Research Article

# REASONING ABILITY IN SCIENCE OF HIGHER SECONDARY STUDENTS IN RELATION TO THEIR SCIENCE ACHIEVEMENT

**By**

**Dr. R. GNANADEVAN**

Reader in Education, Department of Education

Annamalai University, Annamalainagar - 608002

E.mail: gnanadevan_au@yahoo.co.in

**Abstract**

Reasoning ability in science is the mental exercise of inferring relationships among facts and phenomenon having a scientific basis, evaluating evidences and coming to a conclusion. The present study seeks to measure the relationship between the different aspects of reasoning ability in science and achievement in science of higher secondary students. Reasoning ability in science scale constructed and standardized by Anuradha Joshi and Bhuban Chandara Mahaptra (1994) was administered to a random sample of 300 higher secondary students studying in Cuddalore district of Tamil Nadu, India. This study reveals that there is a significant relationship between the reasoning ability in science and achievement in science of higher secondary students.

**Keywords:** *Reasoning ability, science achievement, higher secondary students, inference, evaluation, problem-solving, scientific reasoning, Cuddalore district, Tamil Nadu.*

## INTRODUCTION

The mental exercise or the power of mind to deduce inferences from premises concerning all information of sciences to argue, to examine, to think out, to bring by rationale is called scientific reasoning or reasoning ability in science.

Scientific reasoning can also be defined as the mental exercise of inferring relationships among facts and phenomena having a scientific basis, evaluating evidences and coming to a conclusion. Reasoning can be categorized as inductive reasoning, deductive reasoning, analogical reasoning, abstract reasoning, axiomatic reasoning, electric reasoning, syllogistic reasoning and classification as reasoning etc. For this study five types of reasoning have been considered. These are analogical reasoning, classification as reasoning, electric reasoning, deductive reasoning and inductive reasoning.

The present study focuses on reasoning ability in science, which may have important bearing on the achievement is science. The investigator has made an attempt to study the reasoning ability in science of higher secondary students in relation to their achievement in science.

## OBJECTIVES OF THE STUDY

**The study has the following objectives:**

1. To find out the level of different aspects of reasoning ability in science of higher secondary students.
2. To find out whether there is a significant difference between the higher secondary boys and girls in the different aspects of reasoning ability in science.
3. To find out whether there is a significant difference between the students residing at urban and rural area in the different aspects of reasoning ability in science.
4. To find out whether there is a significant difference between the students studying in government and private school in the different aspects of reasoning ability in science.
5. To find out whether there is a significant relationship between different aspects of reasoning ability in science and achievement in science of higher secondary students.

## METHOD OF STUDY

The normative survey method was used to find out the reasoning ability in science of higher secondary students in relation to their academic achievement. Reasoning ability in science scale constructed and standardized by Anuradha Joshi and Bhuban Chadara Mahaptra (1994) was used to find out the reasoning ability in science of higher secondary students. Academic achievement in science was determined by the marks secured in science subjects by the students in Quarterly examinations. It is taken up from the school register. The tool was administered to a random sample of 300 higher secondary students studying in Cuddalore district of Tamil

Nadu. The data has been subjected to statistical techniques like descriptive analysis, differential analysis and correlational analysis.

## RESULTS AND DISCUSSION

### Analysis of Different Aspects of Reasoning Ability in Science of Higher Secondary Students

The mean and standard deviation has been calculated to find out the reasoning ability in science of higher secondary students, which is found to be 18.41 and 3.75

Respectively (Table 1). It may be remembered that a student can get a maximum score of 30. The mean value is more than the mid score of 15. Hence, it can be concluded that the reasoning ability in science of higher secondary students is high.

A more detailed analysis of the different aspects of reasoning ability in science of the higher secondary students has been made by calculating the mean and standard deviation for different aspects of reasoning ability scores of higher secondary students. The results of the analysis are given in Table 1. The analysis shows the following conclusions:

1) The analogical reasoning of higher secondary students is high.
2) The classification as reasoning of higher secondary students is high.
3) The electric reasoning of higher secondary students is high.
4) The deductive reasoning of higher secondary students is high.
5) The inductive reasoning of higher secondary students is low.

### Comparison of Different Aspects of Reasoning Ability in Science Scores of fighter Secondary Male and Female Students

The 't' value has been calculated to find out the significant difference between the higher secondary boys and girls in the different aspects of reasoning ability. The results of the analysis are given in the Table 2.

**The analysis shows the following conclusions:**

1. The higher secondary boys and girls do not differ significantly in their analogical reasoning.

2. The higher secondary boys and girls do not differ significantly in their classification as reasoning.
3. The higher secondary boys and girls differ significantly in their electric reasoning. The girls students have more electric reasoning than the boys students.
4. The higher secondary boys and girls differ significantly in their deductive reasoning. The girls have more deductive reasoning than the boys students.
5. The higher secondary boys and girls do not differ significantly in their inductive reasoning.
6. The higher secondary boys and girls differ significantly in their reasoning ability. The girls students have more reasoning ability than the boys students.

