

**CRITICAL THINKING AND REASONING ABILITY OF HIGHER
SECONDARY STUDENTS**

*Dissertation submitted to Tamilnadu Teachers Education University in partial
fulfillment of the requirement for the degree of*

Master of Education

By

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DECLARATION

I, Jeya Sheela.T do hereby declare that this dissertation entitled Critical thinking and reasoning ability of higher secondary students is an original work done under the guidance and supervision of Dr. R. P. Deepa, Assistant Professor in N.V.K.S.D College of Education, Attoor and submitted to Tamilnadu Teachers Education University, Chennai in partial fulfillment of the requirements for the award of Degree of Master of Education. This work has not been submitted by me for the award of any degree, diploma or similar title to any University.

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CERTIFICATE

This is to certify that the dissertation entitled critical thinking and reasoning ability of higher secondary students is a bonafide work done by Jeya Sheela. T, (Reg.No: M1411431) M.Ed scholar during the academic year 2014-15, N.V.K.S.D College of Education, Attoor under my guidance and supervision and submitted to Tamilnadu Teachers Education University in partial fulfillment of the requirements for the degree of Master of Education. This work has not formed on the basis for the award of any degree, diploma or other similar title.

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CONTENTS

List of tables

Chapter no	Title of the chapter	Page no
I	Introduction	1
II	Review of Related Literature	10
III	Methodology	30
IV	Data Analysis and Interpretation	51
V	Findings, Conclusions and Suggestions	69

References

Appendices

LIST OF TABLES

Table No	Name of the table	Page. No
3.1	List of school selected and number of samples selected for the study	33
3.2	Gender wise distribution of sample	34
3.3	Locality wise distribution of sample	34
3.4	Type of management wise distribution of sample	35
3.5	Nature of school wise distribution of sample	36
3.6	Subject of study wise distribution of sample	36
3.7	Details of Item selected	42
4.1	Mean and Standard deviation of critical thinking ability statistics	52
4.2	Percentage wise distribution of different levels of Critical thinking ability	53
4.3	Mean, Standard deviation and t values of critical thinking ability of male and female students	54

4.4	Mean, Standard deviation and t values of critical thinking ability of rural and urban students	55
4.5	Mean, Standard deviation and F values of critical thinking ability of government, aided and unaided students	56
4.6	Scheffe's posthoc for pair wise comparison for type of management	57
4.7	Mean, Standard deviation and t values of critical thinking ability of arts and science students	58
4.8	Mean, Standard deviation and F values of critical thinking ability of students of boys, girls and co-education schools	59
4.9	Scheffe's posthoc for pair wise comparison for nature of school	60
4.10	Mean and standard deviation for reasoning ability	61
4.11	Percentage wise distribution of different levels of Reasoning ability	61
4.12	Mean, standard deviation and t values of reasoning ability of male and female students	62
4.13	Mean, standard deviation and t values of reasoning ability of rural and urban students	63
4.14	Mean, standard deviation and F values of reasoning ability of government, aided and unaided students	64
4.15	Mean, standard deviation and t values of reasoning ability of arts and science students	65

4.16	Mean, standard deviation and F values of reasoning ability of students of boys, girls and co-education schools	66
4.17	Scheffe's posthoc for pair wise comparison for nature of school	67
4.18	Correlation between of critical thinking and reasoning ability of higher secondary students	68

CHAPTER -I

INTRODUCTION

- Need and significance of the study
- Statement of the problem
- Operational Definition of the terms

- Objectives of the study
- Hypotheses framed for the study
- Methodology in brief
- Organization of the report

CHAPTER-I

INTRODUCTION

Education is an important tool that is applied in the contemporary world to succeed, as it mitigates the challenges which are faced in life. The knowledge gained through education enables individual to achieve better prospects in career growth. Education has played a paramount role in the thinking process. Education makes the individual to think critically and creatively to take correct decisions. It widens one's thinking to a great extent. Such thinking leads to solve the problems which occur in one's life at any moment. Reasoning power, Problem solving ability, Analytical thinking etc., are possible through a good education and as a whole it is better to integrate various life skills especially critical thinking in education.

Critical thinking ability

Critical thinking is a higher order thinking process through analyzing arguments and generating insight on reasoning patterns and understanding assumptions in the underlying information. It focuses on a credible, concise and convincing style of presentation. According to Beyar (1995), Critical thinking is reasonable, reflective thinking that focuses on deciding what to believe and to do. According to Ryan (1993), Critical Thinking involves careful judgment or evaluation.

To improve student performance on critical thinking test, school education must improve teacher training. They must teach cognitive skills to pre-service teachers before training them to teach these skills in the classroom (Ashton 1988, 2). They must integrate critical thinking skills into all aspects of teacher preparation and train future teachers to be models of effective thinking strategies.

Reasoning ability

Reasoning is considered as the highest form of thinking. It is a complex process that needs a well organized brain. It operates on realizing the highest cognitive objectives of teaching and learning. It also requires some deliberate efforts on the part of individual who reasons. The most orderly process of thinking is reasoning. Piaget and his colleagues defined the use of formal operational reasoning as the ending stage of intellectual development. In the activity of reasoning, a man makes new judgments and decisions on the basis of his old judgments and decisions. With his reasoning ability he tries to examine the existing situation and on the basis of experiences acquired he tries to reach

certain conclusions. Reasoning is the term used to describe mental recognition of cause and effect relationships.

In reasoning we manipulate symbols, instead muscular activity is reduced to a minimum. Many things that go on in the process of learning at the perception action level are duplicated at the symbolic level. Reasoning consists of making a new judgment on the basis of judgments already formed and is commonly defined as “Perceiving relations among judgments”.

Reasoning abilities are developed through experience and exercise. The ability to do a task depends on the attentional resources of individuals who bring to a task, their familiarity with the to-be-remembered information, and their skill in performing the required transformations. Thus, prior knowledge and skill are determinants of the level of reasoning.

Need and significance of the study

Critical thinking is a vital topic in modern education. All educators are interested in teaching critical thinking to their students. Critical thinking is very essential for the students especially the higher secondary school students as they are fresh to face the society directly. The students who have the critical thinking ability can solve problems to understand the problem the ability to infer to meaningfully investigate the matters. Critical thinking ability allows to face of comprehend objective legality by gaining reliable knowledge about the world.

Our classroom practices have no focus on the development of thinking patterns among their students. However we need to keep faith in child’s creative insight should

not ignore vital dimensions of human capacity to create new knowledge to think critically. The learning experience at school should pay the way of construction of knowledge, fostering creativity of improving students thinking abilities as well as become a source of joy but not stress.

One of the main reasons why we lack critical thinking is learner's lack of deep understanding of the topic they study. Many students are unable to give evidence which requires more than mere superficial understanding of the concepts, and unable to apply knowledge they have acquired to real world problems. This is due to superficial teaching methods that fail to engage students in thinking deeply and critically about the topics they are studying and teacher's inability to exercise and promote higher-order thinking skills.

Many researchers suggest that making meaning, development the capacity for abstract thinking, reflection, problem solving and critical thinking are the most important aspects of learning. Recently there has been a greater craving for science group subjects like mathematics, physics or chemistry among students who proceed for higher education in our country. But there is large scale failure in the subjects and afterward many of these students revert to non science courses. The reasoning ability of the students is highly related to critical thinking. So it is very essential to develop the critical thinking of the students. If the critical thinking of the student is high, then the reasoning ability of the student will high.

Deepa (2013) found that boys have better critical thinking ability than girls. Ramalekshmi (2012) found that gender has no impact on critical thinking ability. So the investigator decided to study the critical thinking of higher secondary students. By

studying the critical thinking of the students, the reasoning ability of the student can be measured.

Statement of the problem

Present investigation is designed to study how far critical thinking ability and reasoning ability of higher secondary students are related? and to find the level of critical thinking and reasoning ability of higher secondary students. Hence, the study is entitled as Critical thinking and reasoning ability of higher secondary students.

Operational definition of the key terms

Critical thinking

According to Paul Torrance, “Critical Thinking is a novel way of seeing or doing things that is characterized by four components fluency, flexibility, originality and elaboration”.

Here the investigator means the scores obtained by the Higher Secondary Students in the Critical Thinking Ability Test having the dimensions of recognition of assumptions, Interpretations, Deduction and Evaluation, validated by Dr. Deepa. R. P. & Dr. M. Sadanandan. (2011)

Reasoning ability

According to Cater V Good, “Reasoning ability is defined as the “drawing of inference or conclusion through the use of reason”.

Here the investigator means the scores obtained by the Higher Secondary Students in the Reasoning Ability Test having the dimensions of logical reasoning, verbal reasoning, arithmetic reasoning and non verbal reasoning, validated by the investigator.

Higher secondary students

Higher secondary students refer here the students who are studying in class 11 of various higher secondary schools in Kanyakumari District, following state board syllabus during the academic year 2014-2015.

Objectives of the study

1. To construct and validate Reasoning Ability Test for higher secondary students.
2. To study the level of Critical thinking ability and Reasoning ability of higher secondary students.
3. To study the significant difference if any in the mean scores of Critical thinking ability of higher secondary students, on the basis of
 - i. Gender
 - ii. Locale
 - iii. Subject of study
 - iv. Type of management
 - v. Nature of school
4. To study the significant difference if any in the mean scores of Reasoning ability of higher secondary students, on the basis of

- i. Gender
 - ii. Locale
 - iii. Subject of study
 - iv. Type of management
 - v. Nature of school
5. To study the correlation between the Critical thinking and Reasoning ability of higher secondary students.

Hypotheses framed

The following are the major hypotheses framed for the present investigation.

1. There exists no significant difference in the mean scores of critical thinking ability of male and female higher secondary students.
2. There exists no significant difference in the mean scores of critical thinking ability of rural and urban higher secondary students.
3. There exists no significant difference in the mean scores of critical thinking ability of higher secondary students from government, aided and unaided schools.
4. There exists no significant difference in the mean scores of critical thinking ability of arts and science group higher secondary students.
5. There exists no significant difference in the mean scores of critical thinking ability of higher secondary students from boys, girls and co-education schools.

6. There exists no significant difference in the mean scores of reasoning ability of male and female higher secondary students.
7. There exists no significant difference in the mean scores of reasoning ability of rural and urban higher secondary students.
8. There exists no significant difference in the mean scores of reasoning ability of higher secondary students from government, aided and unaided schools.
9. There exists no significant difference in the mean scores of reasoning ability of arts and science group higher secondary students.
10. There exists no significant difference in the mean scores of reasoning ability of higher secondary students from boys, girls and co-education schools.
11. There exists no significant correlation between critical thinking and reasoning ability of higher secondary students.

Methodology in brief

Method

Normative survey method is adopted for the study.

Population

The population for the study consists of all the higher secondary students who are studying in various higher secondary schools of Kanyakumari district.

Sample

The present study is conducted on a sample of class 11 std students who are studying various higher secondary schools of Kanyakumari district following state board syllabus during the academic year 2014-2015. Size of the sample is 400. Stratified random sampling technique is used to select the sample.

Tools

The following tools are used for the study.

