



## ACADEMIC ACHIEVEMENT IN RELATION TO COGNITIVE ABILITY AMONG SECONDARY SCHOOL STUDENTS

Gagandeep Kaur<sup>1</sup>, Ph. D. & Priyanka Prajapati<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Education, Guru Nanak Dev University, Amritsar

Email-gagandhillon33@yahoo.co.in

<sup>2</sup>Research Scholar, Department of Education, Guru Nanak Dev University, Amritsar

Email-prajapatipriyanka464@gmail.com

**Paper Received On:** 25 JULY 2022

**Peer Reviewed On:** 31 JULY 2022

**Published On:** 1 AUGUST 2022

### Abstract

Various factors influence academic achievement of students including cognitive abilities. The purpose of this study is to investigate the relationship between academic achievement and cognitive ability of secondary school students. Academic achievement or academic performance is the outcome of education to which a student, teacher or institution has achieved their educational goals. 320 adolescents were recruited in this study, with respect to gender, locale and type of school from secondary schools of Amritsar district. The study falls under the domain of descriptive research. Researcher has used stratified random sampling technique to study academic achievement in relation to cognitive ability among secondary school students. Cognitive style inventory by Jha (2001) was used to study cognitive ability of the students. Scores of the previous class were taken for the academic achievement. Statistically significant mean difference was found in scores of academic achievement of secondary school students with respect to different cognitive abilities. The mean score of students with integrated style was higher than followed by systematic, split, undifferentiated and intuitive style. So teacher should focus on the students whose academic achievement is low and use different teaching materials like audio-visual, chart, real objects, and different teaching methods and teach according to the abilities of students which will help students to be successful in academics. Academic success and cognitive ability are positively associated, so schools should give pupils the chance to develop their cognitive abilities through reasoning classes and quiz competitions.

**Keywords:** Academic achievement, cognitive ability, secondary school students.



Scholarly Research Journal's is licensed Based on a work at [www.srjis.com](http://www.srjis.com)

## 1. Introduction

Education is that constructive process, which drags a person out from the darkness, poverty and misery and leads on the path of enlightenment, prosperity and happiness by

developing individually in all its aspects i.e., physical, mental, emotional and social (Suri & Sodhi 2012). Academic achievement has become a measure of self-worth and success. One of the central purposes of intelligence testing is to predict educational achievement (Binet & Simon, 1916). As Intelligence Quotient, Focus Factor, Decision Making Ability as well as Creative Quotient are equally important for getting success in academics” ( Marwaha & Seth 2016). Research has consistently shown that a positive correlation exists between cognitive abilities, measured by various psychometric tests and academic achievement. Cognitive ability is the most important predictor of academic achievement in many subjects, including mathematics (Taub 2008). Individual differences in academic performance, on the other hand, have been related to IQ differences. Students with stronger mental abilities are more likely to excel in school. Schools can be incentivized to give cognitive training if academic accomplishment and cognitive abilities are interconnected (Padmini Pooja 2017). But the concept of cognitive abilities is a complex one, since many different models of cognitive abilities have been proposed. These models may include the idea of a general cognitive ability and/or specific cognitive abilities (Sternberg, 1985). Among the specific cognitive abilities Horn and Cattell (1966) identified the fluid and crystallized cognitive abilities, included in our study. Horn and Cattell (1966) defined fluid cognitive abilities as an individual's ability to reason, form concepts, and solve problems using unfamiliar information or novel procedures, whereas crystallized cognitive abilities include an individual's acquired knowledge, the ability to communicate one's knowledge, and the ability to reason using previously learned experiences or procedures. Research findings supported that sustained and high- quality schooling and education directly affect on cognitive and academic achievement and may indirectly affected academic and cognitive development by triggering cognitive academic bi-directionality (Peng & Kievit 2020). Academic achievement of students can be enhanced by providing them problem solving situations in class, discussion on a topic, quiz competitions, brain storming activities etc. which will in turn help in developing their divergent thinking abilities. Sustain and high-quality of schooling improve the cognitive ability of students. Information processing speed is the key predictor of fluid intelligence, working memory, and number sense, which in turn contribute to individual differences in academic success. Additionally, the specificity of the relationship between individual indicators of cognitive abilities and academic achievement at each level of schooling was revealed (Tikhomirova 2020). Cognitive ability show significant effect on academic performance, and personality

*Copyright © 2022, Scholarly Research Journal for Humanity Science & English Language*

characteristics and psychology health play a partially mediating role between cognitive ability and English academic performance of students (Shi and Qu 2021).

