CHAPTER – 1
INTRODUCTION

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1.0 Introduction

Bloom suggests that we are teaching the basic underlying information. He found that over 95% of the tests questions, students encounter require them to think only at the lowest possible level… the recall of information (Slater, 2004; Pickard, 2007). Further, Bloom has traced on development of higher order thinking skills of the students. The national curriculum frame work for the school education has emphasized on mathematical abilities to develop a logical mind and reasoning power of learner at primary level (National Council of Educational Research and Training [NCERT], 2005). This is also the sound bite we hear from politicians, school boards and CEOs: we need citizens who can access higher-order thinking skills.

The changes in demands of the workplace are concern to employers and to educators and emphasis on higher-order thinking. Leaders in education and business agree that higher-order thinking is difficult to define but easy to recognize in the workplace (Wallace and Masters, 2004). The U.S. department of labor conducted in-depth interviews with employers across the nation and also analyzed a wide variety of jobs. As a result, they determined that the thinking abilities and skills most in demand in the world of work are:

* Reasoning
* Creative thinking
* Problem solving
* Decision making
Reasoning is a powerful tool for problem solving behavior (Chaube, 2005). Reasoning and understanding skills are very important and essential for the development of any human being and its nation. So it is necessary to reason about reasoning and understanding at initial stage of education. At the initial stage of education (primary education), mathematics is an important subject in our curriculum. There is a strong relation between mathematics and reasoning, because the main aim of mathematics is to develop the logical reasoning power of human being.

Due to researches in science and technology, physical labor is replaced by machines; knowledge of mathematics is in the root of such type of researches. Also knowledge of mathematics has become important in the development of technology, trades, information technology, medical science, space science, agriculture, optimization theory, net work analysis, etc. Analytical part of several researches like social science and psychology are depending upon mathematics and logic. Mathematics is also called the science of logical reasoning. In it, we approach everything with a question mark in our mind.

It is concluded that the reasoning power is concerned with development of all the sides of human life. Researcher has found a research gap to construct and standardize a test which can measure the Reasoning Ability in the context of mathematics. Here was an effort to develop an instrument to fill the research gap.

1.1 Statement of the Problem

The title of the present study was as under,

“CONSTRUCTION AND STANDARDIZATION OF THE REASONING ABILITY TEST IN MATHEMATICS FOR PRIMARY SCHOOL STUDENTS”
In the present study, the Reasoning Ability Test [RAT] in Mathematics was constructed and standardized according to specific steps of standardization and test construction. The RAT was developed to measure the Reasoning Ability [RA] of the 5th to 7th grade students of Gujarati medium.

1.2 Clarification of the Important Terms

Before undertaking the study, it is essential for researcher to be clear about the key terms used in the investigation and report writing.

1.2.1 Construction

According to Dictionary of Oxford Advanced Learner (6th ed., 2003), “Construction: Action or manner of constructing, being constructed sense in which words, statements etc. are to be understood, constructing a test.”

In the present study, construction means preparation of a Reasoning Ability test according to the steps of test construction from the material related to the reasoning and mathematics.

1.2.2 Standardization

According to Dictionary of Oxford and Thesaurus-м (2006), standardization refers to, “Process of analyzing the essential steps in a skill or activity to determine the most efficient and safe way to perform it and train others. A standardized procedure provides the basis for developing learning guides, check list and clinical learning packages. Individuals who have been “standardized” in a skill or activity will perform it using the standard, agreed upon steps/ tasks.”
In the present study, the steps of test standardization like; construction of items and preliminary test were followed. The test was passed through pre-piloting, piloting, item analysis and item selection for the test, finding out of reliability and validity for the test and norms establishment with test manual. The RAT was constructed through these steps; this systematic process of test development is called standardization.

1.2.3 Reasoning

According to Dictionary of Oxford Advanced Learner (6th ed., 2003), “Reasoning: The process of thinking about things in a logical way; opinions and ideas that are based on logical thinking.”


According to Skinner (1968), Reasoning is the word used to describe the mental recogonization of cause and effect relationship. It may be prediction of an event from an observed cause or the inference of a cause from an observed event.

According to Gates (1947), Reasoning is a productive thinking in which previous experiences are organized in new way to solve problem.

In the present study, Reasoning is a mental process in which one uses the past experiences of mathematics to solve a new problem.

1.2.4 Ability

According to Dictionary of Oxford Advanced Learner (6th ed., 2003), “A level of skill or intelligence, the fact that somebody/something is able to do something.”
According to Encyclopedia of Education (2010),
“The capability to perform an act, either innate or as the result of learning and practice.”

