a patient disposition toward youngsters with low intelligence. Teachers' ought to Use visual aids, modify their vocabulary, and respond to any queries the learner may have.

Parents need to Use language that is appropriate for their age, pay attention to their reactions, and be aware of how anxious they are. Promote compassion instead of stigma Close discussions with consideration, and keep checking in.

Conclusion

According to the study's findings, there are no statistically significant differences in the intelligence quotient of V-grade pupils according to their age, gender and medium of instruction. According to this study, a student's IQ has the power to affect their proficiency in mathematics. This indicates that teachers of mathematics can raise students' low math achievement levels by putting more emphasis on boosting students' IQs than just teaching methods and instructional materials. However, teachers should also take into account their students' mathematical ability as a component that could aid in improving their poor performance as a way to raise student achievement.

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