

**ADVERSITY QUOTIENT, COGNITIVE STYLES AND
ACHIEVEMENT IN MATHEMATICS AMONG
HIGHER SECONDARY SCHOOL
STUDENTS IN KERALA**

Thesis
Submitted for the degree of
DOCTOR OF PHILOSOPHY IN EDUCATION

By
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**GOVERNMENT COLLEGE OF TEACHER EDUCATION, KOZHIKODE
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2023

DECLARATION

I, SHENI P.R., do hereby declare that this thesis entitled **ADVERSITY QUOTIENT, COGNITIVE STYLES AND ACHIEVEMENT IN MATHEMATICS AMONG HIGHER SECONDARY SCHOOL STUDENTS IN KERALA** is an original study done by me for the award of the Degree of Doctor of Philosophy in Education. I also declare that the entire thesis or part of it has not been previously submitted for the award of any degree, diploma, associateship, fellowship, title or recognition.

Place: Kozhikode

Date: 29/05/2023



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CERTIFICATE

I, DR. ABDUL KADER PARAMBAT, do hereby certify that the thesis entitled **ADVERSITY QUOTIENT, COGNITIVE STYLES AND ACHIEVEMENT IN MATHEMATICS AMONG HIGHER SECONDARY SCHOOL STUDENTS IN KERALA** is a record of bonafide research work carried out by Smt. SHENI P R under my supervision and guidance and that no part thereof has been presented before for any other Degree, Diploma, Associateship or other similar title of recognition in any other University.

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CONTENTS

LIST OF TABLES	i-iv
LIST OF FIGURES	v
LIST OF APPENDICES	vi

<i>Chapter</i>	<i>Title</i>	<i>Page No.</i>
1	INTRODUCTION	1-14
2	REVIEW OF RELATED LITERATURE	15-68
3	METHODOLOGY	69-98
4	ANALYSIS	99-158
5	SUMMARY AND CONCLUSION	159-176
6	RECOMMENDATIONS	177-184
	REFERENCES	185-196
	APPENDICES	vii-lxxii

LIST OF TABLES

Table No.	Title	Page No.
1	An overview of Cognitive Styles	35
2	Factors affecting Achievement in Mathematics	42
3	Dimension wise distribution of items of Adversity Quotient Scale (Draft)	78
4	Component wise distribution of items of Adversity Quotient Scale (Draft)	78
5	The result of item analysis of Adversity Quotient Scale	80
6	Dimension wise distribution of items of Adversity Quotient Scale (Final)	82
7	Component wise distribution of items of Adversity Quotient Scale (Final)	82
8	Result of item analysis of the Cognitive Style Inventory	88
9	Weightage to content and learning outcomes	91
10	Weightage to thinking skills	91
11	Weightage to form of questions	92
12	Blue Print of the Achievement Test in Mathematics	92
13	Result of item analysis of Achievement Test in Mathematics	94
14	The statistical constants of AQ scores for the total sample and subsamples of higher secondary school students	100
15	Statistical constants of scores of Systematic Scale of Cognitive Styles for the total sample and subsamples	101
16	Statistical constants of scores of Intuitive Scale of Cognitive Styles for the total sample and subsamples	101
17	Statistical constants of Achievement in Mathematics for the total sample and subsamples	102
18	Percentages of higher secondary school students belonging to high, moderate and low levels of AQ groups for the total sample	105
19	Percentages of higher secondary school students belonging to high, moderate and low levels of AQ groups among subsamples	106

Table No.	Title	Page No.
20	Percentages of higher secondary school students belonging to different Cognitive Style groups for total sample	109
21	Percentages of higher secondary school students belonging to different Cognitive Style groups among subsamples	110
22	Data and results of the test of significance of difference between the mean scores of AQ among subsamples	113
23	Data and results of the test of significance of difference between the mean scores of Control dimension of AQ among subsamples	114
24	Data and results of the test of significance of difference between the mean scores of Origin and Ownership dimension of AQ among subsamples	114
25	Data and results of the test of significance of difference between the mean scores of Reach dimension of AQ among subsamples	115
26	Data and results of the test of significance of difference between the mean scores of Endurance dimension of AQ among the subsamples	116
27	Data and results of the test of significance of difference between the mean scores of Individual Related component of AQ among subsamples	117
28	Data and results of the test of significance of difference between the mean scores of Home Related component of AQ among subsamples	118
29	Data and results of the test of significance of difference between the mean scores of Institution Related component of AQ among subsamples	119
30	Data and results of the test of significance of difference between the mean scores of Society Related component of AQ among subsamples	119
31	Data and results of the test of significance of difference between the mean scores of Achievement in Mathematics among subsamples	120
32	The descriptive statistics of achievement in mathematics among high, moderate and low levels of AQ for the total sample and subsamples	121
33	Data and result of one way ANOVA in Mathematics Achievement among higher secondary school students with high, moderate and low levels of AQ for the total sample	122
34	Summary of results of Scheffés Post Hoc test for Achievement in Mathematics of higher secondary school students with high, moderate and low levels of AQ for the total sample	123

Table No.	Title	Page No.
35	Data and result of One Way ANOVA in Mathematics Achievement among male students with high, moderate and low levels of AQ	124
36	Summary of Scheffés Post Hoc test for Achievement in Mathematics among male students with high, moderate and low levels of AQ.	125
37	Data and result of One Way ANOVA in Mathematics Achievement among female students with high, moderate and low levels of AQ	126
38	Summary of Scheffés Post Hoc test for Achievement in Mathematics among female students with high, moderate and low levels of AQ	127
39	Data and results of One Way ANOVA in Mathematics Achievement among rural students with high, moderate and low levels of AQ	128
40	Summary of Scheffés Post Hoc test for Achievement in Mathematics among rural students with high, moderate and low levels of AQ	129
41	Data and results of One Way ANOVA in Mathematics Achievement among urban students with high, moderate and low levels of AQ	130
42	Summary of Scheffés Post Hoc Test for Achievement in Mathematics among urban students with high, moderate and low levels of AQ	131
43	Descriptive statistics of Achievement in Mathematics of students with different Cognitive Styles for the total sample	133
44	Data and result of One Way ANOVA in Mathematics Achievement among higher secondary school students with different Cognitive Styles for the total sample	134
45	Summary of Scheffés Post Hoc test for Mathematics Achievement of students with different Cognitive Styles for the total sample	134
46	Descriptive statistics of Achievement in Mathematics among male students with different Cognitive Styles	136
47	Data and result of One Way ANOVA in Mathematics Achievement among male students with different Cognitive Styles	137
48	Summary of Scheffés Post Hoc test for Mathematics Achievement among male students with different Cognitive Styles	137
49	Descriptive statistics of Achievement in Mathematics among female students with different Cognitive Styles	138
50	Data and result of One Way ANOVA in Mathematics Achievement among female students with different Cognitive Styles	139

Table No.	Title	Page No.
51	Descriptive statistics of Achievement in Mathematics among rural students with different Cognitive Styles	140
52	Data and result of One Way ANOVA in Mathematics Achievement among rural students with different Cognitive Styles	141
53	Summary of Scheffés Post Hoc test for Mathematics Achievement among rural students with different Cognitive Styles	142
54	Descriptive statistics of Achievement in Mathematics among urban students with different Cognitive Styles	143
55	Data and result of One Way ANOVA in Mathematics Achievement among urban students with different Cognitive Styles	144
56	Correlation between AQ and Achievement in Mathematics for the total sample and subsamples	145
57	Correlation between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples	146
58	The Correlation Matrix of the criterion variable with the predictor variables for total sample of higher secondary school students	148
59	The model summary of Multiple Correlation Coefficient for Achievement in Mathematics	148
60	Result of ANOVA in Multiple Regression of predictors Control, Origin and Ownership, Reach, and Endurance on Achievement in Mathematics for the total sample	149
61	Variable wise Beta Coefficients and t values in predicting Achievement in Mathematics	149
62	Standardized Regression Coefficients, percentage of Individual Contribution, Structure Coefficient and Squared Structure Coefficient of the predictor variable in predicting Achievement in Mathematics	151

LIST OF FIGURES

Figure No.	Title	Page No.
1	Levels of adversity	18
2	Illustration of the Cognitive Style Model of Martin (1983)	37
3	Diagrammatic representation of variables	70
4	Breakup of the sample	95
5	Normal P-P Plot of AQ	103
6	Normal P-P Plot of Achievement in Mathematics	104
7	Higher secondary school students belonging to high, moderate and low levels of AQ groups for the total sample	106
8	Higher secondary school students belonging to high, moderate and low levels of AQ among subsamples	107
9	Higher secondary school students belonging to different Cognitive Style groups for the total sample	110
10	Higher secondary school students belonging to different Cognitive Style groups among subsample based on gender	111
11	Higher secondary school students belonging to different Cognitive Style groups among subsample based on locale	112
12	Achievement in Mathematics of students with high, moderate and low levels of AQ for the total sample	124
13	Achievement in Mathematics among male students with high, moderate and low levels of AQ	126
14	Achievement in Mathematics among female students with high, moderate and low levels of AQ	128
15	Achievement in Mathematics among rural students with high, moderate and low levels of AQ	130
16	Achievement in Mathematics among urban students with high, moderate and low levels of AQ	132
17	Achievement in Mathematics among higher secondary school students with different Cognitive Styles for the total sample	133
18	Achievement in Mathematics among male students with different Cognitive Styles	136
19	Achievement in Mathematics among female students with different Cognitive Styles	139
20	Achievement in Mathematics among rural students with different Cognitive Styles	141
21	Achievement in Mathematics among urban students with different Cognitive Styles	143

LIST OF APPENDICES

Appendix	Title	Page No.
I	Adversity Identification Questionnaire	vii-xiv
II	Percentages of positive responses to Adverse Situations of higher secondary school students	xv-xviii
III	Adversity Quotient Scale (Draft)	xix-xxx
IV	Adversity Quotient Scale (Final)	xxxi-xxxviii
V	Cognitive Style Inventory (Draft)	xxxix-xlvi
VI	Cognitive Style Inventory (Final)	xlvii-liv
VII	Learning Outcomes	lv-lvi
VIII	Achievement Test in Mathematics (Draft)	lvii-lviii
IX	Scoring key and marking scheme of Achievement Test in Mathematics - Draft	lvix-lxii
X	Question Wise Analysis	lxiii-lxiv
XI	Achievement Test in Mathematics (Final)	lxv-lxvi
XII	Scoring key and marking scheme of Achievement Test in Mathematics – Final	lxvii-lxix
XIII	Certificates of expert validation of the tool ‘Adversity Quotient Scale’	lxx-lxxii

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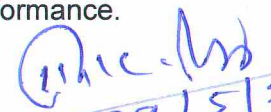
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Abstract

Today's competitive world compels each one to adapt to the life's challenges. Adversity Quotient (AQ) is the ability of an individual to deal effectively with adversities and change them into opportunities for better attainment in life (Stoltz, 1997). Cognitive Styles are psychological dimensions representing consistencies in an individual's manner of cognitive functioning, particularly with respect to acquiring and processing information (Ausburn & Ausburn, 1978). This study was intended mainly to find out whether AQ and Cognitive Styles determine the Achievement in Mathematics of higher secondary school students. Survey method was used for the study. The sample consisted of 1130 higher secondary school students in Kerala. Adversity Quotient Scale (Parambat & Sheni, 2018), Cognitive Style Inventory (Parambat & Sheni, 2018) and Achievement Test in Mathematics (Parambat & Sheni, 2018) were used for collecting data. Statistical techniques used for the study were Percentage Analysis, Mean Difference Analysis, One Way ANOVA, Correlation Analysis, and Multiple Regression Analysis.

The result of the study revealed that there exist different levels of AQ such as High, Moderate and Low among higher secondary school students. The findings of the study also showed that there exists no significant difference in the mean scores of AQ based on gender and locale for the total sample. The study also revealed that students with High AQ achieve greater in Mathematics than students with Moderate AQ or Low AQ. It is also found that there are significant individual and combined contributions of dimensions of AQ in predicting Achievement in Mathematics. There exist significant differences in the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample, male and rural students. Exploring AQ of students may help to train them to analyse their difficulties and to develop resiliency to overcome them effectively. The study also implied that instead of focusing on a particular style, students may be given exposure to familiarise the strategies of alternate styles. Such exposure may be useful for them to improve their performance.


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Abstract

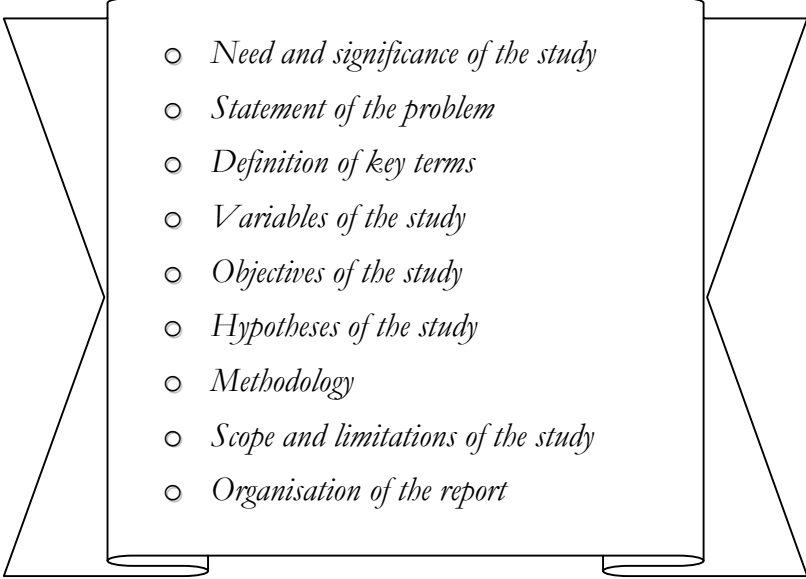
ഇന്നത്തെ മത്സരാധിഷ്ഠിത ലോകം ജീവിതത്തിലെ വെല്ലുവിളികളോട് പൊരുത്തപ്പെടാൻ ഓരോരുത്തരെയും നിർബന്ധിക്കുന്നു. ജീവിതത്തിലെ പ്രതികൂല സാഹചര്യങ്ങളെ ഫലപ്രദമായി നേരിടാനും അവയെ മെച്ചപ്പെട്ട ജീവിതത്തിനുള്ള അവസരമാക്കി മാറ്റാനുമുള്ള വ്യക്തിയുടെ ശേഷിയാണ് അഡ്വേഴ്സിറ്റി കോഷ്യൂസ് (എക്യൂ) (സ്റ്റോൾഡ്സ്, 1997). കോഗ്നിറ്റീവ് ശൈലികൾ എന്നത് ഒരു വ്യക്തിയുടെ വൈജ്ഞാനിക പ്രവർത്തന രീതിയിലുള്ള പ്രത്യേകിച്ച് വിവരങ്ങൾ സമ്പാദിക്കുന്നതും പ്രോസസ്സ് ചെയ്യുന്നതുമായി ബന്ധപ്പെട്ട സ്ഥിരതയെ പ്രതിനിധീകരിക്കുന്ന മനുഷ്യാസ്ത്രപരമായ ഡൈമെൻഷനുകളാണ് (ഓസ്ബേൺ & ഓസ്ബേൺ, 1978). എക്യൂവും, കോഗ്നിറ്റീവ് ശൈലികളും ഹയർസെക്കൻഡറി വിദ്യാർത്ഥികളുടെ ഗണിതശാസ്ത്ര അച്ചീവ്മെന്റിനെ നിർണ്ണയിക്കുന്നുണ്ടോ എന്ന് കണ്ടെത്താനാണ് പ്രധാനമായും ഈ പഠനം ഉദ്ദേശിക്കുന്നത്. പഠനത്തിനായി സർവ്വേ രീതിയാണ് ഉപയോഗിച്ചത്. കേരളത്തിലെ 1130 ഹയർസെക്കൻഡറി സ്കൂൾ വിദ്യാർത്ഥികൾ അടങ്ങുന്നതാണ് സാമ്പിൾ. അഡ്വേഴ്സിറ്റി കോഷ്യൂസ് സ്കെയിൽ (പറമ്പാട്ട് & ഷേനി, 2018), കോഗ്നിറ്റീവ് സ്റ്റൈൽ ഇൻവെന്ററി (പറമ്പാട്ട് & ഷേനി, 2018), ഗണിതശാസ്ത്ര അച്ചീവ്മെന്റ് ടെസ്റ്റ് (പറമ്പാട്ട് & ഷേനി, 2018) എന്നിവയാണ് വിവരശേഖരണത്തിനു ഉപയോഗിച്ചത്, പെർസെൻറേജ് അനാലിസിസ്, മീൻഡിഫറൻസ് അനാലിസിസ്, വൺവേ അനോവ, കോറിലേഷൻ അനാലിസിസ്, മൾട്ടിപ്പിൾ റിഗ്രഷൻ അനാലിസിസ് എന്നീ സ്റ്റാറ്റിസ്റ്റിക്കൽ ടെക്നിക്കുകൾ ആണ് പഠനത്തിനുപയോഗിച്ചത്.

ഹയർസെക്കൻഡറി സ്കൂൾ വിദ്യാർത്ഥികൾക്കിടയിൽ ഉയർന്ന, മിതമായ, താഴ്ന്ന എ.ക്യൂ എന്നിങ്ങനെ വിവിധ തലങ്ങളിൽ എ.ക്യൂ ഉണ്ടെന്ന് പഠനഫലം വെളിപ്പെടുത്തുന്നു. മൊത്തം സാമ്പിളിൽ ലിംഗഭേദവും പ്രാദേശികവും അടിസ്ഥാനമാക്കിയുള്ള എക്യൂ വിൻഡെ ശരാശരി സ്കോറുകളിൽ കാര്യമായ വ്യത്യാസമില്ല. മിതമായ എക്യൂ അല്ലെങ്കിൽ കുറഞ്ഞ എക്യൂ ഉള്ള വിദ്യാർത്ഥികളെ അപേക്ഷിച്ച് ഉയർന്ന എക്യൂ ഉള്ള വിദ്യാർത്ഥികൾ ഗണിതശാസ്ത്രത്തിൽ മികച്ച നേട്ടം കൈവരിക്കുന്നുവെന്നും പഠനം വെളിപ്പെടുത്തുന്നു. ഗണിതശാസ്ത്ര അച്ചീവ്മെന്റ് പ്രവചിക്കുന്നതിൽ എക്യൂവിന്റെ ഡൈമെൻഷനുകളുടെ വ്യക്തിഗതവും സംയോജിതവുമായ സംഭാവനകൾ ഗണ്യമായി ഉണ്ടെന്നും കണ്ടെത്തി. വ്യത്യസ്ത കോഗ്നിറ്റീവ് ശൈലികളുള്ള വിദ്യാർത്ഥികൾക്കിടയിൽ ഗണിതശാസ്ത്ര അച്ചീവ്മെന്റിന്റെ ശരാശരി സ്കോറുകളിൽ കാര്യമായ വ്യത്യാസമുണ്ട് എന്നും പഠനം വ്യക്തമാക്കുന്നു. വിദ്യാർത്ഥികളുടെ എക്യൂ പര്യവേക്ഷണം ചെയ്യുന്നത് അവരുടെ ബുദ്ധിമുട്ടുകൾ വിശകലനം ചെയ്യാനും അവയെ ഫലപ്രദമായി തരണം ചെയ്യുന്നതിനുള്ള പ്രതിരോധശേഷി വികസിപ്പിക്കാനും പരിശീലിപ്പിക്കുന്നതിനു സഹായിച്ചേക്കാം. ഒരു പ്രത്യേക ശൈലിയിൽ ശ്രദ്ധ കേന്ദ്രീകരിക്കുന്നതിനുപകരം, വിദ്യാർത്ഥികൾക്ക് ഇതര ശൈലികളെ പരിചയപ്പെടാൻ അവസരം നൽകണമെന്ന് പഠനം ചൂണ്ടിക്കാട്ടുന്നു. അത്തരം അവസരങ്ങൾ അവരുടെ പ്രകടനം മെച്ചപ്പെടുത്താൻ ഉപയോഗപ്രദമാകും.


29/5/23
Abdul Kader Parambat
Research Supervisor

Chapter 1

INTRODUCTION

- 
- A decorative frame with a central rectangular area containing a list of study components. The frame has a ribbon-like border on the left and right sides, and a scroll-like bottom edge. The list items are centered within the frame.
- *Need and significance of the study*
 - *Statement of the problem*
 - *Definition of key terms*
 - *Variables of the study*
 - *Objectives of the study*
 - *Hypotheses of the study*
 - *Methodology*
 - *Scope and limitations of the study*
 - *Organisation of the report*

INTRODUCTION

Education is a continuous and dynamic process through which an individual acquires knowledge, skills, abilities and values. Education prepares individuals for life. In the present globalization era, education plays a decisive role. Education brings desired changes in the individuals and turns them into good citizens of the nation and the world. Thus education acts as the backbone of every developing society.

Education cannot be considered as acquiring knowledge only, instead it is exploring life. Education is for inducing positive and healthy attitude towards life, instilling democratic values in people, encouraging co-operative living in the society, resolving disputes and promoting independency among the individuals.

Education empowers individuals in all aspects by preparing them to find better means to enhance the quality of their life. It widens the perspective about life of the individuals and helps to understand the world around them.

Modernization is taking place in almost all areas of human endeavour. Education enables a person to know his rights and duties towards society as well as to the nation and serves as a means to make changes in the society. Education empowers critical thinking of humans. It is a tool to turn weakness into strength. It prepares individuals to view obstructions in life as challenges and helps to overcome them with confidence. Education moulds individuals as self-reliant and self-supporting. It equips one to think logically and creatively and to use their innate capabilities to become better problem solvers. Delors (1996) report to UNESCO high lightened the need for individuals to 'learn how to learn' to cope with the rapid changes and challenges of the present and future.

Life is a struggle between positive and negative incidents and follows a balance between successes and failures. Adversities are unavoidable elements in

every one's life. Every individual has to face some sort of adversities in their life. People encounter such situations in diverse ways. Individuals reacts to adversities either productively or unproductively. How effectively a person deals with adversities is important than what happens.

When an individual productively handles an adversity, he attains proper skills to deal with such situations. On the other hand, there are individuals who feel helpless and easily gives up on facing such tough situations in life.

Stoltz (1997) defined Adversity Quotient (AQ) as the ability of the individual to deal effectively with adversities in life and change them into an opportunity for better achievements in life. It is a measure of how one responds when an adversity hits. It has a decisive role in life's various challenges. AQ is an emerging conceptual framework for understanding and developing all facets of success and it is the science of human resilience (Stoltz, 1997). Resilience is the capacity to recover quickly from difficulties and tough situations in life. World Health organization (WHO, 2017) demands training in life skills like resilience in schools. National Educational Policy (2020) has highlighted the need to develop resilience among students.

In the educational context, AQ has vital role in student's life for enhancing their performance. In the case of students, the adversities include peer pressure, gender discrimination, difficulties in society, unfavorable school climate, poor social relationships, discarded family environment, loneliness etc. (Nikam & Uplane, 2013).

AQ predicts who will continue and conquer during the tough situations. Stoltz (1997) considered AQ as a global predictor of success. It briefly explains whether the person is able to overcome adversities successfully, endure to some extent or simply withdraw. In the educational setting it is essential for the teachers to have a knowledge about their student's AQ which better predicts their success.

Individuals differ in their thinking, decision making and problem-solving ability. Individuals have preferred pattern of cognitive processes like perception, information processing, decision making and problem solving. Cognition is the mental activity through which humans attain, remember and learn to use knowledge.

Cognitive Styles are the characteristic ways by which individual conceptualizes the environment (Goldstein & Blackmann, 1978). It is the process through which an individual receives information from the environment, transforms and uses that information to respond to the environment in his own typical ways. Cognitive Styles are psychological dimensions representing consistencies in an individual's manner of cognitive functioning, particularly with respect to acquiring and processing information (Ausburn & Ausburn, 1978).

Educational psychologists consider individual differences as one of their main area of interest. It is essential for both teachers and learners to know how one receives information and converts it into meaningful knowledge in the teaching learning environment. The success of any educational program relies upon how the learner receives and processes information.

Mathematics plays a decisive role especially in the social and economic development of the country. Modernisation demands greater attainment in Science, Technology, Engineering and Mathematics (STEM) domain.

Mathematics is an integral part of human life. As mathematics develops critical thinking and observation, it is essential for solving real world problems. It also induces the skill for problem solving and decision making.

One of the goals of learning mathematics is to make students become effective problem solvers. Mathematics enables students to analyse life's situations logically and determine the proper solution based on the conditions (Ramana, 2016).

Need and Significance of the Study

Today's competitive world compels each one to adapt to the life's challenges. Education guides individuals to fight against adversities with courage and find better solutions to problems.

Adolescent age is very important from the educational point of view. During this stage the adolescents tries to explore their own socio- psychological identity. During this period students experiences biological and psychological changes, anxiety, and mental stress. Adolescents in middle stage (15-17 years) experience capacity for abstract thought and they begin to set long term goals. At this stage adolescents experience social and emotional changes and a growing drive for independence (State Adolescent Health Resource Centre, 2013). Also, they have to take bold decisions about their future education and career.

Adolescence is a time of new challenges and opportunities. At this stage when individuals fail to meet these challenges positively, they may develop personal and social problems leading to their maladjustment (Mallick & Dar, 2015). The lack of support and guidance can lead many adolescents to problematic behaviors, reducing their ability to respond in a healthy way when faced with struggling circumstances or difficult decisions (Haugaurd, 2001). Majority of young people encounter more or less serious problems related to their home, school experiences, and their social relationships. Adolescents at higher secondary level face more problems from educational and emotional aspects (Mumthas & Muhsina, 2014).

The important areas of changes and challenges that the individuals face during adolescence are physiological pressures, cognitive processes and psychological and emotional changes (Kaur, 2006).

Adversities in life cannot be avoided. Depending on the nature of adversities each one has to deal with them effectively. AQ is the ability to deal effectively with adversities in life. Those people who apply AQ in their life will perform optimally in

difficulties. Such people learn to cope with the adversities and respond to them faster and better (Stoltz, 1997).

Three categories of people exist according to their AQ. People who accept challenges and thrive hard are considered as people with High AQ. People with Moderate AQ can manage adverse events but have less drive than those with high AQ. People with Low AQ try to escape from challenges and they tend to give up if worse situation arises (Stoltz, 1997).

People with high Intelligence Quotient (IQ) and Emotional Quotient (EQ) can be considered to have increased chances of success. When an adversity hits, some of the gifted and emotionally stable people may fail to use their potential to the maximum extent. There are individuals with limited resources and opportunities rise above their circumstances and exceed all expectations. AQ predicts performance, motivation, empowerment, creativity, productivity, learning, energy, hope, happiness, vitality, emotional health, physical health, persistence, resilience, attitude, longevity and response to change. (Stoltz, 1997)

AQ has the potential which needs to be explored in order to empower students (D'Souza, 2006) and serve as a predictor besides IQ and EQ on student's Achievement (Stoltz, 1997). A student needs to have high AQ to gain high learning achievement (Hastuti et al., 2018). Thus the AQ of each student is informative for the teachers. It acts as a tool to predict the performance of students. Knowledge of AQ explores the profile of the students to know whether the child has control over the adverse situations, whether they take accountability, whether adversities reach into other areas of their life and whether they consider it as enduring.

Cognitive Style is an important part of various applied fields such as Education, Information Sciences, Management Sciences etc. It helps to know the process by which students, teachers, information seekers process information. The knowledge about Cognitive Style helps to modify teaching - learning systems in order to inculcate the diversified nature of the users. Investigators in many applied fields identified that

Cognitive Style can be a better predictor of an individual's success in a particular situation than general intelligence or situational factor (Stannard, 2003).

The knowledge acquired by the students through different teaching - learning methods depend upon their Cognitive Styles (Grieve & Davis, 1971). Accommodating Cognitive Styles in developing training designs, helps to improve the efficiency and effectiveness of individual learning. The knowledge about strengths and weaknesses of one's own Cognitive Style leads to the formation of coping behaviours (Riding & Smith, 1997).

Quality of learning can be enlightened by giving due consideration to individual differences. The knowledge about Cognitive Styles will help to reduce misunderstandings of the learners and to provide a wide opening to use multisensory approach in the teaching learning process. It plays a vital role in designing various learning experiences. It also helps to decide and implement various learning strategies appropriate for the learner. In order to establish flexibility in planning and adapting the available content to designing topic for learning, it is compulsory to build the capabilities and confidence of teachers to autonomously plan their teaching in response to the needs and demands of children's learning (National Curriculum Framework- NCF, 2005).

Mathematics is an important core subject of the school curriculum. This subject has its own language and pattern. The nature of Mathematics demands high level of thinking, problem solving ability, speed and accuracy.

Mathematics plays a remarkable role in the academic achievement of students because it forms the habit of clarity, brevity, accuracy and certainty among students and assist them in the struggle for existence (Chowdhury, 2014).

Herman (2011) revealed that at elementary level, most students express positive impression towards mathematics but on entering high school it diminishes. Majority of the students have a sense of fear and failure regarding mathematics. Thus, they give up early on and drop out of serious mathematical learning (NCF, 2005).

At higher secondary stage, the aim of mathematics curriculum is to provide students with an appreciation of the wide variety of the application of mathematics and equip them for such application (NCF, 2005).

Higher secondary stage is a turning point in student's life. This is a crucial stage for students to take decisions regarding their higher education. How students are able to manage adversities and how they perceive and process information is essential for their success. AQ and Cognitive Styles may have influence on their Academic Achievement. So, it is important to consider whether AQ and Cognitive Styles determine the performance of students in Mathematics. On reviewing related literature, the investigator could not find any study connecting AQ, Cognitive Styles and Achievement in Mathematics of the higher secondary school students.

Statement of the Problem

Every individual expects high level of achievement in their performance. They want to excel in spite of all the adverse conditions and find optimal solutions to their problems. In the case of students at higher secondary level, they are in the stage of selecting right choice for their future education and career. For a subject like mathematics which seems to be a tough subject for some students, whether AQ, Cognitive Styles determine their Mathematical Achievement is to be given due consideration. Thus, the present study is entitled as **“ADVERSITY QUOTIENT, COGNITIVE STYLES AND ACHIEVEMENT IN MATHEMATICS AMONG HIGHER SECONDARY SCHOOL STUDENTS IN KERALA”**.

Definition of Key Terms

Adversity Quotient (AQ)

Adversity Quotient (AQ) is the ability of the individual to deal effectively with the adversities of his life (Stoltz, 1997).

In the present study AQ is defined as the measure of an individuals' ability to control the effect of adverse situations, to take accountability for improving the situation, and to limit the reach and endurance of adversities.

Cognitive Styles

Cognitive styles are the stable attitudes, preferences, or habitual strategies that determine individual's modes of perceiving, remembering, thinking, and problem solving (Messick, 1976).

In the present study, Cognitive styles of an individual is defined as the preferred way of perceiving and processing information with characteristics of Wholist-Analytic dimension along with the continua in between the above two dimensions.

Achievement in Mathematics

Achievement in Mathematics is the competency shown by the student in the subject mathematics (Pandey, 2017).

In the present study Achievement in Mathematics is a measure of higher secondary student's factual knowledge, conceptual knowledge, procedural knowledge and meta cognitive knowledge in Mathematics.

Higher Secondary School Students

The term Higher Secondary School students denotes students studying in XI or XII standard after matriculation in the formal education system under General Education Department of the Government of Kerala.

Variables of the Study

The present study has the following Independent, Dependent and Classificatory Variables.

Independent Variables

Adversity Quotient and Cognitive Styles of Higher Secondary School Students were the independent variables of the study.

Dependent Variable

Achievement in Mathematics of Higher Secondary School Students was treated as the dependent variable.

Classificatory Variables

Gender and Locale of the Higher Secondary School Students were treated as Classificatory Variables.

Objectives of the Study

1. To examine whether there exist different levels of AQ among Higher Secondary School Students in Kerala for the total sample and sub samples drawn on the basis of Gender and Locale.
2. To examine whether there exist different Cognitive Styles among Higher Secondary School Students in Kerala for the total sample and sub samples of the study.
3. To find out whether there exist any significant differences in the mean scores of AQ, its dimensions and its components among the subsamples of the study.
4. To find out whether there exists any difference in the mean scores of Achievement in Mathematics among the subsamples.
5. To compare the mean scores of Achievement in Mathematics among students with High, Moderate and Low levels of AQ for the total sample and subsamples.
6. To compare the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample and subsamples
7. To find out whether there exists any significant relationship between AQ and Achievement in Mathematics for the total sample and subsamples.
8. To find out whether there exist any significant relationships between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples.

9. To find out the individual and combined contributions of dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics for the total sample.

Hypotheses of the Study

1. There exist different levels of AQ among Higher Secondary School Students in Kerala for the total sample and subsamples drawn on the basis of Gender and Locale.
2. There exist different Cognitive Styles among Higher Secondary School Students in Kerala for the total sample and subsamples of the study.
3. There exist significant differences in the mean scores of AQ, its dimensions and its components among the subsamples of the study.
4. There exists significant difference in the mean scores of Achievement in Mathematics among the subsamples.
5. There exist significant differences in the mean scores of Achievement in Mathematics among students with High, Moderate and Low levels of AQ for the total sample and subsamples.
6. There exist significant differences in the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample and subsamples.
7. There exists significant relationship between AQ and Achievement in Mathematics for the total sample and subsamples.
8. There exist significant relationships between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples.
9. There is significant individual and combined contributions of Dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics for the total sample.

Methodology

The description of methodology of the study such as method, tools and statistical techniques used are given below

Method

Survey method was used to collect data from Higher Secondary School Students in Kerala.

Sample

The sample of the study consists of 1130 students of standard XI from Higher Secondary Schools in Kerala. Stratified sampling technique was used, giving due representation to gender and locale.

Tools used for the Study

In this study the investigator used and prepared the following tools which were developed by the investigator with the help of her supervising teacher.

1. Adversity Quotient Scale (Parambat & Sheni, 2018)
2. Cognitive Style Inventory (Parambat & Sheni, 2018)
3. Achievement Test in Mathematics (Parambat & Sheni, 2018)

Statistical Techniques used for the Study

The statistical techniques used for the study includes

- 1) Percentage Analysis
- 2) Mean Difference Analysis
- 3) Correlation Analysis
- 4) One Way ANOVA
- 5) Multiple Regression Analysis

All the analysis was carried out using SPSS.

Scope and Limitations of the Study

The present study analysed Achievement in Mathematics of Higher Secondary School Students on the basis of their AQ and Cognitive styles. It was conducted on a sample of 1130 Higher Secondary School Students in Kerala. Data was collected using stratified sampling technique. Due representation was given to gender and locale.

As Mathematics is a core subject in the school curriculum, Due consideration has to be given to the teaching and learning of mathematics. AQ helps students to handle tough situations in their life. The ability to bounce back from adversities make students better problem solvers and self-reliant. Some students with high IQ and EQ may fail to progress towards success when faced with adverse situations. But there are people who make every effort within their limitations and exceed all predictions in spite of the adversities they face. Thus, improving student's potential with available resources can be a mile stone in the field of education. Cognitive Styles are the individual way of organising and processing information. Each individual is unique. By understanding Cognitive Styles of the student, it is possible to design teaching and learning strategies which brings flexibility in teaching and learning. It also provides means to use new technological innovations and approaches in a more individualized manner in the educational field.

In the present study the investigator compared Mathematics Achievement of higher secondary school students with different levels of AQ and also with different Cognitive Styles. The investigator studied the relationship between AQ and Achievement in Mathematics. The study also examined the individual and combined contributions of dimensions of AQ in predicting Mathematics Achievement of higher secondary school students. So, this study will provide new insight to parents, teachers, administrators, and curriculum designers.

Delimitations

- The investigator conducted the study only amongst class XI higher secondary school students.
- The investigator conducted the study amongst class XI students studying under Kerala government state syllabus and did not include student from other syllabi.
- The Achievement Test in Mathematics was constructed based on two units only.

The possible laxity of students while answering the questionnaire precisely and collection of data being limited to a representative sample of the population might have affected the accuracy of the result.

Despite the above delimitations and limitations of this study, the investigator made all efforts to make this study as precise and useful as possible.

Organisation of the Report

The whole report is presented in six chapters.

Chapter 1

This chapter presents a brief introduction of the problem, need and significance of the study, statement of the problem, definition of key terms, variables of the study, objectives of the study, hypotheses of the study, methodology, scope and limitations of the study and organization of the report.

Chapter 2

In this chapter theoretical frame work of the variables, review of related studies and conclusions are presented.

Chapter 3

In this chapter variables of the study, objectives of the study, hypotheses of the study, tools used for the study, description of the tools, sample selected for the study, data collection procedure, scoring and consolidation of data and statistical techniques used are presented.

Chapter 4

Details of statistical analysis of the data including preliminary analysis, percentage analysis, mean difference analysis, correlation analysis, multiple regression analysis and discussions of the results are presented in this chapter

Chapter 5

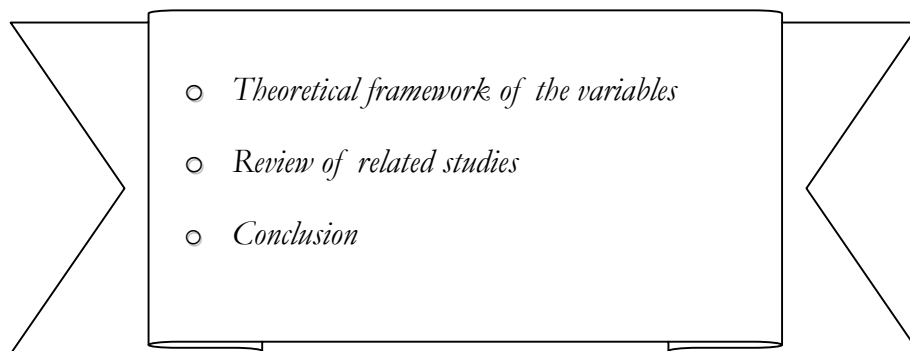
This chapter presents study in retrospect, findings of the study, tenability of hypotheses and conclusions.

Chapter 6

This chapter presents educational implications of the study, recommendations of the study and suggestions for further research.

Chapter 2

REVIEW OF RELATED LITERATURE



REVIEW OF RELATED LITERATURE

A review of the related literature must precede well-organized research. It is valuable for defining a problem, recognizing the significance of the study, selecting proper design and proposing data-gathering tools and analysing the data. Considering these facts, a review of related studies in the area of the present study is attempted at. This study is intended to examine Adversity Quotient, Cognitive Styles and Achievement in Mathematics of Higher Secondary School Students in Kerala. Studies which are directly and indirectly related to the topic under investigation were collected are also presented in this chapter. This chapter is described under the following heads.

❖ **Theoretical Framework of the Variables**

- Adversity Quotient
- Cognitive Styles
- Achievement in Mathematics

❖ **Review of Related Studies**

- Studies on Adversity Quotient
- Studies on Cognitive Styles

❖ **Conclusion**

Theoretical Framework of the Variables

Adversity Quotient

People encounter various challenging situations and adverse conditions throughout their life. Success in life primarily depends upon individual's adaptability and skill to tackle tough situations. Thus it is essential to develop certain skills that prepare people to deal effectively with hardships and obstacles in life. This ability to overcome challenges and hardships is known as Adversity Quotient (AQ).

Human capacities encompass abilities, aptitudes, skills, knowledge, experiences and determination. Usually when complexities and uncertainties arise in life, people lose their ability to cope with them. There are three types of human capacities namely required capacity, existing capacity and accessed capacity. Required capacity is essential to meet world's demands. Existing capacity is the full extent of a person's abilities, skills, aptitudes etc. Accessed capacity is the part of existing capacity that one actually delivers. As adversity increases most individual's existing and accessed capacities reduces. Thus, it is essential to train people to empower their existing and accessed capacities to tackle adverse situations in life.

Success of a person starts from the instant when he is willingly come out from the comfort zone and ready to act promptly. If a person is not ready to defend challenges or adversities, he cannot rise up to his full potential.

The Concept of Adversity Quotient (AQ)

According to Cambridge English Dictionary, Adversity means a difficult or unlucky situation or event. Stoltz (1997) introduced the concept of AQ. It is a measure of one's resilience and ability to persevere in the face of constant change, stress and difficulty. In simple terms AQ is a measure of how one responds to adversity.

AQ predicts whether one can go beyond expectations or backfire in their performance and potential. It forecasts who will give up or overcome when adversity strikes. AQ explains how well one resist the outcome of adversity.

AQ is considered to predict performance, perseverance, endurance and response to changes so that AQ play an important role in one's life and career (Tian & Fan, 2014). AQ is the ability of an individual to survive in facing all kinds of problems to find a way out, solve various problems, reduce obstacles by changing

the ways of thinking and attitude towards the difficulties encountered (Septiana, 2015). In educational perspective AQ is the ability needed to continue to struggle when students face difficulties in the learning process to achieve satisfying learning outcomes (Effendi et al., 2016).

According to Stoltz (1997) **AQ has three forms:**

- AQ is a conceptual framework for understanding and enhancing all aspects of success.
- AQ is a measure of how one responds to adversity which can be calculated and interpreted.
- AQ is a scientifically grounded set of tools for strengthening the responses to adversity of a person which brings about overall personal and professional effectiveness.

AQ verses IQ and EQ

Intelligence Quotient (IQ) predicts the chances of success of a person. At the same time, there are people who have high IQs but seems to be unsuccessful in their doings. In spite of all the advantages in life most gifted people fail to use their abilities to the maximum. On the other hand, there are people with only limited opportunities who rise above all the obstacles in their life. It shows that IQ itself is not enough to be successful in life.

Emotional Quotient (EQ) is a measure of how people are able to control their emotions and empathizes with other people (Golman, 1995). They can interact with others in a very effective manner. Golman argued that in life EQ is more important than IQ. In order to be successful person each one requires both intellectual and emotional abilities. The possession of high EQ and IQ increases the chances of success of a person.

There are many instances of people with high IQ and EQ giving up when an adversity strikes. On the other hand, there are people with a lower level of IQ and EQ keep on fighting with tough situations. Thus, during adverse conditions neither IQ nor EQ appears to determine one's success, it is AQ which decides success of an individual.

Three Levels of Adversity

Stoltz has given a three-level model of adversity which is in pyramid shape. This model explains that adversity is persistent and unavoidable part of life.