### **Objectives**

- To study the difference in cognitive ability of secondary school students with respect to gender, types of school and locale.
- To study the difference in academic achievement of secondary school students with respect to gender, types of school and locale. .
- To study the difference in academic achievement of secondary school students with respect to different cognitive abilities.
- To study the relationship between cognitive ability and academic achievement of secondary school students.

### **Hypotheses of the Study**

- There is no significant difference in cognitive ability of secondary school students with respect to gender, types of school and locale.
- There is no significant difference in academic achievement of secondary school students with respect to gender, types of school and locale.
- There is no significant difference in academic achievement of secondary school students with respect to different cognitive abilities.
- There is no significant relationship between cognitive ability and academic achievement of secondary school students.

### **Reserch Design**

The present study falls under the domain of descriptive study. For the study, 320 students were taken randomly from secondary school of Amritsar district only. The stratification is done based on gender, locality and type of school. Score of the previous class was taken up as academic achievement score. Cognitive style inventory by Jha (2001) was used to measure cognitive ability of students. The research data was analyzed by the statistical tools such as descriptive statistical like Mean and standard deviation (SD). 't' test was applied to find out the significance of difference between different groups. 'One way Anova' was used to find out the significance difference between the cognitive abilities and academic achievement of secondary school students. 'r' value was calculated to find out the relationship.

### Analysis and Interpretation of Data

**Table- 1: Chi-Square Value of Cognitive Ability of Secondary School Students With Respect To Gender, Types of School and Locale**

| Variable        | Category   | N   | Chi- Squire Value | Df | Inference     |
|-----------------|------------|-----|-------------------|----|---------------|
| Gender          | Male       | 160 | 6.24              | 4  | Insignificant |
|                 | Female     | 160 |                   |    |               |
| Types Of School | Government | 160 | 6.94              | 4  | Insignificant |
|                 | Private    | 160 |                   |    |               |
| Locale          | Urban      | 160 | 88.02             | 4  | Significant   |
|                 | Rural      | 160 |                   |    |               |

Table -1 shows value of chi – square (6.24) with respect to gender and (6.94) with respect to types of school is much lower than both the critical value 9.488 at 0.05 and 13.277 at 0.01. The result revealed that there is no significant difference in cognitive ability of secondary school students with respect to gender and type of school. The computed value of chi – square (88.02) with respect to locale is much greater than both the critical value 9.488 at 0.05 and 13.277 at 0.01. The findings show that there is significant difference in cognitive ability of secondary school students with respect to locale.

### T-Value of Academic Achievement of Secondary School Students with Respect Gender, Types Of School and Locale

**Table -2**

| Variable        | Category   | N   | Mean  | S.D   | T- Test | Inference     |
|-----------------|------------|-----|-------|-------|---------|---------------|
| Gender          | Female     | 160 | 78.68 | 8.05  | 2.64    | Significant   |
|                 | Male       | 160 | 73.28 | .776  |         |               |
| Types Of School | Government | 160 | 77.64 | .99   | 1.37    | Insignificant |
|                 | Private    | 160 | 74.33 | 3.32  |         |               |
| Locale          | Urban      | 160 | 76.6  | 19.15 | 0.60    | Insignificant |
|                 | Rural      | 160 | 75.30 | 19.15 |         |               |

Table – 2 show that, the calculated t- value 2.64 (with respect to gender) was found to be more than 0.01. An examination of means shows that academic achievement of females is higher as compared to male secondary school students. (The result revealed that there is significant difference in academic achievement of secondary school students with respect to gender.) The calculated t- value 1.37 and 0.60 (with respect to types of school and locale) was found to be less than 0.05 and 0.01. The findings show that there is no significant difference in academic achievement of secondary school students with respect to type of school and locale.