- i. Critical Thinking ability test (Deepa.R.P & Dr. M. Sadanandan 2011)
- ii. Reasoning Ability Test. (Investigator 2015)

Statistical techniques

For the analysis of the data the following statistical techniques are adopted.

- t test
- ANOVA
- Carl Pearson product moment coefficient of correlation.

Delimitations of the study

- The geographical area is limited to selected representative schools of Kanyakumari District
- The sample size is limited to 400 class 11 students of higher secondary students.

Organization of the report

CHAPTER-I is the introductory chapter which contains the need and significance of the study, statement of the problem, operational definition of key terms, objectives of the study, hypotheses framed, methodology in brief and delimitations of the study.

CHAPTER-II describes review of related literature and related studies on Critical thinking and Reasoning ability.

CHAPTER-III reveals the brief description of methodology used in the study.

CHAPTER-IV includes the details regarding the analysis of data and its interpretations.

CHAPTER-V covers the major findings of the study, conclusions, educational implications and suggestions for the further research in this area.

CHAPTER –II

REVIEW OF RELATED LITERATURE

- Purpose of review of literature
- Theoretical overview
- Studies related to critical thinking
- Studies related to reasoning ability
- Critical review

CHAPTER-II

REVIEW OF RELATED LITERATURE

Research takes advantage of the knowledge which has accumulated in the past as a result of constant human endeavor. It can never be undertaken in isolation of the work that has already been done on the problems which are directly or indirectly related to a study proposed by a researcher. A careful review of the research journals, books, dissertations, thesis and other sources of information's on the problem to be investigated is one of the important steps in the planning of any research study.

Sharma (1988) states "Reviewing the related literature provides one not only with lay a sound foundation for his entire investigation". According to Dalan (1979) review is a brief summary of previous research and writings of recognized experts provide

evidence that the researcher is familiar with what is already known and with what is still unknown and untested.

Purpose of the review of related Literature

Review of the related literature; besides allowing the researcher to acquaint himself with current knowledge in the field or area in which he is going to conduct his research serves the following specific purposes:

- The review of the related literature enables the researcher to define the limits of his field. It helps the researcher to delimit and define his problem. The knowledge of the related literature, brings the researcher up to date on the work which others have done and thus to state the objectives clearly and concisely.
- By reviewing the related literature, the researcher can avoid unfruitful and useless problem areas. He can select those areas in which positive findings are very likely to result and his endeavors would be likely to add to the knowledge in a meaningful way.
- Through the review of related literature, the researcher can avoid unintentional duplication of well established findings. It is no use to replicate a study when the stability and validity of its results have been clearly established.
- The review of related literature gives the researcher an understanding of the research methodology which refers to the way the study is to be conducted. It helps the researcher to know about the tools and instruments which proved to be useful and promising in the previous studies. The advantage of the related

literature is also to provide insight into the statistical methods through which validity of results is to be established.

- The final and important specific reason for reviewing the related literature is to know about the recommendations of previous researchers listed in their studies for further research.

Theoretical overview

Critical Thinking Ability

A cognitive process of analyzing or evaluating information is said to be critical thinking. The information can be gathered from observation, experience, reasoning and communication, can be judged with critical thinking ability. Critical thinking is based on intellectual values that go beyond subject matter divisions include clarity, accuracy, precision, use of evidence thoroughness and fairness.

Critical thinking is the study of clear, reasoned thinking. According to Beyar (1995), Critical thinking means making clear, reasoned judgments. Critical thinking skills or strategies like solving problems, formulation of inferences, calculating likelihoods, making decisions, using skills that are most effective in a particular context and type of thinking task etc. Critical thinking is called directed thinking because it focuses on a desired outcome. According to Mulnix, J.W. (2010), "Critical thinking includes a commitment to using reason in the formulation of our beliefs." M.C. Peck, (1981), defined "Critical thinking is a skill and propensity to engage in an activity with reflective skepticism." Critical thinking is reflective reasoning about beliefs and actions. It is a way of deciding whether a claim is always true, partly true or false. Critical thinking can be

traced in western thought to the Socratic Method of ancient Greece. The processes we use to reflect on assess and judge the assumption underlying our own and other ideas and efforts.

Characteristics of critical thinking

- Recognizing underlying assumptions.
- Scrutinizing arguments.
- Judging ideas.
- Judging the rationality of these justifications by comparing them to a range of varying interpretations and prospective.
- Providing positive as well as negative appraisal.

Ways to foster critical thinking skills in classroom

- Case study method

Mc Dade (1995) describes this method as the teacher presenting a case to the class without a conclusion. Using prepared questions, the teacher then leads students through a discussion, allowing students to construct a conclusion for the case.

- Reciprocal peer questioning

Following the lecture, the teacher displays a list of question items. Students must write answers about the lecture material.

- Conference style learning

The teacher does not teach the class in the sense of lecturing. The teacher is the facilitator of a conference.

- Use writing assignments

Wade sees the uses of writing as fundamental to developing critical thinking skills.

- Ambiguity

Strohm and Baukus advocate producing much ambiguity in the classroom. Don't give students clear cut material. Give them conflicting information that they must think their way through.

Components of Critical Thinking Ability

1. Reasoning ability

Reasoning is the cognitive process of looking for reason, beliefs, conclusions actions or feelings. Reason is a mental faculty found in humans who is able to generate conclusions from assumptions or premises. It involves the process of passing from one or more judgments to another. It is the trial and error process at the ideational level. It is creative and reflective in nature.

2. Problem solving

Problem solving is a process of raising a problem in the minds of students in such a way as to stimulate purposeful reflective thinking in arriving at a rational solution. Problem solving ability is the degree of capacity to find the correct solution to problem.

3. Analytical thinking

Analytical thinking is concerned with the process of breaking the complicated problems, which can be solved by the student. As we know that a new problem can be solved on the basis of previous knowledge, thinking and reasoning. So in the analytic thinking students start to discover the solution to the problem from its whole form.

4. Decision making

Decision making can be regarded as the mental processes resulting in the selection of a course of action among several alternative scenarios. Every decision making process produces a final choice. The output can be an action or an opinion of choice.

5. Evaluating

Evaluating is by using monitoring and other information. It is about using information to make changes and improvements.

Dimensions of critical thinking

- Recognition of assumption
- Interpretation
- Deduction
- Evaluation

Recognition of assumption

Humans are in a constant state of anticipation, scanning, and filling the missing pieces. The ability to create a whole from bits and pieces is a great asset.

Interpretation

It is the assignment of meanings to various concepts, symbols or objects under consideration. It is an assignment of meaning to the symbols of a formal language.

Deduction

The process of reasoning in which a conclusion follows necessarily from the premises presented inference from general to the particular.

Evaluation

Evaluation is a systematic determination of a subject's merit, worth and significance, using criteria governed by a set of standards.

Reasoning ability

Reasoning is the capacity for consciously making sense of things, applying logic, establishing and verifying facts, and changing or justifying practices, institutions, and beliefs based on new or existing information. It is closely associated with such characteristically human activities as philosophy, science, mathematics and art and is normally considered to be a definitive characteristic of human nature.

According to Garrette (1960) "Reasoning is step-wise thinking with a purpose or goal in mind". According to MacIntyre Alasdair (2013) Reason or "reasoning" is associated with thinking, cognition and intellect. Reason, like habit or intuition, is one of the ways by which thinking comes from one idea to a related idea.

Characteristics of Reasoning

1. Reasoning involves a definite purpose or goal.
2. We resort to reasoning when the initial attempt of solving a problem by habitual behavior fails.
3. One makes use of one's previous knowledge and experiences in reasoning. All our previous knowledge and experiences in reasoning. All our previous experiences or the knowledge of the rules, principles of teaching are closely analyzed. We try to see relationship among them and judge their ability in the present context. In the light of this association and generalization we try to infer new principles, rules or technique to solve our problem.
4. It is a careful systematic and organized thinking.
5. Like thinking, Reasoning is a highly symbolic function.
6. Reasoning operates mainly in deductive and inductive forms and develops gradually stage wise.
7. There is great variation among persons with reference to their reasoning ability.

Types of Reasoning

There are several types of reasoning. Some of important which are most frequently used types of reasoning have been listed here,

- a) Verbal reasoning
- b) Nonverbal reasoning
- c) Arithmetic reasoning
- d) Logical reasoning

a) Verbal reasoning

According to James David (2011) Verbal reasoning understands and reasoning using concepts framed in words. It aims at evaluating ability to think constructively, rather than at simple fluency or vocabulary recognition. Verbal reasoning understanding and reasoning using concepts framed in words. It aims at evaluating ability to think constructively, rather than at simple fluency or vocabulary recognition. Verbal reasoning tests of intelligence provide an assessment of individuals' ability to think, reason and solve problems in different ways. These tests usually involve grammar, verbal analogies and following detailed written instructions. They can also include spelling, sentence completion and comprehension.

Eg) SKY: BLUE:: MILK:_____ [Ans: WHITE]

The first set [SKY: BLUE] has the relationship of colour and the same relation can be established with MILK by responding WHITE.

b) Nonverbal reasoning

Nonverbal reasoning is also called “fluid reasoning”. It is an intentional cognitive process that does not occur automatically. It involves the use of deliberate and controlled

mental operations to solve novel problems. Mental operations often include drawing inferences, forming concepts when language is not involved. The ability of a person to analyze and interpret information is usually gauged means of verbal and oral examination. However verbal reasoning is not the only factor considered in measuring intelligence. It is also composed of nonverbal and abstract reasoning. Nonverbal reasoning is the ability of a person to understand given information and find solutions to problems by means of hands. Tasks included in this form of understanding include abstract items; internalized language based reasoning, as well as internalized reasoning without the use of language.

Eg) o, oo, ooo, ?, ooooo [Ans: oooo]

In the above question one figure is missing, the person has to understand the given information and find the missing figure based on visual reasoning.

c) Arithmetic reasoning

Arithmetic reasoning is mathematical reasoning applied to topics in arithmetic. It is used to mean the ability to solve by reasoning verbal problem in arithmetic. For most people, the maths sections of examinations are the most difficult. This section is one of the least popular, as it consists solely of mathematics problems.

Eg) 2, 4, 6, 8, 10, _____ [Ans: 12]

In the above item numbers are arranged in some specific order to form a series, for continuing the same order, suitable numbers are emitted by the students.

d) Logical reasoning

Logical reasoning studies the principles of reasoning, especially of the structure of propositions as distinguished from their content and of method and validity in deductive reasoning. It is the relationship between elements and between an element and the whole in a set of objects, individuals, principles or events.

Role of Reasoning in Teaching

Teaching competency is based on the skills. The skills are the inferred phenomenon. The identification and development of skills depends on the reasoning ability. The coordination of various teaching is done by reasoning. The planning and organization of teaching are highly logical activities. The logic of teaching is purely based on the reasoning power of the teacher. Reflective level teaching, problem solving, seminar, group discussions are used for improving higher level of reasoning process.