The levels of adversity (Stoltz, 1997) are represented in figure 1.

Figure 1

Levels of Adversity



At the top of the pyramid, lies the **Societal Adversity**. At the middle level comes the **Workplace Adversity** and on the lowest level lies the **Individual Adversity**.

Societal Adversity. The society is changing rapidly. Drug abuse, alcoholism, human trafficking, crime among youth, child abuse, teen pregnancy, teenager suicides, domestic violence, sexual assaults, degradation in morality, intolerance towards other religions and minorities are among the common societal adversities.

Workplace Adversity. The workplace equation and work culture are changing worldwide. Employees feel they are always on their toes to keep up with the changing work environment. Today's employees live in a highly insecure environment. Reduced income, decentralization, downsizing is some among the workplace adversities.

Individual Adversity. Adversity starts at societal level, drains into workplace and at last becomes a burden for individuals. Any adversity at societal level ultimately reaches individual level.

Development of the Concept AQ

According to Stoltz (1997) AQ describes a person's hardwired pattern of responses to all types and levels of adversity ranging from major to minor. AQ is the science of human performance grounded in many research studies. It is rooted in three sciences known as Cognitive Psychology, Psychoneuroimmunology and Neurophysiology. These three sciences provide a firm back ground to the study of AQ.

1. Cognitive Psychology. Cognitive Psychology consists of researches related to human demand for control over one's life. It contains fundamental concepts for understanding human motivation, efficiency and performance. They are described as follows

Learned Helplessness. It is a pattern of thinking that can weaken a person's drive towards success (Seligman, 1975). This theory is most significant in forming the concept of AQ. Learned helplessness is the belief owned by the individuals that they always fail in making desired changes in order to escape from challenging situations. When people identify them as helpless it negatively influences their motivation and their drive to take necessary action. Such people cannot be empowered and those who feel themselves as empowered does not suffer from being

helpless which shows that learned helplessness and empowerment are mutually exclusive. People immunised against helplessness mainly focus on the way they react to life's events. They mainly concentrate on the cause and remedies of the failure.

Hardiness. Hardiness is a concept developed by Kobasa (1979). It is the response to stressful conditions with respect to control, challenge and commitment. People who can alter a situation are those with high control. Individuals with high control view adversities as challenges. Tackling a given challenge is dependent on their commitment. Hardiness is a predictor of health and overall quality of life.

Resilience. It is the ability to well adjust with adversities, trauma and stress. Resilient individuals have the capacity to spring back from adversity. This ability emerges from people's ability to respond towards adversity. Resilient people are problem solvers. Psychologists have identified that positive attitude and optimism appears to create resilience.

Self-Efficacy. It is the individual's belief in their mastery over life and their ability to meet the challenges that come across. People who have a sense of self-efficacy bounce back from failures. They approach situations in terms of handling them effectively rather than worrying about it (Bandura, 1977).

Locus of Control. Locus of control is about a person's motivation, his control over life's event, and success. People with control over rewards and punishments (internal locus of control) are found to be less depressed and act promptly than those people who consider rewards and punishment as beyond their control (external locus of control). People with internal locus of control pursue and avoid rewards and punishments where as those with external locus of control accepts it (Rotter, 1966).

Attributional Theory/ Explanatory Style and Optimism. Attributional Style theory suggests that all individuals have a natural tendency to make a sense of the world. Explanatory or Attributional style is found to be a predictor of success. If the cause of an aversive event is attributed to a stable characteristic, then it is likely to last forever and later affect similar situations in the same way. On the other hand, if it is attributed to unstable characteristic then the result will be different for future events. Explanatory style theory is related to the manner by which people are different in their habitual ways of explaining bad events. It tries to account for negative effect associated with different type of habitual responses made (Seligman & Schulman, 1986).

A person with pessimistic explanatory style perceives bad events as stable, internal and global. A person with optimistic explanatory style perceives bad events as unstable, external and specific.

Combining the above theories, Stoltz (1997) identified that success is mainly determined by a person's control over his life. It mainly depends on how people react to adversities in specific pattern which are considered as subconscious and remains constant throughout their life. Such patterns can be measured and strengthened.

2. Psychoneuroimmunology. It studies the relationship between mind (Psyche), brain (Neuro) and the immune system. Emotional health has a vital role to play in one's immune system. Positive emotional state promotes healthy perceptions, thoughts, beliefs, and physical well-being of a person. A weak pattern of response to adversity can cause depression and physical problems.

Based on the researches in Psychoneuroimmunology, it is found that the responses to adversity influences a person's mental, physical health and immune functions. Also, a weak pattern of response to adversity can be the source of depression (Stoltz, 1997).

3. Neurophysiology. It studies the relationship between brain and nervous system. The brain is equipped to form habits. An individual's mode of response to adversity can be changed for better.

From the researches on Neurophysiology, it is concluded that (Stoltz, 1997).

- Brain is ideally equipped to form habits and they become hardwired in the subconscious region of the brain.
- Subconscious habits, such as AQ, can be immediately altered, readily forming new habits that are strengthened over time.

Integrating the finding from Cognitive Psychology, Psychoneuroimmunology and Neurophysiology it is concluded that people respond to adversity in hardwired patterns which can be measured, rewired and improved.

Dimensions of AQ

According to Stoltz (1997), AQ has four dimensions. They are Control, Origin and Ownership, Reach, and Endurance which can be expressed in the acronym **CO₂RE**. The overall score of AQ is not enough to describe a person's weakest area of response to adversity. All the four dimensions must be examined separately to determine the weak and strong areas of a person's personality.

Control (C). This dimension measures how much control a person perceives to have over an adverse condition. Control is regarding a person's perceived ability to alter a situation and response ability to control one's own response to a situation. Since it is impossible to measure actual control, perceived control is identified. Response ability has two forms namely Delayed Response Control and Spontaneous Response Control. After the outbreak of unpredicted events, people regain their senses and are able to respond more wisely. This is the delayed response control. It is the most common form. While spontaneous response control is the ultimate form of control (Stoltz, 2000).

Control is a strong measurement of resilience which is internal and highly individual. The more control one has, the more likely one tends to take positive action. People with high AQ have greater control over adverse situations than those with low AQ. Having greater control over adversities leads to long term performance, productivity and health. It helps a person to arrive at a solution with determination and courage. Low control over the adversities has negative effect in bringing desired changes to the situation. It destroys people's ability to rise above adversities.

Origin and Ownership (O₂). This dimension describes the origin of a problem and also the degree to which one owns up the outcome of an adversity. People with high AQ perceive success as their doing and adversity as originating from external sources. They blame themselves only for what they did while owning the outcome of the adversity and also assess their role in the adverse situations. They learn from the situation and effectively overcome when they face a similar situation. They own the outcome of adversities regardless of their cause. The accountability urges them to take action. Low AQ people view adversity as their fault. They resist to take ownership of the outcome and stay away from taking challenges.

Reach (R). It reflects how one limits the reach of adversity into other areas of their life. It is considered as very essential to limit the reach of a problem entering into other aspects of an individual's life. People with high AQ respond to adversity as specific and limited. By effectively compartmentalizing the reach of adversity, the person can be more empowered and less overwhelmed. It thus helps them to manage the difficulties, frustrations and challenges effectively. Low AQ people may experience adversity entering into other areas of their life. It makes a person helpless from taking necessary actions.

Endurance (E). This dimension explains how long adversity or their cause lasts. People with high AQ will consider the problematic situation as temporary.

They believe that no adversity can have the same effect forever. This makes them to survive greater challenges. On the other hand, low AQ people consider adversity as permanent. Such people may take less effort to act against adversity.

According to Stoltz (1997) AQ predicts the following areas of an individual: Performance, Persistence, Attitude, Motivation, Productivity, Hope: Emotional Health, Resilience, Longevity, Empowerment, Learning, Happiness, Physical Health, Vitality and joy, Creativity, Energy, and Response to change.

Characteristics of People with High AQ and Low AQ

Individuals with High AQ are highly resilient in the face of adversity. They are optimistic and continue to maintain their exceptional performance. They remain healthy and energetic. They learn from experience and try to improve from failures. They are innovative to solutions and also take crucial and complex risks.

Individuals with Low AQ become depressed and feel helpless when they confront adversity. They are pessimistic and easily give up. They avoid challenging tasks and situations.

Levels of AQ. Based on the levels of AQ, Stoltz identifies three types of people. They are Climbers, Campers and Quitters.

Climbers (High AQ). Climbers are the innovative people. They rarely lose hope when confronted by obstacles in life. They are self-motivated. They are constantly in search of new ways to grow and to contribute. They work with clear vision. When an adversity strikes their main focus is on what they can control to influence the situation positively. They remain consistent and resilient. They take ownership for better outcomes and focuses on solutions instead of blaming. They keep adversity in its place instead of allowing it to reach other areas of life. For Climbers adversity is temporary.

Campers (Moderate AQ). Campers show moderate creativity and take risk only in areas that are safe to them. They are motivated by fear and comfort. Campers do not reach their full potential. Campers have reasonable sense of control in challenging situations and may get overwhelmed when adversity strikes. They easily rely on blame when they feel tensed. For them sometimes adversity will enter into other areas of their life. Campers have good hope and faith except when adversity is high. When adversity mounts, they consider it as long lasting.

Quitters (Low AQ). Quitters are defined as depressed individuals who had given up their dreams. Such people often choose the most comfortable and easiest way in order to face challenges. According to Stoltz, individuals labeled as quitters are prone to situations which make them uncomfortable. When adversity hits them, they are incapable of responding properly and fail to overcome the obstacles before them. Quitters escape from challenges and they tend to give up if worse situation arise. Quitters have less control over adverse situations. They stay away from taking accountability and easily opt self-blaming. They also feel overwhelmed even before minute hurdles and consider adversity as permanent.

Stoltz (1997) compared these three categories in Maslow's Hierarchy of Needs as follows;

- Quitters are often stuck on psychological and safety needs.
- Campers are focused on safety, belonging, and esteem needs.
- Climbers work their way up to self-esteem needs.

Role of AQ in Life.

- AQ is the ability of an individual to keep on trying in spite of all adversities and setbacks in life.

- People who respond optimistically towards adversity are predictable in their performance and they take more risks.
- A constructive approach towards adversity imparts energy to successfully compete while a destructive approach to adversity tends people to lose their confidence.
- To be creative one should have the ability to overcome the adversity of uncertainty. People with Low AQ are unable to avoid adversity, thus become incapable to be creative.
- Motivation determines success. People with high AQ are the most motivated even in the face of all challenges.
- Studies show that children with optimistic pattern of response to adversities learn and achieve than those with pessimistic pattern of responses.

The LEAD Sequence to Improve AQ. Stoltz (1997) developed a sequence to improve AQ of a person. In this sequence, the first step is to *Listen* to the adversity response of the self. The second step in the sequence is to *Explore* all origins and ownership of the adverse situations. The third step is to *Analyze* the evidence of no control over situation, that the adversity has high reach and why adversity should last long. The last step is to Do something. The sequence is Known as *LEAD* sequence.

According to this, listening to an individual's own adversity through the CO₂RE dimensions is the basic step. Through this the person may interrupt the pattern of responses. It helps to identify the level of AQ and also helps to understand on which dimension the person is weak or strong.

Exploring Origin and Ownership dimension examine what are the reasons behind the occurrence of an adverse situation and how much responsibility one owns for the causes of such an event. People accepting appropriate blame will strengthen

their integrity and credibility. It prepares a person to select precise and reality-based aspect of the problem for improving the situation. Individual's readiness to take accountability inculcate an inner thrust to take actions. It will strengthen the sense of control of a person to positively influence the situation in hand.

To analyse a situation regarding adversity is the most powerful step of the LEAD sequence. It is a precise method to improve AQ. It addresses Control, Reach and Endurance dimensions.

The last step is to Do something which means to find ways for controlling and limiting the reach of adversity and also to reduce the time span of adversity.

This scientifically grounded method to improve a person's operating system is an effective problem-solving model. It can be used to help others to improve their AQ.

The other methods suggested to reduce the effects of adverse events are to stop overemphasizing a bad event.

Cognitive Styles

All individuals are completely different in every aspect. These individual characteristics will play a key role in the individual's adaptation to their surroundings.

Cognitive style is the relatively stable attitudes, preferences and habitual strategies that determining an individual's typical modes of perceiving, remembering, thinking and problem solving (Messick, 1976). Cognitive styles can be characterised as individual differences in the way people perceive, think, solve problems, learn, and relate to others (Witkin et al., 1977). Cognitive style contains several aspects of differential psychology related to individual differences in the learner and the learning environment (Jonassen & Grabowki, 1993). Studies on Cognitive Styles reveal that they have received attention in the field of Education

and Psychology. Cognitive Style is a bridge between cognition and personality measures (Sternberg & Grigorenko, 1997).

Cognition

Cognition refers to mental processes consisting of perceiving, recalling, judging, decision making and problem solving. The study of cognitive processes finds its roots in the Gestalt psychology of Wertheimer, Kohler and Koffka and in the studies of Piaget during 19th century.

Cognitive Styles differ from intellectual abilities in the sense that they describe the process in which a learner uses information for different tasks and situations.

Style versus Ability

Allport (1937) was probably the first to use the term 'style' with respect to cognition. Ability is more concerned with level of performance, whereas style focuses on the manner of performance. Ability is unipolar while style is bipolar (Guilford, 1980). Both style and ability may influence the performance of a particular task. As the ability increases the performance also improves. The effect of style on performance is either positive or negative depending on the nature of the task. The nature of the style distinct from that of ability is that it should interact with variables such that the relative performance of an individual at one extreme of a dimension should be higher than that of a person at the other end in one condition, but that the situation should be reversed when the condition is changed (Riding, 2001).

Meaning of Cognitive Style

Cognitive style is an independent construct or psychological schema that is not related to intelligence, personality and gender. It may be defined as an individual consistent approach to organising and processing information during learning.

Definition of Cognitive Style

Cognitive Style is a hypothetical construct that has been developed to explain the process of mediation between stimuli and responses (Goldstein & Blackman, 1978).

Cognitive Style is the consistent individual differences in preferred ways of organizing and processing information and experience (Messick, 1984).

Cognitive Style is the way people perceive stimuli and how they use this information to guide the behavior like thinking, feeling actions (Allinson & Hays, 1996).

Cognitive Style refers to the psychological dimension representing consistencies in an individual's manner of cognitive functioning, particularly with respect to acquiring and processing information (Ausburn & Ausburn, 1978).

Cognitive Style is a Bridge between cognition and personality measures (Stenberg & Grigorenko, 1997).

Cognitive Style Research in Perspectives

The experimental studies regarding individual differences in cognitive tasks were conducted in 1940s and 1950s. These studies identified that people differ in the way they perceive, judge and solve the simple cognitive tasks. Cognitive styles were considered as patterns of adaptation to the external world that regulate an individual's cognitive functioning (Klein, 1951). The major contribution in the development of cognitive style research was done by Witkin, et al. (1954). Klein's and Witkin's studies explained the connection between Intelligence and personality. A large number of studies emerged to identify the individual differences in cognition which were considered as stable over time and resulted in other style dimensions.

Most of the studies on cognitive styles did not attempt to relate styles to information processing theories and resulted in overlapping dimensions. It resulted in drastic decrease in the number of studies on Cognitive Styles by the end of 1970's. At the same time the number of studies on styles in applied fields increased rapidly which has resulted in the expansion of the cognitive style concept in relation to complex cognitive activities and arrived at the conclusion that though cognitive styles are relatively stable, it can be adapted to changing environmental and situational demands. Also, Cognitive Styles can be modified by life experiences and are related to social interactions regulating people's beliefs and value systems. A unifying trend emerged in the 1990s aimed to unite and systematize multiple style dimensions into coherent and practically useful models (Kozhevnikov, 2007).

Based on review of different Cognitive Styles, two major cognitive style dimensions which are Wholist-Analytic dimension and Verbalizer-Imager dimension were proposed (Riding & Cheema, 1991).

Fundamental or Principal Dimensions of Cognitive styles

Reviews of the Cognitive Style research literature has pointed out that learners differ in terms of two fundamental and independent dimensions of Cognitive Styles namely Wholist -Analytic and Verbal-Imagery style.

Wholist- Analytic dimension and Verbal-Imagery dimension describes the way in which an individual organises and structures information. Some people analyse information by breaking it to its component parts (Analytic) while others will maintain a global or overall view of information (Wholist). For wholists, the distinction between the parts of a topic may become blurred. For analysts, the separation of the whole into its parts may mean that one aspect of the whole may be focused on at the expense of the others (Riding & Smith, 1997).

Verbal-Imagery dimension describes the tendency to represent information verbally or through mental images. It reflects an individual's habitual mode of

representing of information in memory during thinking process. Verbalisers perceives information in terms of words or verbal associations. Imagers experience spontaneous and frequent pictorial mental pictures while receiving informations.

Characteristics of Cognitive Styles

- 1) Cognitive style refers to individual differences in the way how people perceive, think, solve problems, learn and relate to others.
- 2) They are stable over time.
- 3) Cognitive styles are bipolar and range from one extreme to the opposite where each end of the dimension has different implications for cognitive functioning.

Cognitive Styles Models

Researches on cognitive styles resulted in the development of various cognitive style models which are described below:

Field Dependent- Field Independent (Witkin et al., 1954). This style was introduced by Witkin et al. (1954, 1971). They defined it as bipolar. Field dependent (FD) are more likely to be attentive and make use of existing social frames of reference. Field Independent (FI) tends to be more impersonal. Group Embedded Figure Test is used to measure FI/FD.

Reflexivity-Impulsivity (Kagan, 1966). This was introduced by Kagan and co-workers. It was measured by Matching figure test. Impulsive learners have least attention. They seem to be restless and are premature in decision making. They can't concentrate for a long time and have social difficulties. On the other hand, Reflective learners are over focused and delay in decision making. They can concentrate for long.

Convergent -Divergent (Guilford, 1967). Convergent thinking learners prefer formal materials and logical argument. They may be superior in performance

than divergent thinkers on well-structured tasks which demands logical ability. The convergent have precision and logical conclusions. According to Guilford (1967) convergent thinkers develops logical necessities whereas divergent thinkers generates possibilities from the given information. Hudson (1966) identified that divergent thinking learners are highly imaginative and prefer studies involving emotions. On the other hand, convergent learners keep their emotions away from studies.

Adaptation- Innovation (Kirton, 1976). Adaptation- Innovation theory (1976) was developed by Kirton (1976). Which theory explained cognitive tendencies and problem-solving styles. Adaptors try to do things better. Innovators try to do things differently. Kirton Adaptation Innovation (KAI) theory explains differences in creativity. It pointed out that understanding cognitive styles of adaptors and innovators may enhance organizational cultures of change and diversity. This is a bipolar construct which helps to define each person's preferred approach to problem solving.

Adaptors are concerned with solving problems rather than finding them. They are sensitive to keep group cohesion. Innovators are capable of detailed tasks only in short bursts and seems to be undisciplined, approach tasks from unsuspected angles.

Sequential- Random (Gregorc, 1982).

Sequential. In this style people organise information in a linear step by step manner.

Random. In this style people organise information in chunks and in no specific order. When using this ability individuals are able to skip step in a procedure and still produce the desired results.

Assimilator- Explorer (Kaufmann, 1979, 1989). Kaufmann (1979) identified 2 groups of problem solvers Assimilators and Explorers and explored A-E theory of Cognitive styles. Assimilators are seen as more rule bound in problem solving behaviour. They have a disposition towards interpreting new events in terms of existing knowledge.

On the other hand, explorers have a disposition towards novelty seeking. They search for new types of solutions and new ways of solving problems without any external pressure to do so.

Intuition-Analysis (Allinson & Hayes, 1996). Intuitive individuals are likely to discover opportunities by intuitive sides of an individual. They are likely to discover opportunities by observing cues or signals through unfamiliar or unorganized information that is processed in synthetic and holistic manner. This style is useful in the searching stage of the new venture creation process. Individuals with analytic cognitive style may display competency in judging and evaluating information and selecting actions to implement skills that are needed in later stages of new venture creation process.

Even though a large number of style labels and measurements have been proposed by many researchers, most of them conceptually summarized into two important cognitive styles namely Systematic (Analytic-rational) and Intuitive (Wholistic- Experiential) cognitive styles. (Graff, 2000; Allinson & Hayes., 1996; Epstein et al., 1996; Norris & Epstein, 2011 and Sagiv et al., 2010).

People with systematic style use rule-based thinking (Smith & Decoster, 2000). They logically analyse the situation, observe various alternatives to invent underlying rules on which they can rely while organizing the environment into systematic patterns before selecting methods to act (Perkins, 1981 and Scott & Bruce, 1995).

People with intuitive style use associative thinking (Smith & Decoster, 2000). They will have wholistic perception and are ignorant of their thinking patterns. They rely on intuition and consider facts along with feelings and contexts.

Martin's Cognitive Style Model (1983)

Even though systematic and intuitive styles provided the foundation for Cognitive Style Model, these two styles cannot reflect the entire spectrum of people's behaviour regarding thinking, learning, problem solving and decision

making. An individual's style lies on a continuum between two extremes of the same dimension. Hence a model intended to reflect the entire spectrum was created by Martin. This model consisted of two continua:

- 1) High systematic to low systematic
- 2) High intuitive to low intuitive

The descriptions of Systematic, Intuitive, Integrated, Undifferentiated and Split Cognitive Styles are given below.

Systematic Style. People identified as having systematic style rate high on systematic scale and low on intuitive scale. People with systematic style apply rule based thinking (Smith & DeCoster, 2000). They analyse situations logically, evaluates many alternatives to find out underlying rules and this enable them to organize the problem into systematic patterns. While problem solving, people with systematic style follow a well-defined step by step approach. They also use pragmatic approach and then make an overall plan for solving the problem.

Intuitive Style. People identified with intuitive style rate high on intuitive scale and low on systematic scale. People with intuitive style use associative thinking (Smith & DeCoster, 2000). They have holistic and global perception (Scott & Bruce, 1995). They are unaware of their thinking patterns. They integrate associations and rely on intuitions. They consider feelings, contexts along with facts (Perkins, 1981; Stenberg, 1998). People with intuitive style use an unpredictable ordering of analytical steps in the problem-solving process. They rely on experience patterns and leave alternatives quickly.

Integrated Style. People with integrated style rate high on both systematic scale and Intuitive scale. They are able to change styles quickly and easily. Their style changes takes place unconsciously and within seconds. This unconscious and instant ability generate energy and proactive approach to problem solving. They are often referred to as problem seekers as they attempt to identify potential problems and opportunities in order to find better ways of doing things.

Undifferentiated Style. People with low score on both systematic scale and intuitive scale are termed as having undifferentiated style. Such people appear not to differentiate between systematic and intuitive styles. People with undifferentiated style rely upon instructions from outside sources. They often look to others for problem solving strategies.

Split Style. People rating in the middle range on both systematic scale and intuitive scale are considered to have split style. People with split style show fairly equal degrees of systematic and intuitive specializations. They do not possess integrated behavioral response. People exhibit each separate dimension in completely different settings using one style at a time depending on the nature of the task. They consciously respond to problem solving and learning situations by selecting appropriate styles.

An overview of cognitive styles is given in Table 1

Table 1
An Overview of Cognitive Styles

	Descriptors of style	Nonverbal Patterns
Systematic style	<p>They are convergent thinkers</p> <p>They follow concrete, highly structured, Logical, Rational, Ordered, Linear</p> <p>Step-by-step approach while problem solving. They concrete on facts, figures, and data.</p> <p>They break problems to small parts. They are Product focused and are very conscious of the approach while solving problems.</p> <p>They follow precise method or plan for solving a problem, uses a sequential process.</p>	<p>People with systematic cognitive style follow a chronological ordering of steps to be taken.</p> <p>They spend more time on detailed analysis of the problem.</p> <p>They often stress a point or step of the process before proceeding to the next step.</p>

	Descriptors of style	Nonverbal Patterns
Intuitive style	<p>They are divergent thinkers. They have global, abstract and visual perception.</p> <p>They focus on the process and are driven by experience and always look at the entirety of the problem.</p>	<p>Individuals with intuitive cognitive styles follow visual approach.</p> <p>They appear to be unsystematic. Try to graphically display the problem and also to find alternative solutions.</p>
Integrated style	<p>They have dual cognitive specialties.</p> <p>They changes easily and quickly from one style specialty to another.</p> <p>They display high degrees of internal locus control. They look for opportunities to solve problems.</p> <p>They are creative, innovative Proactive people</p>	<p>Individuals with integrated cognitive styles are always alert, active and fully involved in their doings.</p> <p>Regularly acts as facilitator or interpreter of language in groups.</p>
Undifferentiated style	<p>They are receptive and does not exhibit any specific specialty.</p> <p>They seem to be passive, reflective.</p> <p>They mainly rely on rules, procedures, instructions, suggestions, or guidelines and does not impose a process on the problem.</p> <p>They feel difficulty in making decisions and delays action.</p>	<p>People with undifferentiated cognitive style have low involvement in their doings and waits patiently for particular guidelines from others</p>

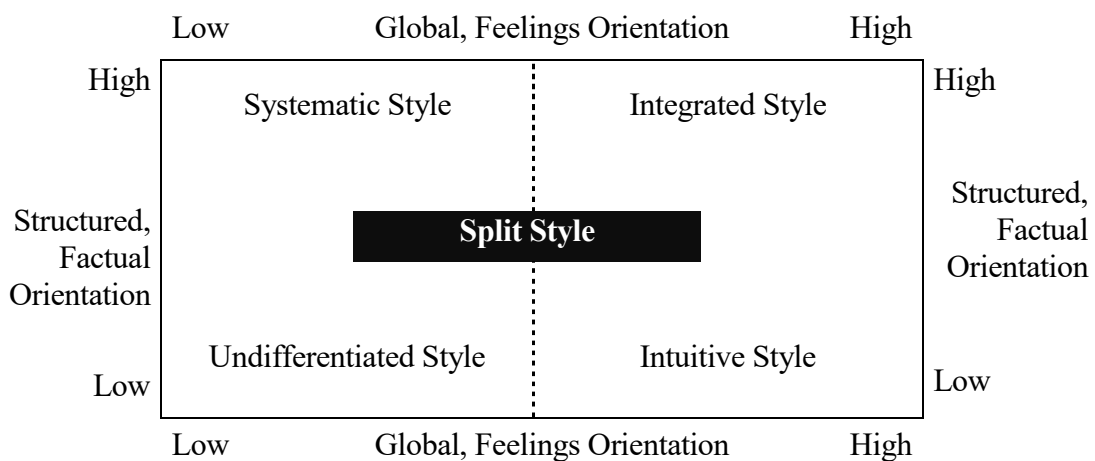
	Descriptors of style	Nonverbal Patterns
Split style	<p>They have approximately equal degrees of systematic and intuitive orientations and use them as completely separate entities.</p> <p>They consciously select each style orientations for each specific situation.</p> <p>One style is used often than the others.</p>	<p>Individuals with split cognitive style change their pattern according to the style being used at the time of observation.</p> <p>Generally, an individual with a split style is in the process of a cognitive transition involving building new strengths and skills in the dimension that is perceived to the weaker of the two (systematic or intuitive).</p>

(Source: <http://home.snu.edu/~jsmith/library/body/v08.pdf>)

The illustration of Cognitive style model of Martin is represented by Figure 2

Figure 2

Illustration of the Cognitive Style Model of Martin (1983)



(Source: <http://home.snu.edu/~jsmith/library/body/v08.pdf>)

Awareness of Cognitive Styles and Learning

In order to encourage classroom relations and to reduce conflicts in classroom communications, teacher has to be conscious of each student’s cognitive style. It helps the teacher to meet student’s needs by proper planning. It is very

essential to have awareness of teacher's own cognitive style and learners' preferred cognitive styles. Along with the awareness of own style, learners have to be conscious of alternate styles so that they can improve their learning by identifying and implementing appropriate learning strategies that best suits them. Teachers may prompt students to use non preferred styles that may be apt for certain situations, acknowledging individual differences and by working cooperatively.

The awareness of different cognitive styles of learners will provide teachers the best opportunity to strengthen classroom efficiency by designing materials in different ways. It will offer entirely different way of delivering learning through multisensory, abstract and concrete learning activities.

Exploring other cognitive styles of the learner will promote flexibility and opportunity for success in tasks and in contexts for which their preferred style is not naturally suited.

If all students are aware about the strengths and limitations of their cognitive styles they can work together cooperatively to encourage and assist each other.

Educational Implications of Cognitive Styles

- Awareness of Cognitive styles are very important for psychologists and instructional designers.
- They are useful in designing and developing effective instructional and learning materials.
- The association of cognitive styles with personality and social function provides wide and accurate classification of students.
- Cognitive styles predict the trend in achievement hence act as a powerful basis for educational guidance.

- Knowledge of Cognitive styles helps to improve the instructional methods.
- They strengthen teacher pupil interaction.
- It enhances students learning by expanding the range of alternative thinking strategies of students.
- It is useful in Guidance and Vocational decision making.
- It will broaden educational goals and outcomes.
- It helps to tune the stylistic demands of learning environment.
- Cognitive styles influence the design and structure of instructional material to meet the characteristics of learners.
- The knowledge of Cognitive styles improves teacher performance.

Achievement in Mathematics

Mathematics is a branch of science concerned with numbers, quantity and space. Mathematics is one of the ways for understanding and interpreting the world. The modern world is mathematically inclined. It is an integral part of not even science and technology but also social science and education. Knowledge of mathematics offers widespread application in many fields. The performance of students from primary to higher education is always a major concern for all educationalists. Poor performance has a direct influence on their academic achievement also. So there is a need for each child to develop proper foundation in mathematics. Mathematics prepares a child to solve day to day real problems in life.

Nature of Mathematics

Mathematics is a science of discovery, precision and accuracy. It deals with skill of drawing conclusions. Mathematics has its own language and symbols. It is an abstract science with logical reasoning. It develops confidence, consistency and

punctuality among students. It disciplines the mind of the learners. It helps to solve real life problems.

Mathematical Processes

There are seven processes inherent in teaching, learning and doing mathematics (Alberta Education, 2008; NCF, 2005).

Communication. Communication helps students to develop connections among concrete, pictorial, symbolic, verbal, written and mental representations of mathematical ideas. It is very necessary for clarifying, reinforcing and modifying ideas, attitudes and beliefs about mathematics. Students should be trained to use a variety of communication forms while learning mathematics. Students also need to communicate their learning by using mathematical terminology.

Connections. Making mathematical learning relevant to the learners through connections will help to arouse interest in mathematics. By connecting mathematical ideas to each other or to the real world problems students consider mathematics as relevant, useful and integrated.

Mental Mathematics. Mental mathematics is a combination of cognitive strategies that enhance flexible thinking and number sense. It helps to improve computational skill and thus problem solving.

Problem Solving. The focus of mathematics at all levels is learning through problem solving. Creating a flexible environment where children find their own strategies for solving problems empowers them to explore more alternatives and enhance confidence, reasoning, and mathematical creativity.

Reasoning. It is very essential to develop the ability to reasoning in children. There are inductive and deductive reasoning. Reasoning based thinking can be applied in real life in a wide spread contexts and disciplines.

Visualization. Visual images and visual reasoning are important components of number sense, spatial sense, and logical thinking. Visualization is important for developing abstract thinking and reasoning.

Technology. Technology contributes to students' achievement of a wide range of mathematical outcomes, and enable children to explore and create patterns, examine relationships, test conjectures, and solve problems.

Factors Affecting Achievement in Mathematics

Achievement in Mathematics is the competency shown by a student in mathematics subject. Even after the advanced and effective methods of teaching, student's performance in mathematics is much below. Researchers have shown that there are many factors influencing the Achievement in Mathematics at large. From the review of literature, it was found that most preferential variables affecting Achievement in Mathematics in psychological category are intelligence, attitude towards mathematics, self-concept, numerical ability and math anxiety. Among social variables are socio economic status, parental involvement and parent's education, and among biographical variables most frequently considered is gender (Kushwaha, 2014).

From the review of related Literatures, the factors affecting Achievement in Mathematics are listed in Table 2.

Table 2*Factors Affecting Achievement in Mathematics*

Psychological Variables	Social Variables	Biographical Variables	Instructional variables
1) Attitude towards Mathematics.	1) Socio Economic Status	1) Gender	1) Teacher effectiveness
2) Intelligence		2) Locality	2) Home Tutoring
3) Mathematical Anxiety	2) School Environment	3) Caste	3) Method of Instruction
4) Self Concept		4) Birth Order	4) Teacher's Expectation
5) Study Habit	3) Home Environment		5) Teaching Style
6) Mathematical Aptitude	4) Parents Education		6) Instructional Strategies
7) Numerical Ability	5) Fathers occupation		
8) Achievement Motivation	6) Income of Father		
9) Cognitive Styles	7) Social Status		
10) Self Esteem	8) Social relations		
11) Interest in Mathematics	9) Type of school		
12) Test Anxiety	10) Social maturity		
13) Reading Ability			
14) Problem Solving Ability			
15) Mathematical Creativity			
16) Educational and Occupational Aspiration			
17) Personal Adjustment			
18) Locus of Control			
19) Emotional Stability			
20) Confidence in Mathematics			
21) Spatial Ability			
22) Logical Reasoning			

(Source: https://www.researchgate.net/publication/347295421_Factors_Influencing_Mathematics_Achievement_of_University_Students_of_Social_Sciences)

Review of Related Studies

Studies on AQ

The investigator reviewed studies on Adversity Quotient for a period from 2005 to 2020. Studies conducted in India and abroad were reviewed and are given as follows.

Hulaikah et al. (2020) examined the Effect of Experiential learning and AQ on problem solving ability. It was an experimental study. The sample consisted of 120 vocational college students from Indonesia. Experimental group was given experiential learning and control group was given direct instruction to learning. A questionnaire of Student Adversity Quotient Profile (SAQP) and Rubrics of Problem Solving based on Polya's steps were used as the tools for the study. Two-way ANOVA was used. Result revealed that Problem Solving Ability of students taught by experiential learning was different from those by direct method of instruction. Problem Solving Ability of the students were found to differ between high and low AQs. Also, there exists interaction effect between experiential learning and AQ which influenced student's Problem Solving Ability.

Juwita et al. (2020) in a paper reviewed 18 articles regarding the role of AQ in the field of education. It explained three aspects of Educational AQ publication including Type of research design used in research related to AQ in the field of education, and type of participants chosen in the research related to AQ and role of AQ in education. Based on the reviews, research on AQ showed a great influence in the field of education. It showed that descriptive and experimental research were the most commonly used design, research participants in AQ research were dominated by students especially university students, and role of AQ was much shown in learning outcomes in the field of skills.

Suryaningrum et al. (2020) in a study aimed to describe the phases of semiotic reasoning of elementary students in constructing the properties of a rectangle. The study was qualitative and explorative descriptive type. 3 participants from 4th grade were selected on the basis of 3 levels of AQ such as High, Medium and Low. Result revealed that in creating sign stage, 3 participants made the same sign that was a rectangular image. However, in all the three stages, namely interpret sign, find out properties of sign and discover properties of the rectangle, participants work in a different way. It was found that only Climber could determine the properties of a rectangle correctly.

Darmawan et al. (2019) in a study aimed to find out mathematic learning achievement with High, Moderate and Low AQ. 189 students were selected for the study from Indonesia. One way ANOVA was used for analysis. It was found that Climbers (High AQ) have better mathematic learning achievement than Campers (Medium AQ) and Quitters (Low AQ) while Campers have better achievement than Quitters.

Hidayat and Husnussalam (2019) administered experimental research to know the Influence of AQ of pre-service mathematics teachers towards the achievement of mathematical understanding ability. 55 teachers were purposefully selected for the study. Significant effect of AQ on Mathematical Understanding Ability was calculated using Regression analysis and the difference between AQ level and Achievement in Mathematical Understanding Ability was determined by One Way ANOVA. It was found that AQ influence the Mathematical Understanding Ability of Pre service Mathematics teachers. 57.3 percent of Mathematical Understanding Ability was predicted by AQ. Also, there are differences in Achievement in Mathematical Understanding Ability of Pre service Mathematics Teachers based on levels of AQ.

Purnamasari et al. (2019) investigated the Effect of AQ of junior high school students on reflective thinking process in mathematical problem solving. Case study research strategy was used. Data were collected through student activities and also by observing events while solving problems. Result revealed that Reflective Thinking process of students with High AQ (Climbers) was different from students with Medium AQ(Campers) and Low AQ(Quitters).

Putri et al. (2019) conducted a qualitative study on Creative thinking skill with AQ based lesson strategy for learning community. Data were collected by observation of learning activities, creative test, questionnaire and interviews. 22 seventh grade students were the sample of the study. Result revealed that High AQ and Medium AQ students had medium creative thinking skill, while Low AQ students had low critical thinking skill. All subjects got best score in the novelty indicator with fluency and flexibility.

Hidayat et al. (2018) by an experimental study aimed to examine the Role of AQ and Argument Driven Inquiry (ADI) learning on improving students mathematical creative reasoning abilities. 90 student teachers were selected as the sample. Result revealed that 1) Improvement in the ability of mathematical creative reasoning ability of student teacher with ADI instruction was better than those with direct instruction. 2) Based on AQ, there were no differences in the mathematical creative reasoning ability of students with ADI and direct instruction. 3) Learning factors and type of AQ affected student's Mathematical Creative Reasoning Ability. 4) There were no interaction effect between learning and AQ together in developing Mathematical Creative Reasoning Ability.

Aryani et al. (2018) examined the algebraic reasoning of AQ types (Climber, Camper and Quitter) of junior high school students in solving mathematical problems. Qualitative description methods were used in the study. Purposive sampling method and task-based interviews were used for collecting data. Result

showed that algebraic reasoning of the students with AQ types in the process of pattern seeking were done in a similar way. But the students found the elements of pattern formation in different ways.

Dina et al. (2018) studied the flexibility in mathematical problem solving based on AQ. Problem solving ability of Climber, Camper and Quitter students were studied. Adversity Response Profile, Problem-Solving task and interviews were administered for data collection. Result revealed that the subjects solved the problem using different strategies. Climbers used two strategies namely sketch and scheme and did not have difficulty. Campers also used two strategies but found difficulty to finish the second one. Quitters used only one strategy and found difficulty to finish the same. The written and interviewed data were analysed according to indicators of flexibility during problem solving. It was concluded that students with high level of AQ (Climbers) were able to show flexibility by using two different strategies to solve the problem. Students with medium level of AQ (Campers) were less able to show flexibility as failed to finish the second strategy. Students with low level of AQ (Quitters) were unable to show flexibility as only used one strategy to solve the problem.

Hastuti et al. (2018) in a study analysed the profile of students with High AQ in learning Mathematics. It was a qualitative research with case study strategy. Questionnaire was used to know the AQ level of students and interview was conducted to get the data about student profile. Three subjects were selected with High AQ. Result revealed that students with High AQ were able to face learning of mathematics in various materials and with different models of teaching.

Hanum (2018) conducted a study to identify the differences in student adversity intelligence by gender. The sample of the study consisted of 470 undergraduate students from Indonesia University of Education, West Java. The result of the study revealed that there was no significant difference in the adversity

intelligence of the students based on gender. The findings of the study also revealed that significant difference was found between male and female students only in the ownership dimensions where females were superior to their male counterparts.

Khairani and Abdullah (2018) in a study aimed to find the relationship between AQ and academic well-being among Malaysian undergraduates. Self-reporting questionnaires were used to find AQ and Academic well-being. Results showed that there were no significant differences in the mean scores of AQ and Academic well-being between male and female students. Also, it was found that AQ and Academic wellbeing are positively correlated.

Rathee and Sharma (2018) conducted a study to determine AQ among high school students with respect to demographic variables such as gender and locality. 400 students from Haryana were selected using multistage random sampling. Adversity Quotient Assessment Scale was used to measure AQ. Result revealed that AQ was not found to be influenced by demographic variables.

Wardani and Mahmudi (2018) in a study aimed to discover AQ of vocational high school student's AQ towards mathematics. Survey method was used for the study. 132 student of 10th grade in South Jakarta were selected for the study. Likert type questionnaire was used as the tool to measure AQ. Findings revealed that 27 percent student were identified as Climbers (High AQ), 72 percent as Campers (Medium AQ) and 1 percent as Quitters (Low AQ).

Amir et al. (2017) conducted a study aimed to analyse students' AQ in mathematics learning based on gender. The study was quantitative survey type. The subjects of study were 8th grade students consisting of 75 girls and 63 boys. AQ scale was used to collect data. The result of the study revealed that there exists significant difference in the dimensions of AQ with respect to gender. It also showed that between boys and girls there exists no significant difference in their Mathematical AQ. The boys were found to be superior to girls in the endurance and

reach dimensions of AQ. Also, girls were found to be superior to boys in the control dimension of AQ.

Marashi and Fotoohi (2017) conducted a study to find the relationship between extrovert and introvert EFL teacher's AQ and professional development. 120 EFL teachers were the sample. Eysenck Personality Inventory, Adversity Quotient Profile, Teaching and Learning International Survey and Teacher Questionnaire were used as the tool. Result showed significant correlation between Introvert and Extrovert EFL teacher's AQ and professional development.

Suryadi and Santoso (2017) conducted the study to measure the effects of self-efficacy and AQ of grade IX students regarding achievement in mathematics. Survey method was used. 140 students were selected for the study using probability sampling. Self-Efficacy Scale and Adversity Quotient Scale were used. Achievement in Mathematics was measured based on School test results. Multiple Regression analysis was used. Result showed significant effects of Self-Efficacy and AQ. There was no significant effect of gender on student's Academic Mathematics Achievement.

Kusumawardani et al. (2017) in a study described the thinking process of students with high, medium and low AQ from 8th grade students in solving open ended problem of PISA model of Space and shape contents based on Polya's Problem Solving. The study was descriptive with a qualitative approach. Result reveals that high AQ students showed a lot of equilibrium through the stage of assimilation and accommodation. Medium AQ students showed a lot of assimilation and accommodation condition and slightly disequilibrium. Low AQ students showed a lot of disequilibrium, assimilation and accommodation and little equilibrium.

Beri and Kumar (2016) conducted a study to identify the cognitive styles of secondary school students in relation to their AQ. Descriptive survey method was used. The investigator selected 200 secondary school students as sample through

stratified random sampling technique. Cognitive Style Inventory developed by Jha (2001) and Adversity Quotient Profile developed by the Investigator were used as the tool. The findings of study revealed that percentage of male students in Systematic and Intuitive Cognitive Style was higher than female students. The female secondary school students possess greater AQ as compared to male secondary school students. It was also found that AQ has no influence on Systematic and Intuitive Cognitive Style of students.