In the present study, ability means ability or capacity to solve a new problem by using reasoning.

1.2.5 Reasoning Ability

In the present study, Reasoning Ability means ability to solve a new problem by using past experiences of mathematics.

The score obtained by the student on the RAT was considered as a Reasoning Ability.

1.2.6 Mathematics

According to Dictionary of Oxford Advanced Learner (6th ed., 2003),
“Science of numbers, quantity and space of which arithmetic, algebra, trigonometry and geometry are branches. The core subjects like English and Science.”

In the present study, mathematics refers to, items concerning to the mathematics of 1st to 4th grade.

1.2.7 Primary School

According to Dictionary of Education (2005), Institution providing full-time general education for children normally aged between 4 or 5 and 11. Some primary schools may have nursery classes for 3 to 4 year olds which provide full or part time education at pre-primary level. All pupils follow a common core
curriculum (statutory curriculum) which varies in some respects between countries. They are normally co-educational or denominational. Ownership, management and funding arrangement depend on the legal category.

In the present study, the schools which give education to grade 1 to 7 and are recognized by Gujarat government.

1.3 Objectives of the Study

Objectives of the present study were as under.

1. To construct and standardize the Reasoning Ability Test for 5th to 7th grade students.
2. To study the effect of Sex on Reasoning Ability.
3. To study the effect of Area on Reasoning Ability.
4. To study the effect of Grade on Reasoning Ability.
5. To establish norms for the Reasoning Ability Test.

1.4 Hypotheses of the Study

The present study was carried out with the help of following null hypotheses:

Ho₁ There is no significant difference between the mean score of Reasoning Ability of boys and girls.

Ho₂ There is no significant difference between the mean score of Reasoning Ability of rural and urban area students.

Ho₃ There is no significant difference between the mean score of Reasoning Ability of 5th, 6th and 7th grade students.
Ho$_4$ There is no significant difference between the mean score of 
Reasoning Ability of rural boys and girls of 5$^{th}$ grade.

Ho$_5$ There is no significant difference between the mean score of 
Reasoning Ability of urban boys and girls of 5$^{th}$ grade.

Ho$_6$ There is no significant difference between the mean score of 
Reasoning Ability of rural and urban boys of 5$^{th}$ grade.

Ho$_7$ There is no significant difference between the mean score of 
Reasoning Ability of rural and urban girls of 5$^{th}$ grade.

Ho$_8$ There is no significant difference between the mean score of 
Reasoning Ability of rural and urban students of 5$^{th}$ grade.

Ho$_9$ There is no significant difference between the mean score of 
Reasoning Ability of boys and girls of 5$^{th}$ grade.

Ho$_{10}$ There is no significant difference between the mean score of 
Reasoning Ability of rural boys and girls of 6$^{th}$ grade.

Ho$_{11}$ There is no significant difference between the mean score of 
Reasoning Ability of urban boys and girls of 6$^{th}$ grade.

Ho$_{12}$ There is no significant difference between the mean score of 
Reasoning Ability of rural and urban boys of 6$^{th}$ grade.

Ho$_{13}$ There is no significant difference between the mean score of 
Reasoning Ability of rural and urban girls of 6$^{th}$ grade.

Ho$_{14}$ There is no significant difference between the mean score of 
Reasoning Ability of rural and urban students of 6$^{th}$ grade.

Ho$_{15}$ There is no significant difference between the mean score of 
Reasoning Ability of boys and girls of 6$^{th}$ grade.
There is no significant difference between the mean score of Reasoning Ability of rural boys and girls of 7th grade.

There is no significant difference between the mean score of Reasoning Ability of urban boys and girls of 7th grade.

There is no significant difference between the mean score of Reasoning Ability of rural and urban boys of 7th grade.

There is no significant difference between the mean score of Reasoning Ability of rural and urban girls of 7th grade.

There is no significant difference between the mean score of Reasoning Ability of rural and urban students of 7th grade.

There is no significant difference between the mean score of Reasoning Ability of boys and girls of 7th grade.