Related Studies

Related studies to Critical thinking

Gurubasappa (2014) conducted a study on critical thinking, emotional intelligence and their effect on Achievement in science of secondary school students. The objectives were to study the relationship between critical thinking and academic achievement, to study the relationship between emotional intelligence and academic achievement and to study the interaction effect of critical thinking and emotional intelligence upon academic achievement. The method used was survey method. The samples used were 600 secondary school students from 4 government, 4 private aided and 2 private unaided high schools in Tumkur district of Karnataka. The tools used were critical thinking test in

physics (CT- TIP). Emotional Intelligence Inventory (EII). The statistical techniques used were t test, two ways ANOVA and Product Method Correlation. The findings showed that there was a significant effect of Critical thinking on the academic achievement in science of secondary school students and there was a significant main and interactive effect of critical thinking and interactive effect of critical thinking and emotional intelligence on the academic achievement in science of secondary school students.

Deepa (2013) conducted a study on Critical Thinking Ability and Problem Solving Ability of Higher Secondary School students of Kanyakumari district. The objectives of the study were, to study the significance of difference in the mean scores of critical thinking and problem solving ability of higher secondary school students on the basis of gender and locale and to study the relationship between critical thinking ability and problem solving ability of higher secondary school students. The samples used were 214 students of XI standard from ten schools of Kanyakumari District. The tools used are critical thinking ability test and problem solving ability test. The statistical techniques used were Pearson Product Moment Correlation Coefficient and t test. The findings revealed that, the boys were found to have better critical thinking ability than those of girls, the rural and urban students did not differ in their critical thinking ability, the urban students were found to have more problem solving ability than those of rural students and a significant positive high correlation was found between critical thinking ability and problem solving ability of higher secondary students.

Vimal (2013) conducted a study on Critical Thinking and Achievement in English of higher secondary students in Dharmapuri district. The objectives were to construct and validate achievement test in English and to study the critical thinking ability of higher

secondary students with respect to Gender. The method used for the study was Normative Survey Method. The samples used for the study were 400 students in various higher secondary students in Dharmapuri district. The tools used were critical thinking test, Achievement test and general data sheet. The Statistical techniques were t test, ANOVA, Pearson Product Moment Correlation. The findings revealed that the higher secondary students possess medium level of critical thinking and achievement in English. Gender had no impact on critical thinking and achievement in English.

Mary (2013) conducted a study on classroom environment and critical thinking ability of secondary students of Kanyakumari district. The objectives were to study the classroom environment and critical thinking ability of higher secondary students and to compare the mean scores of classroom environment of higher secondary school students with regard to back ground variables. The method used for the study was Normative Survey Method. The samples used for the study were 400 higher secondary students in various schools of kanyakumari district. The tools used were Classroom environment Inventory, Critical thinking ability test and General data sheet. The Statistical techniques used were t test, ANOVA, Pearson Product Moment Correlation. The findings showed that there exists no significant difference in the mean scores of male and female higher secondary students in their classroom environment and there exists no significant difference between the mean scores of male and female higher secondary students in their critical thinking ability.

Ramalekshmi (2012) conducted a study on Critical thinking ability among higher secondary students. The objective of the study was to measure the critical thinking ability of higher secondary students. The method used for the study was Normative Survey

Method. The sample used for the study were 400 higher secondary students from Kanyakumari District. The tool used was Critical thinking ability test. The Statistical techniques were t test, ANOVA. The findings showed that there existed no significant difference between the critical thinking ability of higher secondary students based on sex. There exists significant difference between the critical thinking ability of higher secondary students belonging to rural and urban area.

Srinivasalu (2012) conducted a study on Development of critical thinking skills with an inquiry oriented approach in teaching of civics. The objective of the study was to find out the interaction of genders on the achievement of experimental approach. The method used for the study was Experimental method. The Samples used for the study were 80 students studying in IX standard in a state syllabus secondary school of Bangalore city. The study found that, it was one of the most effective teaching-learning strategies used in civics to make learning a joyful activity. It was more psychological to view this as a highly effective learning technique which helps in development of critical thinking ability.

Chan (2011) conducted a study on Epistemic Beliefs and critical thinking of Chinese students. The main aim of the study was to examine the relationship between epistemic beliefs and critical thinking. 138 Chinese under graduates completed the Epistemic Beliefs inventory (EBI) and Halpern Critical Thinking Assessment using everyday situations. These cognitive ability and thinking dispositions were also measured. Result showed that other than cognitive ability, the belief that knowledge is certain was most related to thinking performance.

Harish (2011) conducted a study on Impact of integrated critical thinking skills on Achievement in Mathematics of secondary school students. The objectives of the study were to study the impact of integrated critical thinking skills on achievement in mathematics and to determine the relationship between the integrated critical thinking skills and achievement in mathematics with respect to gender. The samples used for the study were 140 students of ix standard students. The tool used was achievement tests. The statistical techniques used were ANOVA, ANCOVA and factorial design technique. The findings revealed that there was significant difference between the posttest achievement of control and experimental groups. There was no significant difference between the mean scores of boys and girls in the posttest achievement.

Sibichen (2010) conducted a study on Critical thinking and Decision making skills in teaching: A paradigm shift. The objective of the study was to find out the level of critical thinking and decision making skills of students. The method of the study was Normative survey method. The samples of the study were 75 students. The tool used for the study was thinking skill assessment scale. The statistical techniques used for the study were arithmetic mean, Standard deviation, t test, ANOVA, and chi square test. The finding showed that there was significant difference between graduate and post graduate students in their decision making skill.

Femina (2009) conducted a study on A study on relationship between critical thinking and decision making among higher secondary students. The objective of the study was to find out the relationship between critical thinking and decision making of higher secondary school students. It was found that there existed a positive correlation between critical thinking and decision making among higher secondary students.

Paul (2009) conducted a study on critical thinking: Ethical Reasoning and fair minded thinking. Their aim is to introduce some important intellectual tools and understandings for insightfully reasoning through ethical issues and problems. They highlighted native egocentrism as a fundamental barrier to ethical reasoning.

Related studies to Reasoning ability

Suresh (2014) conducted a study on Reasoning ability in science (RAIS). The objectives of the study was to remove suspicions and introducing reasoning ability to familiarize the students to get good achievement in science and make an awareness about reasoning ability which is more useful to attend competitive examinations. The method adopted for this study was normative survey method. The tool used for the study was RAIS. The findings revealed that there was significant difference in reasoning ability between male and female students also it proved that there was significant difference in the reasoning ability between communities.

Murugan (2014) conducted a study on Higher Secondary Students Reasoning Ability and Home Environment. The objectives were, to find out the level of (i) Reasoning ability (ii) Home environment of higher Secondary boys and girls in their reasoning ability and home environment and to find out the significant relationship between their reasoning ability and home environment. The method used was Normative Survey Method. The Sample used for the study were 800 First year Higher Secondary Students from 15 Schools in Villupuram District. The tools used were reasoning ability-constructed and validated by Sadhana Bhatnagar (1986) and Home Environment-constructed and validated by Dr. Karuna Shankar Misra (1983). The Statistical

Techniques were t test and Pearson Product Moment Correlation Coefficient Method. It was found that, first year higher secondary students have average reasoning ability. First year higher secondary students have a favorable home environment. Boys and Girls didn't differ significant relationship between reasoning ability and home environment.

Arsha (2012) conducted a study on Reasoning Ability of higher secondary students in relation to intelligence. The objectives were to find out whether there is any significant difference in higher secondary students in reasoning. The method used for the study was Normative Survey Method. The samples used for the study were 400 higher secondary students. The tools used for the study was Reasoning ability test and S S test of intelligence (Dr. Sam & Sanantha Raj (1995). The Statistical Techniques used were t test, Pearson Product Moment Correlation. The findings showed that higher secondary students were found to have low reasoning ability. There was significant difference between boys and girls in their reasoning ability.

Murugan (2012) conducted a study on Reasoning ability of Higher Secondary School Students. The objectives of the study were to study the reasoning ability of higher secondary students and to find out if there exists any significant difference between boys and girls higher secondary students in their reasoning ability. The samples used for the study were 800 first year higher secondary students selected from 15 schools in villupuram. The method used for the study was Normative Survey Method. The Statistical Technique used was t test. The findings revealed that higher secondary student's exhibit average reasoning ability. Significant difference was found between boys and girls higher secondary students in respect of their reasoning ability and boys showed better reasoning ability than girls.

Bose (2011) conducted a study on Reasoning Ability and Achievement in Mathematics of higher secondary students. The objectives of the study was to construct a Reasoning ability test and to find out the level of reasoning ability of higher secondary students. The method used for the study was Normative survey method. The sample used for the study were 400 higher secondary students. The tools used for the study were Reasoning ability test and General data sheet. The statistical techniques used for the study were t test, ANOVA, Karl Pearson's product moment correlation coefficient. It was found that there existed no significant difference between boys and girls in their reasoning ability.

Wanjari (2010) conducted a study on comparative study of intelligence and Reasoning ability of orphans and normal children with reference to their Scholastic Achievement. The objectives of the study were to study the Scholastic achievement of normal and orphan students and to study Reasoning ability of normal and orphan students. The method of study was descriptive survey and casual comparative method. The sample used for the study was t test. The findings revealed that the Scholastic achievement of normal student was comparatively more than that of orphan student. Normal student differ from orphan in their reasoning ability.

Nicos (2009) conducted a study on Formal reasoning in higher secondary school students: Theoretical and educational implications. The objectives of the study was to investigate the structure and development of formal thought among tenth, eleventh and twelfth grade students. The findings revealed that the students attending the different sections of the study had significantly different TOLT performance, older students

exhibited significantly better TOLT performance than young ones and boys performed significantly better TOLT than girls.

Arumugarajan (2008) conducted a study on Abstract Reasoning of commerce students studying in school. The objectives were to find the level of abstract reasoning ability of commerce students studying in standard XI and XII in Cheranmahadevi Educational District. To find the significant difference between XI and XII standard students studying in commerce group in higher secondary school with reference to Abstract reasoning. The method used in the study was Normative Survey Method. The samples used for the study were 238 higher secondary commerce group students in Cheranmahadevi Education District. The tools used for the study were different aptitude test and office records for the student's academic performance. The Statistical Techniques used are t test, Pearson Product Moment correlation. It was found that the level of abstract reasoning ability of higher secondary commerce students in moderate. There was significant difference between XI and XII standard commerce students with reference to abstract reasoning.

Holvitivi (2007) conducted a study on Logical reasoning ability in engineering students, a case study. The objectives of the study were to find out the logical reasoning ability of engineering student, to compare natural human reasoning and engineering logic. The findings revealed that there were first year engineering students answered four reasoning task as part of a large survey on scientific thinking, producing more incorrect responses than previous studies would have predicted, most notably in international student group.

Vong-Inkwan (2000) conducted a study on Linking brain growth with development of scientific reasoning ability and conceptual change during adolescence. The objectives were to find out the adolescent brain growth plateau and spur and to find out the scientific reasoning ability of adolescents. The method used for the study was survey method. The samples used for the study were 210 students from Korea. It was found that an early adolescent brain growth plateau and spur exist and that this plateau and spur influence student's ability to reason scientifically.

Klaczynski (1996) conducted a study on Everyday statistical reasoning during adolescence and young adulthood: Motivational, general ability and developmental influences. The objectives of the study were to find out the ability of adolescents in solving everyday reasoning problems dealing with the law of intuitive analysis of covariance and to compare statistical reasoning of goal- enhancing problems. The findings revealed that the adolescents solved everyday reasoning problems dealing with the law of large numbers and intuitive analysis of covariance. Statistical reasoning was more frequent on goal-threatening problems than on goal-natural and goal enhancing problems.