**Table-3: Cognitive Style (Systematic, Intuitive, Integrated, Undifferentiated, Split)**

|                             | Cognitive style        | No. of student | Mean  | S.D   |
|-----------------------------|------------------------|----------------|-------|-------|
| <b>Academic achievement</b> | Systematic style       | 16             | 79.94 | 11.15 |
|                             | Intuitive style        | 12             | 71.5  | 15.68 |
|                             | Integrated style       | 13             | 82.38 | 9.54  |
|                             | Undifferentiated style | 214            | 75.58 | 19.71 |
|                             | Split style            | 65             | 77.58 | 10.78 |
|                             | Total                  | 320            |       |       |

In order to analyse the variance in cognitive ability the obtained scores are subjected to ANOVA and the result has been presented as given in table-4

**Summary of Analysis of Variance One Way Anova**

| Source of variance | Df  | Sum of square | Mean square   | f-value | Inference    |
|--------------------|-----|---------------|---------------|---------|--------------|
| Between group      | 4   | 388119808916  | 97029967229   | 80.77   | Significance |
| Within group       | 315 | 378387903454  | 1201231439.54 |         |              |

The f-value for the difference between academic achievement of secondary school students with respect to systematic, Intuitive, Integrated, undifferentiated and split came out to be 80.77 which is significant at both levels. Academic achievement of integrated style students is higher followed by systematic, split, undifferentiated and intuitive style.

**Table -5: Showing Correlation between Academic Achievement and Cognitive Ability of Secondary School Students**

| Variables            | N   | r     | Inference                |
|----------------------|-----|-------|--------------------------|
| Academic achievement | 320 | 0.243 | Significant and positive |
| Cognitive ability    | 320 |       |                          |

The correlation value between academic achievement and cognitive ability is 0.243 which is significant at 0.01. The result indicates that academic achievement is significantly and positively related with cognitive ability of secondary school students.

### Discussion

The main purpose of this study was to explore the relationship between cognitive ability and academic achievement of secondary school students. This study consists of 320 adolescent students of various schools in Amritsar District of Punjab. The results of the present study revealed that insignificant difference was found between cognitive ability of secondary school students with respect to gender and type of school. This result is contradicted to study conducted by Padmini Pooja (2017). Significant difference was found between cognitive ability with respect to locality. The result is supported by previous studies conducted by Padmini Pooja (2017). The present study indicated that there is significant and positive relationship between cognitive ability and academic achievement of secondary school students. The result of the study is in line with the studies conducted by Phillipson and Phillipson(2012) Chong and Jiar (2016), Padmini Pooja (2017), and Tikhomirova (2020) .

### Findings

- The cognitive ability of the secondary school students with respect to gender and type of school was found to be insignificant.
- Cognitive ability of secondary school students with respect to locality was found to be significant.
- Academic achievement of female secondary school students was higher as compared to the male secondary school students.
- Statistically significant mean difference was found in scores of academic achievement of secondary school students with respects to different cognitive abilities. The mean

score of students with integrated style was higher than followed by systematic, split, undifferentiated and intuitive style.

- Academic achievement was found to be significantly and positively related to cognitive ability of secondary school students.

### **Educational Implications**

- The result of the study indicated that there is no difference in cognitive ability of secondary school students with respect to gender and type of school, so school should provide equal opportunity to all students in both curricular and co-curricular activities.
- The result of the study indicated that there is difference in cognitive ability of secondary school students with respect to locale, so school should organize activities like puzzle solving, reasoning classes, brain training game, and used different teaching method according to the ability of students.
- The result of study indicated that there is difference between the academic achievement of male and female secondary school students. Academic achievement of female students is higher as compare to male students, so school should provide the teaching learning resources and focus more on the male students which help student to success in academic.
- The findings of this research provide implications to the schools and teachers, that the academic achievement is different with respect to cognitive abilities, Academic achievement of integrated style, students is higher followed by systematic ,split, undifferentiated and intuitive style, so teacher should focus the students whose academic achievement is low and use different teaching materials like audio- visual, chart, real objects, and different teaching methods and teach according to the abilities of students which help students to success in academic.
- The findings of this research provide significant implication to the schools and teachers that cognitive ability and academic achievement is significantly and positively related, so school should provide cognitive trainings reasoning classes, quiz competition. Improving cognitive ability will increase the academic achievement of the students.

### **Conclusion**

Research findings of this study have demonstrated a strong, positive correlation between cognitive performance and academic success. Based on cognitive capacities, differences are discovered in academic accomplishment. In order to help students succeed in

*Copyright © 2022, Scholarly Research Journal for Humanity Science & English Language*

their academic fields, teachers should concentrate on the students with low academic achievement. To this end, teachers should use a variety of teaching tools, including audio-visual aids, charts, and actual objects. They should also employ a variety of teaching strategies. In order to help pupils develop their cognitive abilities, schools should also offer cognitive training, reasoning classes, quiz competitions, etc. Supporting students' cognitive capacities will advance their academic performance.