Effendi et al. (2016) conducted a study on correlation between Adversity Quotient (AQ), Emotional Quotient (EQ), Intelligence Quotient (IQ) and Spiritual Quotient (SQ) among polytechnic students using Rasch model. Survey method was used for the study. Proportionate clustered multistage stratified random sampling technique was used. Four sets of questionnaires were used to measure AQ, EQ, IQ and SQ. Results of the study showed positive moderate correlation between AQ and EQ, AQ and SQ. Also, a weak positive correlation was found between AQ and IQ. This study explored that AQ can be a strong predictor to enhance EQ and SQ in increasing students' performance.

Bakare (2015) in a study examined the prediction effects of AQ and student-teacher psychological constructs (Students' attribution; students' school connectedness; teachers' self-efficacy; school type; gender; school location and age) on students' academic achievement in mathematics and English language in the West African Senior School Certificate Examination (WASSCE) in Southwestern Nigeria. The study was survey research. A multi-stage sampling technique was used. 120 teachers and 3, 712 students were the sample for the study. Student's Adversity Quotient Profile, Students Attribution Questionnaire, School Connectedness Scale and Teachers' Self-efficacy Scale were used to collect data. Multiple Regression method was used to analyse data. Result indicated that the AQ of the students ranged from 40 to 200. Majority of the students were of Moderate AQ. A positive

correlation was found between AQ and students' Academic Achievement. The eight predictor variables explained Achievement in Mathematics. The most significant predictors of students' Academic Achievement in the examination were AQ, Teacher Self-efficacy, School type, Gender, Age and School location. Students' Attribution and School Connectedness were not found to be significant in predicting Academic Achievement.

Baroa (2015) conducted a study AQ and leadership skills of school administrators. 40 public elementary and 10 public secondary school administrators were selected as the sample. Adversity Response Profile and Leadership Skills Questionnaire were the tools for the study. Results revealed that the demographic profile such as age, sex, marital status, years of experience as school administrators and school level not affected the respondent's response to adversities. Respondents were in average level under reach dimension. The degree of correlation between AQ and Leadership Skills of school administrators was found to be low. Also, level of Leadership Skills of school administrators in terms of administrative, interpersonal and conceptual skills were found to be high.

Baustia (2015) conducted a study to determine the relationship between AQ and teaching performance of faculty members at West Visayas State University. Respondent's Profile, Adversity Quotient Profile, and the Performance Evaluation Sheet were used to collect data. The sample consisted of 30 faculties. The study revealed that, the faculty members had high AQ mean scores and a very satisfactory teaching performance. Results of the t-test showed that there was a significant difference in the AQ of faculty members according to their academic rank and length of service. Results also showed that there was a significant relationship between AQ and Teaching Performance of faculty members.

Hema and Gupta (2015) conducted a study entitled 'Adversity quotient for prospective higher education'. The research was conducted to study the AQ of 11th

standard, English medium school students in Gandhinagar city, Gujarat with reference to various variables. The study was conducted on a sample of 11th standard school students from Gujarat State Board of Education (GSEB) and Central Board of Secondary Education (CBSE) schools. A self-constructed AQ scale was used to collect data from the students. Result revealed that there was no significant difference in the mean scores of AQ based on gender, stream of education such as Commerce, Science and Arts, and various family variables such as nature of the family, size of the family, qualification of parents, parents' working status and parents' occupation. A significant difference was found in the mean scores of AQ of students on the basis of board of school i.e., GSEB and CBSE. The study concluded that AQ is not influenced by gender, stream of education and family factors. It was found that type of schools influenced AQ.

Kusumadhani et al. (2015) in a study attempted to describe the quality of the learning process, learning effectiveness and mathematical literacy competency based on AQ. Both qualitative and quantitative method were used in this study. The sample consisted of students from VIIth grade. Adversity Response Profile was used to determine climber, camper and quitter students. Each category consisted of 2 students. Pretest and Posttest were used to determine the effectiveness of discovery learning with Guilford approach. Post test and interview were used to determine mathematical literacy based on AQ types. Result revealed that discovery learning with Guilford approach had a good quality in learning process. It was found that discovery learning with Guilford approach was effective for improving mathematics literacy ability. Result showed that only climber students were able to solve all mathematical literacy competencies when compared to camper and quitter students.

Matore et al. (2015) in a study tried to find the influence of AQ on academic achievement of Malaysian polytechnic students using a sample of 1845 students from 5 polytechnics. Proportionate clustered multistage stratified sampling was conducted. Regression analysis was used for analysis. It was found that AQ

contributed only 0.9 percent changes in the variance of Academic Achievement score.

Siphai (2015) in a study attempted to find out the influence of Moral Quotient, Emotional Quotient and Adversity Quotient in Good Citizenship of University students. 1087 undergraduates were selected using multi stage sampling technique. MQ questionnaire, AQ questionnaire, EQ questionnaire and Good Citizenship questionnaire were used. Result indicated that AQ and MQ had a positive direct effect on Good Citizenship. EQ had a negative direct effect on Good Citizenship.

Vinas and Malabanan (2015) conducted a study Adversity quotient and coping strategies of college students in Philippines University. Qualitative and quantitative approach was used. The result showed that respondents had Moderate AQ. Respondents' coping strategies were categorized to determine their adversities. The study also revealed that there was a significant relationship between profile variables such as age, gender, civil status in terms of general weighted average and AQ of the respondents.

Cando and Villacastin (2014) through a study established a descriptive profile on the Adversity Quotient and Emotional Quotients of the college faculty members. Result revealed that there was a significant relationship between the AQ and EQ. It was a descriptive method of research. Survey questionnaire and Student evaluation form was used as tool. Individual scores for the four dimensions of AQ presented mid-range scores for all respondents. Correlation coefficient for AQ and teaching performance showed a low relationship between the two variables. Also, a negligible relationship was found between EQ and teaching performance.

Parvathy and Praseeda (2014) conducted a study to find the relationship between AQ and academic problems among student teachers. Survey method was used. 300 student teachers were selected using random sampling. Questionnaire to check Academic problems, Rating scale to rate Self-esteem and Inventory to check

AQ of student teachers were used as the tools. Result indicated that there was significant, substantial and negative correlation between Academic Problems and AQ. Also, there was a significant, substantial and negative relationship between Academic Problems and AQ among student teachers in Kerala.

Tian and Fan (2014) conducted a cross sectional study to investigate AQ, Environmental variables and Career Adaptability in student nurses. 431 students were selected for the sample. Questionnaires on demographic, career adaptability, AQ, Clinical learning environment and social support were administered. Finding revealed that student nurse's AQ, individualized clinical learning environment and family social support associated positively with their degree of career adaptability even after multiple adjustments.

Nikam and Uplane (2013) conducted a study to examine the relationship between AQ and Defense Mechanism (DM) of secondary school students. The study also analysed whether there exists any difference between the level of AQ and DM of boys and girls. The sample included 156 girls and 152 boys (aged from 13 years to 15 years) using random sampling. Inventory was used for data collection of Defense Mechanism. Online Adversity Quotient Profile (Stoltz 1997) was used for data collection of AQ. Result revealed that there was no correlation between AQ and Defense Mechanism of secondary school students. It also revealed that there were no significant differences in the level of AQ and Defense Mechanism of boys and girls.

Cornista and Macasaet (2013) in a study examined the correlation between AQ and achievement motivation of third- and fourth-year psychology students. It was a descriptive correlation study. Adversity Response Profile (ARP) and Achievement Motivation Profile (AMP) were used as the tools. Result revealed that age and gender differences did not affect the selected 3rd and 4th year student's AQ where as year level significantly affected AQ. It was also found that age, gender and year level did not affect Achievement Motivation. Also, significant relationship was found between AQ and Achievement Motivation.

Santos (2012) conducted a study entitled as “Assessing the effectiveness of the adapted adversity quotient program in a special education school”. The study was to assess the effectiveness of the developed AQ Program for special education teachers. Focus group discussion, Interview with the school director and The Adversity Response Profile Quick Take (Stoltz, 1997) were used as the tools. Result revealed that AQ of special education teachers was low. After conducting the developed AQ Program, the post test results significantly increased to moderately high. The results of the study also indicated that that AQ may be used as part of faculty development programs to make special education teachers more resilient and competent members of the workforce.

Pangma et al. (2009) conducted a study on causal factors influencing students AQ between twelfth grade and third-year vocational students in Thailand. 672 twelfth grade and 376 third-year vocational students were selected using multi-stage random sampling techniques. A scale on Self-Esteem, Dominance, Self-Confidence, Sense of Personal Freedom, Achievement Motivation, Ambition, Enthusiasm, Responsibility, Future orientation, and AQ were used for data collection. The results of the study were as follows: (1) The variables influencing the AQ of 12th grade and third-year vocational students were dominance, sense of personal freedom, self-esteem, enthusiasm, self-confidence, ambition and achievement motivation. (2) The variables directly influenced AQ of twelfth grade students was self-confidence while the variables both directly and indirectly influenced AQ of students were dominance, sense of personal freedom, self-esteem, and enthusiasm. (3) The variable influenced AQ of third-year vocational students was Achievement Motivation, while the variables both directly and indirectly influenced the AQ of these students were sense of personal freedom, self-esteem, enthusiasm, self-confidence, and ambition.

D’souza. (2006) conducted a study on Adversity Quotient of secondary schools in relation to their school performance and school climate. The objectives of

the study were to study AQ, school performance and school climate and to compare the AQ and performance of different types of schools namely SSC, ICSE and CBSE boards. A descriptive method of comparative and correlation type was used for the study. 548 secondary school students of 9th standard of SSC, ICSE and CBSE English medium boards of Greater Mumbai were selected for the study. It was found that there was significant difference in the AQ of students of SSC, ICSE and CBSE schools. The student of ICSE and CBSE school types showed better ability to handle adversities than SSC school students. It also indicated that student with Low AQ, irrespective of their school type responded in a similar manner to adverse situations. Also, there was a positive correlation between AQ and school performance.

Studies on Cognitive Styles

The investigator reviewed studies on Cognitive styles for a period from 2003 to 2020. Studies conducted in India and abroad were reviewed and are given as follows.

Olagbaju(2020) conducted a study to determine the extent of cognitive style and gender can predict student's achievement in summary writing. The sample consisted of 350 students. Cognitive Style Inventory of Martin (1983) was used as the tool. Data were analysed using regression analysis. Results showed that Cognitive Style and gender are predictors of student's achievement in summary writing.

Saraswathi (2020) conducted the study about patterns of cognitive styles and level of modernization among school teachers belonging to tribal community. The sample consisted of 310 teachers from Rangareddy district of Telangana state. Cognitive Style Inventory of Jha(2001) was used as the tool. Result showed that there was no significant difference between patterns of Cognitive Style among school teachers belonging to tribal community with respect to their professional qualification.

Arina and Lukito (2019) conducted a study on Algebraic thinking of junior high school students in solving number pattern problems based on Systematic and Intuitive Cognitive Styles. It was a descriptive-qualitative study. Assignments and interviews were used as the tool. Result of the study revealed that in problem solving, systematic cognitive style subjects do it in order. Subjects of Intuitive Cognitive Style work according to the level of difficulty. Also, subjects in Systematic Cognitive Style tries to deconstruct numbers while Intuitive Cognitive Style subjects used trial and error method.

Atsuwe and Mtoh (2019) examined the Effect of cognitive style on student achievement and retention in physics of senior secondary school students using ex-post facto research design. Sample consisted of 150 senior secondary school students. Group Embedded Figure Test, Physics achievement test and Retention test were used as the tool. The analysis was conducted using ANCOVA. Result revealed that field independent achieved better than field dependent in Physics. Field independent students had a higher retention memory than field dependent students. Male students achieved better under field dependent Cognitive Style.

Hooda and Devi (2018) has undertaken a study to examine self-confidence of secondary school students in relation to cognitive styles. The sample consisted of 400 students of class 10th selected using multi stage random sampling method. Cognitive Style Inventory of Jha (2001) and Self-Confidence Inventory were used as the tools. Result revealed that the main effect of cognitive style and gender on Self-Confidence of secondary school students was found to be significant. Double interaction effect of Cognitive Style and gender was also found to be significant. Result of the study implied that teachers should plan their teaching accordingly by adopting effective teaching methods and proper teaching strategies. Also, guide students for promoting their academic excellence and self-confidence.

Joseph (2018) in a study aimed to explore the distribution of Cognitive styles, level of social intelligence, attitude towards learning, interest in learning and

learning environment of higher secondary school students in Kerala and to find out the relationship between these variables. A sample of 1000 higher secondary school students were selected. Cognitive Style Inventory of Martin (1983) was used along with Social Intelligence Scale, Home Learning Environment Inventory, School Learning Environment Inventory, Learning Interest Inventory and Scale of Attitude towards learning. Result indicated that Cognitive Style of higher secondary school students was varied indicating the need for developing and implementing various teaching and learning strategies according to the need of the students. Significant relation between Social Intelligence and select affective and environmental variable indicated the need of arranging proper learning environment in home and school to develop Social Intelligence and attitude and interest for learning.

Sellah et al. (2018) in the study Predictive power of cognitive style on academic performance of students in selected national secondary schools in Kenya examined the interactive effects of Cognitive Styles and their power to predict academic performance in Chemistry. Cognitive Styles were measured on concrete-abstract, active-reflective, verbal-visual and sequential-global dimensions. Cognitive Style Inventory, interview guide for academic masters and marks record form were used for collecting data. Result revealed that out of 4 dimensions of Cognitive Styles only sequential-global dimension was a significant predictor of performance in Chemistry.

Balasubramaniam and Sivakumar (2018) examined the Impact of cognitive style on academic achievement of higher secondary school students. 300 students were selected for the study. Cognitive Style Inventory (Jha, 2001) was used as tool for data collection. t-test and Pearson's product moment correlation was used for analyzing data. Result revealed that there was no significant difference between male and female higher secondary students in their Cognitive Style but there was significant difference between male and female students in their

Academic Achievement. Also, there was significant relationship between Cognitive Style and Academic Achievement.

Udiyono and Yuwono (2018) examined the correlation between cognitive style and student's learning achievement on geometry. Cluster random sampling was used. Group embedded figure test, learning achievement test were used for data collection and simple linear regression was used for analysis. Result indicated that there was a positive correlation between Cognitive Style and student learning achievement on geometry. Also field independent learner had better achievement than field dependent learner.

Astunnisyah et al. (2017) conducted a study to find out the Effect of learning model, cognitive style and the interaction between cognitive style and learning model towards mathematical achievement. The research was quasi experimental with 2x2 factorial design. The sample consisted of 279 eighth grade students. Result showed that students of field independent Cognitive Style had better mathematics achievement than with field dependent Cognitive Style.

Syukriani et al. (2017) conducted the study Strategic competence of senior secondary school students in solving mathematics problem based on cognitive style. Subjects were selected based on the test results of mathematics competence and Group Embedded Figure Test. Result showed that field independent subjects tend to be analytical both in forming the mental imagination and the picture to process information in accordance with his own knowledge structure. Field dependent subjects were less analytical and unable to recognize simple form.

Sampa (2017) conducted a study of Cognitive style, emotional intelligence and locus of control as predictors of academic achievement of secondary school students. 400 students of class 9 were selected as the sample for the study. Group Embedded Figure Test, Emotional Intelligence Scale and Locus of Control Scale

were used as the tools. Result indicated that Cognitive Styles and Emotional Intelligence serve as the foundation of Academic Achievement.

Jain et al. (2017) conducted a study on Cognitive styles of adolescent students in relation to their stress level. Sample consisted of 100 undergraduate students and were selected by simple random sampling. Result indicated that there was no significant impact of stress on Cognitive Styles of college going male students. But significant impact of stress on Cognitive Styles was found on female undergraduate students.

Minchekar (2017) conducted a study on the role of Cognitive style in creative thinking among college students. The study was aimed to explore the relationship between Cognitive Styles and Creativity among college students. 120 students of age group between 18 and 20 years were selected randomly. Cognitive Style Inventory and Creative Thinking Scale were the tools for the study. Result revealed that Systematic Cognitive Style and Intuitive Cognitive Style were positively and significantly related to originality.

Nath (2017) conducted a comparative study of Cognitive style among graduate college students. 100 graduate college students were selected as sample. Cognitive Style Inventory of Jha was used as the tool for data collection. Result indicated that girls were found to be significantly better than boys in systematic and intuitive Cognitive Styles.

Rani (2017) conducted a study on Relationship between Cognitive styles and problem-solving abilities of senior secondary school students. 150 students of Class XI were administered Cognitive Style inventory of Martin (1983) and Problem-Solving Ability Test by Dubey (1971). Result revealed that Cognitive Styles of students were significantly correlated with their problem-solving abilities.

Ravi and Manju (2017) conducted a study to find out and compare the Cognitive style of under graduate male and female mathematics students. The sample consisted of 240 graduate mathematics students. The investigators used Cognitive Style Inventory (Martin, 1983). The findings showed that there was a significant difference in the level of Cognitive Style between male and female undergraduate mathematics students. Also, there was no significant mean score difference in the Cognitive style between male and female undergraduate mathematics students, which showed that gender had no influence on Cognitive Style of undergraduate mathematics students.

Tomar (2017) in a study analysed Cognitive style of senior secondary school students with respect to their streams. 150 students were selected out of which 50 from science, 50 from Arts and 50 from commerce stream. Cognitive style Inventory of Jha was used. Chi square test was conducted and result indicated significant difference between Cognitive Styles among senior secondary students due to variation in their streams.

Utomo et al. (2017) conducted the study on Mathematical visualization process of junior high school students in solving a contextual problem based on cognitive style. Mathematical visualization in this research contains image generation, image inspection, and image scanning and image transformation. Sample selected were 8th grade students. Group embedded figure test adopted from Witkin were used for measuring Cognitive Style. Also, visualization test in contextual problem and interview were used. Result indicated that field dependent and field independent subjects showed difference in responding to contextual problem.

Sharma (2017) studied Cognitive style of senior secondary students with relation to their gender. 100 students were selected as sample. Chi square test was conducted to analyse data. It was found that significant difference had been found between Cognitive Style of senior secondary students.

Singh (2017) conducted the study to explore how learning styles and cognitive styles affect the learning and to find the nature of relationship between these styles with achievement of learners. Result indicated that there was a link between cognitive and learning style determined the achievement of learners. Learners having field dependent and field independent have different learning styles. Result of the study pointed out that as learners differ in their Cognitive Style, the effort to identify them will improve their learning. Also, supplementing the curriculum transaction with awareness of cognitive and learning style teachers can help learners to reach the desired learning levels.

Balasubramanian and Rajaguru (2016) conducted a study to profile the cognitive styles of student teachers. Simple random sampling was used. Sample consists of 75 student teachers. Cognitive style inventory was used as a tool. Result indicated that student teachers possess Split, Systematic and Integrated Cognitive Styles. Also, there was an association in Cognitive Styles of teachers based on variation in their gender.

Devi and Raja (2016) conducted a study to find out the predominance of cognitive Style prevailing among standard XI students. Cognitive Style Inventory of Jha (2001) was used as the tool. A sample of 221 students studying in XI of science and arts group was selected using random sampling technique. Result revealed that Systematic Cognitive Style was predominant than Intuitive Cognitive Style. Moderate level of academic achievement was seen in both Systematic and Intuitive Style.

Katoch and Thakur (2016) conducted a study on Cognitive styles of secondary school teachers in Kullu district of Himachal Pradesh. Random sampling technique was used and sample consisted of 200 secondary teachers. Cognitive Style Inventory by Jha (2001) was used for collecting data. Result showed that there was a

significant difference between male and female secondary school teachers regarding Systematic and Intuitive Cognitive Styles. Also, there was no significant difference between male and female secondary school teachers regarding Integrated, Undifferentiated and Split Cognitive Styles.

Khandagale (2016) conducted a study to identify Cognitive style among teacher educators based on gender and discipline. Descriptive survey method was adopted. Alert Cognitive Style Scale was used as the tool. Findings revealed that left brain is dominant for both gender and discipline.

Wulandari et al. (2016) examined Cognitive style and creative quality in affecting academic achievement of university student in Indonesia. 234 students were selected for the study. Cognitive Reflection Test, Creative Personality Scales were used. Result showed that student who used analytical thinking tends to have higher academic success, particularly in life science majors.

Ahmed (2015) conducted a study to examine the relationship of personality dispositions, cognitive styles and decision-making style with resilience of management students. 130 students were selected as sample through random sampling. Resilience Inventory, Myers Briggs Type Indicator, Cognitive Style Inventory and Decision-Making Inventory were used as tools for the study. Result revealed that resilience had a positive correlation with thinking personality type and an inverse relation with facing personality type. Systematic and intuitive cognitive styles had positive correlation with resilience. Behavioral decision style had shown negative association with resilience.

Kumar and Nagaraju (2015) conducted a study on Cognitive styles and job satisfaction among high school mathematics teachers. The study was conducted to explore the Cognitive Styles of mathematics teachers and also to find out the corresponding levels of Job Satisfaction. 72 high school mathematics teachers were selected by simple random sampling. Cognitive Style Inventory and Job Satisfaction

Scale were used as tools. Result revealed that high school mathematics teachers possess Split Cognitive Style, Integrated and Undifferentiated Cognitive Style. 30 teachers belonging to Split Cognitive Style category had variation ranging from high degree job satisfaction to low degree job satisfaction.

Kumar and Naik (2015) conducted a study to profile the Cognitive styles of high school biological science teachers. Simple random sampling method was used. 70 high school biological science teachers were taken as the sample. Result indicated that high school biological science teachers possessed 3 types of Cognitive Styles namely Split, Undifferentiated and Integrated Cognitive Styles. Also, there was difference in Cognitive Styles of teachers based on variation in their gender and type of management of the school.

Mohan and Babu (2015) conducted a study on Cognitive styles of student teachers in relation to their gender and location. Samples of 600 student teachers were selected using stratified random sampling method. Result revealed that there was a significant difference in Cognitive Styles with respect to location among student teachers. But there was no significant difference in Cognitive Styles with respect to gender among student teachers.

Mohan (2015) in a study tried to find the relationship between Cognitive styles and social and emotional intelligence of student teachers. For this the investigator collected data from 600 student teacher using CSI, Social Intelligence Scale and Emotional Intelligence Scale. Result of the study indicated a positive moderate correlation between Systematic and Intuitive Cognitive Styles and various dimensions of Social Intelligence. Also, positive moderate correlation exists between Systematic and Intuitive Cognitive Styles and Emotional Intelligence. Most of the student teachers possessed Intuitive Cognitive Style approach.

Onyekuru (2015) conducted a study entitled Field dependent and field independent cognitive style, gender, career choice and academic achievement of secondary school students. Sample consisted of 320 students. Group Embedded Figure Test was used as the tool for measuring Cognitive styles. Result showed that a high proportion of male respondents were field independent while a higher proportion of female respondents were field dependent. Significant relationship was found between field dependent and field independent Cognitive Style and gender. Field independent students had a higher mean achievement in sciences than field dependent students while field dependent students had a higher mean achievement in arts than field independent students. Also, significant relationship was seen between field dependent and field independent Cognitive Style and career choice of students.

Tribhuvan (2015) conducted a study on the Role of biological variables in cognitive style among adolescents. Main objective was to know the influence of gender and locality on Cognitive Styles. A sample of 200 adolescents was taken as sample through simple random sampling. Cognitive Style inventory of Jha (2001) was used as the tool. Result revealed that female have higher level of Cognitive Style than male. Also, urban adolescents have higher level of Cognitive Styles. It was found that biological characters influenced Cognitive Styles.

Salahuddin (2015) conducted a study to compare the Cognitive styles of junior college students studying in science stream with respect to gender and locality. Stratified random sampling method was used and the sample consisted of 400 junior college students studying in science stream from rural and urban areas. Standardised Cognitive Style Inventory by Jha (2001) was used. Result showed that junior college science stream students possess Systematic Cognitive Style with respect to gender and locality. Findings also revealed that there was significant

difference in the Systematic and Intuitive Cognitive Styles among male and female junior college students of science stream. Also, there was no significant difference in the Systematic and Intuitive Cognitive styles respectively among rural and urban junior college students of science stream.

Kumar and Kumar (2014) conducted a study to profile the Cognitive styles of high school English teachers. Simple random sampling technique was used for data collection. Sample consisted of 60 high school English teachers. Cognitive Style Inventory was used as the tool. It was a survey study. Chi square test was used as statistical technique. Result revealed that high school English teachers possessed 3 types of Cognitive Styles namely, Integrated, Undifferentiated and Split Cognitive Styles. The result also showed that there were differences in the Cognitive Styles of teachers based on their age and religion.

Kumar (2014) conducted a study on Cognitive styles of J.B.T trainees in Himachal Pradesh with respect to gender, locale, stream and family status. Random sampling, stratified, incidental and purposive sample of 140 J.B.T trainees were selected. Kirton Adaptation/Innovation Inventory was used as the tool to measure cognitive styles. Highly significant differences were found among arts male and arts females also among science male and science female J.B.T trainees with respect to their Cognitive Styles.

Saxena et al. (2014) conducted a study to find out the Impact of cognitive styles on problem solving ability among undergraduates. Result showed that there was no significant impact of Cognitive Style on Problem Solving Ability of undergraduate male and female students of Integrated and Split Style. But a significant difference was found in the Problem-Solving Ability of science and non-science students.

Jain and Kumar (2013) conducted a study to explore the relationship between cognitive style and meta cognitive awareness in young adults. Sample

consisted of 40 students from Agra. Cognitive Style Inventory and Meta Cognitive Awareness Inventory was administered to collect data. Linear regression and product moment correlation were performed. Result indicated a significant positive correlation between Cognitive Style and Meta Cognitive Awareness.

Bashir et al. (2013) conducted a study on Impact of cognitive and decision-making style on resilience. Sample consisted of 152 students selected randomly between the age group of 20-25 years. Correlation and Regression Analysis were conducted. Result revealed that Resilience had a positive association with Cognitive Style. Also, there was no relationship between Resilience and Decision -Making Style. The Systematic and Intuitive Cognitive Styles showed positive correlation with Resilience.

Arisi (2011) investigated the Effect of cognitive style and gender on JSS student's academic achievement in social studies. 192 junior secondary student were selected. It was a quasi-experimental design with 2x2 pretest-posttest non randomised intact groups. Result indicated that there was significant main effect of Cognitive Styles on Academic Achievement in Social Studies. Field independent student performed significantly better than field dependent secondary school students. Also, there was no significant interaction effect of Cognitive Style and gender on student's Academic Achievement in Social Studies.

Shi (2011) conducted the study on Relationship between cognitive styles and learning strategies. 184 second year students were taken as the sample. Learning Style Survey and Chinese version of Oxford's Strategy Inventory for learning were used as tools for the study. Result showed that Cognitive Styles had significant influence on learner's choice learning strategies. It also showed that synthesizing

style, sharpener style, field independent style and impulsive style correlated positively with every strategy presented in this study.

Gulliver and Ghinea (2010) conducted the study entitled “Cognitive style and personality: Impact on multimedia perception”. Purpose of the study was to explore the relationship between Cognitive Style, user personality and perceived multimedia quality. Cognitive Style Analysis and Adapted Myers Brigg Questionnaire was used to assess Cognitive Style and Personality respectively. Findings showed that personality type and user cognitive style affects information assimilation, self-perceived achievement and student level confidence.

Pannu (2010) conducted a study on Academic achievement in relation to cognitive styles, personality traits and adjustment of adolescents. 1246 student were selected as the sample for the study. Results of the study showed that interaction exists between gender and intuitive cognitive styles. Interaction between gender, social adjustments and gender, personality factors were also found out. Positive low correlation between Academic Achievement and Systematic Cognitive Style, positive negligible correlation between Intuitive Cognitive Styles were also found out. Correlation between Academic Achievement with some factors of personality, emotional adjustment and social adjustment were also found out.

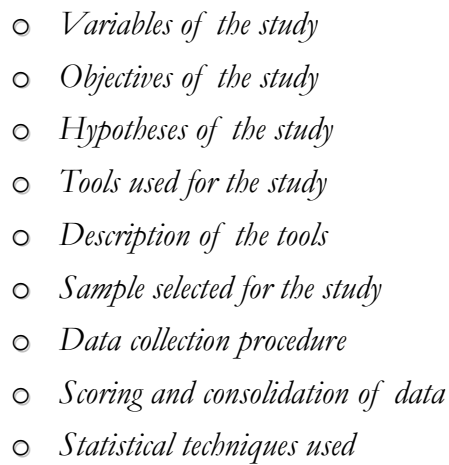
Barin (2003) through the study Influence of cognitive styles on student performance and preferences in mathematical assessment investigated the comparative influence of holistic-analytic style, verbal- imagery style and student’s display of mathematical knowledge. Cognitive Style analysis was used to assess Cognitive Styles. Student’s preferences to aspects of mathematics learning and assessment were examined using a questionnaire. Result indicated a significant partial correlation between Cognitive Style and student preferences in mathematics assessment.

Conclusion

On reviewing the related studies, the investigator found that AQ influenced students' performance related to learning. The investigator also identified various studies of AQ related to Mathematics Achievement which were conducted abroad. The investigator could not identify such studies conducted in Indian context. Similarly on reviewing the related literature, the investigator also noticed that most of the studies related to cognitive styles and Mathematics were based on Witkin's (1954) field dependent-field independent Cognitive Style. The investigator could not find any study on Mathematics Achievement of students based on the continuum in between the two extremes of the Wholist- Analytic cognitive style dimension. The investigator thus decided to conduct a study on higher secondary school students' Mathematics Achievement based on AQ and Cognitive Style (Martins' Model, 1983) which consider the continuum in between the two extremes of the Wholist-Analytic dimension.

Chapter 3

METHODOLOGY

- 
- *Variables of the study*
 - *Objectives of the study*
 - *Hypotheses of the study*
 - *Tools used for the study*
 - *Description of the tools*
 - *Sample selected for the study*
 - *Data collection procedure*
 - *Scoring and consolidation of data*
 - *Statistical techniques used*

METHODOLOGY

Research is the scientific and systematic search for knowledge. It is the systematic study of a well-defined problem through the application of scientific methods.

Research Methodology is a systematic and logical way for solving a research problem. It explains the scientific approaches and methods involved with the process of carrying out a research.

The methodology of the study is presented under the following sections.

- Variables of the study
- Objectives of the study
- Hypotheses of the study
- Tools used for the study
- Description of the tools
- Sample selected for the study
- Data collection procedure
- Scoring and consolidation of data
- Statistical techniques used

Variables of the Study

Variables are the conditions or characteristics that the experimenter manipulates controls or observes (Best & Kahn 2012).

Independent Variables

Independent variables are the conditions or characteristics that the experimenter manipulates or controls in the attempt to ascertain their relationship to

observed phenomena (Best & Kahn, 2012). In the present study there are two independent variables.

- 1) Adversity Quotient
- 2) Cognitive Styles

Dependent Variable

The dependent variables are the conditions or characteristics that appear, disappear or change as the experimenter introduces, removes or changes the independent variable (Best & Kahn, 2012). In the present study the dependent variable is Achievement in Mathematics.

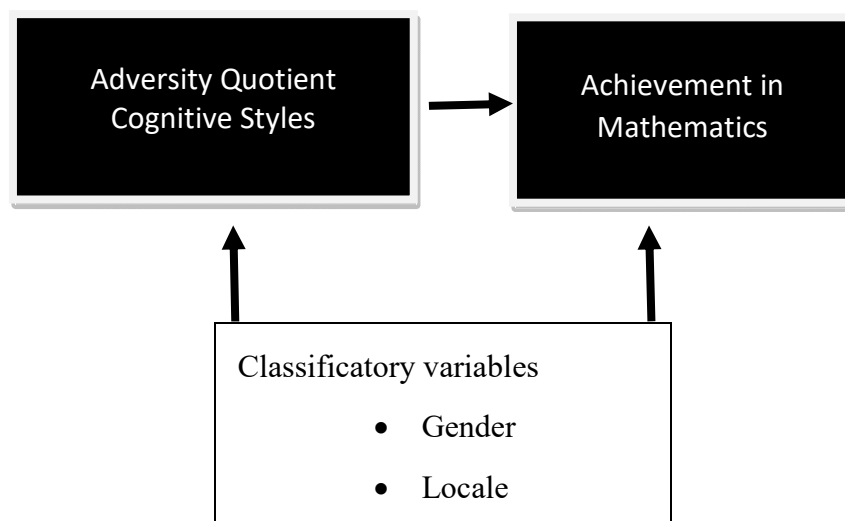
Classificatory Variables

- 1) Gender
- 2) Locale

Diagrammatic representation of the variables is represented in Figure 3

Figure 3

Diagrammatic Representation of Variables



Objectives of the Study

1. To examine whether there exist different levels of AQ among Higher Secondary School Students in Kerala for the total sample and sub samples drawn on the basis of Gender and Locale.
2. To examine whether there exist different Cognitive Styles among Higher Secondary School Students in Kerala for the total sample and sub samples of the study.
3. To find out whether there exist any significant differences in the mean scores of AQ, its dimensions and its components among the subsamples of the study.
4. To find out whether there exists any difference in the mean scores of Achievement in Mathematics among the subsamples.
5. To compare the mean scores of Achievement in Mathematics among students with High, Moderate and Low levels of AQ for the total sample and subsamples.
6. To compare the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample and subsamples
7. To find out whether there exists any significant relationship between AQ and Achievement in Mathematics for the total sample and subsamples.
8. To find out whether there exist any significant relationships between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples.
9. To find out the individual and combined contributions of dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics for the total sample.

Hypotheses of the Study

1. There exist different levels of AQ among Higher Secondary School Students in Kerala for the total sample and subsamples drawn on the basis of Gender and Locale.
2. There exist different Cognitive Styles among Higher Secondary School Students in Kerala for the total sample and subsamples of the study.
3. There exist significant differences in the mean scores of AQ, its dimensions and its components among the subsamples of the study.
4. There exists significant difference in the mean scores of Achievement in Mathematics among the subsamples.
5. There exist significant differences in the mean scores of Achievement in Mathematics among students with High, Moderate and Low levels of AQ for the total sample and subsamples.
6. There exist significant differences in the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample and subsamples.
7. There exists significant relationship between AQ and Achievement in Mathematics for the total sample and subsamples.
8. There exist significant relationships between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples.
9. There is significant individual and combined contributions of Dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics for the total sample.

Tools Used for the Study

The success of any research work depends on the availability of relevant data. So, the researcher requires certain methods and instruments to collect data. Each tool must be appropriate for the collection of certain types of evidence or information.

In this study the investigator used the following tools for collecting data. All the tools were developed by the investigator with the help of her supervising teacher.

- 1) Adversity Quotient Scale
- 2) Cognitive Style Inventory
- 3) Achievement Test in Mathematics

Description of the Tools

1. Adversity Quotient Scale

The investigator decided to identify AQ of Higher Secondary School Students. The investigator with the help of her supervising teacher planned to develop a tool to measure AQ of students. The tool for the present study was prepared by reviewing related literature, available tools with special reference to the contents, item formation, establishing validity and reliability.

Detailed description of the development of the tool is given below under the following heads.

- 1) Adversities identification stage.
- 2) Preparation of items.
- 3) Try out of the tool
- 4) Establishing Validity and Reliability of the tool.

Step 1- Adversity Identification Stage

The investigator consulted books such as Stoltz (1997), American Psychological Association (2002), Bandura (1977) and Haugaard (2001) before the preparation of the items. The investigator reviewed related studies on the subject. She also referred tools developed earlier such as Adversity Response Quick Take (Stoltz, 1997), Resilience Scale for Adults (Friborg et al., 2003). Based on the references the investigator identified 4 components of AQ of higher secondary school students such as Individual related, Home related, Institution related and Society related. They are briefly described below

Individual Related. Adversities due to an individual's inherent elements are considered as individual related adversity. Lack of confidence, lack of interest in studies, mental and emotional problems, health and physical problems, adjustment problems, lack of self-control related to studies etc are some of the individual adversities. Any adversity mentioned previously will gradually reach the individual level

Home Related. The different adversities faced by the students related to their home and family was taken as home related adversity. Unhealthy attitude of family members and neighbours, income level of parents, death of relatives, family friends and neighbors, health problems of the parents and near relatives, violence at home, lack of support from family, feeling neglected by the parents etc comes under this category.

Institution Related. Adversities felt by students during their institutional life are termed as institutional level adversities. Unfriendly attitude of teachers, hostile school climate, projects and assignments related anxieties, attitude and behavior of classmates, inability to adjust with teaching learning process, adjustment problem regarding culture of the institution etc are some of the institutional level adversities.

Society Related. Societal level adversity can be described as an exposure to hardships as a result of social circumstances like, poverty, racial discrimination, maltreatment, intergenerational trauma or community violence. (Gartland et al., 2019). In the case of adolescent students, drug abuse, peer related issues, adjustment problems with societal norms, wrong usage of social media etc comes under this category.

For the purpose of identifying and listing out common adversities faced by higher secondary school students of Kerala, the investigator administered a survey among 300 higher secondary school students of Kozhikode district using Adversity Identification Questionnaire. The Questionnaire consisted of 56 items. The questions were framed based on the above mentioned society, institutional, individual and home related adversities. The possible responses for each question were provided as Yes or No. Also, the students were given option to freely express any other adversities felt by them other than those mentioned in the Adversity Identification Questionnaire. The adverse situations that were raised by 50 percentage and above of the students were selected.

The Adversity Identification Questionnaire and Percentages of common adverse situations which were felt by Higher Secondary Students as Appendix I and Appendix II.

Step 2- Development of Items under Different Dimensions

For the construction of the tool the investigator reviewed related literature and identified the dimensions such as Control, Origin and Ownership, Reach and Endurance.

Items for Adversity Quotient Scale were developed based on the common adversities felt by higher secondary school students in the four components. The listed-out adversities in any of the 4 components had conceptualized into the above

mentioned 4 dimensions. A single situation regarding a particular adversity addressed 2 dimensions either control and origin - ownership dimensions or Reach and endurance dimensions. Thus, from the 35 listed out adversities the investigator developed 70 items. The initial draft was modified. Thus, a likert type scale was prepared for measuring AQ.

The Four dimensions are briefly explained with examples as follows.

Control. It measures how much control one has over an adverse event. It is the perceived ability to alter a situation and response ability to control one's own responses to anything that may arise. Higher the control score, one persists through difficulties and remains dedicated and active in their determination and approach to find a solution. People with low perceived control often feel anchored before adversity.

Eg. I can control the mental pressure from school related to studies.

Origin and Ownership. This dimension assesses the extent to which one takes it upon oneself to improve the situation at hand, regardless of its cause. People with high score in this dimension consider adversity as originating from some external sources and avoid unnecessary self-blame. They learn from their own mistakes and will try to make the situation better next time. Those with low score withdraw from challenges as they resist taking accountable for finding a solution.

Eg. If I face mental pressure from school related to studies, I may have role in it.

Reach. Reach dimension explores how far one let adversity go into other areas of one's work and life. It determines how large one perceives the problem to be, or its apparent extent. Limiting the reach of adversity enables to think clearly and take action. A person with high score in this dimension are able to compartmentalize the reach of adversity and thus manages the difficulties properly while those with

low score in this dimension can't limit the reach of adversity getting into other areas of life. This makes them helpless to take necessary action to get out of the effects of adversity.

Eg. If I have health problems it does not affect my other activities at all.

Endurance. It measures how long the adversity will last and how long will the causes of the adversity last. A person with high score in this dimension considers adversity and it causes as temporary. It provides greater energy and likelihood to take action and survive greater challenges. The lower scores in this dimension make one to view adversity and its causes as permanent and create loss of hope and prevent to take necessary action against challenges.

Eg. If I have to face health problems, I will consider it as temporary.

Scoring Procedure. Subjects have to respond to each of the statements by choosing any one of the 5 alternatives, Always, Often, Sometimes, Rarely, Never which suit their response best. For the positive statements 5 scores were provided. 5 for Always, 4 for Often, 3 for Sometimes, 2 for Rarely, 1 for Never. Negative statements were scored in the reverse order. The scores on all the 70 items of an individual were added together and the total score is considered as the measure of AQ of the individual. The total score of an individual may range from 70 to 350.

The dimension wise distributions of items of Adversity Quotient Scale (draft) are given in Table 3.

Table 3*Dimension wise Distribution of Items of Adversity Quotient Scale (Draft)*

Dimensions	Item No	Total No of Items
Control	1, 3*, 5, 7, 9, 11, 13*, 15, 17, 19*, 21, 23*, 25*, 27*, 29*, 31*, 33*	17
Origin and Ownership	2, 4, 6, 8, 10*, 12, 14, 16, 18*, 20, 22, 24, 26*, 28, 30, 32, 34	17
Reach	35, 37*, 39*, 41*, 43, 45, 47*, 49*, 51*, 53*, 55*, 57*, 59*, 61*, 63*, 65*, 67*, 69*	18
Endurance	36, 38, 40*, 42, 44, 46, 48, 50, 52, 54*, 56, 58, 60*, 62*, 64*, 66*, 68*, 70*	18

*denotes negative items

The component wise distributions of items of Adversity Quotient Scale (draft) are given in Table 4.

Table 4*Component wise Distribution of Items of Adversity Quotient Scale (Draft)*

Components	Item No	Total No of Items
Individual Related	3*, 4, 5, 6, 13*, 14, 23*, 24, 25*, 26*, 33*, 34, 35, 36, 43, 44	16
Home related	9, 10*, 27*, 28, 29*, 30, 41*, 42, 47*, 48, 49*, 50, 51*, 52, 57*, 58, 63*, 64, 69*, 70*	20
Institution related	1, 2, 7, 8, 11, 12, 31*, 32, 37*, 38, 53*, 54*, 61*, 62*, 65*, 66*	16
Society related	15, 16, 17, 18*, 19*, 20, 21, 22, 39*, 40*, 45, 46, 55*, 56, 59*, 60*, 67*, 68*	18

*denotes negative items

The Adversity Quotient Scale (Draft) is given as Appendix III.

Step 3- Tryout of the Tool

After the preparation of the items the investigator conducted a tryout of the tool. A sample of 150 students was selected and the draft tool was administered on them. Each score sheet was scored as per the scoring procedure mentioned above.