Critical review:

Totally the investigator reviewed 22 studies. 14 Indian studies and 8 foreign studies, of these studies 11 studies were related to Critical Thinking and 11 studies related to reasoning ability. It seems that researches have taken the population of secondary, higher secondary and college students. In that, Arsha and Murugan (2012) found that there was significant difference between boys and girls in their reasoning

ability, but Bose (2011) found that there was no significant difference between boys and girls in their reasoning ability.

CHAPTER –III

METHODOLGY

- Method adopted for the study
- Sample of the study
- Tools used
- Data collection procedure
- Statistical techniques used

CHAPTER-III

METHODOLGY

Research methods are of utmost important in a research process. They describe the various step of the plan of attack to be adopted in solving a research problem, such as the manner in which the problems are formulated, the definition of terms, the choice of subjects for investigation, the validation of data gathering tools, the collection, analysis and interpretation of data and the processes of inferences and generalizations.

Methods of research, according to Good, Barr and Scates may be classified from many points of view; the field to which applied; education, history, philosophy,

psychology, etc; Research methods when classified in the above manner give rise to a comprehensive list with much of overlapping among the different methods. Yet despite this lack of clear-cut distinction among the methods, most authors agree on three basic categories.

1. Historical method: which provides a method of investigation to discover, describe and interpret what existed in the past.
2. Descriptive method: which provides a method of investigation to study, describe and interpret what exists at present.
3. Experimental method: This provides a method of investigation to derive basic relationships among phenomena under controlled conditions or most simply to identify the conditions underlying the occurrence of a given phenomenon.

Method used in the present study

The present study attempts to find out the, “critical thinking and reasoning ability of higher secondary students.” Since the problem selected is concerned with “survey” type, the investigator has selected Normative Survey Method for conducting the present study.

The selection of a method and a specific design within that method appropriate in investigating a research problem will depend upon the kind of data that the problem entails. However, the method selected should be in harmony with scientific principles and adequate enough to lead to dependable generalization.

Normative Survey Method

Survey method are conducted to collect detailed descriptions of existing phenomena with the intent of employing data to justify current conditions and practices or to make more intelligent plans for improving them. Their objective is not only to analyze, interpret and report the status of an institution, a group or area in order to guide practice in the immediate future, but also to determine the adequacy of status by comparing it with established standards.

1. Data concerning existing status
2. Comparison of existing status with the established standards and standards, and
3. Means of improving the existing status, while others are limited to one or two of these types.

Survey studies may take different forms depending upon the scope, nature and purpose of the problem under investigation. They may be broad or narrow in scope. Some surveys encompass several countries, states or regions or may be limited to one country, region, state, district, city, school system or some other unit. Survey data may be collected from every unit of a population or from a representative sample.

Normative survey method studies, describes and interprets what exists at present. They are concerned with existing conditions or relations, prevailing practices, beliefs, attitudes etc., on-going processes and the emerging trends. Such investigations are variously termed in research literature as descriptive survey, normative survey, status studies or Trend Analysis.

The sample

The present study is conducted on a sample of 11 std students who are studying various higher secondary schools of Kanyakumari district following state board syllabus during the academic year 2014-2015. Size of the sample is 400. Stratified random sampling technique will be used to select the sample. While selecting the subjects the representations were given to factors such as Gender, Locality, and Type of management, Nature of school and Subject of Study.

Details of the sample selected

Table 3.1

List of schools selected and number of samples selected for the study

Sl. No	List of Schools	Total No. of Samples
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1.	Badharul Islam Matric higher Secondary School, Kaliyakkavilai	20
2.	SRM Higher Secondary School, Mulagumoodu	53
3.	Hindu Vidyalaya Matric Higher Secondary School	16
4.	St. Mary's Higher Secondary School, Melpalai	31
5.	Kids Oxford Matric Higher Secondary School, Kuzhithurai	24
6.	SLB Boys Higher Secondary School, Nagercoil	42
7.	Government higher Secondary School, Thittuvilai	39
8.	N.V.K.S. Higher Secondary School, Attoor	34
9.	Government Higher Secondary School, Thuckalay	34
10.	Ruben Matric Higher Secondary School, Thadikarankonam	35
11.	D.V.D Higher Secondary School, Nagercoil	38
12.	KDVP Girls Government Higher Secondary School, Nagercoil	34

Distribution of the sample

1. Gender wise distribution of sample

Table 3.2

Gender wise distribution of sample

Sl. No	Gender	No. of students	percentage
1.	Male	204	51.00
2.	Female	196	49.00
	Total	400	100

From the table, it is found that the sample consists of 204 boys and 196 girls students. The percentages corresponding to boys and girls students are 51 and 49 respectively.

2. Locality wise distribution of sample

Table 3.3

Locality wise distribution of sample

Sl. No	Locality	No. of students	percentage
1.	Rural	271	67.75
2.	Urban	129	32.25
	Total	400	100

From the above table, it is found that the sample consists of 271 rural and 129 urban students. The percentages corresponding to rural and urban students are 67.75 and 32.25 respectively.

3. Type of management wise distribution of sample

Table 3.4

Type of management wise distribution of sample

Sl. No	Type of management	No. of students	Percentage
1.	Government	145	36.25
2.	Aided	67	16.75
3.	Unaided	188	47.00
	Total	400	100

The sample consists of 145 Government, 67 Aided and 188 Unaided students. The percentages corresponding to Government, Aided and Unaided students are 36.25, 16.75 and 47.00 respectively.

4. Nature of school wise distribution of sample.

Table 3.5

Nature of school wise distribution of sample.

Sl. No	Nature of school	No. of students	Percentage
1.	Boys	38	9.50
2.	Girls	30	7.50
3.	Co-education	332	83.00
	Total	400	100

The sample consists 38 of boys school students, 30 girls school students and 332 co-education students. The percentages corresponding to boys, girls and co-education students are 9.50, 7.50 and 83.00 respectively.

4. Subject of study wise distribution of sample

Table 3.6

Subject of study wise distribution of sample

Sl. No	Subject of study	No. of students	Percentage
1.	Arts	107	26.75

2.	Science	293	73.25
	Total	400	100

The sample consists of 107 Arts and 293 Science students. The percentages corresponding to Arts and Science students are 26.75 and 73.25 respectively.

Tools used for the study

The data must be collected by the help of some tools. The successful outcome is depending upon the selection of correct research tools. The investigator used the following tools in the present study.

- i. Critical Thinking Ability Test constructed and validated by Dr. R.P. Deepa and Dr. M. Sadanandan (2011)
- ii. Reasoning Ability Test constructed and validated by the investigator.(2015)
- iii. General data sheet prepared by the investigator.

- i. Critical thinking ability test

The critical thinking ability test was constructed and validated by Dr. R.P. Deepa and Dr. M. Sadanandan. (2011).

Critical thinking ability test was conceptualized as one of the important variable which affects the performance of the students in classroom. The critical thinking ability

test contains 40 items, under 4 dimensions such as, Recognition of Assumptions, Interpretations, Deduction and Evaluations. Each dimension contains 10 items. The reliability of the test was found by Split-Half Method. The reliability of Critical Thinking Ability Test was found to be 0.94. It contains the adequate content validity and face validity. Hence the tool was highly reliable and valid for the present study.

ii. Reasoning ability test

The reasoning ability test was constructed and validated by the investigator. Reasoning ability test was conceptualized as one of the important variable which affects the performance of the students in the classroom. The reasoning ability test contains 25 items, under 4 dimensions such as Arithmetic reasoning, Logical reasoning, Verbal reasoning and Non verbal reasoning.

Development of Reasoning Ability Test

Reasoning ability test was prepared by T. Jeya Sheela and Dr. R.P. Deepa (2015). The major steps followed in the construction of the tool are as follows:

- i. Planning of the test
- ii. Item writing
- iii. Item editing
- iv. Arrangement of items
- v. Preliminary try out
- vi. Draft scale
- vii. Final tryout
- viii. Scoring
- ix. Item analysis

- x. Item selection
- xi. Final format of the test
- xii. Establishing reliability and validity
 - i. Planning of the test

Reasoning ability test prepared by T. Jeya Sheela and Dr. R.P. Deepa (2015) aims at measuring the reasoning ability of higher secondary students of Kanyakumari district. The considerations were given to the variables tested and to the different aspects involved.

- ii. Item writing

Writing on suitable items is one of the important steps in the construction of any research tool. After a thorough and careful study of literature available on reasoning ability test, the investigator collects materials on different aspects of reasoning ability and prepared a large number of questions. The respondent must select one response out of the given four responses (a/b/c/d). The prepared items are then given for item editing.

- iii. Item editing:

Editing the items needs much care and it is the process of checking and scrutinizing item. The items were referred to the experts for modification. As per their suggestion, the ambiguous items were rewritten in simple and meaningful language.

- iv. Item arrangement

All the items were grouped, and arranged in section wise in order to arouse interest and to maintain attention for responding.

v. Preliminary try-out

A preliminary try-out of the test was arranged to find out the weakness and workability of the items. The difficulties in items and a rough estimate of the time limit for responding the items were noted. This step helped the investigator to modify certain items which were noted. This step helped the investigator to modify certain items which were vague and questionable. For this purpose the scale was given to 30 higher secondary students. Some ambiguous items were modified and the draft scale was prepared.

vi. Draft scale

The first draft scale was prepared by printing the items with the provision to mark response. It was printed in English. Necessary instructions for the respondent were also printed. A sample copy of the draft scale is given as Appendix B.

vii. Final try-out

The tool was administered to a sample of 100 higher secondary students of various schools in Kanyakumari district. They were selected randomly from the population.

viii. Scoring

The collected response sheet was scored with the help of a scoring key prepared by the investigator. The reasoning ability test contains four options; one mark is given to the correct answer and for the wrong answer 0 marks is given. After completion of scoring the data were organized and tabulated for analysis and interpretation.

ix. Item analysis

The selected 40 questions were printed and subjected to a pilot study. The test was administered to a sample of 100 higher secondary school students, representative of those to whom the test is to be finally administered.