**Comparison of Different Aspects of Reasoning Ability Scores of Higher Secondary Students Residing at Urban and Rural Area**

The 't' value has been calculated to find out the significant difference between the students residing at urban and rural area in the different aspects of reasoning ability. The results of the analysis are given in the Table 3.

**The analysis shows the following conclusions:**

1. The higher secondary students residing at urban and rural area differ significantly in their analogical reasoning. The students residing in urban areas have more analogical reasoning than the students residing in rural areas.
2. The higher secondary students residing in urban and rural area do not differ significantly in their classification as reasoning.
3. The higher secondary students residing in urban and rural area do not differ significantly in their electric reasoning.
4. The higher secondary students residing in urban and rural area differ significantly in their deductive reasoning. The students residing in urban area have more deductive reasoning than the students residing in rural area.
5. The higher secondary students residing in urban and rural area do not differ significantly in their inductive reasoning.
6. The higher secondary students residing in urban and rural area differ significantly in their reasoning ability. The students residing in urban area have more reasoning ability than the students residing at rural area.

**Comparison of Different Aspects of Reasoning Ability in Science Scores of Higher Secondary Students Studying in Government and Private School**

The 't' value has been calculated to find out the significant difference between the students studying in government and private school in the different aspects of reasoning ability. The results of the analysis are given in the Table 4.

**The analysis shows the following conclusions:**

1. The higher secondary students studying in government and private school differ significantly in their analogical reasoning. The students studying in private schools have more analogical reasoning than the students studying in government schools.
2. The higher secondary students studying in government and private school differ significantly in their classification as reasoning. The students studying in private schools have more classification as reasoning than the students studying in government schools.
3. The higher secondary students studying in government and private school do not differ significantly in their electic reasoning.
4. The higher secondary students studying in government and private school differ significantly in their deductive reasoning. The students studying in private schools have more deductive reasoning than the students studying in government schools.
5. The higher secondary students studying in government and private school differ significantly in their inductive reasoning. The students studying in private schools have more inductive reasoning the students studying in government schools.
6. The higher secondary students studying in government and private school differ significantly in their reasoning ability. The students studying in private schools have more reasoning ability than the students studying in government schools.

**Relationship Between Different Aspects of Reasoning Ability in Science and Achievement in Science of Higher Secondary Students**

The co-efficient of correlation has been calculated to find out the relationship between different aspects of reasoning ability in science and achievement in science of higher secondary students. The results of the analysis are given in the Table 5.

**The analysis shows the following conclusions:**

1. There is a significant relationship between the analogical reasoning and achievement in science of higher secondary students.
2. There is a significant relationship between the classification as reasoning and achievement in science of higher secondary students.
3. There is no significant relationship between the electic reasoning and achievement in science of higher secondary students.
4. There is a significant relationship between the deductive reasoning and achievement in science of higher secondary students.
5. There is a significant relationship between the inductive reasoning and achievement in science of higher secondary students.
6. There is a significant relationship between the reasoning ability in science and achievement in science of higher secondary students.

**References**

Angell, Richard B., 1964. Reasoning and Logic. Appleton -Century- Crotts, New York.

Bingham, Water Van Dyke., 1937. *Aptitude and Aptitude Testing*. Harper and Brothers publishers, New York.

Chileara, M.S., 1985. An investigation into the Relationship of Reasoning Abilities with Achievement of concept in life science. Unpublished Doctoral Thesis, Department of Education, Jamia Millia Islamia University.

Munn Norman, L.,1969. An Introduction to Psychology. New Delhi: Oxford and IBH publishing Company, New Delhi.

Patel, K., 1969. Reasoning and Memory as determiners of Language Achievement. Journal of Indian Academy of applies Psychology, 6, (3).

Sedio Patric, D., 1991. Relationship between Analogical Reasoning and Flexibility. Dissertation Abstracts International,52,3870.