Item Analysis. The response sheets were arranged in ascending order of the total score obtained by the individual for all items. The top 27% and bottom 27% were identified as upper and lower criterion groups. The 't' is calculated using the formula (Edwards, 1957)

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum (X_H - \bar{X}_H)^2 + \sum (X_L - \bar{X}_L)^2}{n(n-1)}}$$

Where \bar{X}_H = Mean score of a given statement in the higher group,

\bar{X}_L = Mean score of a given statement in the lower group,

X_H = Score of an individual for a given statement in the higher group

X_L = Score of an individual for a given statement in the lower group

The 't' value of 70 items were calculated and tabulated.

The result of Item Analysis of Adversity Quotient Scale is given in Table 5.

Table 5*The Result of Item Analysis of Adversity Quotient Scale*

Item No	t value	Accepted/ Rejected	Item No	t value	Accepted/ Rejected
1	2.579	Accepted	36	3.206	Accepted
2	0.530	Rejected	37	5.000	Accepted
3	1.532	Rejected	38	3.471	Accepted
4	2.319	Accepted	39	4.587	Accepted
5	1.286	Rejected	40	3.579	Accepted
6	1.085	Rejected	41	6.454	Accepted
7	3.454	Accepted	42	2.820	Accepted
8	0.224	Rejected	43	4.791	Accepted
9	4.098	Accepted	44	5.312	Accepted
10	1.039	Rejected	45	2.069	Accepted
11	0.314	Rejected	46	0.757	Rejected
12	2.262	Accepted	47	3.417	Accepted
13	1.092	Rejected	48	3.378	Accepted
14	2.362	Accepted	49	2.721	Accepted
15	3.064	Accepted	50	3.003	Accepted
16	0.167	Rejected	51	2.582	Accepted
17	6.968	Accepted	52	3.470	Accepted
18	2.573	Accepted	53	3.806	Accepted
19	0.816	Rejected	54	3.448	Accepted
20	1.159	Rejected	55	2.076	Accepted
21	0.581	Rejected	56	2.142	Accepted
22	2.422	Accepted	57	3.977	Accepted
23	2.663	Accepted	58	3.746	Accepted
24	2.076	Accepted	59	4.130	Accepted
25	3.151	Accepted	60	4.155	Accepted
26	2.814	Accepted	61	2.254	Accepted
27	5.685	Accepted	62	1.656	Rejected
28	2.314	Accepted	63	3.737	Accepted
29	6.170	Accepted	64	5.037	Accepted
30	0.556	Rejected	65	4.878	Accepted
31	0.779	Rejected	66	4.650	Accepted
32	1.979	Accepted	67	5.118	Accepted
33	2.545	Accepted	68	3.343	Accepted
34	2.975	Accepted	69	1.651	Rejected
35	1.005	Rejected	70	2.266	Accepted

From the above table 52 items with t value greater than or equal to 1.96 were identified among which 11 items were in Institutional related, 11 items in Individual related, 17 items in Home related and 13 items in Society related adversities respectively. On sorting out the same 52 items mentioned above dimension wise, it was found that 10 items were in Control dimension, 10 items in Origin and Ownership, 16 in Reach and 16 in Endurance dimension respectively. In order to maintain equal weightage in both dimensions and components, the investigator omitted 12 items considering the least t value obtained from the 52 items. Thus 40 items were finalised for the Adversity Quotient Scale so that each dimensions and components consisted of 10 items.

Since for a single situation two items were framed in two dimensions, after the item analysis where ever one question was omitted among the similar situation, it was maintained as dummy items in the final tool to conserve the basic structure of Adversity Quotient Scale. The dummy items do not carry a score. The score on all the 40 items were added together and the total score is considered as the measure of AQ of an individual. The total score of an individual may range from 40 to 200. The score obtained on the items belonging to each dimensions of AQ and for each component of AQ such as Institutional related, Individual related, Home related and Society related were also calculated.

The dimension wise distribution of items of Adversity Quotient Scale (Final) are given in Table 6

Table 6*Dimension wise Distribution of Items of Adversity Quotient Scale (Final)*

Dimensions	Item No	Total No of Items
Control	1, 5, 7, 13, 15, 19*, 21*, 23*, 25*, 29*	10
Origin and Ownership	4, 10, 12, 16*, 18, 20, 22*, 24, 28, 30	10
Reach	31*, 33*, 35*, 37, 39*, 41*, 43*, 45*, 49*, 51*	10
Endurance	32, 34*, 38, 40, 42*, 44, 46*, 48*, 50*, 52*	10

*denotes negative items

The component wise distributions of items of Adversity Quotient Scale (Final) are given in Table 7.

Table 7*Component wise Distribution of Items of Adversity Quotient Scale (Final)*

Levels of Adversity	Item No	Total No of Items
Individual related	4, 12, 19*, 20, 21*, 22*, 29*, 30, 37, 38	10
Home related	7, 23*, 24, 25*, 35*, 39*, 40*, 43*, 44, 48*	10
Institution related	1, 5, 10, 28, 31*, 32, 41*, 42*, 49*, 50*	10
Society related	13, 15, 16*, 18, 33*, 34*, 45*, 46*, 51*, 52*	10

*denotes negative items

Serial number of dummy items are given below

2, 3, 6, 8, 9, 11, 14, 17, 26, 27, 36, 47.

Classification of Individuals based on AQ. Based on the total score of AQ the individuals were classified as Climbers, Campers and Quitters as follows.

The total scores of AQ were classified into 3 levels by calculating M , $M+1\sigma$ and $M-1\sigma$ where M is the mean and σ is the standard deviation of the AQ. Individuals whose score lies above $M+1\sigma$ were treated as having high level AQ

and named as Climbers. Individuals whose score lies between $M-1\sigma$ and $M+1\sigma$ were treated as having medium level and named as Campers. The individuals whose score lies below $M-1\sigma$ were treated as having low level of AQ and named as Quitters.

Step 4 Establishing Validity and Reliability

Validity. Validity is the quality of a data gathering instrument or procedure that enables it to measure what it is supposed to measure (Best & Kahn, 2012).

The validity for the present study was ensured using Face validity and content validity.

Face Validity. A test is said to have face validity, when it appears to measure whatever, the author had in mind, namely what was measuring (Garrett,1981). The items in the present study were phrased in the least ambiguous way and the meaning of all items was clearly defined. Hence face validity of the tool was ensured.

Content Validity. The final tool was analyzed for the content validity by a panel of experts and ensured that the items in the scale was prepared on the basis of available literature and incorporated items from all dimensions, thus considered as theoretically valid. The certification by the experts for the content validity is given as Appendix XIII.

Reliability. The reliability of AQ Scale is established through test retest method and by calculating Cronbach's Alpha. Test retest was conducted after 3 weeks and reliability was calculated using coefficient of product moment correlation. Cronbach's Alpha value was also calculated using SPSS. The obtained coefficients for test retest is 0.769 (N=40) and Cronbach's alpha is 0.818(N=40).

The Adversity Quotient Scale (Final) is given as Appendix IV.

Cognitive Style Inventory

Cognitive Style Inventory was prepared and standardised by the investigator with the help of the supervising teacher to identify the cognitive styles of higher secondary school students.

The investigator consulted books such as Srivastava (1997), Zhang et al. (2012), Riding and Rayner (2012). The investigator also referred studies related to the subject. The investigator referred tools developed earlier to measure cognitive styles such as Group Embedded Figure Test (Witkin, 1954), Cognitive Style Inventory (Martin, 1983) and Cognitive Style Inventory (Jha, 2001).

By reviewing the related studies and literature, the investigator identified that the earlier studies conducted by Witkin (1954) resulted in theories that generally assume a single dimension of cognitive style with two extremes. Theories resulted from the work of Witkin assigned a positive value to one of the extremes and a negative value to the other. Later many cognitive styles were identified in different labels but each addressed the same fundamental styles. The two extremes were described in general by Systematic Style and Intuitive Style (McKenney & Keen, 1974). The Systematic style is related to logical, rational behavior which apply a step by step, sequential approach in thinking, learning, problem solving and decision making. The Intuitive Style is associated with a spontaneous holistic and visual approach. Even though these two styles laid the foundation for the Cognitive Style Model, they did not reflect the whole spectrum of people's behavior related to thinking, learning and particularly related to problem solving and decision making. The investigator decided to develop Cognitive Style Inventory based on Martin's (1983) Cognitive Style Model which is an extended version of original Cognitive Style Model. His model reflects the whole spectrum between the extremes which consisted of two continuums, high systematic to low systematic and high intuitive to low intuitive (Jha, 2001).

These two continuums lead to the development of 5 Styles namely Systematic Style, Intuitive Style, Integrated Style, Split Style and Undifferentiated Style. They are described below.

1) Systematic Style

An individual with a systematic style uses a well-defined, sequential approach while handling problems. They look for an overall plan for solving the problem. They are convergent thinkers.

2) Intuitive Style

A person with intuitive style uses random ordering of analytical steps when solving a problem. They are divergent thinkers. They rely on experience patterns. They search alternatives quickly.

3) Integrated Style

A person with an integrated style is able to change styles quickly and easily. The style changes seem to be unconscious and take place in a matter of seconds. It creates energy and a proactive approach to problem solving. People with this style are known as problem seekers.

4) Undifferentiated Style

People with this style person appears not to distinguish between the two style extremes either systematic or intuitive. In a problem-solving they wait for external guidelines. They are not considered as specialists in problem solving.

5) Split Style

An individual with split style has equal degrees of systematic and intuitive specializations. An individual with a split style consciously responds to problem solving and learning situations by selecting appropriate style.

Construction of Items

The items were prepared on the basis of Systematic and Intuitive Cognitive Styles and the other three cognitive styles Integrated, Split and Undifferentiated were identified based on the systematic score and intuitive score of the respondents. The inventory consists of 2 parts, Part A consists of Systematic Scale with 24 items and Part B consists of Intuitive Scale with 24 items. Items were in the form of statements in 5-point Likert scale format.

Specimen of Systematic scale and Intuitive scale are given below.

Part A - Systematic Scale.

Eg. 1) I deal with issues in their order of priority.

2) I check the authenticity of the problems before making decisions.

Part B - Intuitive Scale.

Eg. 1) I am able to analyse problems carefully and accurately, and make quick decisions.

2) I make decisions relevant to the situations.

Scoring Procedure

The subjects have to respond to each of the statements by choosing any one from the 5 alternatives such as Always, Often, Sometimes, Rarely, and Never. A score of '5' for Always, '4' for Often, '3' for Sometimes, '2' for rarely, '1' for Never is assigned. Thus, the total score of an individual to each of the Systematic and Intuitive Scales may range from 24 to 120. All statements are positive.

The Cognitive Style Inventory (Draft) is given as Appendix V.

Try Out of the Tool

The investigator administered the tool on a sample of higher secondary school students from Kannur, Kozhikode and Malappuram districts. The responses were scrutinized and incomplete response sheets were omitted. The responses from 150 students were selected.

Item Analysis. The response sheets were arranged according to the scores obtained. As the inventory consisted of two scales such as Systematic Scale with 24 items in Part A and Intuitive Scale with 24 items in Part B, they were scored and arranged separately for the purpose of item analysis.

For this the response sheets were arranged in ascending order of their total score obtained by the individual for all items. The top 27% and bottom 27% were identified as upper and lower criterion groups. The 't' is calculated using the formula (Edwards, 1957):

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum (X_H - \bar{X}_H)^2 + \sum (X_L - \bar{X}_L)^2}{n(n-1)}}$$

Where \bar{X}_H = Mean score of a given statement in the higher group,

\bar{X}_L = Mean score of a given statement in the lower group,

X_H = Score of an individual for a given statement in the higher group

X_L = Score of an individual for a given statement in the lower group

The result of item analysis of the Cognitive Style Inventory is given in Table 8.

Table 8*Result of Item Analysis of the Cognitive Style Inventory*

Item No	t value	Accepted / Rejected	Item No	t value	Accepted / Rejected
Part A			Part B		
1	5.299	Accepted	25	6.376	Accepted
2	3.915	Accepted	26	3.705	Accepted
3	2.435	Accepted	27	4.336	Accepted
4	8.134	Accepted	28	4.210	Accepted
5	6.890	Accepted	29	1.407	Rejected
6	7.117	Accepted	30	6.053	Accepted
7	7.019	Accepted	31	2.096	Accepted
8	3.021	Accepted	32	3.431	Accepted
9	4.786	Accepted	33	3.983	Accepted
10	1.080	Rejected	34	3.934	Accepted
11	5.888	Accepted	35	3.212	Accepted
12	3.421	Accepted	36	7.556	Accepted
13	6.397	Accepted	37	5.067	Accepted
14	4.369	Accepted	38	3.954	Accepted
15	5.570	Accepted	39	1.985	Accepted
16	8.533	Accepted	40	0.083	Rejected
17	6.336	Accepted	41	5.261	Accepted
18	1.666	Rejected	42	5.854	Accepted
19	2.238	Accepted	43	1.695	Rejected
20	4.682	Accepted	44	3.267	Accepted
21	5.575	Accepted	45	4.166	Accepted
22	4.368	Accepted	46	4.957	Accepted
23	7.071	Accepted	47	3.003	Accepted
24	5.664	Accepted	48	6.411	Accepted

From the table, 22 items from Systematic Scale and 21 items from Intuitive Scale found to have 't' value greater than 1.96. In Systematic Scale 2 least 't' value items among the 22 were omitted and rounded off to 20 items. In Intuitive Scale with 21

items, the item with 't' value 1.98 was omitted and rounded off to 20 items. So, the investigator decided to select 20 items each from Systematic and Intuitive Scales.

In the final tool the investigator arranged items from 1 to 20 as Systematic Scale in Part A. Items from 21 to 40 as Intuitive Scale in Part B.

The Cognitive Style Inventory (Final) is given as Appendix. VI

Interpretation of the Scores. The total responses on each subscale of an individual yield systematic score and intuitive scores of that individual. It helps to determine to what degree they specialize in systematic and intuitive scales and to identify Integrated, Undifferentiated and Split Styles. The scores were classified into 4 levels namely high, medium high, medium low and low in both scales by calculating M , $M+1\sigma$, $M-1\sigma$. The scores below $M-1\sigma$ was treated as low, between $M-1\sigma$ and M as medium low, between M and $M+1\sigma$ as medium high and above $M+1\sigma$ as high.

Classification of cognitive styles on the basis of systematic and intuitive scores were made as given below.

1. A respondent is in systematic Style if any one of the following conditions is satisfied.
 - a) High on systematic score and low or medium low on intuitive score.
 - b) Medium high on systematic score and low on intuitive score.
2. A respondent is in Intuitive Style if any one of the following conditions is satisfied.
 - a) High on Intuitive score and low or medium low on systematic score.
 - b) Medium high on intuitive score and low on systematic score.
3. A respondent is in Integrated Style if any one of the following conditions is satisfied.
 - a) High on systematic score and high on intuitive score.
 - b) High on systematic score and medium high on intuitive score.
 - c) Medium high on systematic and high on intuitive score.

4. A respondent have Undifferentiated Style if any one of the following conditions is satisfied.
 - a) Low on systematic score and low on intuitive score.
 - b) Medium low on systematic score and low on intuitive score.
 - c) Low on systematic score and medium low on intuitive score.

5. A respondent have Split Style if any one of the following conditions is satisfied.
 - a) Medium high on systematic score and medium high on intuitive score.
 - b) Medium high on systematic score and medium low on intuitive score.
 - c) Medium low on systematic score and medium high on intuitive score.
 - d) Medium low on systematic score and medium low on intuitive score.

Validity. Criterion related validity of the tool was established by correlating the scores on this Inventory with that of the Cognitive Style Inventory of Jha (2001). A sample of 40 higher secondary school students was selected for the purpose. Coefficient of Correlation was calculated using SPSS. The coefficient of correlation is found to be 0.777 for systematic scale and 0.687 for intuitive scale which showed substantial correlation. Thus, the investigator established criterion related validity for the tool.

Reliability. The reliability of Cognitive Style Inventory (CSI) is established through test-retest method and by calculating Cronbach's Alpha. Test retest was conducted after 3 weeks and the reliability was calculated using coefficient of product moment correlation. Cronbach's Alpha value was also calculated using SPSS. For the Systematic Style Scale, the obtained Coefficients of correlation in test retest is 0.732(N=40) and Cronbach's alpha is 0.878(N=40) and for Intuitive Style Scale the obtained coefficient of correlation for test retest is 0.663(N=40) and Cronbach's alpha is 0.831(N=40) which shows that the tool is highly reliable.

Achievement Test in Mathematics

Planning of the Achievement Test

The Achievement Test in Mathematics was constructed based on Revised Bloom's Taxonomy. For the development of Achievement Test in Mathematics, the investigator selected units such as Sets, Relations and Functions. These units cover the portions for first terminal examinations of first year higher secondary school students. The learning outcomes were also identified. The form of questions for the test includes objective type, short answer type and Essay type. Based on these the investigator prepared Blue Print and Question Paper for the Achievement Test in Mathematics. Total score for the test was 30 and duration of the test was 1 hour.

Design of the Test

The design presents an outline on weightage given to content and learning outcomes, thinking skills and form of questions. The learning outcomes given in SCERT Handbook (Govt. of Kerala, 2014) for higher secondary school students (Class XI) are given as Appendix VII.

Table 9

Weightage to Content and Learning Outcomes

Sl. No	Content	Learning Outcome No.	No. of Questions	Score	Percentage
1	Sets	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8	8	12	40.0
2	Relations and Functions	2.1, 2.2, 2.3, 2.4, 2.5, 2.7, 2.8, 2.9	10	18	60.0
Total			18	30	100

Table 10

Weightage to Thinking Skills

Sl. No	Thinking Skills	Score	Percentage
1	Lower Order Thinking Skills	18	60
2	Higher Order Thinking Skills	12	40
Total		30	100

Table 11*Weightage to Form of Questions*

Sl. No	Type of Questions	Total Number of Questions	Score	Percentage
1	Objective Type	8	8	26.67
2	Short Answer Type	8	16	53.33
3	Essay Type	2	6	20.00
Total		18	30	100

The blue print of the Achievement Test in Mathematics based on the design is given as Table 12.

Table 12*Blue Print of the Achievement Test in Mathematics*

(Class: XI; Score: 30; Subject: Mathematics; Time: 1 hour)

Form of Questions	Thinking Skills															Total Score
	Remember			Understand			Apply			Analyse			Evaluate			
	O	SA	E	O	SA	E	O	SA	E	O	SA	E	O	SA	E	
Sets	1 (2)			1 (3)			2 (1)			2 (1)			3 (1)			12
Relations and Functions	1 (1)			1 (1)	2 (1)		2 (2)	3 (1)	1 (1)	2 (3)						18
Total Score	3			6			9			9			3			30

Note: Figures inside the bracket indicate number of questions and figures outside the bracket indicate the marks allotted to questions.

Preparation of Scoring Procedure

The total number of items in the Achievement test consists of 18 and 30 scores. Scores were given on the basis of scoring key.

The Achievement Test in Mathematics (Draft) is given as Appendix VIII.

Scoring key/Marking Scheme (Draft) and Question wise Analysis of Achievement Test in Mathematics are given as Appendices IX and X respectively.

Try Out

The investigator administered the tool on a sample of 150 first year higher secondary school students. 18 Questions were included with a maximum score of 30. The duration of the test was 1 hour.

Item Analysis. The response sheets were arranged according to the scores obtained. For this the response sheets were arranged in the ascending order of their total score obtained by the individual for all items. The top 27% and bottom 27% were identified as upper and lower criterion groups.

The difficulty indices were worked out separately for objective and descriptive type items. The difficulty index of an objective type item was calculated using the formula, $DI = \frac{U + L}{2N}$ where U is the number of right responses for the item in the upper group, L is the number of right response for the item in the lower group and N is the number of pupils in the upper or lower group. The difficulty index of a descriptive type item is usually termed as Facility Value (FV) and is calculated using the formula.

$$FV = \frac{\text{Sum of marks by all students on the question (both in the upper and lower group)}}{\text{Sum of maximum marks obtainable on that question}}$$

The discriminating power is worked out separately for objective and descriptive type items.

Discriminating power (DP) of an objective type item is calculated using the formula, $DP = \frac{U - L}{N}$

Where U is number of right response for the item in the upper group, L is the number of right response for the item in the lower group and N is the number of pupils in the upper or lower group. Discriminating power of descriptive type item was calculated using the formula, $DP = \frac{\text{Difference between Mean scores}}{\text{Standard Error of the difference}}$.

Items were selected based on difficulty index and discriminating power. An objective item with difficulty index between 0.4 and 0.6 and discriminating power greater than 0.4 was considered to be an ideal item, where as a descriptive item with

facility value between 0.4 and 0.6 and discriminating power greater than 2.58 was considered to be an ideal item.

Result of Item Analysis of Achievement Test in Mathematics is given in Table 13

Table 13

Result of Item Analysis of Achievement Test in Mathematics

Item No	Discriminating Power	Difficulty Index/FV	Accepted/ Rejected
1	0.48	0.61	Accepted
2	0.43	0.53	Accepted
3	0.40	0.64	Accepted
4	0.46	0.56	Accepted
5	0.44	0.41	Accepted
6	0.52	0.53	Accepted
7	0.56	0.55	Accepted
8	0.60	0.44	Accepted
9	1.220	0.92	Rejected
10	0.953	0.84	Rejected
11	3.004	0.56	Accepted
12	5.120	0.40	Accepted
13	2.582	0.62	Accepted
14	3.484	0.59	Accepted
15	8.562	0.46	Accepted
16	2.708	0.43	Accepted
17	7.810	0.60	Accepted
18	6.706	0.52	Accepted

Items from 1 to 8 were of objective type and items from 9 to 18 were of descriptive type. 16 items were selected based on difficulty index (or facility value) and discriminating power as mentioned in Table 13. Maximum score obtained for the 16 items was 26. In order to round off the maximum score to 25 the investigator omitted an objective type item with a score of 1 from the above mentioned 16 items. The final Achievement Test in Mathematics consisted of 15 questions with a maximum score of 25. The duration of the test was 45 minutes. The Achievement

Test in Mathematics (Final) and Scoring key/Marking scheme are given as Appendices XI and XII respectively.

Validity. Criterion related validity of the tool was established by correlating the scores on this test with that of the first terminal Mathematics examination of first year higher secondary school students. A sample of 40 higher secondary school students was selected for the purpose. Coefficient of Correlation was calculated using SPSS. The coefficient of correlation is found to be 0.807. Thus the criterion related validity of the tool was established.

Reliability. The Reliability of the Achievement Test was established by the investigator using test-retest method which was administered on a sample of 40 students after a gap of 3 weeks after the first administration. The correlation coefficient is found to be 0.717. The value indicates that the test is reliable.

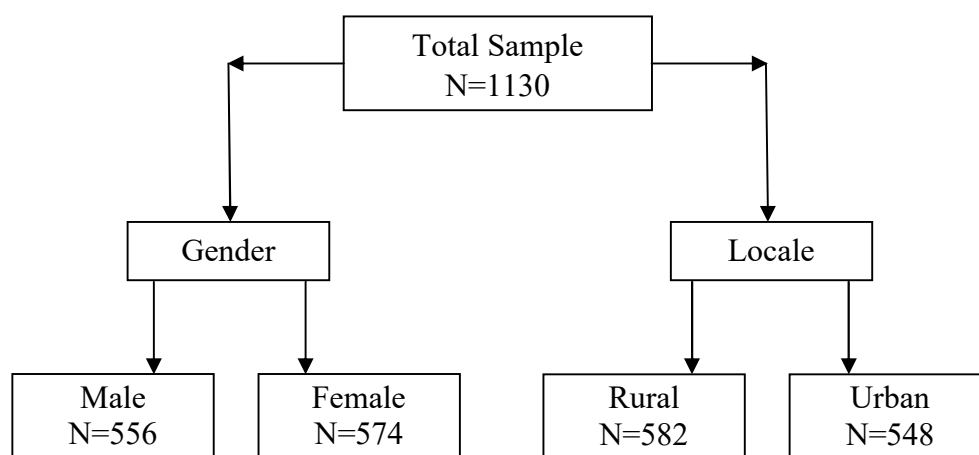
Sample Selected for the Study

The students of higher secondary school were the population of the study. The size of the sample was 1130 students out of which 574 were females and 554 males. Also, out of 1130 students 582 were from rural and 548 from urban schools.

The breakup of final sample is represented by figure 4

Figure 4

Breakup of the Sample



Data Collection Procedure

The investigator collected data from the sample drawn. In order to collect data investigator contacted heads of higher secondary schools in Kerala. It was a survey study. The heads of the institutions and teachers offered their support for the data collection procedure. Before administering the tools, the investigator explained the purpose of the study to the students and established rapport with the students. The instructions to be followed by the students were also explained. A total of 2 hours was taken by the students to mark their responses. Students cooperated well in completing the responses. Data collection was conducted during September to December 2019.

Scoring and Consolidation of Data

The sample of the study was 1130 higher secondary school students in Kerala. The response of the students to the situations mentioned in Adversity Quotient Inventory and Cognitive Style Inventory were tabulated. Also, the score of Achievement Test in Mathematics was calculated for the total sample and subsamples of the study and set ready for conducting analysis.

Statistical Techniques Used

The investigator used the following statistical techniques for analyzing the collected data in order to realize the objectives and for testing the stated hypotheses.

Preliminary Analysis

Descriptive statistics such as mean, median, mode, standard deviation, skewness and kurtosis of independent and dependent variables were estimated for the total sample and subsamples based on gender and locale.

Percentage Analysis

Percentage analysis was used to identify the common adversities faced by higher secondary school students. It was also used to find the percentages of

students belonging to High, Moderate and low levels of AQ and also the students belonging to different Cognitive Styles.

Mean Difference Analysis

Mean difference analysis was used to estimate the significant difference between mean scores of AQ, its dimensions and its Components among subsamples based on gender and locale. Achievement in Mathematics of higher secondary school students was also estimated by mean difference analysis.

Correlation Analysis

The relationship of AQ and its dimensions with Achievement in Mathematics for the total sample and the selected subsamples were estimated using Pearson's Product Moment Correlation. The formula for Product Moment method is

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

Where,

r = Coefficient of Correlation

$\sum X$ = Sum of X scores

$\sum Y$ = Sum of Y scores

$\sum X^2$ = Sum of squared X scores

$\sum Y^2$ = Sum of squared Y scores

$\sum X\sum Y$ = Sum of the product of paired X and Y scores

$(\sum X)(\sum Y)$ = Product of the sums X and Y scores

N = Number of paired scores

Verbal Interpretation of 'r' (Garret, 1981)

The following criteria was used for verbally interpret the degree of relationships between the variables.

- r from 0.00 to 0.20 : Indifferent or negligible
- r from 0.20 to 0.40 : Low or slight relation
- r from 0.40 to 0.60 : Moderate relationship
- r from 0.60 to 0.80 : Substantial or marked relationship
- r from 0.80 to 1 : High to very high relationship

Test of Significance of r

The significance of r was tested using Fishers' t.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Where t = t distribution with (n-2) degrees of freedom

n = Size of the sample

r = Observed sample correlation

Correlation coefficient is significant depending upon the t value at 0.01 or 0.05 level of significance.

One way ANOVA

Analysis of Variance was used to compare Achievement in Mathematics of higher secondary school students among High, Moderate and Low levels of AQ and also for different Cognitive Styles. Scheffe's Post Hoc Test was carried out to find the significance of difference between the groups.

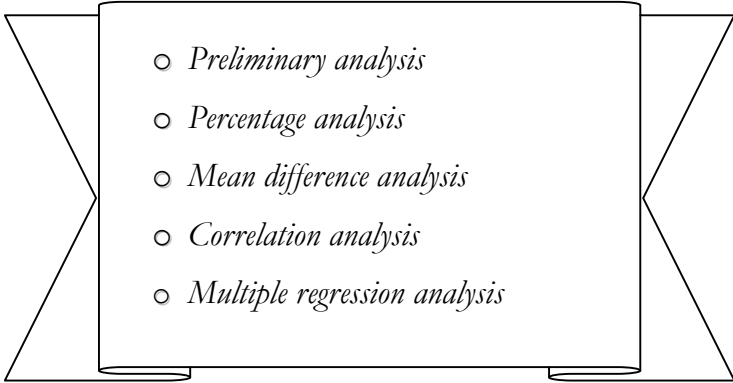
Multiple Regression Analysis

Multiple Regression Analysis was conducted to predict the Achievement in Mathematics of Higher Secondary School Students for the predictor variables using enter method.

Regression equation is also framed to predict Achievement in Mathematics.

Chapter 4

ANALYSIS

- 
- *Preliminary analysis*
 - *Percentage analysis*
 - *Mean difference analysis*
 - *Correlation analysis*
 - *Multiple regression analysis*

ANALYSIS

The present study was carried out with the objective of analysing AQ and different Cognitive Styles of Higher Secondary School students in Kerala in relation to Achievement in Mathematics. AQ and Cognitive Styles were treated as independent variables and Achievement in Mathematics as the dependent variable. Gender and locale were treated as the classificatory variables. The data was analysed using SPSS. The details of the analysis are described under the following heads

- Preliminary Analysis
- Percentage Analysis
- Mean Difference Analysis
- Correlation Analysis
- Multiple Regression Analysis

Preliminary Analysis

The score distributions of the independent and dependent variables were studied to understand their normality. Important statistical constants of the variables were calculated for the total sample and subsamples. The essential statistical indices namely mean, median, mode, standard deviation, skewness and kurtosis of the scores of the distributions of the variables are presented below.

Descriptive Statistics for AQ for the Total sample and subsamples

The statistical constants of AQ for the total sample and subsamples drawn on the basis of gender and locale were calculated and the details are given in Table 14.

Table 14

The Statistical Constants of AQ Scores for the Total Sample and Subsamples of Higher Secondary School Students

Sample	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Total	1130	127.28	127.00	126.00	16.64	0.023	0.020
Male	556	127.81	127.00	125.00	16.39	0.074	0.247
Female	574	126.76	126.00	124.00	16.89	-0.016	-0.179
Rural	582	127.59	128.00	128.00	16.79	-0.006	-0.093
Urban	548	126.94	126.00	124.00	16.50	0.054	0.165

Table 14 reveals that the scores of mean, median, mode and standard deviation of the total sample of higher secondary school students with respect to their AQ are 127.28, 127.00, 126.00 and 16.64 respectively. The indices of skewness and kurtosis shows that the distribution is positively skewed and slightly leptokurtic.

Among the subsamples, the mean score obtained by male students is 127.81 and female students is 126.76. Also, the mean scores of rural students is 127.59 and that of urban students is 126.94. The distributions are negatively skewed and platykurtic for the sub sample female and rural and positively skewed and leptokurtic for male and urban students. As the measures of central tendency are in close proximity, it is interpreted that the distribution is almost normal.

Descriptive Statistics for the Systematic and Intuitive Scores of Cognitive Styles

The descriptive statistics for Systematic scores and Intuitive scores of Cognitive Styles were calculated and the details are described below.

Systematic Score of Cognitive Styles. The statistical constants of Systematic Score of Cognitive Styles for the total sample and subsamples of higher secondary school students are given in Table 15.

Table 15

Statistical Constants of Scores of Systematic Scale of Cognitive Styles for the Total Sample and Subsamples

Sample	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Total	1130	69.32	70.00	71.00	12.16	- 0.335	0.263
Male	556	67.09	68.00	69.00	12.54	- 0.348	0.184
Female	574	71.47	72.00	73.00	11.39	- 0.235	0.189
Rural	582	69.49	70.00	71.00	12.04	- 0.332	0.289
Urban	548	69.13	69.50	69.00	12.30	- 0.338	0.208

Table 15 reveals that for the total sample with respect to the Systematic Score of Cognitive Style the mean, median, mode and standard deviation are 69.32, 70.00, 71.00 and 12.16 respectively. The distribution is negatively skewed and leptokurtic.

The mean scores among subsamples such as male, female, rural and urban are 67.09, 71.47, 69.49 and 69.13 respectively. All the distributions are negatively skewed, also, the distributions are leptokurtic. This indicates that the distributions are approximately near to normal

Intuitive Score of Cognitive Styles. The statistical constants of Intuitive Score of Cognitive Styles for the total sample and subsamples of higher secondary school students are given in Table 16.

Table 16

Statistical Constants of Scores of Intuitive Scale of Cognitive Styles for the Total Sample and Subsamples

Samples	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Total	1130	73.38	74.00	71.00	11.44	-0.573	0.609
Male	556	70.64	71.00	71.00	12.09	-0.502	0.424
Female	574	76.02	77.00	79.00	10.11	-0.470	0.488
Rural	582	73.65	77.00	74.00	10.77	-0.620	0.508
Urban	548	73.08	74.00	71.00	12.12	-0.520	0.599

Table 16 shows that the measures of central tendency of mean (73.38), median (74.00) and mode (71.00) are nearly close to proximity for the total sample. The indices of skewness (-0.573) and kurtosis (0.609) for the total sample shows that the distribution is negatively skewed and leptokurtic.

Among the subsamples the mean score obtained by female students is 76.02 and by male students is 70.64. Also, the mean score of rural students is 73.65 and that of urban students is 73.08. The distributions are negatively skewed and leptokurtic for all the subsamples. Thus, the distributions are approximately near to normal.

Descriptive Statistics for Achievement in Mathematics

The statistical constants of Achievement in Mathematics for the total sample and subsamples of higher secondary school students are calculated and is given in Table 17.

Table 17

Statistical Constants of Achievement in Mathematics for the Total Sample and Subsamples

Samples	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Total	1130	14.70	15.00	15.00	4.35	- 0.101	- 0.173
Male	556	14.35	14.00	13.00	4.26	- 0.257	0.176
Female	574	15.05	15.00	16.00	4.42	0.017	- 0.546
Rural	582	14.65	15.00	16.00	4.16	- 0.182	- 0.138
Urban	548	14.76	15.00	15.00	4.55	- 0.041	- 0.235

Table 17 shows that the mean, median, mode and standard deviation of Achievement scores in Mathematics for the total sample are 14.70, 15.00, 15.00 and 4.35 respectively. Also, distribution is negatively skewed and platykurtic.

The mean score obtained by male students is 14.35 and by female students is 15.05. The distribution is positively skewed and platykurtic for female students and negatively skewed and leptokurtic for male students. The mean score of rural students is 14.65 and that of urban students is 14.76. Both the distributions are negatively skewed and platykurtic.

The values of statistical constants indicates that the distribution is approximately near to normal.

The descriptive statistics for the independent and dependent variables were analysed. Result shows that mean, median and mode, standard deviation, skewness and kurtosis of AQ, Systematic and Intuitive scores of Cognitive Styles and Achievement in Mathematics are approximately near to normal for total sample and subsamples drawn on the basis of gender and locale.

The distribution of the scores of the Independent and Dependent variables under the study were further analysed using P-P plot.

P-P Plots

The Preliminary analysis shows that the distribution of the scores of AQ and Achievement in Mathematics follows near normality. The P-P plots are drawn which indicates the cumulative probability of the variable against the cumulative probability of the normal distribution.

The P-P plot of the distribution of the scores of AQ and Achievement in Mathematics for the total sample are presented as figure 5 and figure 6 respectively.

Figure 5

Normal P-P Plot of AQ

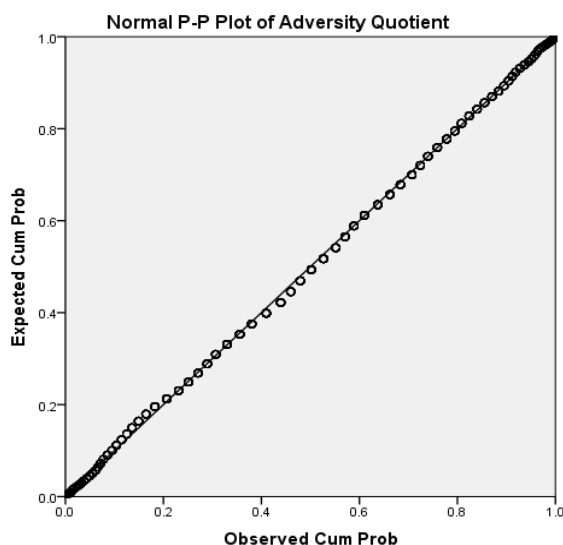
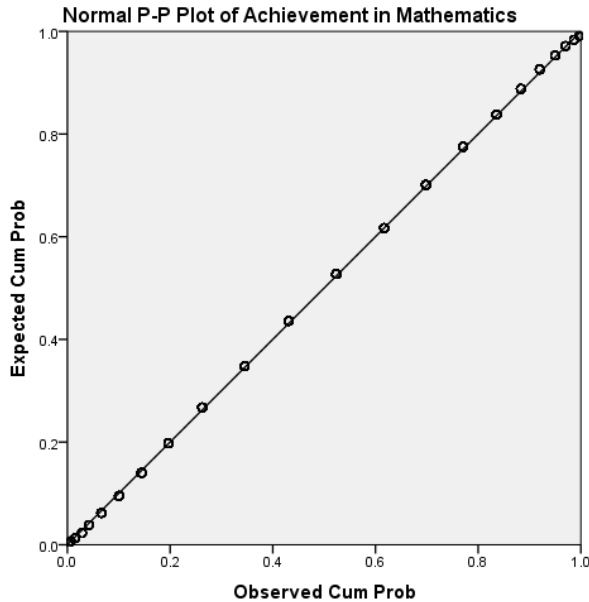


Figure 6*Normal P-P Plot of Achievement in Mathematics*

The P-P plot of AQ and Achievement in Mathematics for the Total Sample shows that the scores are distributed approximately normal. This shows that the dispersion of the scores of AQ and Achievement in Mathematics follow a normal distribution approximately. It can be concluded that the sample selected is a true representative of the population under study.

Percentage Analysis

Percentage analysis was carried out to estimate the percentages of Higher Secondary School Students belonging to High, Moderate and Low AQ groups and also belonging to different cognitive style groups. The results of percentage analysis is described below.

Categorizing Higher Secondary School Students to High, Moderate and Low Levels of AQ for the Total Sample and subsamples

Percentages of higher secondary school students belonging to High, Moderate and Low levels of AQ groups for the total sample and subsamples were calculated using Percentage Analysis. For this purpose, the respondents were

classified according to the value obtained by adding and subtracting 1σ unit from the mean of the total sample. The respondent whose score is greater than or equal to $M+1\sigma$ belongs to High AQ group. The respondent whose score is in between $M-1\sigma$ and $M+1\sigma$ belongs to Moderate AQ group and the respondent whose score is less than or equal to $M-1\sigma$ belongs to Low AQ group. All the respondents were classified in to these 3 groups accordingly.

Percentages of Higher Secondary School Students Belonging to High, Moderate and Low Levels of AQ for the Total Sample

Percentages of students belonging to High, Moderate and Low levels of AQ for the total sample were estimated using percentage analysis and the details are presented in Table 18.

Table 18

Percentages of Higher Secondary School Students Belonging to High, Moderate and Low Levels of AQ Groups for the Total Sample

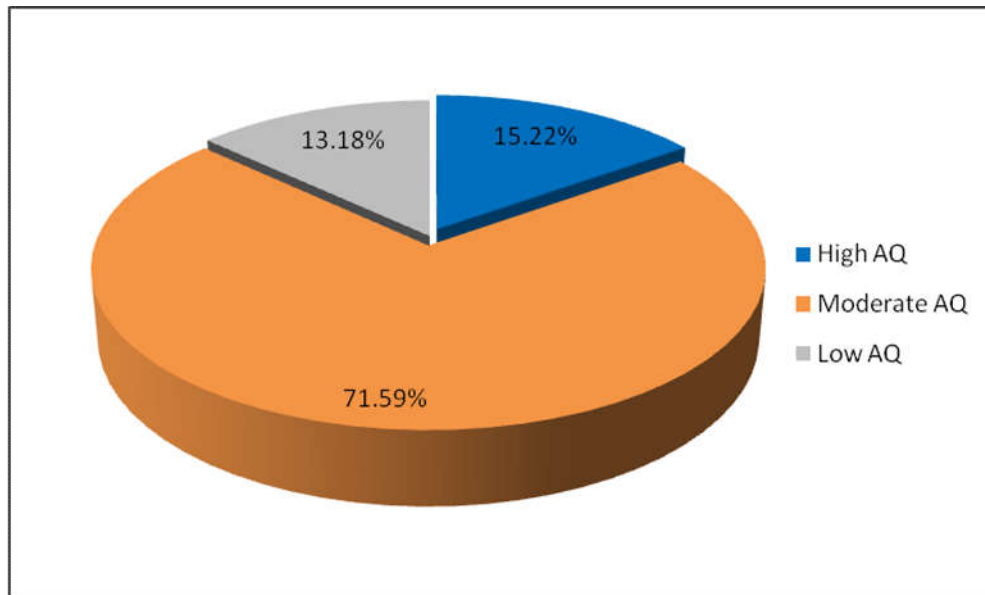
Samples	N	High AQ		Moderate AQ		Low AQ	
		N	%	N	%	N	%
Total	1130	172	15.22	809	71.59	149	13.18

Table 18 shows that among the total sample of higher secondary school students, 15.22 percent belongs to High AQ group, 71.59 percent belongs to Moderate AQ group and 13.18 percent belongs to Low AQ group.

Percentages of higher secondary school students belonging to High, Moderate and Low levels of AQ groups for the total sample is diagrammatically represented as Figure 7.

Figure 7

Higher Secondary School Students Belonging to High, Moderate and Low Levels of AQ Groups for the Total Sample



Percentages of Higher Secondary School Students Belonging to High, Moderate and Low Levels of AQ groups among Subsamples

Percentages of higher secondary school students belonging to High, Moderate and Low Levels of AQ groups among subsamples were estimated and the details are presented in Table 19.