1.5 Variables of the Study

The present study was conducted with different variables shown in Table 1.1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
<th>Type</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sex</td>
<td>Independent</td>
<td>Boys and Girls</td>
</tr>
<tr>
<td>2</td>
<td>Area</td>
<td>Independent</td>
<td>Rural and Urban</td>
</tr>
<tr>
<td>3</td>
<td>Grade</td>
<td>Independent</td>
<td>5th, 6th, and 7th</td>
</tr>
<tr>
<td>4</td>
<td>Reasoning Ability</td>
<td>Dependent</td>
<td>--</td>
</tr>
</tbody>
</table>

The effect of independent variables on dependent variables was studied in the context of norms.
1.6 Area of the Study

The main goal of the study was to construct and standardize the RAT for primary school students. So, the present study was related to measurement and evaluation. The test was developed for primary school students, i.e. it is concerned with primary education. The constructed test is related to mathematics and reasoning, so the study further relates to mathematics and psychology. It can be concluded that the present study is related to following area of research in all.

- Measurement and evaluation
- Primary education
- Mathematics
- Educational psychology

1.7 Type of the Study

The results and findings of RAT are valuable in current situation; therefore, present study can be covered under applied research. In this study, the data were collected through the RAT from the students and analyzed by different statistical techniques, so this study can be also comprised in quantitative research.

1.8 Method of the Study

The core of present study was to collect data, analyze them, and make appropriate inferences based on the collected data, so the method employed was survey method. Reliability, validity and norms were also established for the present test that indicates the present study was carried out with normative survey research method.
1.9 Importance of the Study

Good research works have been conducted concerning various subjects taught at elementary school level in our country. But research work in the field of mathematics and reasoning at primary school level was not found to have attracted sufficient attention. In such a condition, the present study was more important not only because of its originality but its multifarious utility today.

- It provides a launching pad to have a good take off for the future related researches.
- It can be a powerful and useful tool to measure student’s Reasoning Ability for guidance and counseling.
- The result of the RAT can be considered as a supplement to the result of other psychological tests.
- It can be helpful to the teacher to find out Reasoning Ability of the students.
- It helps parents to find out Reasoning Ability of their child.
- This test can also be helpful to the teacher to classify the students according to Reasoning Ability.

1.10 Population of the Study

RAT was constructed and standardized on the students of grade 5th to 7th of Gujarati medium schools. Therefore, these students were the population of the study. A total 4135 students of different schools, different grades and different area were selected for final run of the test.
1.11 Delimitations of the Study

Delimitations of the study were as under;

1. The study was delimited to the students of 5th to 7th grade.
2. The study was delimited to Gujarati medium school students.
3. The study was delimited to the student studying during 2008-09 academic year.

1.12 Limitations of the Study

Limitations of the present study were as under;

1. Different sample size and sampling techniques were used at different stages of test development, so the limitations of sample selection and sample size become the limitations of the present study.
2. In the present study, the findings drawn were depended upon the sample selected at different stages of test development.

1.13 Scheme of the Chapterizations

The chapters have been sequenced to be able to move logically towards the conclusions of the study. Researcher has divided the whole report in to eight chapters which are as follows.

Chapter-1 Introduction

The first chapter is devoted to introduction of the study. In this chapter, researcher has discussed about problem, meaning and definition of the important terms, objectives, hypotheses, variables of the study, limitations and delimitations.
Chapter-2 Theoretical Perspectives

The second chapter deals with the theoretical perspectives. In this chapter, concept of reasoning, Indian logic, Reasoning Ability, development of reasoning and types of reasoning, and brain centre of reasoning are elaborated in details.

Chapter-3 Review of Related Literature

In this chapter, researcher has discussed about past Indian and foreign researches related to present study. Objectives, sample, validity, reliability and findings of the past researches are also summarized and reviewed to make the course of study more clear.

Chapter-4 Planning and Procedure

This chapter deals with origin of the problem, planning of test construction, sample and sampling method and statistical analysis.

Chapter-5 Test Construction

In this chapter, researcher has discussed about construction of items, content analysis of text books for component selection, pre-piloting, piloting, and item-analysis, time fixing for test completion, fixing of the test format and answer sheet, and details of instructions, scoring method and manual for the test.

Chapter-6 Reliability and Validity

In this chapter, different types of reliability, like test-retest, split half reliability, rational equivalence method and validity by different methods like
content validity, construct validity, concurrent validity, and factor validity has been discussed.

**Chapter-7 Analysis of the Data**

This chapter deals with measurement scale and analysis of collected data, frequency distributions and graphical representation of data.

**Chapter-8 Discussion, Implications and Recommendations**

This chapter encompassed discussion of the results obtained, implications of the study in real life situations especially in school settings, and eventually, it paves the way for further study with the recommendation made in it.