The total score for each subject for all the items was then found out. One point credit was given to each correct answer. For item analysis the answer sheets were arranged in descending order of the aggregate scores obtained for the test. Then the top 27 percent of the answer sheet were classified as upper group and bottom 27 percent the answer sheet were classified as lower group. The number of correct responses for each item was identified for both the upper group and lower group. The difficulty index and discriminating power of each item was calculated using the formula,

$$\text{Difficulty Index} = \frac{R_H + R_L}{N_1 + N_2}$$

$$\text{Discriminating Power} = \frac{R_H - R_L}{N}$$

R_H = Number of correct responses in the upper group

R_L = Number of correct responses in the lower group

N = Number of students in the upper or lower group

Item selection

Items having difficulty index between 0.4 and 0.8 and discriminating power above 0.25 were selected for the final test. The detail of item selection is given in the table

Table 3.7

Details of Item selected

Item no	Difficulty index	Discriminating power	Selected item
1.	0.611	0.555	✓
2.	0.555	0.597	✓
3.	0.57	0.407	✓
4.	0.203	0.259	✓
5.	0.407	0.272	✓
6.	0.38	0.185	×
7.	0.33	0.25	✓
8.	0.35	0.333	✓
9.	0.240	0.185	×
10.	0.370	0.296	✓
11.	0.555	0.518	✓
12.	0.574	0.70	✓
13.	0.33	0.27	✓

14.	0.5	0.33	✓
15.	0.35	0.37	✓
16.	0.4074	0.22	×
17.	0.240	0.111	×
18.	0.259	0.07	×
19.	0.377	0.407	✓
20.	0.444	0.518	✓
21.	0.74	0.370	✓
22.	0.203	0.111	×
23.	0.370	0.074	×
24.	0.185	0.222	×
25.	0.370	0.148	×
26.	0.370	0.29	✓
27.	0.370	0.370	✓
28.	0.30	0.222	×
29.	0.537	0.62	✓
30.	0.5	0.70	✓
31.	0.351	0.481	✓

32.	0.314	0.407	✓
33.	0.316	0.111	×
34.	0.240	0.03	×
35.	0.296	0	×
36.	0.203	0.037	×
37.	0.33	0.296	✓
38.	0.277	0.037	×
39.	0.46	0.259	✓
40.	0.55	0.37	✓

Note: ✓ Mark indicates the selected items.

× Mark indicates the rejected items.

x. Preparation of the final test

Out of the 40 items included in the tryout, 25 items were selected for the final test based on difficulty index and discriminating power of items, the final reasoning ability test was printed with necessary instructions. Separate response sheets were printed for answering the test. A copy of reasoning ability test (final form) is given in Appendix C.

xi. Establishing reliability and validity of the test

Reliability and validity are essential to the effectiveness of any data gathering procedure.

Reliability

Reliability is an important criterion of a measuring tool. It refers to consistency of the test. The reliability of the test was found by using The Split-Half Technique.

The Split-Half technique

The test was split into two half's by separate the odd numbered and the even numbered items. The correlation between the sets of scores obtained from the odd numbered items and even numbered items provides a measure of reliability called co-efficient of homogeneity. The reliability determined in this way is the reliability of half-length of the test. A correction formula is applied to obtain the reliability of full test. This is done by using Spearman-Brown Formula which can be stated as,

$$r' = \frac{2r}{1+r}$$

where,

r' - reliability coefficient of the full test

r - reliability coefficient obtained between the two halves of the test.

It was found to be 0.96, showing that the scale is reasonably reliable one.

Validity

The validity of the test may be defined as accuracy with which the test measures when it suppose to do. A test is valid if it is telling the truth validity implies truthfulness. As per the opinion of experts, the Reasoning Ability Test possesses adequate face validity. Hence the tool is reliable and valid one.

xii. The final format of the test

The final format of the test includes a total number of 25 items. These items were arranged in a random order as there is an objective item alone a copy of final draft of reasoning ability is given in Appendix.

Administration of the tools

For administration of the tool, the investigator visited different schools of Kanyakumari District. Before administering the tool the investigator explained the purpose of her study. The respondents were given a copy of critical thinking ability test, reasoning ability test, general data sheet and response sheet and the investigator gave the instructions clearly. 1.20 hrs is given to making the responses, the response sheet were collected from the respondents.

Statistical techniques used

Statistical techniques are very important for any research. The relevant statistical techniques help the investigator to analysis and interpret the data meaningfully in the study. In the present study the investigator used the following statistical techniques.

- i. Arithmetic mean
- ii. Standard deviation
- iii. t test
- iv. Analysis of variation (ANOVA)

v. Carl Pearson's product moment coefficient of correlation

i. Arithmetic mean

Mean is the most reliable and universally used central tendency. Mean is simplest and can be defined as the sum of all the values of item in a series divided by the number of items.

$$\bar{X} = A + \frac{\sum fd}{N} \times C$$

A = Assumed Mean

f = Frequency of each class interval

d = Deviation of scores from the assumed mean

N = Total frequency

C = Class interval

ii. Standard deviation

Standard Deviation is the most stable index of variability standard deviation measures the scattered of the values. It is defined as the squares root of the average of the squares of the deviation of each scores from the mean.

$$\sigma = c \times \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2}$$

σ = Standard Deviation

C = Class interval

d = Deviation from the assumed mean

f = frequency

N = Total sample

iii. t test (test of significance)

It is used for finding significant level of differences between two groups of population from the mean and standard deviation t-value can be calculated as.

$$t = \frac{M1 - M2}{\sqrt{\frac{\sigma_1^2}{N1} + \frac{\sigma_2^2}{N2}}}$$

M1 = Mean of the first sample

M2 = Mean of the second sample

σ_1 = Standard deviation of first sample

σ_2 = Standard deviation of second sample

N1 = Total number of frequency of first sample

N2 = Total number of frequency of second sample

iv. ANOVA (Analysis of Variance)

To find out whether there is any significant difference between the means of two random samples. We use the t-test for analysis of variance and the corresponding test of significance based upon f-distribution is used in their case. The analysis of variance leads with variance rather than with standard deviations and standard errors.

$$f = \frac{\text{mean square variance between groups}}{\text{mean square variance with in groups}}$$

v. Carl Pearson's product moment coefficient of correlation

Correlation is used to measure the degree of relationship between two variables. It shows us the extent to which value in one variable are linked or related to values in another variable correlation coefficient is calculated using the formula.

$$r = \frac{N(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{N[\Sigma x^2 - (\Sigma x)^2]} \sqrt{N[\Sigma y^2 - (\Sigma y)^2]}}$$

Where,

r = correlation coefficient

Σx = sum of scores

Σy = sum of y scores

Σx^2 = sum of square of x scores

Σy^2 = sum of square of y scores

Σxy = sum of square of x and y scores

N = Number of students.

Coefficient correlation

Garrett (1969) presents the following suggestions for interpreting the various values of 'r's.

$r = 0$ denotes no relationship

$r = 0.00$ to 0.20 denotes negligible correlation

$r = 0.20$ to 0.40 denotes low correlation

$r = 0.40$ to 0.70 denotes substantial correlation

$r = 0.70$ to 0.90 denotes high correlation

$r = 0.90$ to 0.99 denotes very high dependable relationship
correlation

$r = 1$ denotes perfect correlation

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

- Percentage wise analysis
- Differential analysis
- Correlation analysis

CHAPTER-IV

ANALYSIS AND INTERPRETATION

Data analysis is the process of systematically applying statistical and logical techniques to describe and illustrate, condense and recap, and evaluate data. According to Shamoo and Rensik (2003) various analytic procedures provide a way of drawing inductive inferences from data and distinguishing the signal from the noise present in the data.

1. To think in terms of significant tables that the data permit.
2. To examine carefully the statement of the problem and earlier analysis and to study the original records of the data.
3. To get away from the data and to think about the problem in lay man's terms, or to actually discuss that problem with others.
4. To attack the data by making various statistical calculations.

The exploratory modes may prove very helpful in the analysis of data of any research study and no similarities, differences, trends and significant factors would go unnoticed by the researcher.

Statistical techniques have contributed greatly in gathering, organizing, analyzing and interpreting numerical data. The processing of numerical data through statistics calls for competence in the use of statistical methods and for understanding of concepts that

underline their development and their application. The researcher must know the strengths and the weakness of the statistical methods which he uses so that he may not mislead or be misled by such methods.

Preliminary analysis

Critical thinking ability of higher secondary students

Table 4.1

Mean and Standard Deviation of critical thinking ability statistics

Category	No. of students	Arithmetic mean	Standard deviation
Higher Secondary Students	400	10.93	3.21

From the above table it is clear that the total number of sample selected for the present study was 400. The arithmetic mean score for the total sample was 10.93 and the standard deviation value was 3.21.

Percentage wise analysis for critical thinking ability

Table 4.2

Percentage wise distribution of different levels of Critical thinking ability

Critical thinking ability	No. of students	Percentage
Low	57	14.25
Medium	295	73.75
High	48	12.00
Total	400	100

From the above table, it is clear that 14.25% of higher secondary students have low level of critical thinking ability. 73.75% of students have medium level of critical thinking ability and only 12% of students have high levels of critical thinking ability. This indicates that majority of Higher Secondary students have medium level of critical thinking ability.

Differential analysis

Comparison of mean scores of Critical thinking ability of higher secondary students based on the background variables

Comparison of mean scores of critical thinking ability based on gender

Null hypothesis 1

There exists no significant difference in the mean scores of critical thinking ability of male and female higher secondary students.

Table 4.3

Mean, standard deviation and t values of critical thinking ability of male and female students

Gender	Mean	SD	N	t	p	Level of significance
Male	10.62	3.05	204	1.999	0.046	0.05
Female	11.26	3.34	196			

From table 4.3, it is clear that the calculated t value ($t=1.99$; $p<0.05$) is significant at 0.05 level. Therefore the null hypothesis there exists no significant difference in the mean scores of critical thinking ability of male and female higher secondary students is rejected. Also it is clear that the mean scores of critical thinking

ability of female students is 11.26 which is significantly higher than that of male students whose mean scores 10.62. It may therefore, be said that the female higher secondary students were found to have significantly superior critical thinking than those of male higher secondary students.

Comparison of mean scores of critical thinking ability based on locale

Null hypothesis 2

There exists no significant difference in the mean scores of critical thinking ability of rural and urban higher secondary students.

Table 4.4

Mean, standard deviation and t values of critical thinking ability of rural and urban students

Locale	Mean	SD	N	t	p	Level of significance
Rural	11.45	3.29	271	5.150	0.000	0.01
Urban	9.84	2.73	129			

From the above table the calculated t value ($t=5.150$; $p<0.01$) is significant at 0.01 level. Therefore the null hypothesis there exists no significant difference in the mean scores of critical thinking ability of rural and urban higher secondary students is rejected. Also it is clear that the mean scores of critical thinking ability of rural students

is 11.45 which is significantly higher than that of urban students whose mean scores 9.84. It may therefore, be said that the rural higher secondary students were found to have significantly superior critical thinking than those of urban higher secondary students.

Comparison of mean scores of critical thinking ability based on type of management

Null hypothesis 3

There exists no significant difference in the mean scores of critical thinking ability of Government, Aided and Unaided higher secondary students.

Table 4.5

Mean, standard deviation and F values of critical thinking ability of government, aided and unaided students

Type of Management	Mean	SD	Source Squares	Sum of square	Mean	F	p	Level of Significance
Government	10.34	2.8	Between GP	157.2	78.61			
Aided	10.34	2.84	Within GP	3942.8	9.93	7.915	0.000	0.01
Unaided	11.6	3.49	Total	4100.0				

From the above table, the calculated F value ($F= 7.915$; $p<0.01$) is significant at 0.01 level. Therefore the null hypothesis there exists no significant difference in the mean scores of critical thinking ability of higher secondary students from government, aided and unaided schools is rejected. It is clear that the mean scores of critical thinking ability of higher secondary students statistically differ with the type of management. The result does not help to identify exactly the pairs of groups which differ statistically. Hence Scheffe's Multiple Comparison is used for further analysis.