Table 19

Percentages of Higher Secondary School Students Belonging to High, Moderate and Low Levels of AQ Groups among Subsamples

Subsamples	N	High AQ		Moderate AQ		Low AQ	
		N	%	N	%	N	%
Male	556	79	14.21	410	73.74	67	12.05
Female	574	93	16.20	399	69.51	82	14.29
Rural	582	92	15.81	414	71.13	76	13.06
Urban	548	80	14.60	395	72.08	73	13.32

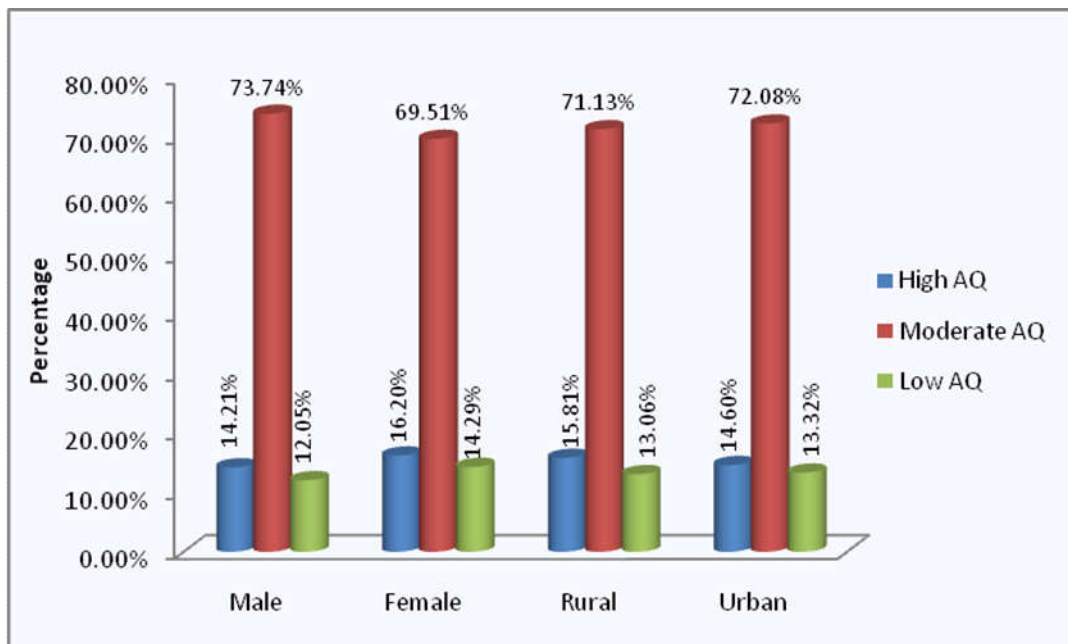
Table 19 shows that among male students, 14.21 percent belongs to High AQ group, 73.74 percent belongs to Moderate AQ group and 12.05 percent belongs to Low AQ group. The above table also reveals that among female students, 16.20 percent belongs to High AQ group, 69.51 percent belongs to Moderate AQ group and 14.29 percent belongs to Low AQ group.

From the table it can also be observed that among rural students, 15.81 percent belongs to High AQ group, 71.13 percent belongs to Moderate AQ group and 13.06 percent belongs to Low AQ group. Also, among urban students, 14.60 percent belongs to High AQ group, 72.08 percent belongs to Moderate AQ group and 13.32 percent belongs to Low AQ group.

Percentages of higher secondary school students belonging to High, Moderate and Low levels of AQ among subsamples is diagrammatically represented as figure 8.

Figure 8

Higher Secondary School Students Belonging to High, Moderate and Low Levels of AQ among Subsamples



Categorizing Higher Secondary School Students to Different Cognitive Style Groups for the Total Sample and Subsamples

Percentages of higher secondary school students belonging to different Cognitive Styles for the total sample and subsamples were calculated.

For the purpose of categorizing the respondents into 5 groups of Cognitive Styles such as Systematic Style group, Intuitive Style group, Integrated Style group, Undifferentiated Style group and Split Style group, each of the Systematic score and Intuitive Score of the Cognitive Style were classified as High, Medium High, Medium Low and Low by calculating M , $M+1\sigma$, $M-1\sigma$. The scores below $M-1\sigma$ was treated as Low, between $M-1\sigma$ and M as Medium Low, between M and $M+1\sigma$ as Medium High And above $M+1\sigma$ as High.

Classifications of students into different Cognitive Style groups on the basis of their systematic and intuitive scores were made as per the criteria given below.

1. A respondent is said to have systematic Style if any one of the following conditions is satisfied.
 - a) High on systematic score and low or medium low on intuitive score.
 - b) Medium high on systematic score and low on intuitive score.
2. A respondent is said to have Intuitive Style if any one of the following conditions is satisfied.
 - a) High on Intuitive score and low or medium low on systematic score.
 - b) Medium high on intuitive score and low on systematic score.
3. A respondent is said to have an Integrated Style if any one of the following conditions is satisfied.
 - a) High on systematic score and high on intuitive score.
 - b) High on systematic score and medium high on intuitive score.
 - c) Medium high on systematic and high on intuitive score.

4. A respondent have Undifferentiated Style if any one of the following conditions is satisfied.
 - a) Low on systematic score and low on intuitive score.
 - b) Medium low on systematic score and low on intuitive score.
 - c) Low on systematic score and medium low on intuitive score.
5. A respondent have Split Style if any one of the following conditions is satisfied.
 - a) Medium high on systematic score and medium high on intuitive score.
 - b) Medium high on systematic score and medium low on intuitive score.
 - c) Medium low on systematic score and medium high on intuitive score.
 - d) Medium low on systematic score and medium low on intuitive score.

All the respondents were classified in to these 5 groups accordingly for the total sample.

Percentages of Higher Secondary School Students Belonging to Different Cognitive Style Groups for the Total Sample

Percentages of students in Systematic, Intuitive, Integrated, Undifferentiated, and Split Cognitive Style groups for the total sample were estimated and the details are presented in Table 20.

Table 20

Percentages of Higher Secondary School Students Belonging to Different Cognitive Style Groups for Total Sample

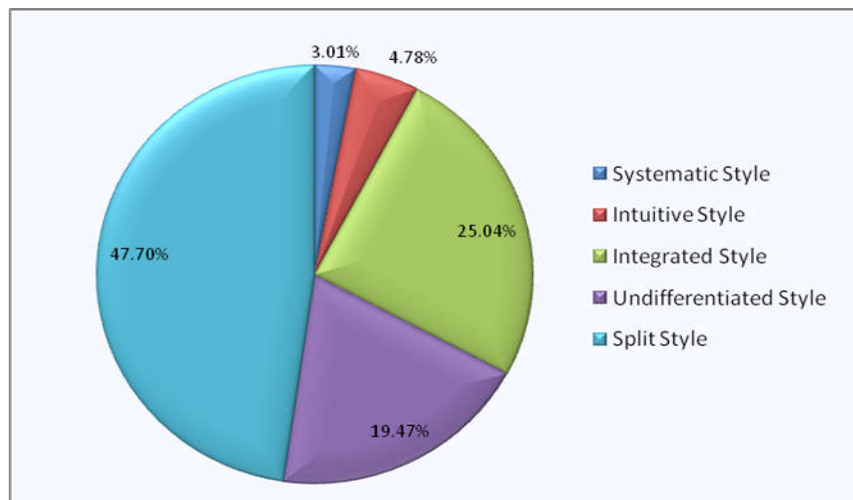
Total Sample	Systematic Style		Intuitive Style		Integrated Style		Undifferentiated Style		Split Style	
N	N	%	N	%	N	%	N	%	N	%
1130	34	3.01	54	4.78	283	25.04	220	19.47	539	47.70

Table 20 shows that, 47.70 percent of the sample of higher secondary school students belongs to the category of Split Style. The percentage of students among total sample belongs to Intuitive, Integrated and Undifferentiated styles are 4.78 percent, 25.04 percent and 19.47 percent respectively. The table also reveals that a mere 3.01 percent of the sample of students use Systematic Cognitive Style.

Percentages of higher secondary school students belonging to different Cognitive Style groups for the total sample is diagrammatically represented as Figure 9.

Figure 9

Higher Secondary School Students Belonging to Different Cognitive Style Groups for the Total Sample



Percentages of Higher Secondary School Students Belonging to Different Cognitive Style Groups for the Subsamples

The Percentages of higher secondary school students belonging to different Cognitive Style groups were estimated among the subsamples and the details are presented in Table 21.

Table 21

Percentages of Higher Secondary School Students Belonging to Different Cognitive Style Groups among Subsamples

Subsamples	Systematic Style			Intuitive Style		Integrated Style		Undifferentiated Style		Split Style	
	N	N	%	N	%	N	%	N	%	N	%
Male	556	23	4.14	34	6.12	102	18.35	141	25.35	256	46.04
Female	574	11	1.91	20	3.50	181	31.53	79	13.76	283	49.30
Rural	582	18	3.09	29	4.98	150	25.77	110	18.90	275	47.25
Urban	548	16	2.92	25	4.56	133	24.27	110	20.07	264	48.18

Table 21 shows that the percentages of male students belonging to systematic style group, intuitive style group, integrated style group, undifferentiated style group and split style group are 4.14 percent, 6.12 percent, 18.35 percent, 25.35 percent and 46.04 percent respectively. Similarly, the percentages of female students belonging to systematic style group, intuitive style group, integrated style group, undifferentiated style and split style group are 1.91 percent, 3.50 percent 31.53 percent, 13.76 percent and 49.30 percent respectively.

Table 21 also shows that the percentages of rural students belonging to systematic style group, intuitive style group, integrated style group, undifferentiated style and split style group are 3.09 percent, 4.98 percent, 25.77 percent, 18.90 percent and 47.25 percent respectively. Similarly, the percentages of urban students belonging to systematic style group, intuitive style group, integrated style group, undifferentiated style and split style group are 2.92 percent, 4.56 percent, 24.27 percent, 20.07 percent and 48.18 percent respectively.

Percentages of higher secondary school students belonging to different Cognitive Style groups among subsamples are diagrammatically represented as Figure 10 and Figure 11 respectively.

Figure 10

Higher Secondary School Students belonging to Different Cognitive Style Groups among Subsample based on Gender

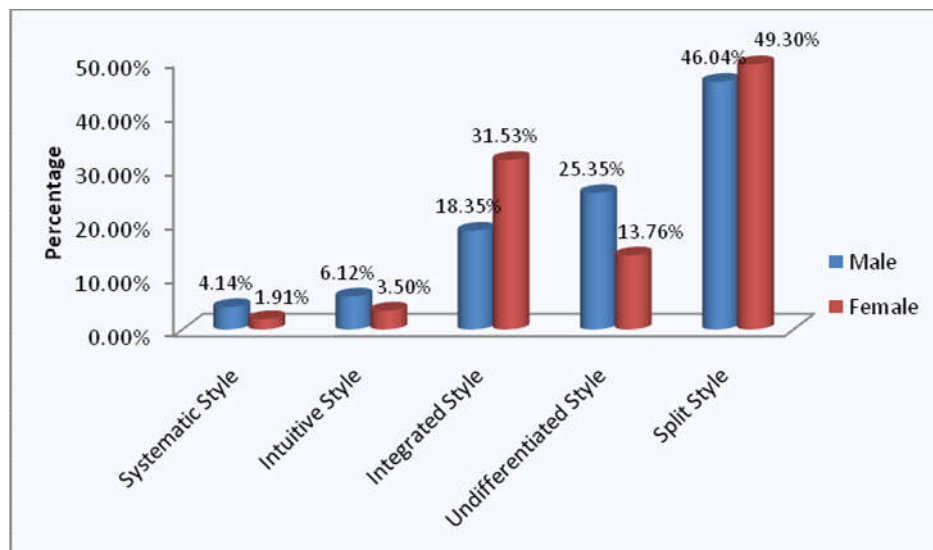
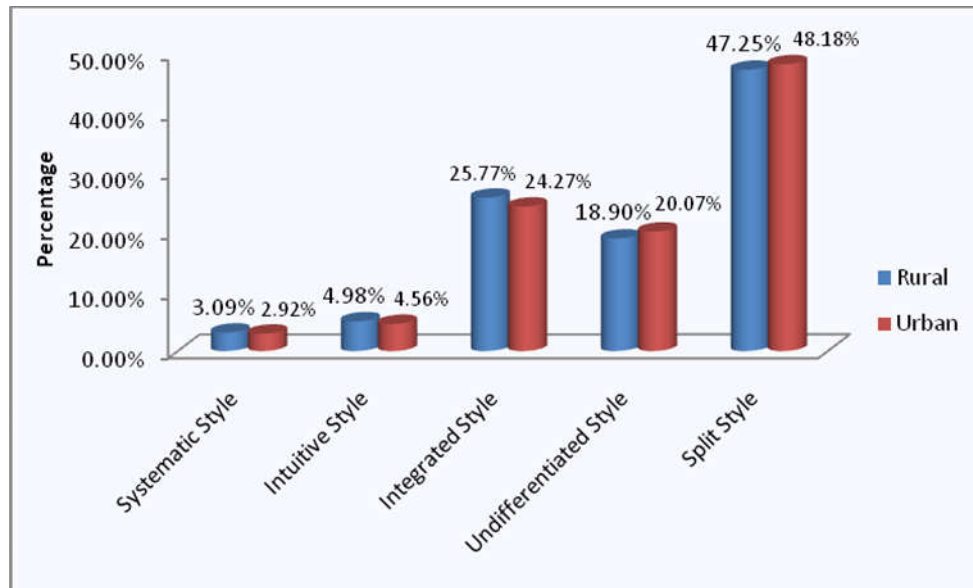


Figure 11

Higher Secondary School Students Belonging to Different Cognitive Style Groups among Subsample based on Locale



Mean Difference Analysis

The preliminary analysis of the data revealed that mean scores of AQ, its dimensions and its components and Achievement in Mathematics of Higher Secondary School students differ among the subsamples of the study. Hence the investigator decided to test whether significant differences exist in the mean scores of AQ, its dimensions and its components, and Achievement in Mathematics of Higher Secondary School Students in Kerala among subsamples drawn on the basis of gender and locale. Two tailed tests (t test) of significance were carried out to compare the means between two independent groups. In the case of mean scores of more than two groups, One Way ANOVA was used for this purpose.

Difference in the Mean Scores of AQ, its Dimensions and its Components among Subsamples

Significance of difference in the mean scores of AQ, its dimensions and its components were calculated using test of significance of difference between means and the details are described below.

Difference between the Mean Scores of AQ

The test of significance of difference in the mean scores of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 22.

Table 22

Data and Results of the Test of Significance of Difference between the Mean Scores of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	127.81	16.39	1.05 ^{NS}	0.294
Female	574	126.76	16.89		
Rural	582	127.59	16.79	0.66 ^{NS}	0.509
Urban	548	126.94	16.50		

NS: Not Significant

Table 22 reveals that the t-value obtained for the sample means of AQ of higher secondary school students among the subsamples drawn on the basis of gender and locale are 1.05 and 0.66 correspondingly. These are lower than the table value required for 0.05 level of significance. Hence it is implied that the AQ of higher secondary school students in Kerala is almost the same among select subgroups of the population.

Difference in the of Dimensions of AQ among Subsamples

Significance of difference in the mean scores of dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance were tested and the details are given below.

Control Dimension of AQ. The test of significance of difference in the mean scores of Control dimension of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table. 23.

Table 23

Data and Results of the Test of Significance of Difference between the Mean Scores of Control Dimension of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	32.39	5.85	0.12 ^{NS}	0.907
Female	574	32.35	6.27		
Rural	582	32.52	6.07	0.87 ^{NS}	0.382
Urban	548	32.21	6.06		

NS: Not significant

Table 23 shows that the mean scores of Control dimension of AQ of male and female higher secondary school students are 32.39 and 32.35 respectively. The obtained t-value 0.12 is lower than the table value at 0.05 level of significance. It shows that there is no significant difference between male and female higher secondary school students in the mean scores of Control dimension of AQ.

The table also shows that the t-value obtained for subsamples based on locale is 0.87 which is lower than the table value at 0.05 level of significance. Hence it is clear that the mean scores of Control dimension of AQ of rural and urban higher secondary school students do not differ significantly.

Origin and Ownership Dimension of AQ. The test of significance of difference in the mean scores of Origin and Ownership dimension of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 24.

Table 24

Data and Results of the Test of Significance of Difference between the Mean Scores of Origin and Ownership Dimension of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	33.30	6.25	10.01 ^{**}	0.000
Female	574	37.07	6.31		
Rural	582	35.84	6.77	3.33 ^{**}	0.001
Urban	548	34.55	6.25		

^{**} p<.01

Table 24 shows that the t-value obtained on comparison of male and female higher secondary school students is 10.01, which is significant at 0.01 level. It shows that the mean scores of Origin and Ownership dimension of AQ of male and female higher secondary school students differ significantly. It indicates that female higher secondary school students are superior in their Origin and Ownership dimension of AQ to their male counterparts.

The mean scores of rural and urban higher secondary school students in the Origin and Ownership dimension of AQ are 35.84 and 34.55 respectively. The obtained t-value of 3.33 is greater than the table value at 0.01 level of significance. Therefore, it is interpreted that rural students are superior to urban students in their Origin and Ownership dimension of AQ.

Reach Dimension of AQ

The test of significance of difference in the mean scores of Reach dimension of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 25.

Table 25

Data and Results of the Test of Significance of Difference between the Mean Scores of Reach Dimension of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	30.55	7.54	6.36 ^{**}	0.000
Female	574	27.63	7.87		
Rural	582	28.78	7.85	1.28 ^{NS}	0.201
Urban	548	29.37	7.83		

^{**} p<.01; NS- Not Significant

The above table indicates that the t-value obtained for male and female higher secondary school students with respect to the mean scores of Reach dimension of AQ is 6.36, which is significant at 0.01 level. It shows that there is significant difference in the mean scores of Reach Dimension of AQ of male and female

students. It indicates that male students are superior to female students in their Reach Dimension of AQ.

Table 25 also reveals that t-value obtained for subsamples based on locale is 1.28, which is lower than the table value at 0.05 level of significance. Hence it is clear that the mean scores of Reach Dimension of AQ of rural and urban higher secondary school students do not differ significantly.

Endurance Dimension of AQ. The test of significance of difference in the mean scores of Endurance dimension of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 26

Table 26

Data and Results of the Test of Significance of Difference between the Mean Scores of Endurance Dimension of AQ among the Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	31.37	5.69	4.86 ^{**}	0.000
Female	574	29.64	6.24		
Rural	582	30.17	6.17	1.84 ^{NS}	0.066
Urban	548	30.83	5.88		

** p<.01; NS: Not Significant

Table 26 shows that the t-value obtained on comparison of male and female higher secondary school students in their mean scores of Endurance dimension of AQ is 4.86 which is significant at 0.01 level. It shows that mean scores of Endurance dimension of AQ of male and female higher secondary school students differ significantly. It indicates that male higher secondary school students are superior to their female counterparts in their Endurance dimension of AQ.

The table also shows that the mean scores of Endurance dimension of AQ of rural and urban higher secondary school students are 30.17 and 30.83 respectively. The obtained t-value 1.84 is lower than the table value at 0.05 level of significance. It shows that there is no significant difference in the mean scores of Endurance dimension of AQ among subsamples drawn on the basis of locale.

Difference between the Mean Scores of Components of AQ among Subsamples

Significance of difference among the subsamples of the study in the mean scores of the components of AQ such as, Individual related, Home related, Institution related and Society related components were tested and the results are described below.

Individual Related Components of AQ. The test of significance of difference in the mean scores of Individual related components of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 27.

Table 27

Data and Results of the Test of Significance of Difference between the Mean Scores of Individual Related Component of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	32.02	6.81	4.08**	0.000
Female	574	30.33	7.15		
Rural	582	31.35	7.01	0.82 ^{NS}	0.410
Urban	548	30.97	7.06		

** p<.01, NS: Not Significant

The above table shows that the t-value obtained on comparison of male and female higher secondary school students in their Individual related component of AQ is 4.08 which is significant at 0.01 level. It indicates that male higher secondary school students are superior in the Individual related component of AQ than female students.

Table 27 also shows that the t-value obtained for subsamples based on locale is 0.82 which is lower than the table value at 0.05 level of significance. Hence it is clear that the mean scores of Individual related components of AQ of rural and urban higher secondary school students are almost equal among the subsamples drawn on the basis of locale.

Home Related Component of AQ. The test of significance of difference between the mean scores of Home related component of AQ among the subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 28.

Table 28

Data and Results of the Test of Significance of Difference between the Mean Scores of Home Related Component of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	33.13	5.23	6.84**	0.000
Female	574	35.13	4.88		
Rural	582	34.65	5.22	3.86**	0.000
Urban	548	33.61	5.03		

**
p<.01

Table 28 reveals that the t-value obtained for the sample means of Home related component of AQ of higher secondary school students among subsamples drawn on the basis of gender and locale are 6.84 and 3.86 correspondingly. These are significant at 0.01 level. Hence it implies that the Home related component of AQ of higher secondary school students differ significantly among select subgroups of the population. Female and rural higher secondary school students are superior in Home related component of AQ than their male and urban counterparts correspondingly.

Institution Related Component of AQ. The test of significance of difference in the mean scores of Institution related component of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 29.

Table 29

Data and Results of the Test of Significance of Difference between the Mean Scores of Institution Related Component of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	31.91	5.57	1.57 ^{NS}	0.117
Female	574	31.38	5.77		
Rural	582	31.38	5.76	1.64 ^{NS}	0.102
Urban	548	31.93	5.57		

NS: Not Significant

Table 29 reveals that the t-value obtained for the sample means of Institution related component of AQ of higher secondary school students among subsamples drawn on the basis of gender and locale are 1.57 and 1.64 correspondingly. These are lower than the table value required for 0.05 level of significance. Hence it implied that the Institutional related component of AQ of higher secondary school students in Kerala is almost the same among select subgroups of the population.

Society Related Component of AQ. The test of significance of difference in the mean scores of Society related component of AQ among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 30.

Table 30

Data and Results of the Test of Significance of Difference between the Mean Scores of Society Related Component of AQ among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	30.53	5.25	2.66 ^{**}	0.008
Female	574	29.64	6.00		
Rural	582	30.02	5.83	0.37 ^{NS}	0.713
Urban	548	30.14	5.47		

** p<.01, NS: Not Significant

Table 30 shows that the t-value obtained on comparison of male and female higher secondary school students in their Society related component of AQ is 2.66 which is significant at 0.01 level. It indicates that male higher secondary school students are superior to their female counterparts in their Society related component of AQ.

The table also shows that the t-value obtained for the Society related component among subsamples based on locale is 0.37 which is lower than the table value at 0.05 level of significance. Hence it is clear that the mean scores of Society related component of AQ of rural and urban higher secondary school students are almost the same among subsamples.

Difference in the Mean Scores of Achievement in Mathematics among Subsamples

The test of significance of difference in the mean scores of Achievement in Mathematics among subsamples drawn on the basis of gender and locale were carried out and the details are presented in Table 31.

Table 31

Data and Results of the Test of Significance of Difference between the Mean Scores of Achievement in Mathematics among Subsamples

Subsamples	N	Mean	SD	t-value	p
Male	556	14.35	4.26	2.71**	0.007
Female	574	15.05	4.42		
Rural	582	14.65	4.16	0.41 ^{NS}	0.683
Urban	548	14.76	4.55		

** p<.01, NS: Not Significant

Table 31 reveals that the obtained t-value on comparison of male and female higher secondary school students with respect to their mathematics achievement is 2.71, which is significant at 0.01 level. It reveals that the mean scores of Achievement in Mathematics of female and male higher secondary school students differ

significantly. It is interpreted that female higher secondary school students are superior to their male counterparts in their mathematics achievement.

The table also shows that the t-value obtained for sub sample based on locale is 0.41 which is lower the table value at 0.05 level of significance. It indicates that there is no significant difference in the mean scores of Achievement in Mathematics of rural and urban higher secondary school students.

Comparison of Mathematics Achievement among Higher Secondary School Students with High, Moderate and Low Levels of AQ for the Total sample and Subsamples

Higher secondary school students with High, Moderate and Low levels of AQ were compared with respect to their mathematics achievement for the total sample and subsamples of the study. The analysis was done by One way ANOVA using SPSS. The details are described below.

The descriptive statistics of Achievement in Mathematics among High, Moderate and Low levels of AQ for the total sample and subsamples drawn on the basis of gender and locale is given in Table 32.

Table 32

The Descriptive Statistics of Achievement in Mathematics among High, Moderate and Low levels of AQ for the Total Sample and Subsamples

Samples	High AQ			Moderate AQ			Low AQ		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Total	172	18.68	3.13	809	14.90	3.62	149	8.97	3.19
Male	79	18.37	2.87	410	14.54	3.51	67	8.38	3.33
Female	93	18.94	3.33	399	15.28	3.69	82	9.46	3.02
Rural	92	18.45	2.66	414	14.74	3.56	76	9.54	3.38
Urban	80	18.95	3.60	395	15.08	3.67	73	8.39	2.89

Table 32 shows that mean scores of Achievement in Mathematics for the total sample and subsamples of higher secondary school students increased from Low AQ

group to Moderate AQ group, and to High AQ group in that order. Hence the investigator decided to test whether significant difference exists in the mean scores of achievement in mathematics among High, Moderate and Low AQ groups for the total sample subsamples using One-way ANOVA and the details are given below.

Total Sample

The total sample of higher secondary school students with High, Moderate and Low levels of AQ were compared with respect to their Mathematics Achievement using One Way ANOVA and the details are given in Table 33.

Table 33

Data and Result of One Way ANOVA in Mathematics Achievement among Higher Secondary School Students with High, Moderate and Low Levels of AQ for the Total Sample

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	7643.69	2	3821.84	312.61	0.000
Within Groups	13778.4	1127	12.23		
Total	21422.1	1129			

Table 33 shows that there is significant difference in the mean scores of Achievement in Mathematics among High, Moderate and Low AQ groups, $F(2,1129) = 312.61, p < .01$. The mean scores of Achievement in Mathematics differ among students with Low AQ ($M=8.97, SD=3.19$), Moderate AQ ($M=14.90, SD=3.62$) and High AQ ($M=18.68, SD=3.13$).

To check the significance of difference of mean scores among the groups, Scheffés Post Hoc test was carried out and the result is presented in Table 34.

Table 34

Summary of Results of Scheffé's Post Hoc test for Achievement in Mathematics of Higher Secondary School Students with High, Moderate and Low levels of AQ for the Total Sample

Variables	AQ Groups		Mean Difference	Std. Error	p
Achievement in Mathematics	Moderate AQ	Low AQ	5.93 ^{**}	.312	0.000
	High AQ	Moderate AQ	3.78 ^{**}	.293	0.000
	High AQ	Low AQ	9.71 ^{**}	.391	0.000

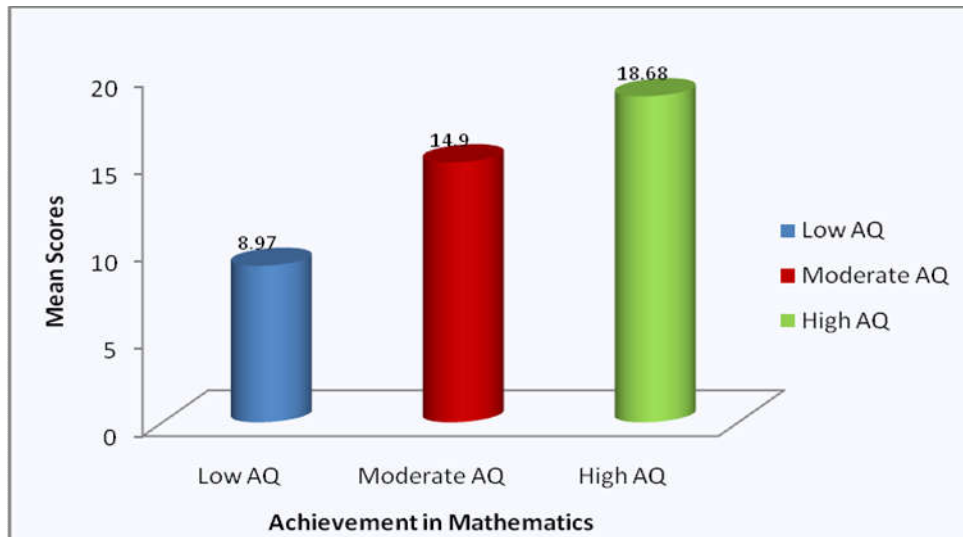
^{**} p<.01

Table 34 shows that there is a significant difference in the mean scores of Achievement in Mathematics of higher secondary school students between Low and Moderate AQ groups, Mean difference=5.93, SE=.312, p<0.01. This indicates that the Achievement in Mathematics of Students with Moderate AQ is higher than that of students with Low AQ. Also, there is a significant difference in the mean scores of Achievement in Mathematics of Higher Secondary School Students between Moderate and High AQ groups, mean difference = 3.78, SE=.293, p<0.01 and also between Low and High AQ groups, Mean difference=9.71, SE=.391, p<0.01. This indicates that students with High AQ achieve mathematics significantly higher than that of students with Moderate or Low AQ.

The mean scores of Achievement in Mathematics of students with High, Moderate and Low levels of AQ is represented as Figure 12.

Figure 12

Achievement in Mathematics of Students with High, Moderate and Low Levels of AQ for the Total Sample



Comparison of Mathematics Achievement of Higher Secondary School Students with High, Moderate and Low levels of AQ among Subsamples

The higher secondary school students with High, Moderate and Low levels of AQ groups were compared with respect to their Mathematics Achievement among subsamples of the study and the details are described below.

Male Students. The male higher secondary school students with High, Moderate and Low levels of AQ were compared with respect to their mathematics achievement using One Way ANOVA and the details are given in Table 35.

Table 35

Data and Result of One Way ANOVA in Mathematics Achievement among Male Students with High, Moderate and Low Levels of AQ

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	3679.77	2	1839.88	158.82	0.000
Within Groups	6406.22	553	11.58		
Total	10086	555			

Table 35 indicates that there is significant difference in the mean scores of Achievement in Mathematics among High, Moderate and Low AQ groups of male higher secondary school students, $F(2,555) = 158.82$ $p < .01$. The mean scores of Achievement in Mathematics differ significantly among students with Low AQ ($M = 8.38$ $SD = 3.33$), Moderate AQ ($M = 14.54$, $SD = 3.51$), and High AQ ($M = 18.37$, $SD = 2.87$).

To check the significance of difference of mean scores among the Groups, Scheffé's Post Hoc test was carried out and the result is presented in Table 36.

Table 36

Summary of Scheffé's Post Hoc test for Achievement in Mathematics among Male Students with High, Moderate and Low Levels of AQ.

Variables	AQ Groups		Mean Difference	Std. Error	p
Achievement in Mathematics	Moderate AQ	Low AQ	6.15**	.45	0.000
	High AQ	Moderate AQ	3.83**	.42	0.000
	High AQ	Low AQ	9.99**	.57	0.000

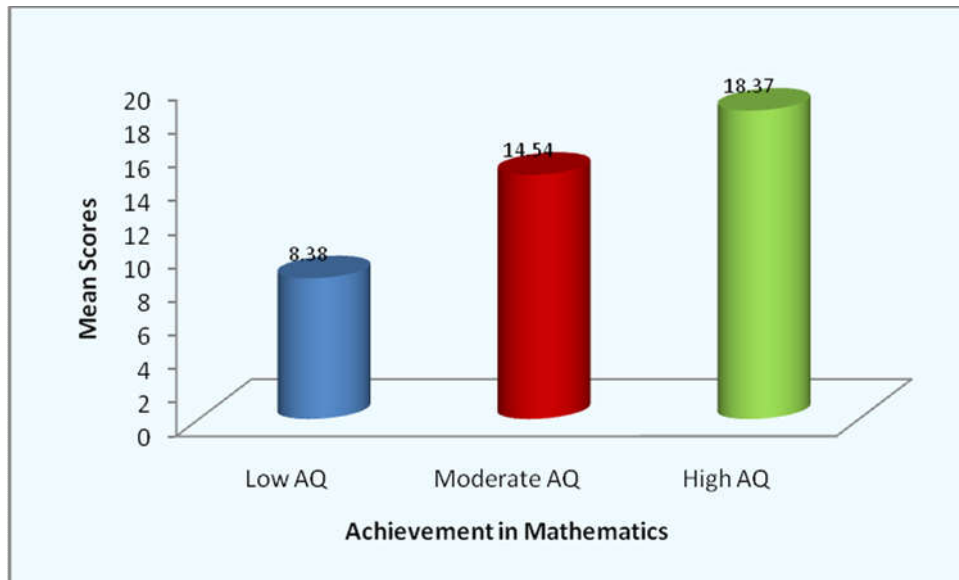
** $p < .01$

Table 36 shows that the difference in the mean scores of Achievement in Mathematics of male higher secondary school students between Low and Moderate AQ group is statistically significant, mean difference = 6.15, $SE = .45$, $p < 0.01$. This indicates that the Achievement in Mathematics of male students with Moderate AQ is greater than that of students with Low AQ. Also, there is significant difference in the mean scores of Achievement in Mathematics between Moderate and High AQ group, mean difference = 3.83, $SE = .42$, $p < 0.01$ and also between Low and High AQ group, mean difference = 9.99, $SE = .57$, $p < 0.01$. This also indicates that male students with High AQ shows greater Achievement in Mathematics than the students with Moderate or Low AQ.

The mean scores of Achievement in Mathematics among male students with High, Moderate and Low levels of AQ is represented as Figure 13.

Figure 13

Achievement in Mathematics among Male Students with High, Moderate and Low Levels of AQ



Female Students. The female higher secondary school students with High, Moderate and Low levels of AQ were compared with respect to their mathematics achievement using One Way ANOVA and the details are given in Table 37.

Table 37

Data and Result of One Way ANOVA in Mathematics Achievement among Female Students with High, Moderate and Low levels of AQ

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	3993.18	2	1996.59	158.24	0.000
Within Groups	7204.55	571	12.62		
Total	11197.73	573			

Table 37 indicates that there is significant difference in the mean scores of Achievement in Mathematics among High, Moderate and Low AQ groups of female higher secondary school students, $F(2,573) = 158.24$ $p < .01$. The mean scores of Achievement in Mathematics differ significantly among students with Low AQ ($M = 9.46$, $SD = 3.02$), Moderate AQ ($M = 15.28$, $SD = 3.69$), and High AQ ($M = 18.94$, $SD = 3.33$).

To check the significance of difference of mean scores among the Groups, Scheffés Post Hoc test was carried out and the result is presented in Table 38.

Table 38

Summary of Scheffés Post Hoc test for Achievement in Mathematics among Female Students with High, Moderate and Low levels of AQ

Variables	AQ Groups		Mean Difference	Std. Error	p
Achievement in Mathematics	Moderate AQ	Low AQ	5.82**	.43	0.000
	High AQ	Moderate AQ	3.66**	.41	0.000
	High AQ	Low AQ	9.48**	.54	0.000

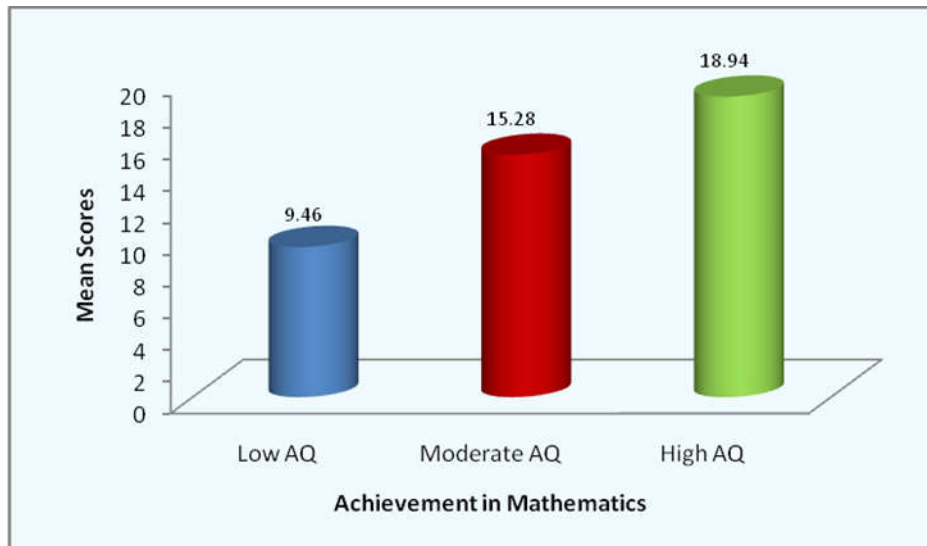
** p<.01

Table 38 shows that there is significant difference in the mean scores of Achievement in Mathematics of female higher secondary school students between Low and Moderate AQ group, Mean difference =5.82, SE = .43, p<0.01. This indicates that the Achievement in Mathematics of female students with Moderate AQ is greater than the students with Low AQ. Also, there is a significant difference in the mean scores of Achievement in Mathematics between moderate and high AQ group, mean difference=3.66, SE = .41, p<0.01 and also between Low and High AQ group, mean difference=9.48, SE = .54, p<0.01. This indicates that mean scores of Achievement in Mathematics of female students with High AQ is significantly greater than that of students with Moderate or Low AQ.

The mean scores of Achievement in Mathematics among female students with High, Moderate and Low levels of AQ is represented as Figure 14

Figure 14

Achievement in Mathematics among Female Students with High, Moderate and Low Levels of AQ



Rural Students. The rural higher secondary school students with High, Moderate and Low levels of AQ were compared with respect to their mathematics achievement using One Way ANOVA and the details are given in Table 39.

Table 39

Data and Results of One Way ANOVA in Mathematics Achievement among Rural Students with High, Moderate and Low Levels of AQ

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	3321.63	2	1660.81	142.37	0.000
Within Groups	6754.57	579	11.66		
Total	10076.19	581			

Table 39 shows that the difference in the mean scores of Achievement in Mathematics among High, Moderate and Low AQ groups of rural higher secondary school students, is statistically significant. $F(2,581) = 142.37$ $p < .01$. The mean scores of Achievement in Mathematics differ significantly among students with Low AQ ($M = 9.54$, $SD = 3.38$), Moderate AQ ($M = 14.74$, $SD = 3.56$) and High AQ ($M = 18.45$, $SD = 2.66$).

To check the significance of difference of mean scores among the groups, Scheffés Post Hoc test was carried out. Result of the Post Hoc test is presented in Table 40.

Table 40

Summary of Scheffés Post Hoc test for Achievement in Mathematics among Rural Students with High, Moderate and Low Levels of AQ

Variables	AQ Groups		Mean Difference	Std. Error	p
Achievement in Mathematics	Moderate AQ	Low AQ	5.20**	.43	0.000
	High AQ	Moderate AQ	3.71**	.40	0.000
	High AQ	Low AQ	8.91**	.54	0.000

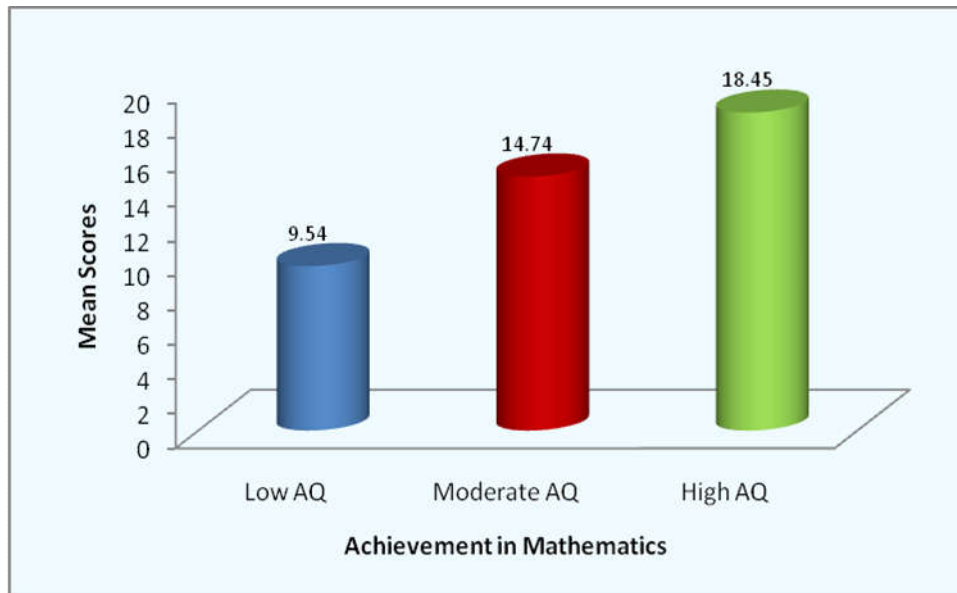
** p<.01

Table 40 shows that the difference in the mean scores of Achievement in Mathematics of rural higher secondary school students between Low and Moderate AQ group is statistically significant, mean difference= 5.20, SE = .43, p<0.01. It indicates that the Achievement of Students with Moderate AQ is higher than that of students with Low AQ in Mathematics. Also, there is significant difference in the mean scores of Achievement in Mathematics between Moderate and High AQ group of rural students, mean difference= 3.71, SE = 0.40, p<0.01 and also between Low and High AQ group, mean difference= 8.91, SE = 0.54, p<0.01. It implies that the rural students with high AQ have high Achievement in Mathematics than their moderate or low AQ counterparts.

The mean scores of Achievement in Mathematics among rural students with High, Moderate and Low levels of AQ is represented as Figure 15.

Figure 15

Achievement in Mathematics among Rural Students with High, Moderate and Low Levels of AQ



Urban Students. The urban higher secondary school students with High, Moderate and Low levels of AQ were compared with respect to their mathematics achievement using One Way ANOVA and the details are given in Table 41.

Table 41

Data and Results of One Way ANOVA in Mathematics Achievement among Urban Students with High, Moderate and Low Levels of AQ

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	4401.2	2	2220.6	172.78	0.000
Within Groups	6941.52	545	12.74		
Total	11342.72	547			

Table 41 indicates that there is significant difference in the mean scores of Achievement in Mathematics among High, Moderate and Low AQ groups of urban higher secondary school students, $F(2,547) = 172.78$ $p < .01$. The mean scores of Achievement in Mathematics differ significantly among Low AQ ($M = 8.39$, $SD = 2.89$), Moderate AQ ($M = 15.08$, $SD = 3.67$), and High AQ ($M = 18.95$, $SD = 3.60$).

To check the significance of difference of mean scores among the Groups, Scheffés Post Hoc test was carried out and the results are presented in Table 42.