## References

- Ault, R.L. (1977). *Children's cognitive development : Piaget's theory and process approach*, Oxford University Press, New York.
- Bloom, B., Englehart, M., Furst, E., Hill, W., & Krathwohl, D. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain*. New York, Toronto: Longmans, Green.
- Bernardo, A. B., Zhang, L. F., Callueng, C. M., (2002) *Thinking styles and academic achievement among filipino students. The Journal of Genetic Psychology*, 163 (2) 149-163.
- Carroll, J. B., (1993). *Human cognitive abilities: A survey of factor-analytic studies*. Cambridge University Press.
- Crow, L.D. & Crow, (1969). *Adolescent development and adjustment*. United States: McGraw-Hill Company.
- Chong, Y.L & Jiar-Yeo, K. (2016). *Cognitive Ability and Academic Achievement of Undergraduates. Man in India*, 96 (6), 1903-1912.
- Chauhan, S. S. (2007). *Advanced Educational Psychology*. Vikas Publishing House Pvt.Ltd.
- Elliott, C. D., Hale, J. B., Fiorello, C. A., Dorvil, C., Moldovan, J. (2010). *Differential ability scales-II prediction of reading performance: Global Scores Are Not Enough*
- Fry, A. F., & Hale, S. (1996). *Processing speed, working memory, and fluid intelligence: Evidence for a developmental cascade. Psychological Science*, 7 (4), 237–241.
- Francisco C. G. & Elaine H. H, (2010). *Learning and Thinking Styles: An analysis of their interrelationship and influence on academic achievement. Educational Psychology*, 20 (4), 413-430.
- Mangal, S.K. (2016). *Advanced Educational Psychology*. Published by Phi Learning Private, Delhi.
- Kytala, M., & Lehto, J. E. (2008). *Some factors underlying mathematical performance: The role of visuo spatial working memory and non-verbal intelligence. European Journal of Psychology of Education*, 23, 77–94.
- Peng, P., & Kievit, R. A. (2002). *The development of academic achievement and cognitive abilities: A bidirectional perspective. Child Development perspective*. 14 (1), 15-20.
- Proctor, B. (2012). *Relationships between Cattell – Horn - Carroll (CHC) cognitive abilities and math achievement within a sample of college students with learning disabilities. Journal of Learning disabilities*, 45 (3), 278-87.
- Phillipson, s., & Phillipson, S.N. (2012). *Children's cognitive ability and their academic achievement: The mediation effects of parental expectations. Asia Pacific Education Review*, 13 (3), 495-508. doi 10.1007/s1264-011-9198-1.
- PadminiPooja, M. (2017). *A study on the relationship between cognitive abilities and academic achievement of higher secondary school student. Ijariie-Issn (0) -2395-4396*. 3(3) 3524-3530.



- Pithers, R.T. (2002). *Cognitive learning style: a review of the field independent-field independent approach. Journal of Vocational Educational and Training*, 54(1)117-132, doi: 10.1080/13636820200200191.
- Rudasill, K.M, Adelson, J.L, Callahan, C.M., Houlihan, C.V & Keizer, B.M. (2012). *Gifted students' perceptions of parenting styles associations with cognitive ability, sex, race, and age. Gifted Child Quarterly*, 57(1).
- Sharma, H.L. & Pooja (2018). *Relationship of cognitive style with academic achievement among secondary school students. Journal of Research in Engineering*. 08 (04) 55-60.
- Sodhi, T. S., Suri, A. & Sodhi, H. K. (2012). *Philosophical and sociological foundation of education, Patiala: Bawa publications.*
- Sternberg, R. J., Kaufman, J. C., & Grigorenko, E. L. (2008). *Applied intelligence. Cambridge University Press.*
- Shi, Y., & Qu, S. (2021). *Cognition and Academic Performamance: Mediating Role of Personality Charecteristics ans Psychology Health. Front. Psychology*. (12): 774548. Doi: 10.3389/fpsyg.2021.774548.
- Vock, M., Preckel, F & Holling, H. (2011). *Mental Abilities and School Achievement: A Test of a Mediation Hypothesis. Intelligence*, 39(5), 357-369.
- Walia, J. S. (2016). *Philosophical and sociological base of education. Ahimpaul Publishers Jalandhar.*
- Zhang, L. F. (2004). *Predicting cognitive development, intellectual styles, and personality traits from self-rated abilities. Learning and Individual Differences*, 1(5), 67–88.