Table- 4.6

Scheffe's posthoc for pair wise comparison for type of management

Type of Management	N	Pair	p(Scheffe)	Level of Significance
Government (A)	145	A Vs B	1.000	NS
Aided (B)	67	B Vs C	0.020	0.05
Unaided (C)	188	A Vs C	0.002	0.01

From the above table, the result showed that the mean scores of the students of Government and Aided (A Vs B) do not differ statistically in their critical thinking ability. But the students of Aided and Unaided (B Vs C) and Government and Unaided (A Vs C) statistically differ in their critical thinking ability. From the mean scores it is clear that the unaided students possess 11.6 which is superior than that of Government and aided students.

Comparison of mean scores critical thinking ability based on subject of study

Null hypothesis 4

There exists no significant difference in the mean scores of critical thinking ability of Arts and Science higher secondary students.

Table 4.7

Mean, standard deviation and t values of critical thinking ability of arts and science students

Subject of study	Mean	SD	N	t	p	Level of significance
Arts	10.01	2.79	107	3.808	0.000	0.01
Science	11.27	3.28	293			

From the above table, the calculated t value ($t=3.808$; $p<0.01$) is significant at 0.01 level. Therefore the null hypothesis there exists no significant difference in the mean scores of critical thinking ability of Arts and Science higher secondary students is rejected. Also it is clear that the mean scores of critical thinking ability of science

students is 11.27 which is significantly higher than that of Arts students whose mean scores 10.01. It may therefore, be said that the Science students were found to have significantly superior critical thinking than those of Arts students.

Comparison of critical thinking ability based on nature of school

Null hypothesis 5

There exists no significant difference in the mean scores of critical thinking ability of higher secondary students from boys, girls and co-education schools.

Table-4.8

Mean, standard deviation and F values of critical thinking ability of students of boys, girls and co-education schools

Type of Management	Mean	SD	Source	Sum of Squares	Mean square	F	p	Level of Significance
Boys	9.53	2.29	Between GP	167.59	83.80			
Girls	9.47	2.47	Within GP	3932.45	9.91	8.460	0.000	0.01
Co-edn	11.22	3.28	Total	4100.94				

From the above table the calculated F value ($F= 8.460$; $p<0.01$) is significant at 0.01 level. Therefore the null hypothesis there exists no significant difference in the mean scores of critical thinking ability of higher secondary students from boys, girls and co-education schools is rejected. It is clear that the critical thinking ability of higher secondary students statistically differ with the nature of school. The result does not help to identify exactly the pairs of groups which differ statistically. Hence Scheffe's Multiple Comparison is used for further analysis.

Table- 4.9

Scheffe's posthoc for pair wise comparison table for nature of school

Nature of school	N	Pair	p(Scheffe)	Level of significance
Boys (A)	38	A Vs B	0.997	NS
Girls (B)	30	B Vs C	0.015	0.05
Co-edn (C)	332	A Vs C	0.008	0.01

From the above table, the result showed that the mean scores of students of Boys and Girls (A Vs B) do not differ statistically in their critical thinking ability. But the students of Girls and Co-education (B Vs C) and Boys and Co-education (A Vs C) showed differ statistically in their critical thinking ability. From the mean scores it is clear that the students from co-education students possess 11.22 which is superior than that of boys and girls.

Reasoning ability of higher secondary students

Table 4.10

Mean and Standard deviation of Reasoning ability

Category	No. of students	Arithmetic mean	Standard deviation
Higher Secondary Students	400	8.61	3.18

From the above table it is clear that the total number of sample selected for the present study was 400. The arithmetic mean score for the total sample was 8.61 and the standard deviation value was 3.18.

Percentage analysis for reasoning ability

Table 4.11

Percentage wise distribution of different levels of Reasoning ability

Reasoning ability	No. of students	percentage
Low	59	14.75
Medium	281	70.25
High	60	15.00
Total	400	100

From the above table 4.11, it is clear that 14.75% of higher secondary students have low level of reasoning ability. 70.25% of students have medium level of reasoning ability and only 15% of students have high level of critical thinking ability. This indicates that majority of Higher Secondary students have medium level of reasoning ability.

Differential analysis

Comparison of mean scores of reasoning ability of higher secondary students based on the background variables

Comparison of mean scores of reasoning ability based on gender

Null hypothesis 6

There exists no significant difference in the mean scores of reasoning ability of male and female higher secondary students.

Table 4.12

Mean, standard deviation and t values of reasoning ability of male and female students

Gender	Mean	SD	N	t	p	Level of significance
Male	8.30	2.71	204			
Female	8.93	3.58	196	1.979	0.049	0.05

From the above table the calculated t value ($t=1.979$; $p<0.05$) is significant at 0.05 level. Therefore the null hypothesis there exists no significant difference in the mean scores of reasoning ability of male and female higher secondary students is rejected. Also it is clear that the mean scores of reasoning ability of female students is 8.93 which is significantly higher than that of male students whose mean scores 8.30. It may therefore, be said that the female higher secondary students were found to have significantly superior reasoning ability than those of male higher secondary students.

Comparison of mean scores of reasoning ability based on locale

Null hypothesis 7

There exists no significant difference in the mean scores of reasoning ability of rural and urban higher secondary students.

Table 4.13

Mean, standard deviation and t values of reasoning ability of rural and urban students

Locale	Mean	SD	N	t	p	Level of significance
Rural	8.58	3.27	271	0.273	0.785	NS
Urban	8.67	2.98	129			

From the above table, the calculated t value ($t=0.273$; $p>0.01$) is not significant at any level. Therefore the null hypothesis there exists no significant difference in the mean scores of critical thinking ability of rural and urban higher secondary students is accepted. It may therefore be said that the rural and urban higher secondary students possess almost same level of reasoning ability.

Comparison of mean scores of reasoning ability based on type of management

Null hypotheses 8

There exists no significant difference in the mean scores of reasoning ability of Government, Aided and Unaided higher secondary students.

Table 4.14

Mean, Standard Deviation and F values of Reasoning Ability of Government, Aided & Unaided Students

Type of Management	Mean	SD	Source Squares	Sum of square	Mean	F	p	Level of Significance
Government	8.48	2.87	Between GP	10.4	5.22			
Aided	8.96	3.14	Within GP	4018.709	10.12	0.516	0.597	NS
Unaided	8.59	3.42	Total	4029.16				

From the above table, the calculated F value ($F= 0.516$; $p>0.01$) is not significant at any level. Therefore the null hypothesis there exists no significant difference in the mean scores of reasoning ability of higher secondary students from government, aided and unaided schools is accepted. It is clear that the reasoning ability of higher secondary students statistically not differ with the type of management.

Comparison of mean scores of reasoning ability based on subject of study

Null hypothesis 9

There exists no significant difference in the mean scores of reasoning ability of Arts and Science higher secondary students.

Table 4.15

Mean, Standard Deviation and f values of Reasoning Ability of Arts and Science Students

Subject of study	Mean	SD	N	t	p	Level of significance
Arts	9.41	3.29	107	2.980	0.003	0.01
Science	8.32	3.09	293			

From the above table, the calculated t value ($t=2.980$; $p<0.01$) is significant at 0.01 level. Therefore the null hypothesis there exists no significant difference in the mean scores of reasoning ability of Arts and Science higher secondary students is rejected. Also it is clear that the mean scores of reasoning ability of arts students is 9.41 which is significantly higher than that of science students whose mean scores 8.32. It may therefore, be said that the arts students were found to have significantly superior reasoning ability than those of science students.

Comparison of mean scores of reasoning ability based on nature of school

Null hypothesis 10

There exists no significant difference in the mean scores of reasoning ability of higher secondary students from boys, girls and co-education schools.

Table 4.16

Mean, Standard deviation and F values of reasoning ability of students of boys, girls and co-education schools

Type of Management	Mean	SD	Source	Sum of Squares	Mean square	F	p	Level of Significance
Boys	8.13	2.43	Between GP	71.3	35.64			
Girls	10.03	3.91	Within GP	3957.9	9.97	3.575	0.029	0.05
Co-edn	8.54	3.16	Total	4029.2				

From the above table, the calculated F value ($F= 3.575$; $p<0.05$) is significant at 0.01 level. Therefore the null hypothesis there exists no significant difference in the mean scores of reasoning ability of higher secondary students from boys, girls and co-education schools is rejected. It is clear that the reasoning ability of higher secondary students statistically differ with the nature of school. The result does not help to identify exactly the pairs of groups which differ statistically. Hence Scheffe's Multiple Comparison is used for further analysis.

Table- 4.17

Scheffe's posthoc for pair wise comparison for nature of school

Nature of school	N	Pair	p(Scheffe)	Level of significance
Boys (A)	38	A Vs B	0.049	0.05
Girls (B)	30	B Vs C	0.048	0.05
Co-edn (C)	332	A Vs C	0.750	NS

From the above table, the result showed that the mean scores of students of boys and co-education students (A Vs C) do not differ statistically in their reasoning ability. But the students of Girls and Co-education (B Vs C) and Boys and girls (A Vs B) showed differ statistically in their reasoning ability. From the mean scores it is clear that the students from girls school students possesses 10.53 which is superior than that of boys and co-education school students.

Correlation between critical thinking and reasoning ability of higher secondary students

Null hypothesis 11

There exists no significant correlation between critical thinking and reasoning ability of higher secondary students.

Table 4.18

Correlation between critical thinking and reasoning ability of higher secondary students

Total sample	Pearson correlation (r)	p	Level of significance
400	0.125	0.012	0.05

An analysis of table reveals that the calculated value ($r=0.125$; $p<0.05$) is significant at 0.05 level. Hence there is significant relationship between critical thinking and reasoning ability of higher secondary students. From the r value it can be said there exists verbal negligible positive correlation between critical thinking and reasoning ability.

FINDINGS CONCLUSION AND SUGGESTIONS

- Major findings
- Conclusion
- Educational implication
- Suggestions for further study

CHAPTER-V

FINDINGS CONCLUSION AND SUGGESTIONS

Resume of the study

The study under investigation is entitled as “Critical thinking and reasoning ability of higher secondary students.

A sample of 400 higher secondary students who were in the age group 16-17 years were selected from different schools in Kanyakumari district of Tamilnadu. The investigator used normative survey method and random sampling technique for the collection of data.

The tools employed were Critical thinking ability Test, Reasoning ability test and General data sheet. The data were subjected to statistical techniques like percentage, t test, ANOVA and Carl Pearson Product Moment Coefficient of Correlation.

Objectives of the study

1. To construct and validate Reasoning Ability Test for higher secondary students.
2. To study the level of Critical thinking ability and Reasoning ability of higher secondary students.
3. To study the significant difference if any in the mean scores of critical thinking ability of higher secondary students, on the basis of
 - i. Gender
 - ii. Locale
 - iii. Subject of study
 - iv. Type of management
 - v. Nature of school
4. To study the significant difference if any in the mean scores of reasoning ability of higher secondary students, on the basis of

- i. Gender
 - ii. Locale
 - iii. Subject of study
 - iv. Type of management
 - v. Nature of school
5. To study the correlation between the critical thinking and reasoning ability of higher secondary students.

Hypotheses framed

The following are the major hypotheses framed for the present investigation.