Table 42

Summary of Scheffés Post Hoc Test for Achievement in Mathematics among Urban Students with High, Moderate and Low Levels of AQ

Variables	AQ Groups		Mean Difference	Std. Error	p
Achievement in Mathematics	Moderate AQ	Low AQ	6.69**	.45	0.000
	High AQ	Moderate AQ	10.55**	.58	0.000
	High AQ	Low AQ	3.87**	.44	0.000

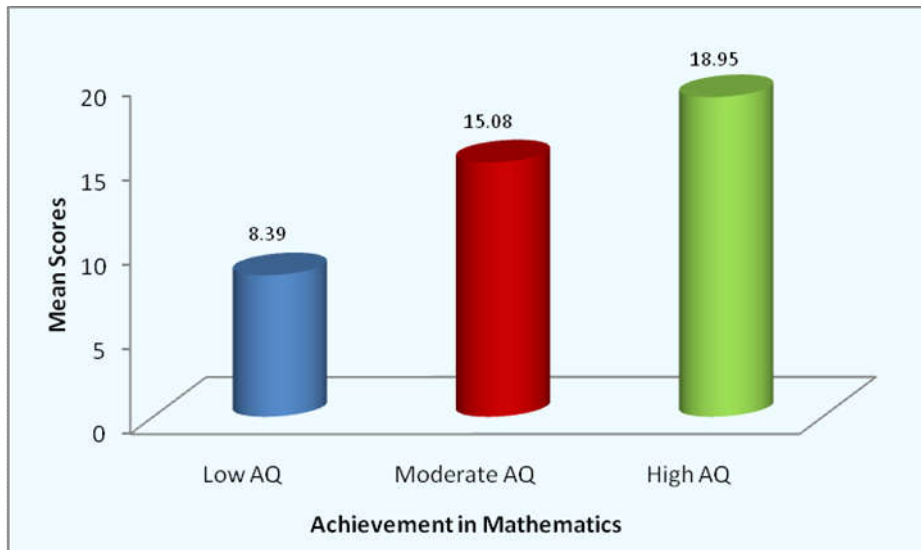
** p<.01

Table 42 shows that the difference in the mean scores of Achievement in Mathematics of Higher Secondary School Students between Low and Moderate AQ group is statistically significant, mean difference= 6.69, SE = .45, p<0.01. This shows that students with Moderate AQ achieve mathematics significantly better than students with Low AQ. Also, there is significant difference in the mean scores of Achievement in Mathematics between Moderate and High AQ group, mean difference= 10.55, SE =.58, p<0.01 and between Low and High AQ group, mean difference= 3.87, SE = .44, p<0.01. This indicates that students in High level of AQ have greater Achievement in Mathematics than students with Low or Moderate levels of AQ.

The mean scores of Achievement in Mathematics among urban students with High, Moderate and Low levels of AQ is represented as Figure 16.

Figure 16

Achievement in Mathematics among Urban Students with High, Moderate and Low Levels of AQ



Comparison of Mathematics Achievement among Students with Different Cognitive Styles for the Total Sample and Subsamples

Higher secondary school students with different Cognitive Styles such as Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style and Split Style were compared with respect to their Mathematics Achievement for the total sample and subsamples of the study. The analysis was done by One Way ANOVA using SPSS and the details are described below.

Comparison of Mathematics Achievement among Students with Different Cognitive Styles for the Total Sample

The mean scores of Achievement in Mathematics of higher secondary school students for the total sample were compared among different Cognitive Styles such as Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style, and Split Style. The details are described below.

The descriptive statistics of Achievement in Mathematics for different Cognitive Style groups for the total sample is presented in Table 43.

Table 43

Descriptive Statistics of Achievement in Mathematics of Students with Different Cognitive Styles for the Total Sample

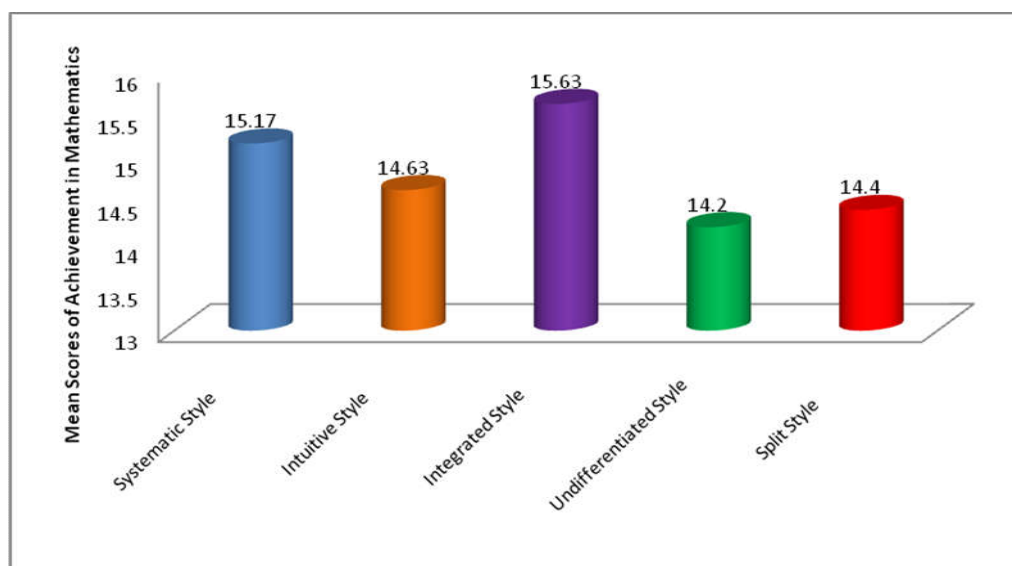
Cognitive Styles	N	Mean	SD
Systematic Style	34	15.17	3.91
Intuitive Style	54	14.63	4.43
Integrated Style	283	15.63	4.36
Undifferentiated Style	220	14.20	4.47
Split Style	539	14.40	4.26

From the table it is clear that Achievement in Mathematics increased from the Undifferentiated style group (n= 220, M = 14.20, SD = 4.47), to Split style group (n= 539, M = 14.40, SD = 4.26), to Intuitive style group (n= 54, M = 14.63, SD = 4.43), to Systematic style group (n= 34, M = 15.17, SD = 3.91), to Integrated style group (n= 283, M = 15.63, SD = 4.36), in that order.

The mean scores of Achievement in Mathematics among higher secondary school students with different Cognitive Styles for the total sample is represented as Figure 17.

Figure 17

Achievement in Mathematics among Higher Secondary School Students with Different Cognitive Styles for the Total Sample



To check the significance of difference in Achievement in Mathematics, One-way ANOVA was used and the details are given in Table 44.

Table 44

Data and Result of One Way ANOVA in Mathematics Achievement among Higher Secondary School Students with different Cognitive Styles for the Total Sample

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	356.48	4	89.12	4.76	0.001
Within Groups	21065.61	1125	18.73		
Total	21422.09	1129			

Table 44 indicates that there is a significant difference in the mean scores of Achievement in Mathematics of Higher Secondary School Students among different Cognitive Style groups, $F(4,1129) = 4.76, p < .01$.

To check the significance of difference of mean scores among the Groups, Scheffés Post Hoc test was carried out. Result of the Post Hoc test is presented in Table 45.

Table 45

Summary of Scheffés Post Hoc test for Mathematics Achievement of Students with Different Cognitive Styles for the Total Sample

Variables	Cognitive Style Groups	Mean Difference	Std. Error	p
Achievement in Mathematics	Split Integrated	-1.288 **	0.318	0.005
	Split Undifferentiated	0.205	0.346	0.986
	Split Intuitive	-0.229	0.618	0.998
	Split Systematic	-0.775	0.765	0.905
	Integrated Undifferentiated	1.434 **	0.389	0.009
	Integrated Intuitive	0.999	0.642	0.659
	Integrated Systematic	0.452	0.785	0.988
	Undifferentiated Intuitive	-0.434	0.657	0.979
	Undifferentiated Systematic	-0.981	0.797	0.924
	Intuitive Systematic	-0.547	0.947	0.988

** $p < .01$

Table 45 shows that the difference in the mean scores of Achievement in Mathematics of Higher Secondary School Students between Split and Integrated Cognitive Style group is statistically significant, Mean difference =1.228, SE=.318, $p < .01$. This indicates that students with Integrated Cognitive Style ($M= 15.63$, $SD=4.36$) achieve greater in Mathematics than students with Split Cognitive Style ($M= 14.40$, $SD=4.26$). Also, the difference in the mean scores of Achievement in Mathematics of Higher Secondary School Students between Integrated and Undifferentiated Cognitive Style group is statistically significant, Mean difference =1.434, SE=.389, $p < .01$. This indicates that students with Integrated Cognitive Style ($M= 15.63$, $SD=4.36$) have greater Achievement in Mathematics than the students with Undifferentiated Cognitive Style ($M= 14.20$, $SD=4.47$).

There is no significant difference in the mean scores of Achievement in Mathematics among other Cognitive Style group pairs such as Split style and Undifferentiated style, Split style and Intuitive style, Split style and Systematic style, Integrated style and Intuitive style, Integrated style and Systematic style, Undifferentiated style and Intuitive style, Undifferentiated style and Systematic style, and Intuitive style and Systematic style.

Comparison of Mathematics Achievement of Higher Secondary School Students with Different Cognitive Styles among Subsamples

The subsamples of higher secondary school students with different Cognitive Styles such as Systematic style, Intuitive style, Split style, Integrated style, and Undifferentiated style were compared with respect to their mathematics achievement. The details are described below.

Male Students. The mean scores of Achievement in Mathematics of male higher secondary school students were compared among different Cognitive Styles such as Systematic style, Intuitive style, Split style, Integrated style, and Undifferentiated style and the details are described below.

The descriptive statistics of Achievement in Mathematics among male students with different Cognitive Styles is presented in Table 46.

Table 46

Descriptive Statistics of Achievement in Mathematics among Male Students with Different Cognitive Styles

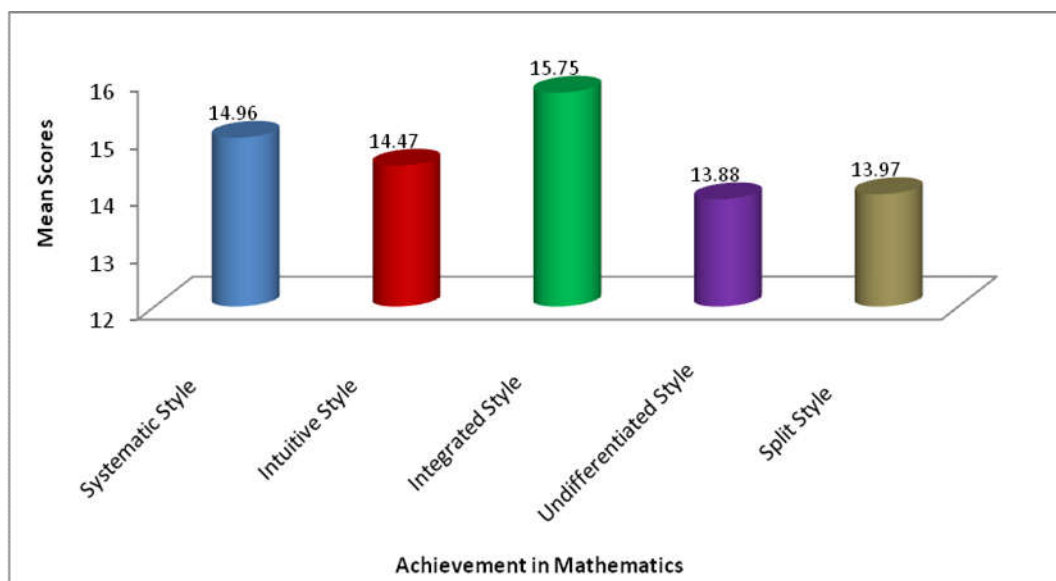
Cognitive Styles	N	Mean	SD
Systematic Style	23	14.96	3.98
Intuitive Style	34	14.47	4.34
Integrated Style	102	15.75	4.47
Undifferentiated Style	141	13.88	4.04
Split Style	256	13.97	4.22

From the table it is clear that Achievement in Mathematics increased from the Undifferentiated Style group (n= 141, M = 13.88, SD = 4.04), to Split style group (n= 256, M = 13.97, SD= 4.22), to Intuitive style group (n= 34, M=14.47, SD=4.34), to Systematic style group (n=23, M=14.96, SD=3.98), to Integrated style group (n= 102, M = 15.75, SD = 4.47), in that order.

The mean scores of Achievement in Mathematics among male students with different Cognitive Styles is presented as Figure 18.

Figure 18

Achievement in Mathematics among Male Students with Different Cognitive Styles



To check the significance of difference in Achievement in Mathematics, One-way ANOVA was used. Details are given in Table 47.

Table 47

Data and Result of One Way ANOVA in Mathematics Achievement among Male Students with Different Cognitive Styles

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	274.21	4	68.55	3.85	0.004
Within Groups	9811.79	551	17.80		
Total	10086.01	555			

Table 47 indicates that there is a significant difference in the mean scores of Achievement in Mathematics of Higher Secondary School Students among different Cognitive Style groups of male students, $F(4,555) = 3.85, p < .01$.

To check the significance of difference of mean scores among the Groups, Scheffés Post Hoc test was carried out. Result of the Post Hoc test is presented in Table 48.

Table 48

Summary of Scheffés Post Hoc test for Mathematics Achievement among Male Students with Different Cognitive Styles

Variables	Cognitive Style Groups	Mean Difference	Std. Error	p
Achievement in Mathematics	Split Integrated	- 1.772 *	0.494	0.013
	Split Undifferentiated	0.086	0.443	1.00
	Split Intuitive	- 0.497	0.770	0.981
	Split Systematic	- 0.984	0.919	0.887
	Integrated Undifferentiated	1.858 *	0.548	0.023
	Integrated Intuitive	1.274	0.836	0.676
	Integrated Systematic	0.788	0.974	0.957
	Undifferentiated Intuitive	-0.584	0.806	0.971
	Undifferentiated Systematic	- 1.070	0.949	0.866
	Intuitive Systematic	- 0.485	1.139	0.996

* $p < .05$

Table 48 shows that the difference in the mean scores of Achievement in Mathematics of Higher Secondary School Students between Split and Integrated Cognitive Style group is statistically significant, Mean difference = 1.77, SE = 0.49, $p < .05$. Also, there is significant difference in the mean scores of Achievement in Mathematics between Integrated and Undifferentiated Cognitive Style group, Mean difference=1.858, SE=0.548, $p < .05$. This indicates that Achievement in Mathematics of male students with Integrated Cognitive Style (M = 15.75, SD = 4.47) is higher than that of male students with Split (M = 13.97, SD = 4.22), or Undifferentiated (M = 13.88, SD = 4.04) Cognitive Styles.

The table also reveals that there is no significant difference in the mean scores of Achievement in Mathematics among Cognitive Style group pairs of male students such as Split style and Undifferentiated style, Split style and Intuitive style, Split Style and Systematic style, Integrated style and Intuitive style, Integrated style and Systematic style, Undifferentiated style and Intuitive style, Undifferentiated style and Systematic style, and Intuitive style and Systematic style.

Female Students. The mean scores of Achievement in Mathematics of female higher secondary school students were compared among different Cognitive Styles such as Systematic style, Intuitive style, Split style, Integrated style, and Undifferentiated style and the details are described below.

The descriptive statistics of Achievement in Mathematics among female students with different Cognitive Styles is given in Table 49

Table 49

Descriptive Statistics of Achievement in Mathematics among Female Students with Different Cognitive Styles

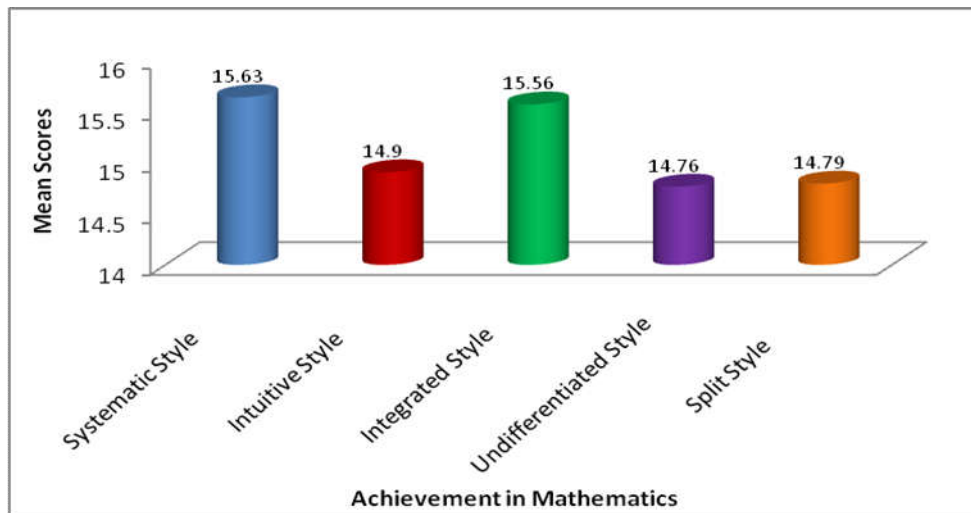
Cognitive Styles	N	Mean	SD
Systematic Style	11	15.63	3.90
Intuitive Style	20	14.90	4.68
Integrated Style	181	15.56	4.32
Undifferentiated Style	79	14.76	5.11
Split Style	283	14.79	4.27

From the table it is clear that Achievement in Mathematics increased from the Undifferentiated style group ($n= 79$, $M = 14.76$, $SD = 5.11$), to Split style group ($n= 283$, $M = 14.79$, $SD = 4.27$), to Intuitive style group ($n= 20$, $M = 14.90$, $SD = 4.68$), to Integrated style group ($n= 181$, $M = 15.56$, $SD = 4.32$), to Systematic style group ($n= 11$, $M = 15.63$, $SD = 3.90$) in that order.

The mean scores of Achievement in Mathematics among female students with different Cognitive Styles is presented as Figure 19.

Figure 19

Achievement in Mathematics among Female Students with Different Cognitive Styles



Female higher secondary school students with different Cognitive Styles were compared with respect to their mathematics achievement and the details are given in Table 50.

Table 50

Data and Result of One Way ANOVA in Mathematics Achievement among Female Students with Different Cognitive Styles

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	77.03	4	19.26	.985	.415
Within Groups	11120.69	569	19.54		
Total	11197.73	573			

From Table 50, it is clear that there is no significant difference in the mean scores of Achievement in Mathematics of female higher secondary school students with different Cognitive Styles.

Rural Students. The mean scores of Achievement in Mathematics of rural higher secondary school students were compared among different Cognitive Styles such as Systematic style, Intuitive style, Split style, Integrated style, and Undifferentiated style and the details are described below.

The descriptive statistics of Achievement in Mathematics among rural students with different Cognitive Styles is given in Table 51.

Table 51

Descriptive Statistics of Achievement in Mathematics among Rural Students with Different Cognitive Styles

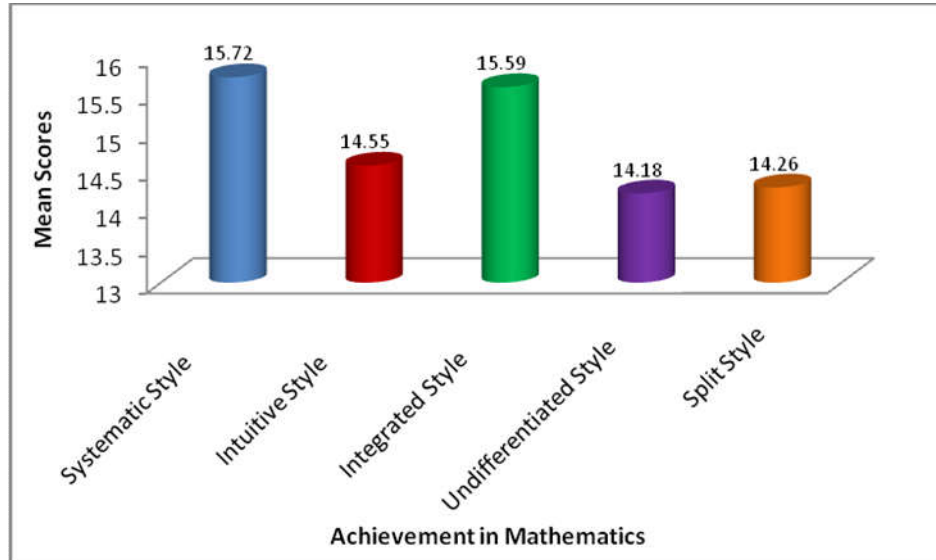
Cognitive Styles	N	Mean	SD
Systematic Style	18	15.72	4.05
Intuitive Style	29	14.55	3.87
Integrated Style	150	15.59	4.13
Undifferentiated Style	110	14.18	4.47
Split Style	275	14.26	4.02

From the table it is clear that Achievement in Mathematics increased from the Undifferentiated Style group (n= 110, M = 14.18, SD = 4.47), to Split Style group (n= 275, M = 14.26 SD = 4.02), to Intuitive Style group (n= 29, M = 14.55, SD = 3.87), to Integrated Style group (n= 150, M = 15.59, SD = 4.13), to Systematic Style group (n= 18, M = 15.72, SD = 4.05), in that order.

The mean scores of Achievement in Mathematics among rural students with different Cognitive Styles is presented as Figure 20.

Figure 20

Achievement in Mathematics among Rural Students with Different Cognitive Styles



Rural higher secondary school students with different Cognitive Styles were compared with respect to their mathematics achievement and the details are given in Table 52.

Table 52

Data and Result of One Way ANOVA in Mathematics Achievement among Rural Students with Different Cognitive Styles

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	219.23	4	54.81	3.208	0.013
Within Groups	9856.96	577	17.08		
Total	10076.19	581			

Table 52 indicates that there is a significant difference in the mean scores of Achievement in Mathematics of rural higher secondary school students among different Cognitive Style groups, $F(4,581) = 3.208, p < .05$.

To check the significance of difference of mean scores among the Groups, Post Hoc test was carried out. Result of the Post Hoc test is presented in Table 53.

Table 53

Summary of Scheffé's Post Hoc Test for Mathematics Achievement among Rural Students with Different Cognitive Styles

Variables	Cognitive Style Groups		Mean Difference	Std. Error	p
Achievement in Mathematics	Split	Integrated	-1.328*	0.40	0.041
	Split	Undifferentiated	0.084	0.47	1.000
	Split	Intuitive	-0.286	0.81	0.998
	Split	Systematic	-1.457	1.01	0.718
	Integrated	Undifferentiated	1.412	0.52	0.118
	Integrated	Intuitive	1.041	0.84	0.819
	Integrated	Systematic	-0.129	1.03	1.000
	Undifferentiated	Intuitive	-0.360	0.86	0.996
	Undifferentiated	Systematic	-1.540	1.05	0.708
	Intuitive	Systematic	-1.170	1.24	0.926

* p<.05

Table 53 shows that the difference in the mean scores of Achievement in Mathematics of rural higher secondary school students between Split and Integrated Cognitive Style groups is statistically significant, Mean difference=1.33, SE=0.40, $p < .05$. This indicates that the rural students with Integrated Cognitive Style ($M = 15.59$, $SD = 4.13$) has greater Achievement in Mathematics than the rural students with Split Cognitive Style ($M = 14.26$, $SD = 4.02$).

There is no significant differences in the mean scores of Achievement in Mathematics among cognitive style group pairs of rural students such as Split style and Undifferentiated style, Split style and Intuitive style, Split style and Systematic style, Integrated style and Intuitive style, Integrated style and Undifferentiated style, Integrated style and Systematic style, Undifferentiated style and Intuitive style, Undifferentiated style and Systematic style, and Intuitive style and Systematic style .

Urban Students. The mean scores of Achievement in Mathematics of urban higher secondary school students were compared among different Cognitive Styles such as Systematic Style, Intuitive Style, Split Style, Integrated Style, and Undifferentiated Style and the details are described below.

The descriptive statistics of Achievement in Mathematics among urban students with different Cognitive Styles is given in Table 54.

Table 54

Descriptive Statistics of Achievement in Mathematics among Urban Students with Different Cognitive Styles

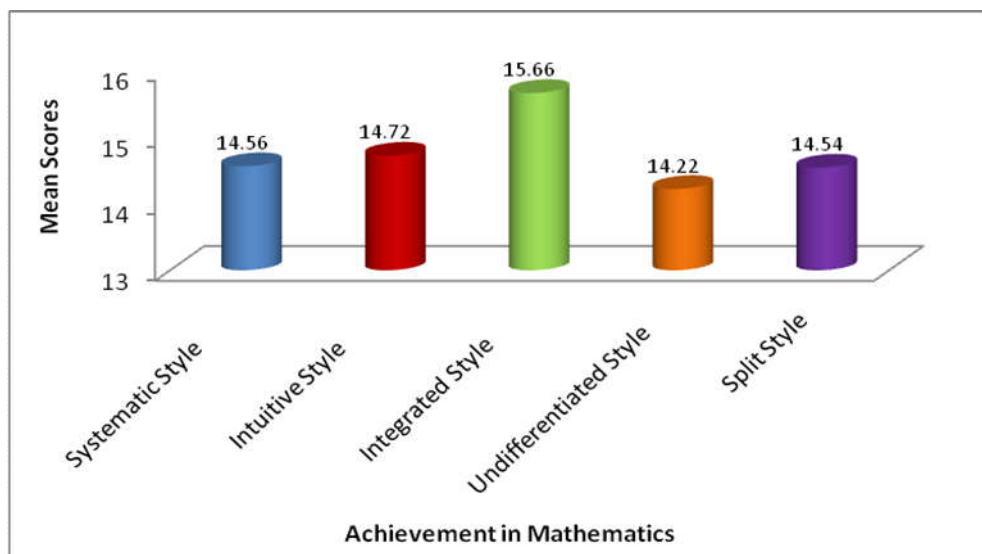
Cognitive Styles	N	Mean	SD
Systematic Style	16	14.56	5.07
Intuitive Style	25	14.72	3.77
Integrated Style	133	15.66	4.62
Undifferentiated Style	110	14.22	4.47
Split Style	264	14.54	4.51

From the table it is clear that Achievement in Mathematics increased from the Undifferentiated Style group (n= 110, M =14.22, SD=4.47), to Split Style group (n=264, M =14.54, SD =4.51), to Systematic Style group (n= 16, M=14.56, SD=5.07), to Intuitive Style group (n= 25, M=14.72, SD=3.77), to Integrated Style group (n= 133, M=15.66, SD=4.62), in that order.

The mean scores of Achievement in Mathematics among urban students with different Cognitive Styles is presented as Figure 21.

Figure 21

Achievement in Mathematics among Urban Students with Different Cognitive Styles



To check the significance of difference in Achievement in Mathematics, One-way ANOVA was used and the details are given in Table 55.

Table 55

Data and Result of One Way ANOVA in Mathematics Achievement among Urban Students with Different Cognitive Styles

Source of Variance	Sum of Squares	df	Mean Square	F	sig
Between Groups	153.66	4	38.416	1.864	0.115
Within Groups	11189.06	543	20.606		
Total	11342.72	547			

From Table 55, it is clear that there is no significant difference in the mean scores of Achievement in Mathematics of urban higher secondary school students among different Cognitive Style groups.

Correlation Analysis

Estimation of relationship between independent and dependent variables were one of the objectives of the study. Pearson's Product Moment Correlation method was used for the purpose. The results were interpreted using verbal interpretation of coefficients of correlation by (Garrett, 1981).

The coefficient of Correlation between AQ and Achievement in Mathematics of the higher secondary school students was found out for the total sample and subsamples of the study. Also the relationships between each dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance, and Achievement in Mathematics were calculated. The correlation coefficient and the significance of the correlation coefficient were determined using SPSS. The details of Correlation Analysis are described below.

Relationship between AQ and Achievement in Mathematics for the Total Sample and Subsamples of Higher Secondary School Students

The correlation between AQ and Achievement in Mathematics for the Total sample and subsamples drawn on the basis of gender and locale are given in Table 56.

Table 56

Correlation between AQ and Achievement in Mathematics for the Total Sample and Subsamples

Variables	Sample	AQ
Achievement in Mathematics	Total Sample	0.650**
	Male	0.660**
	Female	0.651**
	Rural	0.629**
	Urban	0.675**

** indicates correlation is significant at the 0.01 level (2-tailed)

Table 56 shows that the coefficient of correlation between AQ and Achievement in Mathematics for the total sample is 0.650 ($p < .01$). The relationship is interpreted as positive and substantial for the total sample of higher secondary school students.

Table 56 also shows that the coefficient of correlation between AQ and Achievement in Mathematics for male and females are 0.660 and 0.651 respectively and are significant ($p < .01$). The coefficient of correlation indicates that the relationship between AQ and Achievement in Mathematics are positive and substantial in the case of male and female higher secondary school students.

Also, from the above table the coefficient of correlation for rural and urban students are 0.629 and 0.675 respectively and are significant ($p < .01$). The coefficient of correlation indicates that the relationship between AQ and Achievement in Mathematics are positive and substantial in the case of rural and urban higher secondary school students.

Estimation of Relationships between Each Dimensions of AQ and Achievement in Mathematics for the Total Sample and Subsamples of the Study

The correlation between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples of higher secondary school students are given in Table 57.

Table 57

Correlation between Each of the Dimensions of AQ and Achievement in Mathematics for the Total Sample and Subsamples

Variables	Sample	Dimensions of AQ			
		Control	Origin and Ownership	Reach	Endurance
Achievement in Mathematics	Total	.448**	.253**	.424**	.459**
	Male	.476**	.274**	.445**	.482**
	Female	.427**	.211**	.441**	.473**
	Rural	.444**	.239**	.394**	.386**
	Urban	.453**	.276**	.451**	.536**

** indicates correlation is significant at the 0.01 level (2-tailed)

Table 57 shows that significant correlation exists between each dimension of AQ and Achievement in Mathematics for the total sample. The coefficients of Correlation of each dimension of AQ such as Control, Origin and Ownership, Reach, and Endurance with Achievement in Mathematics are 0.448, 0.253, 0.424 and 0.459 respectively and are significant ($p < .01$). The coefficients of correlation indicates that the relationships of Achievement in Mathematics with the dimensions of AQ are positive and moderate in the case of Control, Reach, and Endurance dimensions, and positive and low in the case of Origin and Ownership dimension.

Table 57 also reveals that among male students, significant correlation exists between each of the dimensions of AQ and Achievement in Mathematics. The coefficients of Correlation of each dimension of AQ such as Control, Origin and Ownership, Reach, and Endurance with Achievement in Mathematics are 0.476, 0.274, 0.445, 0.482 respectively and are significant ($p < .01$). The coefficients of correlation indicates that the relationships of Achievement in Mathematics with the dimensions of AQ are positive and moderate in the case of Control, Reach, and Endurance dimensions, and positive and low in the case of Origin and Ownership dimension.

Similarly, the coefficients of correlation of each of the dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance of AQ of female

students with Achievement in Mathematics are 0.427, 0.211, 0.441, 0.473 respectively and are significant ($p < .01$). The coefficients of correlation indicates that the relationships of Achievement in Mathematics with the dimensions of AQ are positive and moderate in the case of Control, Reach, and Endurance dimensions, and Positive and low in the case of Origin and Ownership dimension.

Among rural students, the coefficients of correlation of each of the dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance with Achievement in Mathematics are .444, .239, .394, .386 respectively and are significant ($p < .01$). The coefficients of correlation indicates that the relationships of Achievement in Mathematics with the dimensions of AQ are positive and moderate in the case of Control dimension. In the case of Origin and Ownership, Reach, and Endurance dimensions the relationships are positive and low.

In the case of urban students, the coefficients of correlation of each of the dimension Control, Origin and Ownership, Reach, and Endurance of AQ with Achievement in Mathematics are 0.453, 0.276, 0.451, 0.536 respectively and are significant ($p < .01$). The coefficients of correlation indicates that the relationships of Achievement in Mathematics with the dimensions of AQ are positive and moderate in the case of Control, Reach, and Endurance dimensions, and positive and low in the case of Origin and Ownership dimension.

Multiple Regression Analysis

Multiple Regression Analysis was carried out to predict the value of dependent variable Achievement in Mathematics based on the predictor variables Control, Origin and Ownership, Reach, and Endurance. An equation is also framed to explain the relationship between the variables using multiple regression analysis. Enter method of regression analysis was used and was done using SPSS.

The correlation matrix of the criterion variable Achievement in Mathematics with predictor variables Control, Origin and Ownership, Reach, and Endurance are given in Table 58.

Table 58

The Correlation Matrix of the Criterion Variable with the Predictor Variables for Total Sample of Higher Secondary School Students

Variables	Control	Origin & Ownership	Reach	Endurance
Achievement in Mathematics	0.448	0.253	0.424	0.459

From Table 58, all the predictive variables have positive significant correlation with Achievement in Mathematics.

Prediction of Achievement in Mathematics with the Predictor Variables

Multiple regression analysis was done for Achievement in Mathematics with the predictor variables such as Control, Origin and Ownership, Reach, and Endurance. The details of regression analysis are presented in Table 59.

Table 59

The Model Summary of Multiple Correlation Coefficient for Achievement in Mathematics

R	R Square	Adjusted R Square
0.632	0.400	.397

Pearson correlation coefficient between the scores predicted by the regression model (i.e., the predicted scores) and the actual values of the dependent variable Achievement in Mathematics is .632 indicate a moderate strong level of association. R^2 for the overall model is .400 with an adjusted R^2 .397, which indicates that 40 percent of the variation in the Achievement in Mathematics score can be explained by the regression model developed with variables Control, Origin and Ownership, Reach, and Endurance.

Results of ANOVA in Multiple Regression of predictors Control, Origin and Ownership, Reach, and Endurance on Achievement in Mathematics for the total sample is presented in Table 60.

Table 60

Result of ANOVA in Multiple Regression of Predictors Control, Origin and Ownership, Reach, and Endurance on Achievement in Mathematics for the Total Sample

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	8558.426	4	2139.607	187.12	.001
1 Residual	12863.666	1125	11.434		
Total	21422.092	1129			

From the table it is clear that the predicted variables Control, Origin and Ownership, Reach, and Endurance statistically significantly predicted Achievement in Mathematics, $F(4,1129) = 187.12, p < 0.01$. Details of Variable wise Beta Coefficients and t values in predicting Achievement in Mathematics are given in Table 61.

Table 61

Variable wise Beta Coefficients and t values in Predicting Achievement in Mathematics

Predictor	Unstandardized Coefficients(β)	t	p
(Constant)	-7.342	-8.607	<.01
Control	.190	10.29	<.01
Origin and Ownership	.198	12.78	<.01
Reach	.123	7.62	<.01
Endurance	.175	8.16	<.01

From Table 61, it is clear that β coefficient obtained for the Control is 0.190, it means that the increase in the score of Achievement in Mathematics is 0.190 for increase in each unit of Control score. The obtained t value shows that the β values obtained differ significantly from zero ($t = 10.29, p < .01$). Hence the variable Control is significant predictor of Achievement in Mathematics of students.

β coefficient obtained for the Origin and Ownership is 0.198, it means that the increase in the score of Achievement in Mathematics is 0.198 for increase in each unit of Origin and Ownership score. The obtained t value shows that the β values obtained differ significantly from zero ($t = 12.78, p < .01$). Hence the variable Origin and Ownership is significant predictor of Achievement in Mathematics of students.

β coefficient obtained for the Reach is 0.123, it means that the increase in the score of Achievement in Mathematics is 0.123 for increase in each unit of Reach score. The obtained t value shows that the β values obtained differ significantly from zero ($t = 7.62$, $p < .01$). Hence the variable Reach is significant predictor of Achievement in Mathematics of students.

β coefficient obtained for the Endurance is 0.175, it means that the increase in the score of Achievement in Mathematics is 0.175 for increase in each unit of Endurance score. The obtained t value shows that the β values obtained differ significantly from zero ($t = 8.16$, $p < .01$). Hence the variable Endurance is significant predictor of Achievement in Mathematics of students.

Hence the variables Control, Origin and Ownership, Reach, and Endurance are significant predictors of Achievement in Mathematics of students.

With the values of beta, the regression model can be expressed as

$$Y^1 = 0.190 X_1 + 0.198 X_2 + 0.123 X_3 + 0.175 X_4 - 7.342$$

Where,

Y^1 – Predicted value of Achievement in Mathematics

X_1 – Score on Control

X_2 – Score on Origin and Ownership

X_3 – Score on Reach

X_4 – Score on Endurance

The data were further analysed to know the individual contribution of the predictor variables in predicting the Achievement in Mathematics of Higher Secondary School Students. Details are given in Table 62.

Table 62

Standardized Regression Coefficients, Percentage of Individual Contribution, Structure Coefficient and Squared Structure Coefficient of the Predictor Variable in Predicting Achievement in Mathematics

Predictors	Standardized Coefficients (Beta)	Percentage of Contribution	r_s	r_s^2
Control	.265	11.87	.709	.503
Origin and Ownership	.298	7.54	.400	.16
Reach	.222	9.41	.671	.450
Endurance	.242	11.11	.726	.527

$R = 0.632, R^2 = .400$

The table shows that individual contribution of Control to the model is 11.87 percent (.265×.448). Individual contribution of Origin and Ownership to the model is 7.54 percent (.298×.253). Individual contribution of Reach to the model is 9.41 percent (.222×.424). Individual contribution of Endurance to the model is 11.11 percent (.242×.459).

The structure coefficient of the predictor Control is .709 and the squared value is .503 indicating that 50.3 percent of the explained variance in Achievement in Mathematics by the model is accounted by the predictor Control. Similarly, 16 percent, 45percent and 52.7 percent of the explained variance in Achievement in Mathematics by the model is accounted by the Origin and Ownership, Reach, and Endurance respectively.

The Multiple Regression equation is modified by using standardised beta coefficients as

$$Z_Y' = 0.265 Z_{X1} + 0.298 Z_{X2} + 0.222 Z_{X3} + 0.242 Z_{X4}$$

Where Z_Y' = Standardised predicted value of Achievement in Mathematics

Z_{X1} = Standardised predicted value of Control

Z_{X2} = Standardised predicted value of Origin and Ownership

Z_{X3} = Standardised predicted value of Reach

Z_{X4} =Standardised predicted value of Endurance.

Discussions

In the present study, the investigator analysed AQ, Cognitive Styles and Achievement in Mathematics of higher secondary school students.

Percentages of students belonging to high, Moderate and Low levels of AQ groups for the total sample shows that majority (71.59 %) of the students possess Moderate AQ. Only 15.22 percent of students possess High AQ and 13.18 percent possess Low AQ. Among subsamples drawn on the basis of gender, majority of the male (73.74 %) and female (69.51 %) students have Moderate AQ. Also, it is found that 14.21 percent of male students and 16.20 percent of female students and have High AQ. Similarly, 12.05 percent of male students and 14.29 percent of female students have Low AQ.

It is also found that majority of the rural (71.13 %) and urban (72.08 %) students belongs to Moderate AQ group. Only 15.81 percent of rural and 14.60 percent of urban students belongs to High AQ group. Similarly, 13.06 percent rural and 13.32 percent of urban students belongs to Low AQ group. Thus, it can be concluded that majority of the higher secondary school students have Moderate AQ for the total sample and subsamples.

While analysing Cognitive Styles it is found that among the total sample of the higher secondary school students, 3.01 percent have systematic cognitive style, 4.78 percent have intuitive cognitive style, 25.04 percent have integrated cognitive style, 19.47 percent have undifferentiated cognitive style and 47.70 percent have split cognitive style.

It also shows that 4.14 percent of male and 1.91 percent of female students have systematic cognitive style and only 6.12 percent of male students and 3.50 percent of female students have intuitive cognitive style. 18.35 percent of male students and 31.53 percent of female students have integrated cognitive style. Similarly, in the case of undifferentiated cognitive style, the percentages of male and female students are 25.35 and 13.76 respectively. Most of the male (46.04 %) and female (49.30 %) students have split cognitive style.

It is found that 3.09 percent of rural and 2.92 percent of urban students have systematic cognitive style and 4.98 percent of rural and 4.56 percent of urban students have intuitive cognitive style. Similarly, 25.77 percent of rural and 24.27 percent of urban students have integrated cognitive style. Also, 18.90 percent of rural and 20.07 percent of urban students have undifferentiated cognitive style. Most of the rural (47.25%) and urban (48.18 %) students have split cognitive style. Also, it is found that among total sample and subsamples, the percentage of students in split style is above 40 percent and the percentages of students in systematic style is below 5 percent. Also, for the total sample, majority (47.70 %) of the students are of split style.

Mean difference analysis revealed that there exists no significant difference in the mean scores of AQ of higher secondary school students drawn on the basis of gender and locale.

Significant difference was found between male and female students with respect to their mean scores of dimensions of AQ such as Origin and Ownership, Reach, and Endurance. Female students were superior to male students in the Origin and Ownership dimension of AQ. Male students were found to be superior to their female counterparts in both Reach and Endurance dimensions of AQ. No significant difference was found between male and female students with respect to their mean scores of Control dimension of AQ.

Similarly, significant difference was found between rural and urban students with respect to their mean scores of Origin and Ownership dimension of AQ. No significant difference was found between rural and urban students with respect to their mean scores of dimensions of AQ such as Control, Reach, and Endurance.

Significant difference was also found between male and female students with respect to their mean scores of components of AQ such as Individual related, Home related and Society related. Male students were found to have high mean score than female students in Individual related and Society related components of AQ. Also, female students were found to be superior to male students in their Home related component of AQ. No significant difference was found between male and female students with respect to their mean scores of Institution related component of AQ.

Similarly, significant difference was found between rural and urban students with respect to their mean scores of Home related component of AQ. Rural students was found to have high mean score than urban students in Home related component of AQ. No significant difference was found between rural and urban students with respect to their mean scores of Individual related, Institution related and Society related components of AQ.

The mean difference analysis also revealed that there exists significant difference between male and female students in their Achievement in Mathematics. Female students are superior to their male counterparts with respect to their Achievement in Mathematics. However, there is no significant difference between rural and urban students in Mathematics Achievement.

Comparison of Mathematics Achievement of higher secondary school students with High, Moderate and Low AQ revealed that there exist significant

differences in the mean scores of Achievement in Mathematics for the total sample. Result of Post hoc test revealed that students with High level of AQ is superior to students with Moderate or Low AQ with respect to their Mathematics Achievement.

Similarly, there exists significant difference in the mean scores of Achievement in Mathematics among male and female higher secondary school students with High, Moderate and Low AQ. Results of Post hoc test revealed that students with High AQ have greater Achievement in Mathematics than students with Moderate or Low AQ among male and female higher secondary school students.