**Table 1**

**Mean and Standard Deviation for Different Aspects of Reasoning Ability Scores of Higher Secondary Students**

| S.No. | Type of Reasoning | N | Mean | Standard Deviation |
|---|---|---|---|---|
| 1 | Analogy | 300 | 3.55 | 1.45 |
| 2 | Classifications | 300 | 4.81 | 1.01· |
| 3 | Eclectic | 300 | 3.29 | 1.07 |
| 4 | Deduction | 300 | 4.08 | i.41 |
| 5 | Inductive | 300 | 2.66 | 1.12 |
| | Reasoning Ability in Science | 300 | 18.41 | 3.75 |

**Table 2**

**Comparison of Reasoning Ability Scores of Higher Secondary Male and Female Students**

| Class | Sub-Sample | N | Mean | S.D | 't' value | Level of significance at 0.05 level |
|---|---|---|---|---|---|---|
| Analogical Reasoning | Boys | 158 | 3.62 | 1.37 | 0.87 | Not Significant |
| | Girls | 142 | 3.47 | 1.53 | | |
| Classification as Reasoning | Boys | 158 | 4.76 | 1.02 | 0.91 | Not Significant |
| | Girls | 142 | 4.87 | 1.00 | | |
| Electic Reasoning | Boys | 158 | 3.06 | 1.14 | 3.87 | Significant |
| | Girls | 142 | 3.54 | 0.94 | | |
| Deductive Reasoning | Boys | 158 | 3.65 | 1.29 | 5.82 | Significant |
| | Girls | 142 | 4.55 | 1.39 | | |
| Inductive Reasoning | Boys | 158 | 2.56 | 1.08 | 1.58 | Not Significant |
| | Girls | 142 | 2.77 | 1.15 | | |
| Reasoning Ability in Science | Boys | 158 | 17.68 | 3.59 | 3.62 | Significant |
| | Girls | 142 | 19.22 | 3.76 | | |

**Table3**

**Comparison of Reasoning Ability Scores of Higher Secondary Students Residing at Urban and Rural Area**

| Class | Sub-Sample | N | Mean | S.D | 't' value | Level of significance at 0.05 level |
|---|---|---|---|---|---|---|
| Analogical Reasoning | Rural | 191 | 3.37 | 1.40 | 2.86 | Significant |
| | Urban | 109 | 3.87 | 1.49 | | |
| Classification as Reasoning | Rural | 191 | 4.R3 | 0.95 | 0.47 | Not Significant |
| | Urban | 109 | 4.77 | 1.11 | | |
| Eclectic Reasoning | Rural | 191 | 3.31 | 1.04 | 0.44 | Not Significant |
| | Urban | 109 | 3.25 | 1.14 | | |
| Deductive Reasoning | Rural | 191 | 3.90 | 1.39 | .2.85 | Significant |
| | Urban | 109 | 4.38 | 1.40 | | |
| Inductive Reasoning | Rural | 191 | 2.64 | 1.07 | 0.35 | Not Significant |
| | Urban | 109 | 2.69 | 1.20 | | |
| Reasoning Ability in Science | Rural | 191 | 18.08 | 3.44 | 2.02 | Significant |
| | urban | 109 | 18.99 | 4.19 | | |

**Table4**

**Comparison of Reasoning Ability Scores of Higher Secondary Students Studying in Government and Private Schools**

| **Class** | **Sub-Sample** | **N** | **Mean** | **S.D** | **'t' value** | **Level of significance at 0.05 level** |
|---|---|---|---|---|---|---|
| Analogical Reasoning | Private | 145 | 3.78 | 1.57 | 2.67 | Significant |
| | Government | 155 | 3.34 | 1.30 | | |
| Classification as Reasoning | Private | 145 | 5.06 | 0.89 | 4.15 | Significant |
| | Government | 155 | 4.58 | 1.06 | | |
| Electic Reasoning | Private | 145 | 3.37 | 1.13 | 1.33 | Not Significant |
| | Government | 155 | 3.21 | 1.01 | | |
| Deductive Reasoning | Private | 145 | 4.39 | 1.46 | 3.79 | Significant |
| | Government | 155 | 3.78 | 1.30 | | |
| Inductive Reasoning | Private | 145 | 2.91 | 1.16 | 3.82 | Significant |
| | Government | 155 | 2.43 | 1.02 | | |
| Reasoning Ability in Science | Private | 145 | 19.53 | 3.92 | 5.24 | Significant |
| | Government | 155 | 17.36 | 3.24 | | |

**Table 5**

**Co-Efficient of Correlation Between the Different Aspects of Reasoning Ability in Science and Achievement in Science of Higher Secondary Students**

| SI.No. | Variables | Number | 'r' value | Level of significance at 0.05 level |
|---|---|---|---|---|
| 1. | Analogical Reasoning and Science Achievement | 300 | 0.238 | Significant |
| 2. | Classification as Reasoning and Science Achievement | 300 | 0.194 | Significant |
| 3. | Electic Reasoning and Science Achievement | 300 | 0.053 | Not Significant |
| 4. | Deductive Reasoning and Science Achievement | 300 | 0.250 | Significant |
| 5. | Inductive Reasoning and Science Achievement | 300 | 0.123 | Significant |
| 6. | Reasoning Ability in Science and Science Achievement | 300 | 0.291 | Significant |