1. There exists no significant difference in the mean scores of critical thinking ability of male and female higher secondary students.
2. There exists no significant difference in the mean scores of critical thinking ability of rural and urban higher secondary students.
3. There exists no significant difference in the mean scores of critical thinking ability of higher secondary students from government, aided and unaided schools.
4. There exists no significant difference in the mean scores of critical thinking ability of arts and science group higher secondary students.
5. There exists no significant difference in the mean scores of critical thinking ability of higher secondary students from boys, girls and co-education schools.
6. There exists no significant difference in the mean scores of reasoning ability of male and female higher secondary students.

7. There exists no significant difference in the mean scores of reasoning ability of rural and urban higher secondary students.
8. There exists no significant difference in the mean scores of reasoning ability of higher secondary students from government, aided and unaided schools.
9. There exists no significant difference in the mean scores of reasoning ability of arts and science group higher secondary students.
10. There exists no significant difference in the mean scores of reasoning ability of higher secondary students from boys, girls and co-education schools.
11. There exists no significant correlation between critical thinking and reasoning ability of higher secondary students.

Methodology in brief

a) Method

Normative survey method is adopted for the study.

b) Sample

The present study is conducted on a sample of 11 std students who are studying various higher secondary schools of Kanyakumari district following state board syllabus during the academic year 2014-2015. Size of the sample is 400. Stratified random sampling technique is used to select the sample.

c) Tools

The following tools are used for the study.

- iii. Critical Thinking ability test (Deepa.R.P & Dr. M. Sadanandan 2011)
- iv. Reasoning Ability Test. (Investigator 2015)

v. General data Sheet

Statistical techniques

For the analysis of the data collected, following statistical techniques is adopted.

- t test
- ANOVA
- Carl Pearson product moment coefficient of correlation.

Major findings

The following are the important findings of the present investigation

1. There exists significant difference in the mean scores of male and female higher secondary students in their critical thinking ability.
2. There exists significant difference in the mean scores of rural and urban higher secondary students in their critical thinking ability.
3. There exists significant difference in the mean scores of government, aided and unaided higher secondary students in their critical thinking ability.
4. There exists significant difference in the mean scores of arts and science higher secondary students in their critical thinking ability.
5. There exists significant difference in the mean scores of higher secondary students from boys, girls and co-education schools in their critical thinking ability.
6. There exists significant difference in the mean scores of male and female higher secondary students in their reasoning ability.

7. There exists no significant difference in the mean scores of rural and urban higher secondary students in their reasoning ability.
8. There exists no significant difference in the mean scores of government, aided and unaided higher secondary students in their reasoning ability.
9. There exists significant difference in the mean scores of arts and science higher secondary students in their reasoning ability.
10. There exists significant difference in the mean scores of higher secondary students from boys, girls and co-education schools in their reasoning ability.
11. There exists significant correlation between critical thinking and reasoning ability.

Conclusion

Based on the findings, the investigator arrived at the following conclusions

Gender has significant influence on the critical thinking ability of higher secondary students. Female higher secondary school students possess high critical thinking ability than that of male higher secondary school students. This may be due to the careful attention of female students. Locale has significant influence on the critical thinking ability of higher secondary students. Rural higher secondary school students possess high critical thinking ability than that of urban higher secondary school students. This may be due to the risk practical life of rural students. Type of management has significant influence on the critical thinking ability of higher secondary students. Unaided higher secondary school students possess high critical thinking ability than that of government and aided higher secondary school students. This may be due to the proper motivation given to the unaided students. Subject of study has significant influence on the

critical thinking ability of higher secondary students. Science higher secondary school students possess high critical thinking ability than that of Arts higher secondary school students. This may due to the subject knowledge of science students. Nature of the school has significant influence on the critical thinking ability of higher secondary students. Co-education higher secondary school students possess high critical thinking ability than that of boys and girls higher secondary school students. This may due to the proper group activities of Co-education students. Gender has significant influence on the reasoning ability of higher secondary students. Female higher secondary school students possess high reasoning ability than that of male higher secondary school students. This may due to the careful attention of female students. Subject of study has significant influence on the reasoning ability of higher secondary students. Arts higher secondary school students possess high reasoning ability than that of Science higher secondary school students. Nature of the school has significant influence on the reasoning ability of higher secondary students. Girls higher secondary school students possess high reasoning ability than that of boys and co-education higher secondary school students. This may due to the proper concentration of girls school students. There exists significant positive correlation between critical thinking ability and reasoning ability.

Educational implications

The present investigation aimed at studying the critical thinking and reasoning ability of higher secondary students. The study revealed that there exists significant and positive correlation between critical thinking and reasoning ability of higher secondary

students. The findings of the study have certain implications in developing improved educational practices.

1. Classroom teaching could be based on developing Critical thinking.
2. Students could be encouraged to solve various puzzles. So that they can improve their critical thinking ability and reasoning ability.
3. The curriculum could be reoriented to give emphasis on critical thinking ability and reasoning ability.
4. The students could be given challenging projects to improve their critical thinking and reasoning ability.
5. Students could be encouraged to play games like “SUDOKU”
6. Library reading can be encouraged.
7. Seminar and symposium could be organized to improve critical thinking ability.
8. Special coaching classes could be arranged in the school to improve critical and reasoning ability.
9. Students could be encouraged to solve problems by their own.
10. Challenging assignments should be given to the students to improve their critical thinking skill.
11. Cooperative learning could be followed in teaching various subjects.
12. Group discussions can be encouraged.
13. Peer questioning/ Peer tutoring could be encouraged.

Suggestion for further research

The present study leads to the following suggestions for further research.

1. A study may be carried out on state wide sample.

2. Attitude of parents and teachers towards critical thinking and reasoning ability can be studied.
3. Relation of critical thinking with problem solving ability can be studied.
4. Relation of reasoning ability with problem solving ability can be studied.
5. A study on factors influencing critical thinking ability can be studied.
6. A study on factors influencing reasoning ability can be studied.
7. Similar studies can be conducted for disabled children also.

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APPENDICES

Appendix- A

CRITICAL THINKING ABILITY TEST

By

(Deepa R.P & Dr. M. Sadanandan)

(2011)

This test provides problems and situations which require the application of some of the important abilities involved in critical thinking. It contains of 4 parts.

- ❖ Recognition of assumptions
- ❖ Interpretations
- ❖ Deduction
- ❖ Evaluations

The section as recognition of assumptions is items which consist of one statement, followed by two assumptions. Using which the subject is required to judge whether the series are given assumptions follow or not from the statement.

The section on interpretation requires the subject to interpret ideas contained in the factual statements.

The section on deduction was items when the subject is required to read independent statements and decide whether a series of given conclusions follow from original statements.

The section evaluation was a question, for which answer are given together with arguments supporting the answer, the subject has to decide whether the arguments given are strong or weak.

Part – I (Recognition of Assumptions)

Directions: Read the Statements in the top. Decide whether the assumption given below follow from the statements at the top. Then mark your answer as (a), (b), (c), (d)

Question: 1

Statement: The Situation of this area still contains to be tense and out of control. People are requested to be in their homes only.

Assumptions:

1. There had been some serious incidents.
2. People will not go to the office.
3. Normalcy will be restored shortly.

- (a) Only I is implicit (b) Only I and II are implicit
(c) None is implicit (d) Only I and III are implicit

Question: 2

Statement: Pramod decides to get the railway reservation in May, for the journey he wants to make in July to Madras.

Assumptions:

1. The railway issues reservations two months in advance.
2. There is more than one train to Madras
3. There will be vacancy in the desired, class

- (a) Only I is implicit (b) Only II and III are implicit
(c) Only I and III are implicit (d) All are implicit

Question: 3

Statement: The resident of the locality wrote a letter to the corporate requesting to restore normalcy in the supply of drinking water immediately as the supply at present is just not adequate.

Assumptions:

1. The Corporation may not take any action on the better.
2. The Municipality has enough water to meet the demand
3. The water supply to the area was adequate in the past

(a) Only I and III are implicit

(b) Only II is implicit

(c) Only II and III are implicit

(d) Only III is implicit

Question: 4

Statement: The successful man has the ability to judge himself correctly

Assumption:

1. Inability to judge correctly cause failure
2. To judge others is of no use to successful man.
3. The Successful man cannot make a wrong judgment.

(a) None is implicit

(b) All are implicit

(c) Only I and II are implicit

(d) Only II and III are implicit

Question: 5

Statement: The Telephone Company informed the subscribers through a notification that those who do not pay their bills by the due date will be charged penalty for every defaulting day.

Assumptions:

1. Majority of the people may pay their bills by the due date to avoid penalty.
2. The money collected as penalty may set off their losses due to delayed payment
3. People generally pay need to such notices

(a) All are implicit

(b) Only I and III are implicit

(c) Only I and II are implicit

(d) none is implicit

Direction

Read the statements in the top, decide whether the assumption given below follow from the statements at the top. Then mark your answer as (a) only I is implicit (b) Only II is implicit (c) Both I and II is implicit (d) None of these.

Question: 6

Statement: Gandhiji wanted to use the latent energies of the rural unemployed to be Property utilized.

Assumptions:

1. There are unemployed in the villages.
2. Gandhiji was a reformer

Question: 7

Statement: Poverty is a symptom as well as consequence of social disorder.

Assumption:

1. Poverty is a type of social order
2. Poverty is related to social order

Question: 8

Statement: Mankind can get freedom only through revolution

Assumption:

1. Revolutions can bring freedom
2. Expect revolutions there is no other method of getting freedom

Question: 9

Statement: There is no need to open a school here

Assumption:

1. Children in this area do not study
2. There are already many schools in the area.

Question: 10

Statement: Barking dogs seldom bite.

Assumption:

1. Dogs always bark
2. Some dogs bite

Part – II Interpretation

Directions:

In each of the following questions, a statements is given, followed by two conclusions, or ideas supposed to be contained in the original statement examine each conclusion given below and mark your answer as (a) only I follows (b) Only II follows (c) Both I and II are follows (d) None of these.

Questions:

1. Walking is good for health

a) All healthy people go for walking

b) Only walking makes you healthy

2. Company Y-has marketed the product go ahead purchase it if price and quality are your considerations.

a) The product must be good in quality

b) The price of the product must reasonable

3. A neurotic is a non stupid person who behaves stupidly

a) Neuroticism and stupidity go hand in hand

b) Normal persons behave intelligently

4. India's economy is depending mainly on forests.

a) Trees should be preserved to improve Indian economy

b) India wants only maintenance of forests to improve economic conditions.

5. All the organized persons find time for rest; Sunita, in spite of her very busy schedule finds time for rest.

a) Sunita is an organized person

b) Sunita is an industrious person

6. Parents are prepared to pay any price for an elite education to their children

a) All parents these days are very well off

b) Parents have an obsessive passion for a perfect development of their children through good schooling

7. The government of country X has recently announced several concessions and offered attractive package tours for foreign visitors.

a) Now, more number of foreign tourists will visit the country.

b) The government of country X seems to be serious in attracting tourists.