Also, there exists significant difference in the mean scores of Achievement in Mathematics among rural and urban higher secondary school students with High, Moderate and Low AQ. Results of Post hoc test revealed that students with High AQ is superior to students with Moderate or Low AQ with respect to their Achievement in Mathematics among rural and urban higher secondary school students.

Comparison of Mathematics Achievement among Higher Secondary School Students with Different Cognitive styles revealed that there exists significant difference in the mean scores of Achievement in Mathematics among different Cognitive Style groups for the total sample. Results of Post hoc test revealed that significant difference was found among cognitive style pairs such as Integrated style and Split style, and Integrated style and Undifferentiated style. Students with Integrated Cognitive Style have greater Achievement in Mathematics than students with Split or Undifferentiated Cognitive Styles for the total sample. There is no significant difference in the mean scores of Achievement in Mathematics among other cognitive style group pairs such as Split style and Undifferentiated style, Split style and Intuitive style, Split style and Systematic style, Integrated style and Systematic style, Integrated style and Intuitive style,

Systematic style and Undifferentiated style, Intuitive style and Undifferentiated style, and Systematic style and Intuitive style.

Similarly, there exists significant difference in the mean scores of Achievement in Mathematics among different Cognitive Style groups in the case of male students. Results of Post hoc test revealed that significant difference was found between cognitive style group pairs such as Integrated style and Split style; and Integrated style and Undifferentiated style. Male students with Integrated Cognitive Style have greater Achievement in Mathematics than male students with Split or Undifferentiated Cognitive Styles. There is no significant difference in the mean scores of Achievement in Mathematics among other cognitive style group pairs such as Split style and Undifferentiated style, Split style and Intuitive style, Split style and Systematic style, Integrated style and Systematic style, Integrated style and Intuitive style, Systematic style and Undifferentiated style, Intuitive style and Undifferentiated style, and Systematic style and Intuitive style.

Significant difference was found in the mean scores of Achievement in Mathematics among different Cognitive Style groups in the case of rural students. Results of Post hoc revealed that significant difference was found between Integrated style and Split Cognitive style group. The rural students with Integrated Cognitive Style achieve higher in mathematics than rural students with Split style. There is no significant difference in the mean scores of Achievement in Mathematics among other cognitive style group pairs such as Split style and Undifferentiated style, Split style and Intuitive style, Split style and Systematic style, Integrated style and Systematic style, Integrated style and Undifferentiated style, Integrated style and Intuitive style, Systematic style and Undifferentiated style, Intuitive style and Undifferentiated style, and Systematic style and Intuitive style.

There is no significant difference in the mean scores of Achievement in Mathematics of female and urban higher secondary school student with different Cognitive Styles.

Correlation Analysis revealed that significant relationship exists between AQ and Achievement in Mathematics for the total sample and subsamples. The Correlation Coefficient for the total sample was found to be 0.650 which is significant at 0.01 level. The coefficient of correlation indicates that the relationships of AQ with Achievement in Mathematics are positive and substantial for the total sample. It is also found that there exist positive and moderate relationships between each of the dimensions of AQ such as Control, Reach and Endurance and Achievement in Mathematics for the total sample and subsamples such as male, female and urban. Meanwhile there exists only a positive and low relationship in the case of Origin and Ownership dimension of AQ for the total sample and subsamples. Also there exists only a positive and low relationships between AQ and Achievement in Mathematics in the Reach and Endurance dimensions of rural students.

Multiple Regression Analysis revealed that the predictor variables such as Control, Origin and Ownership, Reach, and Endurance are significant predictors of Achievement in Mathematics of Higher Secondary School Students. 40 percent of the variation in the Achievement in Mathematics can be explained by the regression model.

The Regression equation is given by

$$Z_Y' = 0.265 Z_{X1} + 0.298 Z_{X2} + 0.222 Z_{X3} + 0.242 Z_{X4}$$

Where Z_Y = Standardised predicted value of Achievement in Mathematics

Z_{X1} = Standardised predicted value of Control

Z_{X2} = Standardised predicted value of Origin and Ownership

Z_{X3} = Standardised predicted value of Reach

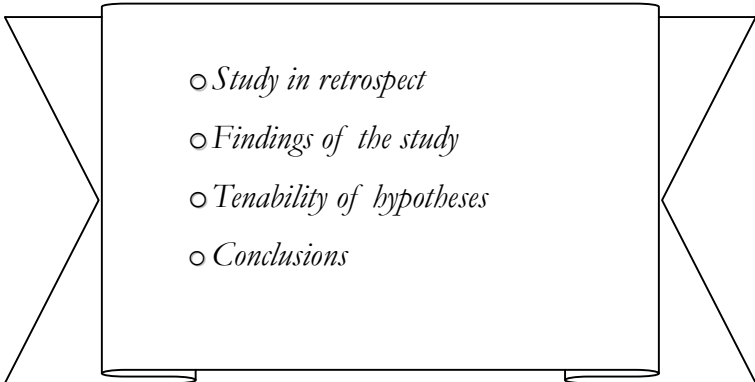
Z_{X4} = Standardised predicted value of Endurance

The equation can be interpreted as when there is an increase in standard deviations of Control by one unit there is a corresponding increase in Achievement in Mathematics by 0.265 standard deviations.

In the case of Origin and Ownership dimension, when there is an increase in the standard deviations by one unit, there is a corresponding increase in the Achievement of Mathematics by 0.298 standard deviations. Similarly for unit increase in the standard deviations of Reach, there is a corresponding increase of 0.222 standard deviations in Achievement in Mathematics. Also, for unit increase in the standard deviations of Endurance, there is a corresponding increase of 0.242 standard deviations in Achievement in Mathematics.

Chapter 5

SUMMARY AND CONCLUSION

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- A decorative frame consisting of a central rectangle with a double-line border, flanked by two triangles pointing towards the center, and a horizontal line at the bottom with a double-line border. Inside the frame is a list of four items, each preceded by a small circle.
- *Study in retrospect*
 - *Findings of the study*
 - *Tenability of hypotheses*
 - *Conclusions*

SUMMARY AND CONCLUSION

Study in Retrospect

Restatement of the Problem

Adversity Quotient is the ability of an individual to deal adverse situations in life. It empowers individuals to efficiently and effectively face challenges and help them to keep on struggling when faced with difficulties in their life. The way through which a person perceives and processes information is important to make sense of the world around him and to become effective problem solvers. Cognitive style is the individualised manner of receiving and processing information. Mathematics is a challenging subject and students require mental ability to be successful in their learning process. Thus, the investigator decided to study on the Adversity Quotient, Cognitive Styles and their relation to Achievement in Mathematics.

Title of the Study

The present study was stated as ADVERSITY QUOTIENT, COGNITIVE STYLES AND ACHIEVEMENT IN MATHEMATICS AMONG HIGHER SECONDARY SCHOOL STUDENTS IN KERALA

Variables Selected for the Study

The independent variable, dependent variable and the classificatory variables of the present study were the following.

Independent Variables

In the present study Adversity Quotient (AQ) and Cognitive Styles were treated as the independent variables of the study.

Dependent Variable

Achievement in Mathematics was treated as the dependent variable.

Classificatory Variables

Gender and Locale were selected as the classificatory variables of the study.

Objectives

1. To examine whether there exist different levels of AQ among Higher Secondary School Students in Kerala for the total sample and sub samples drawn on the basis of Gender and Locale.
2. To examine whether there exist different Cognitive Styles among Higher Secondary School Students in Kerala for the total sample and sub samples of the study.
3. To find out whether there exist any significant differences in the mean scores of AQ, its dimensions and its components among the subsamples of the study.
4. To find out whether there exists any difference in the mean scores of Achievement in Mathematics among the subsamples.
5. To compare the mean scores of Achievement in Mathematics among students with High, Moderate and Low levels of AQ for the total sample and subsamples.
6. To compare the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample and subsamples
7. To find out whether there exists any significant relationship between AQ and Achievement in Mathematics for the total sample and subsamples.
8. To find out whether there exist any significant relationships between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples.

9. To find out the individual and combined contributions of dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics for the total sample.

Hypotheses

1. There exist different levels of AQ among Higher Secondary School Students in Kerala for the total sample and subsamples drawn on the basis of Gender and Locale.
2. There exist different Cognitive Styles among Higher Secondary School Students in Kerala for the total sample and subsamples of the study.
3. There exist significant differences in the mean scores of AQ, its dimensions and its components among the subsamples of the study.
4. There exists significant difference in the mean scores of Achievement in Mathematics among the subsamples.
5. There exist significant differences in the mean scores of Achievement in Mathematics among students with High, Moderate and Low levels of AQ for the total sample and subsamples.
6. There exist significant differences in the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample and subsamples.
7. There exists significant relationship between AQ and Achievement in Mathematics for the total sample and subsamples.
8. There exist significant relationships between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples.
9. There is significant individual and combined contributions of Dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics for the total sample.

Methodology

Method

Survey method was used to collect data from Higher Secondary School Students in Kerala.

Sample

The present study was conducted on a representative sample of 1130 students of standard XI from Higher Secondary Schools in Kerala. The Sample was drawn by stratified sampling technique, giving due representation to gender and locale.

Tools used for the Study

The investigator used the following tools for collecting data.

1. Adversity Quotient Scale

The Adversity Quotient Scale was developed and standardized by the investigator with the help of her supervising teacher. The tool consisted of 52 items.

2. Cognitive Style Inventory

The Cognitive Style Inventory was developed and standardized by the investigator with the help of her supervising teacher. There were 40 items in the tool.

3. Achievement Test in Mathematics

The investigator developed and standardised Achievement Test in Mathematics with the help of her supervising teacher. It was constructed based on Revised Blooms Taxonomy. The test consisted of both objective and descriptive type items. The maximum score was 25.

Statistical Techniques Used for the Study

Descriptive Statistics

The mean, median, mode, standard deviation, skewness and kurtosis of AQ, Systematic and Intuitive scores of Cognitive Styles, and Achievement in Mathematics of Higher Secondary School Students for the Total sample and subsamples were calculated.

Percentage Analysis

In order to identify the levels of Adversity Quotient and different Cognitive Styles of higher secondary school students, Percentage Analysis was conducted for the total sample and subsamples.

Mean Difference Analysis

Test of significance of difference between two means for independent large sample was used to compare the mean scores of two independent groups (t test). The significant differences in the mean scores of more than two groups were compared by One-Way ANOVA.

In the present study, test of significance of difference between means was used to find the significance of difference in the mean scores of the independent variable AQ, its dimensions and its components and also for the dependent variable Achievement in Mathematics. The comparison of students with High, Moderate and Low levels of AQ with respect to their Mathematics Achievement and also the comparison of the students with different Cognitive Styles with respect to their Mathematics Achievement were calculated by One-way ANOVA for the total sample and subsamples. Scheffe's Post Hoc Test was used to find the groups with significant differences in their mean scores.

Correlation Analysis

The relationships between the independent and dependent variable was calculated using correlation analysis. In the present study, the relationships of AQ and its dimensions with that of Achievement in Mathematics were calculated using Pearson's Product Moment Correlation method.

Multiple Regression Analysis

The individual and combined contributions of the predictor variables such as Control, Origin and Ownership, Reach, and Endurance on the dependent variable, Achievement in Mathematics was calculated by Multiple Regression Analysis using enter method.

Findings of the Study

The major findings of the study are summarised below.

1. It is found that there exist High, Moderate and Low levels of AQ among higher secondary school students. 15.22 percent of higher secondary school students belongs to High AQ group, 71.59 percent to Moderate AQ group and 13.18 percent to Low AQ group.
2. Among male students, 14.21 percent belongs to High AQ group, 73.74 percent to Moderate AQ group and 12.05 percent to Low AQ group. Similarly, among female students, 16.20 percent belongs to High AQ group, 69.51 percent to Moderate AQ group and 14.29 percent to Low AQ group.
3. Among Rural students, 15.81 percent belongs to High AQ group, 71.13 percent to Moderate AQ group and 13.06 percent to Low AQ group. Similarly, among urban students, 14.60 percent belongs to High AQ group, 72.08 percent to Moderate AQ group and 13.32 percent to Low AQ group.
4. It is found that higher secondary school students are using different Cognitive Styles namely Split Style, Integrated Style, Undifferentiated Style,

Intuitive Style and Systematic Style. The percentage of higher secondary school students using Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style, and Split Style are 3.01 percent, 4.78 percent, 25.04 percent, 19.47 percent, and 47.70 percent respectively.

5. The percentages of male students using Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style and Split Style are, 4.14, 6.12, 18.35, 25.35 and 46.04 respectively. Similarly, the percentages of female students using Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style and Split Style are 1.91, 3.50, 31.53, 13.76 and 49.30 respectively.
6. The percentages of rural students using Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style and Split Style are 3.09, 4.98, 25.77, 18.90 and 47.25 respectively. Similarly, the percentages of urban students using Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style and Split Style are 2.92, 4.56, 24.27, 20.07 and 48.18 respectively.
7. The study reveals that most of the students are using Split Style (47.70%) and are considered to have equal degree of Systematic and Intuitive orientations. Only a few students prefer either Systematic Style (3.01%) or Intuitive Style (4.78%) for the total sample.
8. It is found that there exists no significant difference in the mean scores of AQ between male and female students ($t=1.05$, $p>.05$) and also between rural and urban students ($t=0.66$, $p>.05$).
9. There exists significant difference between male and female students in the mean scores of Origin and Ownership dimension of AQ ($t=10.01$, $p<.01$). The mean score of female students is higher than male students. Similarly, there exists significant difference in the mean scores of Reach dimension of AQ ($t= 6.36$, $p<.01$), where male students have highest mean score than female students. Also there exists significant difference in the mean scores of

Endurance dimension of AQ ($t=4.86$, $p<.01$), where mean score of male students is higher than female students. However there exists no significant difference in the mean score of Control dimension of AQ.

10. There exists significant difference between rural and urban students in the mean scores of Origin and Ownership dimension of AQ ($t=3.33$, $p<.01$), where rural students have highest mean score than urban students. However, there exist no significant differences in the mean scores of Control, Reach and Endurance dimensions of AQ.
11. It is found that among the subsample drawn on the basis of gender, there exists significant difference in the mean scores of Home related component of AQ, $t= 6.84$, $p<.01$ where mean scores of female students is higher than male students. Also, there exists significant difference in the mean scores of Individual related component of AQ, $t= 4.08$, $p<.01$ where male students are superior than female students. Similarly, there exists significant difference in the mean scores of Society related component of AQ, $t=2.66$, $p<.01$ where male students have high mean score than female students. However, there is no significant difference in the mean scores of Institution related component of AQ.
12. It is found that among the subsample drawn on the basis of locale, significant difference exists in the mean scores of Home related component of AQ ($t=3.86$, $p<.01$), where rural students are superior than urban students. However there exist no significant differences in the mean scores of Individual related, Institution related and Society related components of AQ.
13. There exists significant difference in the mean scores of Achievement in Mathematics of the students ($t=2.71$, $p<.01$) among the subsample drawn on the basis of gender where female students were found to be superior than male students.

14. There exists no significant difference in the mean scores of Achievement in Mathematics ($t=0.41$, $p>.05$) among the subsample drawn on the basis of locale.
15. It is found that there exist significant differences in the mean scores of Achievement in Mathematics of higher secondary school students with High, Moderate and Low AQ for the total sample, $F(2, 1129) = 312.61$, $p <.01$. Scheffés Post Hoc Analysis shows that students with High AQ, Moderate AQ and Low AQ differ significantly in Mathematics Achievement. Students with High AQ have greater mathematics achievement than students with Moderate or Low AQ.
16. There exist significant differences in the mean scores of Achievement in Mathematics of male students with High, Moderate and Low AQ, $F(2, 555) = 158.82$, $p <.01$. Scheffés Post Hoc Analysis showed that students with High AQ, Moderate AQ and Low AQ differ significantly in Mathematics Achievement. Students in High AQ have greater Mathematics Achievement than students with Moderate or Low AQ.
17. Similarly, there exist significant differences in the mean scores of Achievement in Mathematics of female students with High, Moderate and Low AQ, $F(2, 573) = 158.24$, $p <.01$. Scheffés Post Hoc Analysis showed that students with High AQ, Moderate AQ and Low AQ differ significantly in Mathematics Achievement. Students with High AQ have greater mathematics achievement than students with Moderate or Low AQ.
18. There exist significant differences in the mean scores of Achievement in Mathematics of rural students with High, Moderate and Low AQ, $F(2, 581) = 142.37$, $p <.01$. Scheffés Post Hoc Analysis showed that students with High AQ, Moderate AQ and Low AQ differ significantly in Mathematics

Achievement. Students with High AQ have greater mathematics achievement than students with Moderate or Low AQ.

19. There exist significant differences in the mean scores of Achievement in Mathematics of urban students with High, Moderate and Low AQ, $F(2, 547) = 172.78$, $p < .01$. Scheffé's Post Hoc Analysis showed that students with High AQ, Moderate AQ and Low AQ differ significantly in Mathematics Achievement. Students with High AQ have greater mathematics achievement than students with Moderate or Low AQ.
20. It is found that there exist significant differences in the mean scores of Achievement in Mathematics among higher secondary school students with different Cognitive Styles for the total sample, $F(4, 1129) = 4.76$, $p < .01$. Scheffé's Post Hoc Analysis showed that there exist significant differences in the mean scores of Achievement in Mathematics between Split and Integrated Cognitive Style group and also between Integrated and Undifferentiated Cognitive Style group. Students with Integrated Cognitive Style have greater Achievement in Mathematics than the students with Split Cognitive Style or Undifferentiated Cognitive Style.
21. There exist significant differences in the mean scores of Achievement in Mathematics among male students with different Cognitive Styles, $F(4, 555) = 3.85$, $p < .01$. Scheffé's Post Hoc Analysis showed that there is significant difference in the mean scores of Achievement in Mathematics between Split and Integrated cognitive style group and also between Integrated and Undifferentiated Cognitive Style group. Achievement in Mathematics of male students with Integrated Cognitive Style is higher than that of the students with Split Cognitive style or Undifferentiated Cognitive Style
22. There exist significant differences in the mean scores of Achievement in Mathematics among rural students with different Cognitive Styles, $F(4, 581)$

= 3.208, $p < .05$. Scheffé's Post Hoc Analysis showed that there is significant difference in the mean scores of Achievement in Mathematics of students between Split and Integrated Cognitive Style group. The students with Integrated Cognitive Style have greater Achievement in Mathematics than the students with Split Cognitive Style.

23. There exist no significant differences in the mean scores of Achievement in Mathematics among female students, ($F = 0.985$, $p > .01$) and urban students ($F = 1.864$, $p > .01$) with different cognitive styles.
24. It is found that there exists substantial and significant (0.01 level) positive relationship between AQ and Achievement in Mathematics of higher secondary school students for the total sample and subsamples of the study.
25. There exist significant (0.01 level) positive relationships between each of the dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance with Achievement in Mathematics of higher secondary school students for the total sample and subsamples of the study. The relationship is moderate in the case of Control, Reach, and Endurance dimensions where as it is low in the case of Origin and Ownership dimensions for the total sample and subsamples such as male, female and urban. Among rural students, the relationship is moderate in the case of Control dimension and low in the case of Origin and Ownership, Reach and Endurance dimensions.
26. Multiple regression coefficient for the predictor variables is found to be 0.632 which is significant at 0.01 level. It means that the predictor variables such as Control, Origin and Ownership, Reach, and Endurance contributes in predicting Achievement in Mathematics. The percentage of joint contribution of Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics is found to be 40.0 percent. The individual contributions of Control, Origin and Ownership, Reach, and Endurance in

predicting Achievement in Mathematics are 11.87 percent, 7.54 percent, 9.41 percent and 11.11 percent respectively.

For predicting Achievement in Mathematics from the predictor variables namely Control, Origin and Ownership, Reach and Endurance of higher secondary school students, the regression equation is formed. The equation is

$$Y^1 = 0.190 X_1 + 0.198 X_2 + 0.123 X_3 + 0.175 X_4 - 7.342$$

Where,

Y^1 - Predicted value of Achievement in Mathematics

X_1 - Score on Control

X_2 - Score on Origin and Ownership

X_3 - Score on Reach

X_4 - Score on Endurance

Multiple Regression Equation is modified by using standardized beta coefficients is as follows

$$Z_Y' = 0.265 Z_{X1} + 0.298 Z_{X2} + 0.222 Z_{X3} + 0.242 Z_{X4}$$

Where Z_Y' = Standardised predicted value of Achievement in Mathematics

Z_{X1} = Standardised predicted value of Control

Z_{X2} = Standardised predicted value of Origin and Ownership

Z_{X3} = Standardised predicted value of Reach

Z_{X4} = Standardised predicted value of Endurance.

Tenability of Hypotheses

- 1) Hypothesis 1 - There exist different levels of AQ among Higher Secondary School Students in Kerala for the total sample and subsamples drawn on the basis of Gender and Locale.**

The analysis revealed that there exist High, Moderate and Low levels of AQ among higher secondary school students for the Total Sample and sub

samples drawn on the basis of gender and locale. Thus, the above hypothesis is substantiated.

2) Hypothesis 2-There exist different Cognitive Styles among Higher Secondary School Students in Kerala for the total sample and subsamples of the study.

The analysis revealed that different Cognitive Styles namely Split Style, Integrated Style, Undifferentiated Style, Intuitive Style and Systematic Style were identified among Higher Secondary School Students for the Total sample and sub samples drawn on the basis of gender and locale. Thus, the hypothesis is substantiated.

3) Hypothesis 3- There exist significant differences in the mean scores of AQ, its dimensions and its components among the subsamples of the study.

The analysis revealed that there is no significant difference in the mean scores of AQ of the students among the subsamples. Also, it was found that between male and female students there exist significant differences in the mean scores of each dimension of AQ such as Origin and Ownership, Reach, and Endurance. However, between male and female students there is no significant difference in the mean scores of Control dimension of AQ. Similarly, between rural and urban students there exist no significant differences in the mean scores of each dimension of AQ such as Control, Reach and Endurance. However, between rural and urban students significant difference was found in the Origin and Ownership dimension of AQ. Thus, the hypothesis is partially substantiated.

4) Hypothesis 4- There exists significant difference in the mean scores of Achievement in Mathematics among the subsamples.

The analysis revealed that there is significant difference in the mean scores of Achievement in Mathematics between male and female students. It was also found that there is no significant difference in the mean scores of Achievement in

Mathematics between rural and urban students. Thus, the hypothesis is partially substantiated.

5) Hypothesis 5 - There exist significant differences in the mean scores of Achievement in Mathematics among students with High, Moderate and Low levels of AQ for the total sample and subsamples

It was found that there exist significant differences in the mean scores of Achievement in Mathematics among students with High, Moderate and Low AQ groups for the Total Sample and sub samples drawn on the basis of gender and locale. Students with High AQ have greater Achievement in Mathematics than students with Low or Moderate AQ for the Total sample and sub samples of the study. Thus, the hypothesis is substantiated.

6) Hypothesis 6 - There exist significant differences in the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample and subsamples.

The analysis revealed that there exist significant differences in the mean scores of Achievement in Mathematics of students with different Cognitive Styles for the total sample and for subsamples such as male and rural. Significant difference exists between Split and Integrated Cognitive Style group and Undifferentiated and Integrated Cognitive Style group for the total sample and for subsample male. The significant difference exists between Integrated and Split Style among rural students. There are no significant differences between the other pairs of Cognitive Style groups of higher secondary school students with respect to their Achievement in Mathematics. Thus, the above hypothesis is partially substantiated.

7) Hypothesis 7 - There exists significant relationship between AQ and Achievement in Mathematics for the total sample and subsamples.

Significant and positive relationship was found between AQ and Achievement in Mathematics for the Total and sub samples drawn on the basis of

gender and locale of higher secondary school students. Thus the hypothesis is substantiated.

8) Hypothesis 8- There exist significant relationships between each of the dimensions of AQ and Achievement in Mathematics for the total sample and subsamples.

Significant and positive relationship was found between each dimension of AQ and Achievement in Mathematics for the Total and sub samples based on gender and locale of higher secondary school students. Thus, the hypothesis is substantiated.

9) Hypothesis 9 - There is significant individual and combined contributions of Dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics for the total sample.

Multiple Regression analysis revealed that the variation in the Achievement in Mathematics score can be explained by the regression model developed with the predictor variables Control, Origin and Ownership, Reach, and Endurance. There is significant individual and combined contribution of the predictor variables on Achievement in Mathematics. Thus, the hypothesis is substantiated.

Conclusions

The findings of the present study revealed that there exist different levels of AQ such as High, Moderate and Low AQ among higher secondary school students. Majority (71.59 percent) of the students are of Moderate AQ. It is also noted that there exists no significant difference in the mean scores of AQ among subsamples drawn on the basis of gender. This showed that both male and female students are equal in dealing with adversities. This is in line with the findings of Khairani and Abdullah (2018), Rathee and Sharma (2018), Hema and Gupta

(2015) and Cornista and Mecasaet (2013). While it is in contradiction with the findings of Vinas and Malabanan (2015) and Beri (2016). The result of the present study also revealed that there is no significant difference between rural and urban students in the mean scores of AQ. This is also supported by the findings of Rathee and Sharma (2018).

The findings of the study also showed that gender difference was not found in the Control dimension of AQ. In the Origin and Ownership dimension of AQ, female students were superior to male students. This supports the findings of Hanum (2018). The present study also revealed that in both Reach and Endurance dimensions of AQ, male students were found to be superior to female students. Locale wise difference was found only in the Origin and Ownership dimension of AQ, where rural students were superior to urban students.

The findings of the study also revealed that there exist gender differences in the mean scores of Individual related, Home related and Society related components of AQ. Male students deal individual and societal adversities in a better way than female students. At the same time female students deal home related adversities better than male students. Also, there is no significant differences between male and female students in the Institutional related component of AQ.

The study also revealed that students with High AQ achieve greater in Mathematics than students with Moderate AQ or Low AQ. The findings of Darmawan et al. (2019) supports that students with High AQ have better Mathematics Achievement than students with Moderate or Low AQ. Similarly, Students with Moderate AQ have better Mathematics Achievement than students with Low AQ. It is noted that the study conducted by Punamasari et al. (2019) revealed that Reflective Thinking Process in Mathematical Problem Solving of junior high school students with High AQ was different from students with

Moderate AQ or Low AQ. The investigator also noticed that studies conducted by Dina et al. (2018) revealed that students with High AQ showed high level of flexibility in Mathematical problem solving, students with Moderate AQ was less able to show flexibility and students with Low AQ doesn't able to show flexibility in mathematical problem solving. Also, it is noted that the findings of Hidayat and Husnussalam (2019) showed that the Mathematical Understanding Ability of students with High AQ are better than students with Moderate AQ or Low AQ. The results of the studies of Bakare (2015) showed that students with High AQ showed high Academic Achievement. In the present study significant difference also exists in the mean scores of Achievement in Mathematics based on High, Moderate and Low AQ among subsamples.

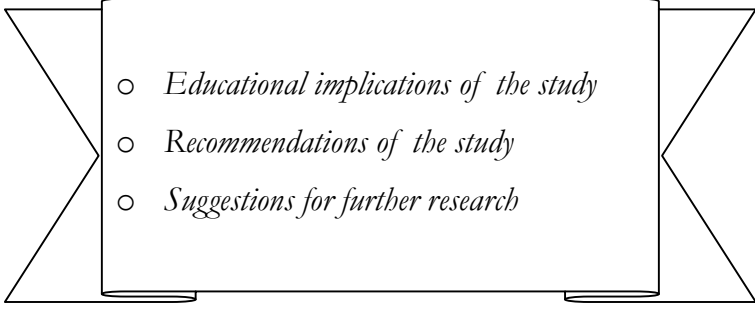
It is also found that there is significant positive relationship between AQ and Achievement in Mathematics of higher secondary school students. This is in line with the findings of Bakare (2015). It is also found that there is significant individual and combined contributions of dimensions of AQ such as Control, Origin and Ownership, Reach, and Endurance in predicting Achievement in Mathematics. It is noted that the findings of Bakare (2015) also showed that AQ is the most significant predictor of Academic Achievement of students.

The study also showed that different Cognitive Styles namely Systematic Style, Intuitive Style, Split Style, Integrated Style and Undifferentiated Style are found among higher secondary school students. Most of the students (47.70 percent) possesses Split Style. This revealed that they were considered to have equal degree of Systematic and Intuitive specialisations. They use only one style at a time depending mainly on the nature of the task before them. Also, there is significant difference in the mean scores of Achievement in Mathematics among students with different Cognitive Styles for the total sample, male and rural students. Students with Integrated Cognitive Style achieve higher than the students with Split or

Undifferentiated Style for the total sample and among male students. Rural students with Integrated Cognitive Style achieve higher than the students with Split Style. This revealed that students with Integrated Cognitive Style have high Systematic and Intuitive specialisations and they attempt to do things by changing styles quickly with ease.

Chapter 6

RECOMMENDATIONS

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- *Educational implications of the study*
 - *Recommendations of the study*
 - *Suggestions for further research*

RECOMMENDATIONS

This chapter describes the Educational Implications of the Study on the basis of the findings. Also, the investigator suggests some recommendations to the stakeholders based on the findings. Suggestions for further research are also included in this chapter.

Educational Implications of the Study

Learning is a continuous process. Students face various challenging situations while learning. Whatever be the challenges students face, they may be trained to meet all the tough situations in life. Then only they may be able to meet the demands of the present competitive world.

Adversities may influence individuals positively or negatively depending on how one reciprocates to it. The success of a person during the toughest periods in life depends on his or her ability to counter them efficiently and to learn from adversities rather than conceding defeat.

AQ is the concept introduced by Stoltz (1997) for enhancing the success of an individual. It is a measure of a person's hardwired pattern of responses to adversities. AQ can be applied to self, to others and to organizations (Stoltz, 2000). According to Stoltz (2000), improving individual's responses to adversities may result in their personal and professional attainment. AQ has attained prominent place in the educational field also.

The present study explored higher secondary school students' AQ and Cognitive Styles. The study also analysed Mathematics Achievement of the students in relation to their AQ and Cognitive Styles.

The study revealed that higher secondary school students of Kerala belonged to 3 groups based on their levels of AQ namely High AQ, Moderate AQ and Low AQ. It is found that the percentage of female students (14.29%) in Low AQ group is higher than their male counterparts (12.05%). The percentages of rural (13.06%) and urban (13.32%) students in the Low AQ group is nearly the same.

The study also revealed that female students effectively tackled Home related adversities than their male counterparts. The individual and Society related adversities were effectively handled by male students when compared to female students. It indicates that female students may be provided opportunities to interact with society which helps them to overcome adversities.

The result of the study also indicated that female and rural students were willing to own the outcome of adversities. Male students were able to restrict adversities entering into other areas of their work than their female counterparts. It was also found that female students consider adversities as long lasting. These findings indicated the need for empowering female students.

Exploring AQ of the students will be helpful for the teachers. Teachers may train students to analyse the difficulties they face and develop resilient attitude to overcome them effectively.

As Mathematics Achievement is a deciding factor for higher secondary school students, due consideration may be given to improve their level of achievement. The findings of the study revealed that female students were superior to male students in Mathematics Achievement. It indicated that more focus may be given to increase the interest in the subject among male students.

On comparing Mathematics Achievement of higher secondary school students on the basis of High, Moderate and Low AQ, it is observed that students

with High AQ were found to be superior than those with Moderate or Low AQ. Similarly, students with Moderate AQ showed greater achievement in Mathematics than those with Low AQ. It implied that Mathematics Achievement of higher secondary school students varied with levels of AQ. It is also observed that there is significant positive relationship between AQ and Achievement in Mathematics. Also, AQ predicted Mathematics Achievement of higher secondary school students. The study also revealed the contribution of each dimensions of AQ in predicting Mathematics Achievement. This supports the need to strengthen the dimensions of AQ of the students. A survey may be conducted to explore the profile of the students in each dimension of AQ. It will help to identify the strengths and weaknesses of the students in relation to the dimensions of AQ.

The investigator also analysed the Cognitive Styles of higher secondary school students. Cognitive Styles are considered as the individual way of receiving and processing information. It describes the cognitive processes related to information processing. All individuals are unique in every aspect. The awareness about these unique characteristics and knowledge about style preferences of the individuals is important in the teaching- learning context.

In the present study, instead of focussing on the two extremes of Wholist-Analytic dimensions, the investigator examined the continua in between the two extremes using Martin's Cognitive Style model (1983). The investigator identified 3 Cognitive Styles namely Integrated style, Undifferentiated style and Split style along with the two extreme styles namely Systematic Style and Intuitive Style.

A person with Systematic style follows a well-defined step by step method while a person with Intuitive style follows unpredictable means for problem solving. In the Integrated style, one may adapt to either Systematic or

Intuitive orientations consequently. People with Undifferentiated style cannot be distinguished between Systematic or Intuitive orientations. People with Split style have equal degree of both Systematic and intuitive orientations and use them depending on the contexts.

While exploring Cognitive Styles of higher secondary school students it was observed that only a few percent of students belonged to Systematic (3.01%) and Intuitive (4.78%) styles. Most of the students possess Split Style (47.70 %) and thus have equal degree of systematic and intuitive orientations. 25.04% percent of the students were found to be using Integrated Style. They were identified as problem solvers and subconsciously use either Systematic or Intuitive style characteristics. 19.47 percent of students were using Undifferentiated style. They never show any particular style orientations and rely on external support and guidance.

The result of the study thus indicated that most students exhibited the characteristics of the styles in the continua in between the two extreme style dimensions and only a few percentage of students were found to have the characteristics of the extreme styles. So, Martin's (1983) Cognitive Style Model is better explained the Cognitive Style characteristics of higher secondary school students.

Along with the above findings, it is also found that students with Integrated Style have better Mathematics Achievement than students with Split or Undifferentiated style for the total sample. Thus, instead of focusing on a particular style, students may be familiarised about the strategies of alternate styles. Such exposure may be useful for them to improve their performance.

Recommendations of the Study

Based on the findings of the study the investigator suggests some recommendations that are given below.

Teachers

- Encourage students to develop healthy risk-taking attitude by providing challenging tasks while teaching and give feedback at each stage of their progress to improve their AQ.
- Teachers may try to avoid gender stereotyping in the classroom so that female students may get more exposure to society by participating in various activities and programmes from the school itself.
- Teachers may focus on guiding students rather than solving their problems to increase their ability to manage adversities.
- Teachers may communicate with the parents for ensuring a healthy home environment.
- Female students may be trained to improve their confidence level so that they become self-reliant and able to meet any sort of challenges from the society. Encourage them to develop their social skills through suitable classroom activities.
- Female students may be given training in various programs like Woman Empowerment Programs, Self Defence Programs, Communication Skill Development Programs etc. They may be encouraged to join Student Police, NCC, NSS, Guides etc.
- Students with High AQ may have a strong urge to attain achievements. Teachers may focus on maintaining their urge to succeed.

- Students with Moderate AQ may find themselves in a comfortable position, they may not use their full potential unless exposed to external motivation programs. They may be promoted to participate in programs and activities such as Olympiads, Talent Search Exams, Workshops, Sports, etc.
- Students with Low AQ never try to succeed. They need more care and support to develop positive attitude towards taking challenges in life. It is essential to enhance their AQ. Train them in activities which involve varying difficulty level in a progressive manner. Encourage such students to learn through trial and error method.
- The findings of the study revealed that students cannot be classified only on the basis of either of the characteristics of systematic or intuitive orientations. Most of the students showed both the characteristics up to a certain degree. Thus, teachers need to identify students' cognitive styles based on multidimension and plan classroom activities and teaching strategies accordingly.

Curriculum Planners, Administrators and Policy Makers

- Curriculum planners may give priority to develop flexible and personalised curriculum.
- A survey may be conducted for students especially among adolescents, to measure their AQ, to identify strengths and weaknesses in the dimensions of AQ and to know the levels of AQ. Identifying one's own strengths and focussing on it may help to gain confidence and motivation and thus helps to view opportunities around them.
- The school administrators may provide sessions on parenting which may be helpful for the parents to understand the adversities faced by the adolescents and to find better ways to channelise their emotions and feelings. The

guidance and support from the parents may develop students' ability to control home related adversities. Also, promote engagement of parents' participation in the intervention programs for enhancing AQ of the students.

- The result of the study also implicated the need for improving the ability of female students to effectively deal with society related adversities. Curriculum planners and school administrators may establish healthy school-community relationship through various collaborative programs.
- School administrators may conduct various guidance and counselling programs to equip students to overcome the adversities they encounter in life including those related to learning also. They may be given opportunities to develop coping strategies to deal with tough situations and manage daily challenges and adversities. Various workshops may be conducted with a view to enhance students' resilience.
- Include Self-regulatory learning skills in the pedagogy in order to develop resilience among learners.
- A survey may be conducted among the students to understand their cognitive styles. It helps to visualize educational planning that may address the individual differences in Cognitive Styles. The knowledge about cognitive styles of the students may be utilized in the development of various individualized learning programs for students.
- Make provisions in the curriculum to promote style flexibility among the learners. Due importance may be given in the curriculum to develop meta cognitive skills which may help students to overcome their style rigidity.
- Implement e-learning pedagogy and integrate learning activities based on augmented and virtual learning which will be helpful for students with different Cognitive Styles

- Teachers may be given training to use various teaching strategies required for accommodating students with different cognitive styles.
- Curriculum planners may encourage autonomy in learning which will be more useful in the learning of Mathematics. It may help to develop a sense of control and ownership over their own learning.

Suggestions for Further Research

- The study may be replicated among students of Kendriya Vidyalayas, Navodaya Vidyalayas, Military Schools and Residential Schools at secondary and senior secondary levels.
- A study may be conducted among higher secondary school students to know their career aspirations in relation to AQ and Cognitive Styles.
- A study may be conducted among tribal students and non-tribal students to compare their AQ.
- A comparative study may be conducted among students of fishermen and non-fishermen families to know their AQ.
- A study on Leadership behaviour of school principals in relation to their Cognitive Styles and AQ may be conducted.

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APPENDICES

Appendix I

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ADVERSITY IDENTIFICATION QUESTIONNAIRE

DR. Abdul Kader Parambat

Research Supervisor
 Principal
 Govt. College of Teacher Education, Kozhikode

Sheni P.R.

Research Scholar
 Govt. College of Teacher Education,
 Kozhikode

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

നിർദ്ദേശങ്ങൾ

നിങ്ങളെ സംബന്ധിക്കുന്ന ചില ചോദ്യങ്ങൾ ചുവടെ നൽകിയിരിക്കുന്നു. ഓരോ ചോദ്യത്തിനും 'ഉണ്ട്' അല്ലെങ്കിൽ 'ഇല്ല' എന്നിങ്ങനെ 2 പ്രതികരണങ്ങളാണുള്ളത്. ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിച്ചു അതത് കോളങ്ങളിൽ ഒരു ടിക്ക് മാർക്ക് (✓) ഉപയോഗിച്ചു നിങ്ങളുടെ യഥാർത്ഥ പ്രതികരണങ്ങൾ രേഖപ്പെടുത്തുക. എല്ലാ ചോദ്യങ്ങൾക്കും ദയവായി പ്രതികരിക്കുക. നിങ്ങളുടെ പ്രതികരണങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കുന്നതും ഗവേഷണ ആവശ്യത്തിനായി മാത്രം ഉപയോഗിക്കുന്നതുമാണ്.

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	Yes	No
1.	പഠനത്തിൽ നിങ്ങൾക്ക് അമിതഭാരം തോന്നുന്നുണ്ടോ?		
2.	അധ്യാപകരുടെ പെരുമാറ്റത്തിൽ നിങ്ങൾക്ക് അസ്വസ്ഥത തോന്നുന്നുണ്ടോ?		
3.	നിങ്ങളുടെ അധ്യാപകരുടെ പിന്തുണ നിങ്ങൾക്ക് കിട്ടാതെ വരാറുണ്ടോ?		
4.	ക്ലാസിലെ ചില വിദ്യാർത്ഥികൾക്ക് അധ്യാപകർ പ്രത്യേക പരിഗണന നൽകുന്നുണ്ടോ?		
5.	അധ്യാപകരുടെ പ്രവൃത്തികൾ നിങ്ങളെ മാനസികമായി വേദനിപ്പിച്ചിട്ടുണ്ടോ?		
6.	സ്കൂളിലേക്കു യാത്ര ചെയ്യുന്നതിൽ നിങ്ങൾക്ക് ബുദ്ധിമുട്ട് തോന്നുന്നുണ്ടോ?		