8. Reading makes a full man, conference a ready man and writing an exact man.

a) Pointed and precise expression comes only through extensive writing

b) Extensive reading makes a complete man

9. Industrial revolution which first of all started in Europe has brought about modern age.

a) Disparity between rich and poor result in revolution

b) Revolution overhauls society

10. This world is neither good nor evil; each man manufactures a world for himself.

a) Some people find this world quite good

- b) Some people find this world quite bad

Part – III – Deduction

Direction:

In each question below are given two statements followed by two conclusions numbered I and II. You have take the given two statements to be even if they seem to be at variance from commonly known facts. Read the conclusions and then decide which of the given conclusions logically from the two given statements disregarding commonly known facts. Give answer (a) only conclusion I follows (b) only conclusion II follows (c) Both conclusion I and II follows (d) none of these.

1. Horse is a bird. Some birds are clouds. So

Conclusion:

- a) Horse is a cloud
b) Some clouds are birds

2. All tables are ants, some ants ate chars so

Conclusion:

- a) Some tables are chairs
b) Some chairs are tables

3. No man is a monkey. John is man. So John is not a monkey.

Conclusion:

- a) John is not a monkey
b) John is a monkey

4. All boys are mothers. All mothers are Father. So

Conclusion:

a) All mothers are boys

b) All boys are Fathers

5. All hens are swans. No swan is a chair. Therefore,

Conclusion:

a) No chair is hen

b) No hen is chair

6. All children are innocent some animals are innocent. Therefore,

Conclusion:

a) Some animals are children

b) Some children's are animals

7. Only first divisioners are admitted. Ram is first divisioner, so,

Conclusion:

a) Ram is admitted

b) All admitted are first divisioners

8. Sounds are visible, colours are not sounds, So

Conclusion:

a) Colours are not visible

b) No visible thing is colour

9. Light removes darkness. Aluminum is light, So

Conclusion:

a) Colours are not visible

b) No visible thing is colour

10. All nouns are verbs. All verbs are adjectives. Therefore,

Conclusion:

- a) Some nouns are adjectives
- b) Some adjectives are noun.

Part – IV – Evaluation

Directions:

Examine that statement given below. Every statements are followed by an argument either positive (or) negative decide which one is strongly support the statement and which one weak. Then mark your answer as (a) only arguments I is strong (b) only arguments II is strong (c) Both arguments I and II are strong (d) None of these.

1. Should number of holidays of Government employees be reduced?

Arguments:

- a) Yes, our Government employees are having minimum number of holidays among the other countries of the world.
- b) No. It will lead to decreased productivity of govt. offices.

2. Should there be reservation of seats and posts on communal basis?

Arguments:

- a) Yes, it will check most of the inter-communal biases.
- b) No. Ours is a secular state.

3. Should government spend huge amounts of money in international sports?

Arguments:

- a) No this money can be utilized for upliftment of the poor.
- b) Yes, sports person will be frustrated and will not get international exposure.

4. Should there be a complete ban on selling drugs near school?

Arguments:

a) Yes, children's health is spoiled by using them.

b) No, it will affect the business of shop keeper

5. Should a total ban to put on trapping wild animals?

a) Yes, Trappers are making a lot of money

b) No, Ban on hunting and trapping are not effective

6. Should school education be made free in India?

Arguments:

a) Yes, this is the only way to improve the level of literacy.

b) No, it will affect the business of shop keeper.

7. Should an like organization UNO be dissolved?

a) Yes, with cold war coming to an end, such organizations have no role to pay.

b) No, in the absence of such organizations there may be a world war.

8. Should India stop missile development

a) Yes, the U.S.A desires so,

b) No, the nation must always remain up to date in its defense preparedness.

9. Should government jobs in rural areas have more incentives

a) Yes, incentives are essential for attracting government servants there

b) No, rural areas are already cheaper. Healthier and less complex than urban areas so, why offer extra incentives

10. Should military service be made compulsory in our country

a) No. It is against the policy of non-violence.

b) Yes, every citizen should protect his country.

Appendix-B

(Draft scale)

N.V.K.S.D. COLLEGE OF EDUCATION, ATTOOR

REASONING ABILITY TEST

(JEYA SHEELA T. & Dr. DEEPA.R.P.)

(2014-2015)

Instructions

This test consists of questions related to Arithmetic reasoning, Logical reasoning, Verbal reasoning and Non verbal reasoning abilities.. Each question has multiple choices for answering. Please read all questions carefully and write your answer as 'a', 'b', 'c', or 'd'.

Section: A

1. The next term in the series:

2,3,10,15,26,_____

a)36 b)35 c)37 d)40

2. Two numbers are in the ratio 3:5. If 9 is subtracted from the numbers, the ratio becomes 12: 23. The numbers are

a)30,50 b)36,50 c)33,55 d)42,70

3. Find the greatest number which will divide 2112 and 2792 leaving the remainder 4 in each case

a)63 b)64 c)68 d)78

4. 45:36::63:?

a)71 b)54 c)61 d)64

5. If '/' means '+', '-' means 'X', 'X' means '/', and '+' means '-' then, find 15-

$8 \times 6 / 12 + 4 + ?$

- a)20 b)28 c)84 d)23
6. Find the next number in the series. 23, 25, 53, 163, 657, 3291, ”?”
- a)16461 b)13169 c)19753 d)9877
7. $1485X? = 594$
- a)2/5 b)3/4 c)3/5 d)5/6
8. $2116 + 692 - ? = 1111$
- a)1667 b)1677 c)1687 d)1697
9. $672/24 \times 18 + 153 - 345 = ?$
- a)318 b)314 c)308 d)none of these
10. What is the value of three fourth of sixty percent of 480?
- a)216 b)218 c)212 d)214

section: B

1. The next term in the series: ED, JI, NM, QP, ?
- a)UT b)ST c)TU d)SU
2. If PAPER is coded RCRGT, then PURSE will be coded as,
- a)RXNKG b)RWTUG c)QMSTO d)RXMZN
3. In a certain code, TABLES is written as UBAMDT. How is CANDLE written in that code?
- a)DBOEJE b)BBMCHC c)DZOCJC d)BBMEKF
4. What should come next in the following letter series?
- ABCDPQRSABCDEPQRSTABCDEFQRST
- a)A b)V c)U d)W
5. ‘BF’ is related to ‘HL’ in the same way as ‘EI’ is related to?

a)KO b)KN c)JN d)JO

6. A word given in capital letters is followed by four words. Out of these only one cannot be formed by using the letters of the given word. Find out the word.

REVOLUTIONARY

a)REVOLT b)TRAIL c)VOCATIONd)VOLUNTARY

7. In a certain code, JOURNEY is written as TNISZFO. How is MEDICAL written in that code?

a)CDLJMBD b)CDLJMBH c)CDFRTYN d)HUYTHIN

8. How many meaningful English words can be made with the letters DLEI using each letter only once in each word?

a)none b)one c)two d)three

9. In a certain code, JUMP is written as '39/4', and MEALS is written as '/2#7@'. How PULSE written in that code?

a)493@2 b)47@54 c)487@7 d)497@2

10. Arrange the following words as per dictionary

1)lazy 2)late 3)lamp 4)lack 5)lake

a)4,3,5,2,1 b)4,5,3,2,1 c)3,4,2,1,5 d)3,2,4,5,1

section: C

1. Jan 2, 2007 was Monday, what day of the week lies on jan2, 2008?

a)Monday b)Tuesday c)Wednesday d)sunday

2. The calendar for the year 2008 will be same for the year,

a)2014 b)2016 c)2017 d)2019

3. At 3.40, the hour hand and the minute hand of a clock form an angle of

- a)120° b)125° c)130° d)135°
4. How many times in a day, the hands of a clock are straight?
a)22 b)24 c)44 d)48
5. A group went out for a walk. Shiji walked before Jeberson. Jebin was walking behind Shibina and ahead of Jeberson. Who walked last?
a)Jebin b)Jeberson c)Shibina d)Shiji
6. Study : knowledge :: work:?
a)Experience b)service c)Experiment d)appointment
7. Among MNOP and Q, each having different weights. P is heavier than only M and O is lighter than N and Q. Who among them is the heaviest
a)N b)Q c)O d)data inadequate
8. Psychology: mind ::Ornithology:?
a)Sanskrit b)coin c)Mammal d)Bird
9. Pick out the odd one,
a)cotton b)terene c)silk d)wool
10. Spears is brother of Stanlin. Stanlin is brother of Eugin. Eugin is the husband of Sowmiya. Sylus is the father of Spears. Sowmiya is related to Sylus as,
a)Daughter b)daughter in law c)sister in law d)sister

Appendix-C

(Final Scale)

N.V.K.S.D. COLLEGE OF EDUCATION, ATTOOR

REASONING ABILITY TEST

(JEYA SHEELA T. & Dr. DEEPA.R.P.)

(2014-2015)

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a)20 b)28 c)84 d)23

6. $1485X? = 594$

a)2/5 b)3/4 c)3/5 d)5/6

7. $2116 + 692 - ? = 1111$

a)1667 b)1677 c)1687 d)1697

8. What is the value of three fourth of sixty percent of 480?

a)216 b)218 c)212 d)214

Section: B

1. The next term in the series: ED, JI, NM, QP, ?

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2. If PAPER is coded RCRGT, then PURSE will be coded as,

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3. In a certain code, TABLES is written as UBAMDT. How is CANDLE written in that code?

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a)493@2 b)47@54 c)487@7 d)497@2

7. Arrange the following words as per dictionary

1)lazy 2)late 3)lamp 4)lack 5)lake

a)4,3,5,2,1 b)4,5,3,2,1 c)3,4,2,1,5 d)3,2,4,5,1

Section: C

1. Jan 2, 2007 was Monday, what day of the week lies on Jan 2, 2008?

a)Monday b)Tuesday c)Wednesday d)sunday

2. Study : knowledge :: work:?

a)Experience b)service c)Experiment d)appointment

3. Among M, N, O, P and Q, each having different weights. P is heavier than only M and O is lighter than N and Q. Who among them is the heaviest

a)N b)Q c)O d)data inadequate

4. Pick out the odd one,

a)cotton b)terene c)silk d)wool

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a)Daughter b)daughter in law c)sister in law d)sister

Appendix- D

N.V.K.S.D. COLLEGE OF EDUCATION,

ATTOOR.

(2014-2015)

GENERAL DATA SHEET

1. Name of the student :
2. Age :
3. Name of the school :
4. Gender : Male/ Female
5. Locale : Rural/ Urban
6. Subject of study : Arts/ Science
7. Type of management : Govt/ aided/ unaided
8. Nature of the school : Boys/ Girls/ Co-ed

Appendix-E

Scoring Keys

Critical Thinking Ability Test

Part I

1)b 2)a 3)d 4)d 5)c 6)b 7)c 8)d 9)b 10)c

Part II

1)d 2)c 3)a 4)a 5)c 6)b 7)c 8)c 9)b 10)c

Part III

1)d 2)d 3)a 4)b 5)d 6)d 7)a 8)d 9)d 10)c

Part IV

1)b 2)b 3)b 4)a 5)d 6)b 7)b 8)b 9)a 10)d

Reasoning Ability Test

Section A

1)b 2)c 3)c 4)d 5)b 6)a 7)d 8)a

Section B

1)a 2)b 3)a 4)c 5)a 6)d 7)b

Section C

1)b 2)a 3)c 4)b 5)b

Section D

1)b 2)c 3)c 4)a 5)d