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	Yes	No
7.	സുഹൃത്തുക്കൾക്കിടയിൽ നിങ്ങൾക്ക് വേണ്ടത്ര പരിഗണന കിട്ടാത്തതായി തോന്നാറുണ്ടോ?		
8.	നിങ്ങളുടെ മാതാപിതാക്കൾ നിങ്ങളെ ഒരുപാട് ശകാരിക്കുന്നുണ്ടോ?		
9.	പഠനവുമായി ബന്ധപ്പെട്ട സാമഗ്രികൾ യഥാസമയം ലഭിക്കാൻ നിങ്ങൾക്ക് ബുദ്ധിമുട്ടുണ്ടോ?		
10.	സുഹൃദ്ബന്ധങ്ങൾ തകരുന്ന സാഹചര്യങ്ങൾ നിങ്ങൾ അഭിമുഖീകരിച്ചിട്ടുണ്ടോ?		
11.	ലഹരിവസ്തുക്കളുടെ ഉപയോഗത്തിനുള്ള പ്രലോഭനം നിങ്ങൾ നേരിട്ടിട്ടുണ്ടോ?		
12.	അധ്യാപകരിൽ നിന്ന് നിങ്ങൾക്ക് ശാരീരിക പീഡനം അനുഭവപ്പെട്ടിട്ടുണ്ടോ?		
13.	ലഹരിവസ്തുക്കളുടെ ഉപയോഗത്തിൽ നിന്ന് പുറത്തുകടക്കാൻ നിങ്ങൾക്ക് കഴിയുമോ?		
14.	നിങ്ങളുടെ സഹോദരങ്ങൾക്ക് ലഭിക്കുന്ന അതേ രക്ഷാകർതൃ പരിഗണനകൾ നിങ്ങൾക്ക് ലഭിക്കുന്നുണ്ടോ?		
15.	പ്രിയപ്പെട്ടവരുടെ വേർപാട് ഉൾക്കൊള്ളാൻ നിങ്ങൾക്ക് ബുദ്ധിമുട്ടുണ്ടോ?		
16.	സമൂഹത്തിൽ നിന്ന് നിങ്ങൾക്ക് അപ്രതീക്ഷിതമായ പ്രശ്നങ്ങൾ നേരിടേണ്ടി വന്നിട്ടുണ്ടോ?		
17.	പ്രിയപ്പെട്ടവർക്ക് ഗുരുതരമായ അസുഖങ്ങൾ വരുമ്പോൾ നിങ്ങൾക്ക് അസഹനീയമായ ദുഃഖം തോന്നാറുണ്ടോ?		
18.	പഠനവുമായി ബന്ധപ്പെട്ട ജോലികൾ കൃത്യസമയത്ത് പൂർത്തിയാക്കാൻ നിങ്ങൾക്ക് ബുദ്ധിമുട്ടുണ്ടോ?		
19.	താങ്കളുടെ അശ്രദ്ധ കാരണം പ്രധാനപ്പെട്ട രേഖകൾ നഷ്ടപ്പെട്ടിട്ടുണ്ടോ?		
20.	നിങ്ങൾക്ക് അപകർഷതാബോധം തോന്നുന്നുണ്ടോ?		
21.	നിങ്ങളുടെ അശ്രദ്ധ മൂലം വിലപിടിപ്പുള്ള വസ്തുക്കൾ നഷ്ടപ്പെട്ടിട്ടുണ്ടോ?		
22.	നിങ്ങൾക്ക് വീട്ടിൽ അരക്ഷിതാവസ്ഥ അനുഭവപ്പെടുന്നുണ്ടോ?		
23.	നിങ്ങളുടെ മാതാപിതാക്കൾ സാമ്പത്തിക ബുദ്ധിമുട്ടുകൾ നേരിടുന്നുണ്ടോ?		
24.	നിങ്ങളുടെ സുഹൃത്തുക്കളുമായി ഊഷ്മളമായ ബന്ധം നിലനിർത്താൻ നിങ്ങൾക്ക് സാധിക്കാതെ വരാറുണ്ടോ?		
25.	നിങ്ങൾക്ക് അധ്യാപകരിൽ നിന്നും ശക്തമായ വിമർശനം നേരിട്ടിട്ടുണ്ടോ?		

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	Yes	No
26.	സുഹൃത്തുക്കൾ നിങ്ങളെ വല്ലാതെ പരിഹസിക്കാറുണ്ടോ?		
27.	നിങ്ങൾക്ക് എത്ര പരിശ്രമിച്ചിട്ടും പരീക്ഷയിൽ നല്ല മാർക്ക് നേടാൻ കഴിയാതെ വരാറുണ്ടോ?		
28.	ഉദ്യേശിച്ച പോലെ പരീക്ഷയ്ക്കു തയ്യാറെടുക്കാൻ നിങ്ങൾക്ക് കഴിയാതെ വരാറുണ്ടോ ?		
29.	നിങ്ങൾ പതിവായി ആരോഗ്യപ്രശ്നങ്ങൾ നേരിടുന്നുണ്ടോ?		
30.	കുടുംബാംഗങ്ങൾ നിങ്ങളുടെ അഭിപ്രായങ്ങൾ അവഗണിക്കാറുണ്ടോ?		
31.	പാഠ്യേതര പ്രവർത്തനങ്ങളിൽ പങ്കെടുക്കാൻ നിങ്ങൾ നിർബന്ധിക്കപ്പെടാറുണ്ടോ?		
32.	പ്രകൃതിദുരന്തങ്ങൾ കാരണം നിങ്ങൾക്ക് പ്രശ്നങ്ങൾ നേരിട്ടിട്ടുണ്ടോ?		
33.	മറ്റുള്ളവർ സൃഷ്ടിച്ച പ്രശ്നങ്ങളുടെ ഉത്തരവാദിത്തം നിങ്ങൾക്ക് ഏൽക്കേണ്ടതായി വന്നിട്ടുണ്ടോ?		
34.	മറ്റുള്ളവരുമായി ഇടപഴകാൻ നിങ്ങൾക്ക് ബുദ്ധിമുട്ടുണ്ടോ?		
35.	നിങ്ങൾ സോഷ്യൽ മീഡിയ വളരെ അധികം ഉപയോഗിക്കാറുണ്ടോ?		
36.	സോഷ്യൽ മീഡിയ വഴിയുള്ള സൗഹൃദങ്ങൾ മൂലം നിങ്ങൾക്ക് പ്രശ്നങ്ങൾ അനുഭവപ്പെടാറുണ്ടോ?		
37.	ക്ലാസ് മുറിയിലെ പഠന പ്രവർത്തനങ്ങളുമായി പൊരുത്തപ്പെടാൻ നിങ്ങൾക്ക് ബുദ്ധിമുട്ടുണ്ടോ?		
38.	താങ്കൾക്ക് ഹയർസെക്കൻഡറി വിദ്യാഭ്യാസത്തിന് പ്രിയപ്പെട്ട വിഷയങ്ങളിൽ പ്രവേശനം കിട്ടാതെ വന്നിട്ടുണ്ടോ?		
39.	നിങ്ങൾക്ക് മാതാപിതാക്കളുടെ പ്രതീക്ഷയ്ക്കൊത്ത് ഉയരാൻ സാധിക്കാതെ വന്നിട്ടുണ്ടോ?		
40.	പ്രായപൂർത്തിയാകുമ്പോൾ ഉണ്ടാകുന്ന ശാരീരിക മാറ്റങ്ങളുമായി പൊരുത്തപ്പെടാൻ നിങ്ങൾക്ക് ബുദ്ധിമുട്ട് നേരിട്ടിട്ടുണ്ടോ?		
41.	മോശം വ്യക്തികളുമായി സൗഹൃദത്തിൽ നിങ്ങൾ അകപ്പെട്ടുപോയിട്ടുണ്ടോ?		
42.	അധ്യാപകർ നിങ്ങളെ തെറ്റിദ്ധരിക്കാൻ ഇടയായിട്ടുണ്ടോ?		
43.	നിങ്ങളുടെ മാതാപിതാക്കൾ എപ്പോഴും പരസ്പരം വഴക്കിടാറുണ്ടോ?		
44.	നിങ്ങളുടെ മാതാപിതാക്കൾക്ക് സ്ഥിരമായ ജോലിയുണ്ടോ?		
45.	നിങ്ങൾക്ക് വാടക വീട്ടിൽ താമസിക്കുന്ന പ്രയാസം നേരിട്ടിട്ടുണ്ടോ?		

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	Yes	No
46.	സ്കൂൾ സംസ്കാരവുമായി പൊരുത്തപ്പെടുന്നതിൽ താങ്കൾക്ക് പ്രയാസം നേരിട്ടിട്ടുണ്ടോ?		
47.	നിങ്ങൾ ജാതി വിവേചനം നേരിട്ടിട്ടുണ്ടോ?		
48.	പ്രണയബന്ധം തകർന്നതായി താങ്കൾക്ക് അനുഭവപ്പെട്ടിട്ടുണ്ടോ??		
49.	നിങ്ങളുടെ മാതാപിതാക്കൾക്ക് ഇടയ്ക്കിടെ അസുഖം വരാറുണ്ടോ?		
50.	നിങ്ങളുടെ രക്ഷിതാക്കളിൽ ആർക്കെങ്കിലും പെരുമാറ്റവൈകല്യം ഉള്ളതായി തോന്നിയിട്ടുണ്ടോ?		
51.	നിങ്ങൾക്ക് അസുഖകരമായ പഠന അന്തരീക്ഷം നേരിടേണ്ടി വന്നിട്ടുണ്ടോ?		
52.	നിങ്ങളുടെ രൂപഭാവത്തിൽ നിങ്ങൾക്ക് ഉത്കണ്ഠ തോന്നാറുണ്ടോ?		
53.	കുടുംബാംഗങ്ങളുമായി പല കാര്യങ്ങളിലും യോജിച്ചു പോകാൻ താങ്കൾക്ക് പ്രയാസം തോന്നാറുണ്ടോ?		
54.	താങ്കളുമായി അയൽപക്കക്കാർക്ക് സൗഹൃദ ബന്ധം ഉണ്ടോ?		
55.	ജോലിസംബന്ധമായി രക്ഷിതാവിനു നിങ്ങളിൽ നിന്നും അകന്നു നിൽക്കേണ്ട സാഹചര്യം ഉണ്ടായിട്ടുണ്ടോ?		

നിർദ്ദേശങ്ങൾ

മുകളിൽ കൊടുത്തിരിക്കുന്നതിൽ നിന്നും വ്യത്യസ്തമായി മറ്റേതെങ്കിലും തരത്തിലുള്ള പ്രതികൂല സാഹചര്യം നിങ്ങൾക്ക് അനുഭവപ്പെട്ടിട്ടുണ്ടെങ്കിൽ അതു താഴെ ഒന്നാണായി രേഖപ്പെടുത്തുക.

Appendix I

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ADVERSITY IDENTIFICATION QUESTIONNAIRE

DR. Abdul Kader Parambat

Research Supervisor

Principal

Govt. College of Teacher Education, Kozhikode

Sheni P.R.

Research Scholar

Govt. College of Teacher Education,

Kozhikode

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

Directions

Some questions concerning you are given below. Each question has 2 responses such as 'Yes' or 'No'. Read the questions carefully and mark your true responses by putting a tick mark (✓) in the respective columns. Please respond to all questions. Your responses will be kept confidential and will be used for research purpose only.

Sl. No	Statements	Yes	No
1.	Do you feel overburdened with your studies?		
2.	Do you feel uncomfortable by the behaviour of teachers.		
3.	Are you not getting the support of your teachers?		
4.	Do teachers give special consideration to some students in the class?		
5.	Have you been emotionally hurt by the actions of teachers?		
6.	Do you find difficulty in traveling to school ?		
7.	Do you feel that you are not getting consideration from friends?		
8.	Do your parents scold you a lot?		
9.	Do you find it difficult to obtain study related materials in time?		

Sl. No	Statements	Yes	No
10.	Have you faced situations of breaking of friendships?		
11.	Have you faced temptation to substance abuse?		
12.	Have you experienced physical harassment from teachers?		
13.	Were you able to get out of substance abuse?		
14.	Do you get the same parental considerations as your siblings?		
15.	Do you find it difficult to accept the separation of loved ones?		
16.	Have you faced unexpected problems from society?		
17.	Do you feel unbearably sad when loved ones become seriously ill?		
18.	Do you find it difficult to complete study related tasks on time?		
19.	Have you lost important documents due to your carelessness?		
20.	Do you feel inferiority complex?		
21.	Have you lost valuable materials due to your negligence?		
22.	Do you feel insecurity at home?		
23.	Do your parents face financial difficulties?		
24.	Are you unable to maintain warm relationships with your friends?		
25.	Have you faced strong criticism from teachers?		
26.	Do your friends make fun of you a lot?		
27.	Are you unable to score good marks in exams even if you do hard work?		
28.	Are you unable to prepare for the exam as intended?		
29.	Do you face health problems regularly?		
30.	Do your friends ignore your comments?		
31.	Are you forced to participate in extracurricular activities?		
32.	Have you been faced problems due to natural calamities?		
33.	Have you ever had to bear responsibility of problems created by others?		

Sl. No	Statements	Yes	No
34.	Do you have difficulty in mingling with others?		
35.	Do you use social media a lot?		
36.	Do you experience problems by friendships through social media?		
37.	Do you find it difficult to adapt to learning activities in the classroom?		
38.	Have you failed to get admission in your favourite subjects for higher secondary education?		
39.	Have you failed to live up to your parents' expectations?		
40.	Have you faced difficulty adjusting to the physical changes that come with puberty?		
41.	Have you ever fallen into friendship with bad individuals?		
42.	Have teachers ever misunderstood you?		
43.	Do your parents always quarrel with each other?		
44.	Do your parents have a regular job?		
45.	Are you having trouble living in a rented house?		
46.	Have you had difficulty adjusting to the school culture?		
47.	Have you ever faced caste discrimination?		
48.	Have you ever felt a broken relationship?		
49.	Do your parents get sick often?		
50.	Did any of your parents seem to have a behaviour disorder?		
51.	Have you faced unpleasant learning environment?		
52.	Do you feel anxious about your appearance?		
53.	Do you find it difficult to agree on many things with family members?		
54.	Do your parents get angry always?		
55.	Do your neighbours have friendly relations with you?		

Sl. No	Statements	Yes	No
56	Has there been a situation where the parents have to stay away from you due to work?		

Directions

If you have experienced adverse situations other than mentioned above, please list it one by one below.

Appendix II

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

Percentages of Positive Responses to Adverse Situations of Higher Secondary School Students

Sl. No	Adverse Situations	% of Response	
		Yes	No
1.	Do You feel overburdened with your studies?	85.60	14.40
2.	Do You feel uncomfortable by the behaviour of teachers?	61.70	38.30
3.	Are you not getting the support of your teachers?	43.30	56.70
4.	Do teachers give special consideration to some students in the class?	87.70	12.30
5.	Have you been emotionally hurt by the actions of teachers?	22.00	78.00
6.	Do you find difficulty in travelling to school?	76.30	23.70
7.	Do you feel that you are not getting consideration from friends?	19.00	81.00
8.	Do your parents scold you a lot?	51.33	48.67
9.	Do you find it difficult to obtain study related materials in time?	5.70	94.30
10.	Have you faced situations resulting in breaking of friendships?	60.00	40.00
11.	Have you faced temptation to substance abuse?	79.00	21.00
12.	Have you experienced physical harassment from teachers?	9.00	91.00
13.	Were you able to get out of the habit of substance abuse?	33.30	66.70
14.	Do you get the same parental considerations as your siblings?	18.60	81.30
15.	Do you find it difficult to accept the separation of loved ones?	77.30	22.70
16.	Have you faced unexpected problems from the society?	62.70	37.30
17.	Do you feel unbearably sad when loved ones become seriously ill?	79.00	21.00

Sl. No	Adverse Situations	% of Response	
		Yes	No
18.	Do you find it difficult to complete your study related tasks on time?	68.00	32.00
19.	Have you lost important documents due to your carelessness?	8.70	91.30
20.	Do you feel inferiority complex?	28.60	71.30
21.	Have you lost valuable materials due to your negligence?	52.30	47.70
22.	Do you feel insecurity at home?	3.70	96.30
23.	Do your parents face financial difficulties?	54.00	46.00
24.	Are you unable to maintain warm relationships with your friends?	33.70	66.30
25.	Have you faced strong criticism from teachers?	59.60	40.30
26.	Do your friends make fun of you a lot?	72.60	27.30
27.	Are you unable to score good marks in exams even if you do hard work?	76.00	24.00
28.	Are you unable to prepare for the exam as intended?	88.30	11.70
29.	Do you face health problems regularly?	61.70	38.30
30.	Do your friends ignore your comments?	67.40	32.60
31.	Are you forced to participate in extracurricular activities?	28.70	71.30
32.	Have you been faced problems due to natural calamities?	26.70	73.30
33.	Have you ever had to bear responsibility of problems created by others?	53.70	46.30
34.	Do you have difficulty in mingling with other people?	37.30	62.70
35.	Do you use social media a lot?	61.70	38.30
36.	Do you experience problems by friendships through social media?	57.60	42.40
37.	Do you find it difficult to adapt to learning activities in the classroom?	63.70	36.30

Sl. No	Adverse Situations	% of Response	
		Yes	No
38.	Have you failed to get admission in your favourite subjects for higher secondary education?	25.70	74.30
39.	Have you failed to live up to your parents' expectations?	73.60	26.30
40.	Have you faced difficulty adjusting to the physical changes that come with puberty?	58.70	41.30
41.	Have you ever fallen into friendship with bad individuals?	12.00	88.00
42.	Have teachers ever misunderstood you?	71.00	29.00
43.	Do your parents always quarrel with each other?	63.70	36.30
44.	Do your parents have a regular job?	26.30	73.70
45.	Are you having trouble living in a rented house?	15.60	84.40
46.	Have you had difficulty adjusting to the school culture?	66.30	33.70
47.	Have you faced caste discrimination?	8.40	95.30
48.	Have you ever felt a broken relationship?	27.70	72.30
49.	Do your parents get sick often?	27.40	72.60
50.	Did any of your parents seem to have a behaviour disorder?	6.30	93.70
51.	Have you faced unpleasant learning environment?	11.00	89.00
52.	Do you feel anxious about your appearance?	76.30	23.70
53.	Do you find it difficult to agree on many things with family members?	53.00	47.00
54.	Do your parents get angry always?	51.30	48.70
55.	Do your neighbours have friendly relations with you?	55.70	44.30
56.	Has there been a situation where the parent has to stay away from you due to work?	66.60	33.30

Note: The shaded columns indicates the adverse situations with percentage of 50 or above and were selected for Adversity Quotient Scale

Adverse Situations obtained from Open-ended Questions

1. Parents do not spend time with me
2. I have lack of confidence

Appendix III

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ADVERTISTY QUOTIENT SCALE (DRAFT)

DR. Abdul Kader Parambat

Sheni P.R.

Research Supervisor

Research Scholar

Principal

Govt. College of Teacher Education,

Govt. College of Teacher Education, Kozhikode

Kozhikode

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

നിർദ്ദേശങ്ങൾ

നിങ്ങളുടെ ജീവിതത്തിൽ അപ്രതീക്ഷിതമായി സംഭവിക്കാവുന്ന പ്രതികൂല സാഹചര്യങ്ങളിലെ നിങ്ങളുടെ പ്രതികരണങ്ങളെക്കുറിച്ചുള്ള പ്രസ്താവനകൾ താഴെ നൽകിയിരിക്കുന്നു. ഓരോ പ്രസ്താവനയ്ക്കും ഒരിക്കലുമില്ല, അപൂർവ്വമായി, വല്ലപ്പോഴും, മിക്കപ്പോഴും, എല്ലായ്പ്പോഴും എന്നിങ്ങനെ അഞ്ചു പ്രതികരണങ്ങൾ നൽകിയിട്ടുണ്ട്. ഓരോ പ്രസ്താവനയും ശ്രദ്ധാപൂർവ്വം വായിച്ച ശേഷം എറ്റവും ഉചിതമായ കോളത്തിൽ നിങ്ങളുടെ പ്രതികരണം ശരി അടയാളം (✓) ഉപയോഗിച്ച് രേഖപ്പെടുത്തുക. ദയവായി എല്ലാ പ്രസ്താവനകൾക്കും പ്രതികരണം രേഖപ്പെടുത്തുക. താങ്കൾ നൽകുന്ന വിവരങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കുന്നതും ഗവേഷണ ആവശ്യത്തിന് മാത്രം ഉപയോഗിക്കുന്നതുമാണെന്ന് ഉറപ്പു നൽകുന്നു.

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
1.	പഠനസംബന്ധമായി സ്കൂളിൽ നിന്നും മാനസിക സമ്മർദ്ദം നേരിട്ടാൽ എനിക്കതിനെ നിയന്ത്രിക്കാൻ സാധിക്കും					
2.	സ്കൂളിൽ വെച്ച് പഠനവുമായി ബന്ധപ്പെട്ട് മനസിക സമ്മർദ്ദം നേരിട്ടാൽ എനിക്കും അതിൽ പങ്കുണ്ടാകും					
3.	പഠനവുമായി ബന്ധപ്പെട്ട പ്രവർത്തനങ്ങൾ നിശ്ചിത സമയത്തിനുള്ളിൽ പൂർത്തിയാക്കാൻ എനിക്ക് സാധിക്കാതെ വരാറുണ്ട്					
4.	പഠനപ്രവർത്തനങ്ങൾ നിശ്ചിത സമയത്തിനുള്ളിൽ പൂർത്തീകരിക്കാതിരുന്നാൽ അതിന്റെ പൂർണ്ണ ഉത്തരവാദിത്തം ഞാനേറ്റെടുക്കും					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
5.	വിലയേറിയ വസ്തുക്കൾ എന്റെ പക്കൽ നിന്നും നഷ്ടപ്പെടാൻ ഇടയായാൽ അതിന്റെ അനന്തര ഫലങ്ങൾ എനിക്ക് നേരിടാൻ സാധിക്കും					
6.	എന്റെ കൈയിൽ നിന്നും വിലയേറിയ വസ്തുക്കൾ നഷ്ടപ്പെടാൻ ഇടയായാൽ ഞാനതിന്റെ ഉത്തരവാദിത്തം ഏറ്റെടുക്കും					
7.	അധ്യാപകർ എന്നെ ശക്തമായി വിമർശിച്ചാൽ ഉൾക്കൊള്ളാൻ എനിക്ക് സാധിക്കും					
8.	മറ്റുള്ളവർ കാരണം എനിക്ക് അധ്യാപകരിൽ നിന്നും വിമർശനങ്ങൾ നേരിടേണ്ടി വന്നിട്ടുണ്ട്					
9.	കുടുംബാംഗങ്ങൾ എന്റെ അഭിപ്രായങ്ങളോട് വിധേയപ്പെട്ടു പ്രകടിപ്പിച്ചാൽ ഞാൻ നിരാശപ്പെടില്ല.					
10.	കുടുംബാംഗങ്ങളുമായി അഭിപ്രായ വ്യത്യാസമുണ്ടാകാനിടയായാൽ എനിക്കതിൽ യാതൊരു പങ്കുമുണ്ടാകില്ല					
11.	ക്ലാസ്സ്മുറിയിലെ പഠനപ്രവർത്തനങ്ങൾ മനസ്സിലാക്കാൻ സാധിക്കാതെ വരുമ്പോൾ ഞാൻ നിരാശപ്പെടാതിരിക്കും					
12.	ക്ലാസ്സ്മുറിയിലെ പഠനപ്രവർത്തനങ്ങൾ മനസ്സിലാക്കാൻ സാധിക്കാതെ വന്നാൽ അതിൽ എനിക്കും പങ്കുണ്ടാകും					
13.	പരീക്ഷകളിൽ നല്ല മാർക്ക് കിട്ടാതെ വന്നാൽ ഞാൻ മാനസികമായി തളർന്ന് പോകും					
14.	പരീക്ഷകളിൽ നല്ലമാർക്ക് നേടാനാവാതെ വന്നാൽ ഞാനതിന്റെ പൂർണ്ണ ഉത്തരവാദിത്തം ഏറ്റെടുക്കും					
15.	സുഹൃത്തുക്കൾ എന്നെ പരിഹസിക്കുന്ന സന്ദർഭങ്ങൾ ഉണ്ടായാൽ ഞാനതിനെ അവഗണിക്കും					
16.	സുഹൃത്തുക്കൾ എന്നെ പരിഹസിച്ചാൽ ഞാൻ എന്റെ പോരായ്മകൾ അംഗീകരിക്കും					
17.	സുഹൃദ്ബന്ധങ്ങൾ തകരുന്ന സന്ദർഭങ്ങളിലെ മാനസികാവസ്ഥയെ എനിക്ക് നിയന്ത്രിക്കാൻ സാധിക്കും					
18.	സുഹൃദ്ബന്ധങ്ങൾ തകരാൻ ഇടയായാൽ എനിക്കതിൽ യാതൊരു പങ്കുമുണ്ടാകില്ല					
19.	ലഹരിവദാർത്ഥങ്ങൾ ഉപയോഗിക്കാൻ നിർബന്ധിച്ചാൽ ഞാൻ വഴങ്ങിപ്പോകും					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വലുപ്പം	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
20.	ലഹരിപദാർത്ഥങ്ങൾ ഉപയോഗിക്കാൻ ഇടയായാൽ അതിന്റെ ഉത്തരവാദിത്തം എനിക്കാണ്					
21.	സോഷ്യൽമീഡിയ വഴിയുള്ള സൗഹൃദങ്ങൾ പ്രശ്നങ്ങൾ സൃഷ്ടിച്ചാൽ എനിക്കതിനെ ഫലപ്രദമായി കൈകാര്യം ചെയ്യാൻ സാധിക്കും					
22.	സോഷ്യൽമീഡിയയിലൂടെയുള്ള സൗഹൃദബന്ധങ്ങൾ മൂലം പ്രശ്നങ്ങൾ ഉണ്ടായാൽ ഞാനതിന്റെ ഉത്തരവാദിത്തമേറ്റെടുക്കും.					
23.	സൗന്ദര്യസംബന്ധമായ ഉത്കണ്ഠ അലട്ടിയാൽ എനിക്ക് അത് നിയന്ത്രിക്കാൻ സാധിക്കില്ല					
24.	സൗന്ദര്യസംബന്ധമായ ഉത്കണ്ഠ എന്നെ അലട്ടാൻ ഇടയായാൽ അതിനു കാരണം മറ്റുള്ളവർ മാത്രമാണ്					
25.	ആത്മവിശ്വാസക്കുറവ് എന്റെ പല പ്രവർത്തനങ്ങളേയും ബാധിക്കും.					
26.	എന്റെ ആത്മവിശ്വാസം നഷ്ടപ്പെടാൻ ഇടയാവുന്നതിൽ മറ്റുള്ളവർക്ക് നല്ല പങ്കുണ്ട്					
27.	മാതാപിതാക്കൾ എന്നോട് ദേഷ്യപ്പെട്ടാൽ എനിക്ക് എന്നെ നിയന്ത്രിക്കാനാവില്ല					
28.	മാതാപിതാക്കൾ എന്നോട് ദേഷ്യപ്പെട്ടാൽ അതിൽ എന്റെ പങ്ക് മനസ്സിലാക്കാൻ ഞാൻ ശ്രമിക്കും					
29.	വീട്ടിൽ സന്തോഷപ്രദമായ അന്തരീക്ഷം ഇല്ലാതിരുന്നാൽ എനിക്ക് മാനസിക പിരിമുറുക്കം നിയന്ത്രിക്കാൻ സാധിക്കാതെ വരും					
30.	വീട്ടിലെ സന്തോഷപ്രദമല്ലാത്ത അന്തരീക്ഷത്തിൽ എന്റെ പങ്ക് കണ്ടെത്തിയാൽ ഞാൻ തിരുത്തും.					
31.	സ്കൂളിന്റെ സംസ്കാരവുമായി പൊരുത്തപ്പെടാൻ സാധിച്ചില്ലെങ്കിൽ അതെന്റെ മാനസികസുഖം നഷ്ടപ്പെടുത്തും					
32.	സ്കൂളിന്റെ സംസ്കാരവുമായി പൊരുത്തപ്പെടാൻ സാധിക്കാതെ വന്നാൽ അത് എന്റേതല്ലാത്ത മറ്റുപല കാരണങ്ങൾ നിമിത്തമായിരിക്കും					
33.	ഉദ്ദേശിച്ചപോലെ പരീക്ഷയ്ക്ക് തയ്യാറെടുക്കാൻ സാധിക്കാതെ വന്നാൽ ഞാൻ മാനസികമായി തളർന്നു പോകും					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
34.	ഉദ്ദേശിച്ചപോലെ പരീക്ഷയ്ക്ക് തയ്യാറെടുക്കാൻ സാധിക്കാതെ വന്നാൽ എന്റെ പോരായ്മകൾ തിരുത്താൻ ഞാൻ ശ്രമിക്കും					
35.	ആരോഗ്യപ്രശ്നങ്ങൾ ഉണ്ടാകുമ്പോൾ അതെന്റെ മറ്റു പ്രവർത്തനങ്ങളെ ഒട്ടും ബാധിക്കാറില്ല.					
36.	എനിക്ക് ആരോഗ്യപ്രശ്നങ്ങൾ നേരിടേണ്ടി വരുമ്പോൾ ഞാനതിനെ താൽക്കാലികമായി കരുതും					
37.	അധ്യാപകരിൽ നിന്നും മാന്യമല്ലാത്ത പെരുമാറ്റം നേരിടേണ്ടി വന്നാൽ അതെന്നെ പലതരത്തിൽ ബാധിക്കും					
38.	അധ്യാപകരിൽനിന്നും മാന്യമല്ലാത്ത പെരുമാറ്റം നേരിടേണ്ടിവന്നാൽ എനിക്കതിന്റെ അനന്തരഫലങ്ങളെ പെട്ടെന്ന് തരണം ചെയ്യാൻ സാധിക്കും					
39.	മറ്റൊരാളുടെ കുറ്റം എന്റെ മേൽ ആരോപിച്ചാൽ അതെന്നെ പല വിധത്തിൽ ബാധിക്കും					
40.	മറ്റൊരാളുടെ കുറ്റം എന്റെ മേൽ ആരോപിച്ചാൽ അതിന്റെ അനന്തരഫലങ്ങളിൽ നിന്നും മുക്തി നേടാൻ എനിക്ക് കഴിയാതെ വരും					
41.	രക്ഷിതാക്കളുടെ പ്രതീക്ഷക്കനുസരിച്ചു ഉയരാൻ പറ്റാതിരുന്നാൽ അതെന്റെ മറ്റു പ്രവർത്തനങ്ങളിൽ നിഴലിക്കും					
42.	രക്ഷിതാക്കളുടെ പ്രതീക്ഷക്കനുസരിച്ച് ഉയരാൻ പറ്റാതിരുന്നാൽ ഞാൻ അതിനെ താൽക്കാലിക സാഹചര്യമായി മാത്രമേ കരുതൂ					
43.	വളർച്ചയോടനുബന്ധിച്ചുണ്ടായ ശാരീരികമാറ്റങ്ങളെ അംഗീകരിക്കാനുള്ള പ്രയാസം എന്റെ പെരുമാറ്റത്തെ ഒട്ടും ബാധിച്ചിട്ടില്ല.					
44.	വളർച്ചയോടനുബന്ധിച്ചുണ്ടായ ശാരീരികമാറ്റങ്ങളെ അംഗീകരിക്കാൻ എനിക്ക് പെട്ടെന്ന് സാധിച്ചു.					
45.	പ്രിയപ്പെട്ടവരുടെ വേർപാടുണ്ടാക്കുന്ന മനഃപ്രയാസം എന്റെ മറ്റുള്ള കാര്യങ്ങളെ ബാധിക്കാറില്ല.					
46.	പ്രിയപ്പെട്ടവരുടെ വേർപാടുണ്ടാക്കുന്ന മനഃപ്രയാസം ഞാൻ പെട്ടെന്ന് തരണം ചെയ്യും					
47.	കുടുംബാംഗങ്ങൾക്ക് പ്രയാസം നേരിട്ടാൽ അതെന്നെ പല വിധത്തിൽ ബാധിക്കും					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വലുപ്പം	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
48.	കുടുംബാംഗങ്ങൾക്ക് പ്രയാസം നേരിടുമ്പോഴുണ്ടാകുന്ന മാനസികസമ്മർദ്ദം ഞാൻ പെട്ടെന്ന് തരണം ചെയ്യും					
49.	മാതാപിതാക്കൾക്ക് സാമ്പത്തിക ബുദ്ധിമുട്ട് നേരിടേണ്ടി വന്നാൽ അതെന്റെ എല്ലാ പ്രവർത്തനങ്ങളിലും നിഴലിക്കും.					
50.	വീട്ടിലെ സാമ്പത്തികബുദ്ധിമുട്ടുകളെ ഞാൻ താത്കാലികമായി സംഭവിക്കുന്ന ഒന്നായി മാത്രമേ കരുതൂ					
51.	മാതാപിതാക്കൾ പരസ്പരം വഴക്കടിച്ചാൽ അത് എന്നെ എല്ലാതരത്തിലും പ്രതികൂലമായി ബാധിക്കും					
52.	മാതാപിതാക്കൾ പരസ്പരം വഴക്കടിച്ചാൽ എനിക്ക് ഉണ്ടാകുന്ന മനുഷ്യപ്രയാസങ്ങളിൽ നിന്ന് ഞാൻ എളുപ്പത്തിൽ മോചിതനാവും					
53.	അധ്യാപകർ ക്ലാസ്സിൽ ചില കുട്ടികൾക്ക് മാത്രം പരിഗണന നൽകാനിടവന്നാൽ അതെന്റെ പഠനത്തെ പ്രതികൂലമായി ബാധിക്കും					
54.	അധ്യാപകർ ക്ലാസ്സിൽ ചില കുട്ടികൾക്ക് മാത്രം പ്രത്യേക പരിഗണന നൽകിയാൽ എന്നെ സംബന്ധിച്ച് അതിന്റെ പ്രത്യാഘാതം എപ്പോഴും നിലനിൽക്കും					
55.	അയൽവാസികളിൽ നിന്നും സഹകരണമില്ലായ്മ നേരിട്ടാൽ അതെന്നെ സാരമായി ബാധിക്കും					
56.	അയൽവാസികളിൽ നിന്നും സഹകരണമില്ലായ്മ നേരിടേണ്ടി വന്നാൽ അതിനെ ഒരു താത്കാലിക അവസ്ഥയായി മാത്രമേ ഞാൻ കരുതൂ					
57.	കുടുംബാംഗങ്ങളുമായി സ്വരചേർച്ചയില്ലായ്മയുണ്ടായാൽ അതെന്റെ ജീവിതത്തെ മോശമായി ബാധിക്കും					
58.	കുടുംബാംഗങ്ങളുമായി സ്വരചേർച്ചയില്ലായ്മ ഉണ്ടായാൽ അതിനെ താത്കാലികമായി മാത്രമേ ഞാൻ കരുതൂ					
59.	സോഷ്യൽമീഡിയയുടെ തെറ്റായ സ്വാധീനത്തിൽ പെട്ടാൽ അതെന്റെ മറ്റു പ്രവർത്തനങ്ങളിൽ താത്പര്യക്കുറവ് ഉണ്ടാകും					
60.	സോഷ്യൽമീഡിയയുടെ തെറ്റായ സ്വാധീനത്തിൽപ്പെട്ടാൽ അതിൽനിന്നും എനിക്ക് ഒരിക്കലും മുക്തി നേടാൻ സാധിക്കില്ല.					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
61.	സ്കൂളിലേക്കുള്ള യാത്രയിൽ ക്ലേശങ്ങൾ നേരിട്ടാൽ അതെന്റെ പഠനത്തെ ബാധിക്കും					
62.	സ്കൂളിലേക്കുള്ള യാത്രയിൽ ക്ലേശങ്ങൾ നേരിട്ടാൽ അതെന്നെ എപ്പോഴും അലട്ടും					
63.	മാതാപിതാക്കൾ എന്നോടൊപ്പം സമയം ചെലവഴിക്കാൻ തയ്യാറാവാതിരുന്നാൽ അതെന്റെ എല്ലാ പ്രവർത്തികളെയും ബാധിക്കും					
64.	മാതാപിതാക്കൾ എന്നോടൊപ്പം സമയം ചിലവഴിക്കാൻ തയ്യാറാവാതിരുന്നാൽ എനിക്ക് എപ്പോഴും വിഷമം തോന്നും					
65.	അധ്യാപകർ എന്നെ തെറ്റിദ്ധരിക്കാൻ ഇടവന്നാൽ അതെന്നെ എല്ലാവിധത്തിലും അലട്ടും					
66.	അധ്യാപകർ എന്നെ തെറ്റിദ്ധരിക്കാനിടവന്നാൽ എനിക്കതുപെട്ടെന്ന് മറികടക്കാൻ സാധിക്കില്ല					
67.	പരിചിതരിൽ നിന്നും പ്രതീക്ഷിക്കാത്ത തരത്തിൽ മോശം പെരുമാറ്റം നേരിട്ടാൽ അതെന്റെ ജീവിതത്തെ പ്രതികൂലമായി ബാധിക്കും					
68.	പരിചിതരിൽ നിന്നും പ്രതീക്ഷിക്കാത്ത തരത്തിൽ മോശം പെരുമാറ്റം നേരിട്ടാൽ അതെനിക്ക് എളുപ്പത്തിൽ മറക്കാൻ സാധിക്കില്ല					
69.	ജോലിസംബന്ധമായി മാതാപിതാക്കൾക്ക് എന്നെ വിട്ടുനിൽക്കേണ്ട അവസ്ഥയുണ്ടായാൽ എനിക്ക് ഒരു കാര്യത്തിലും ഏർപ്പെടാൻ തോന്നില്ല					
70.	ജോലിസംബന്ധമായി മാതാപിതാക്കൾക്ക് എന്നെ വിട്ടുനിൽക്കേണ്ട അവസ്ഥയുണ്ടായാൽ അതിന്റെ പ്രത്യാഘാതം എന്നിൽ നീണ്ട് നിൽക്കും.					

Appendix III

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ADVERSITY QUOTIENT SCALE (Draft)

DR. Abdul Kader Parambat
Principal, GCTE

Sheni P.R.
Research Scholar, GCTE

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

Directions

Statements about your reactions to unexpected adverse situations that may arise in your life are given below. Five responses such as Never, Rarely, Sometimes, Often, Always are given for each statement. Read each statement carefully and mark your responses truthfully in the most appropriate column using a tick mark (✓). Please mark your responses to all the statements. All details furnished by you are guaranteed to be kept confidential and will be used for research purpose only.

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
1.	I can control the mental pressure from school related to studies					
2.	If I face mental pressure from school related to studies, I may have a role in it.					
3.	I am unable to complete study related activities within the stipulated time.					
4.	I will take full responsibility if the study related activities are not completed within the stipulated time.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
5.	I can face the consequences if valuable materials are lost from me.					
6.	I will take responsibility if a valuable thing is lost from me.					
7.	I can accommodate strong criticism from my teachers.					
8.	I had to face criticism from teachers caused by others.					
9.	I will not be disappointed if my family members disagree with my opinions.					
10.	If there is a difference of opinion with family members, I will have no role in it.					
11.	I will not be disappointed if I am not able to understand the learning activities in the classroom.					
12.	If I am unable to understand the learning activities in the class, I also have a role in it.					
13.	If I don't get good marks in exams, I will get mentally exhausted.					
14.	If I don't get good marks in exams, I will take full responsibility of it.					
15.	If there arise instances of friends making fun of me, I ignore it.					
16.	If my friends make fun of me, I will accept my shortcomings.					
17.	I can control my mental state when friendships break down.					
18.	If friendships break down, I will have no part in it.					
19.	If I am forced for substance use, I would give in.					
20.	If I happen to use intoxicants, I will be responsible for it.					
21.	If friendships through social media cause problems, I can handle them effectively.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
22.	I will take responsibility if I face problem with friendships through social media.					
23.	I cannot control my anxiety related to personal appearance.					
24.	If anxiety about personal appearance bothers me, it's only because of others.					
25.	Lack of confidence affects many of my activities.					
26.	Others play a major role in losing my confidence.					
27.	If my parents get angry with me, I can't control myself.					
28.	If my parents get angry with me, I try to understand my role in it.					
29.	If environment at home is not pleasant, I cannot control my stress.					
30.	If I find myself having a role in an unpleasant environment at home, I will rectify it.					
31.	If I can't adapt to the culture of the school, it affects my mental wellbeing.					
32.	If I am unable to adapt to the culture of the school, it may be due to reasons other than mine.					
33.	If I am not able to prepare for the examinations as intended, I will be mentally exhausted.					
34.	If I am unable to prepare for the examinations as intended, I will try to rectify the shortcomings on my part.					
35.	If I have health problems, it does not affect my other activities at all.					
36.	If I have to face health problems, I will consider it as temporary.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
37.	If I have to face indecent behaviour from teachers, it will affect me in various ways.					
38.	If I face indecent behaviour from teachers, I can quickly overcome from its consequences.					
39.	If someone else's fault is put on me, it will affect me in many ways.					
40.	If someone else's fault is wrongly put on me, I cannot free myself from its consequences.					
41.	If I can't live up to my parent's expectations, it affects my other activities.					
42.	If I can't live up to my parent's expectations, I consider it as a temporary situation.					
43.	Difficulty in accepting the physical changes that occur with my growing up did not affect me at all.					
44.	I could quickly accept the physical changes that occur with my growing up.					
45.	The mental stress caused by the separation of loved ones does not affect my other activities.					
46.	I will quickly overcome the mental strain caused by the separation of loved ones.					
47.	If family members face difficulties, it will affect me in many ways.					
48.	I quickly overcome the mental stress that occurs, when family members face difficulties.					
49.	If parents face financial hardships, it will affect all my activities.					
50.	I consider financial hardships at home to be a temporary one.					
51.	If my parents quarrel with each other, it totally affects me negatively.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
52.	I am easily able to overcome myself from the stress when parents quarrel with each other.					
53.	If teachers give consideration only to certain children in the class, it will affect my learning adversely.					
54.	If teachers give special consideration only to certain children in the class, the adverse effects are long-lasting for me.					
55.	If I have to face non-co-operation from neighbours, it will affect me badly.					
56.	If I have to face any non-co-cooperativeness from my neighbours, I consider it only as temporary situation.					
57.	Disharmony with family members will affect my life adversely.					
58.	I consider disharmony with family members to be only a temporary one.					
59.	If I fall under the wrong influence of social media, it will make me lose interest in other activities.					
60.	If I fall under the wrong influence of social media, I can never overcome out of it.					
61.	If I face hardships during travel to school, it affects my studies.					
62.	It always bothers me if I face difficulties during my travel to school.					
63.	If my parents are not willing to spend time with me, it will affect all my activities.					
64.	I always feel bad when my parents are not willing to spend time with me.					
65.	If teachers misunderstand me, it bothers me in every way.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
66.	If teachers misunderstand me, I will not be able to quickly overcome it.					
67.	Unexpected misbehaviour from people known to me has a negative impact on my life.					
68.	I can't easily forget unexpected misbehaviour from people known to me.					
69.	If my parents have to stay away from me due to work, I will not be able to pay attention to anything.					
70.	The consequences of parents staying away from me due to their work-related engagements will be long lasting.					

Appendix IV

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE Research Centre in Education (University of Calicut)

ADVERSITY QUOTIENT SCALE (Final)

DR. Abdul Kader Parambat

Sheni P.R.

Research Supervisor

Research Scholar

Principal

Govt. College of Teacher Education,

Govt. College of Teacher Education, Kozhikode

Kozhikode

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

നിർദ്ദേശങ്ങൾ

നിങ്ങളുടെ ജീവിതത്തിൽ അപ്രതീക്ഷിതമായി സംഭവിക്കാവുന്ന പ്രതികൂല സാഹചര്യങ്ങളിലെ നിങ്ങളുടെ പ്രതികരണങ്ങളെക്കുറിച്ചുള്ള പ്രസ്താവനകൾ താഴെ നൽകിയിരിക്കുന്നു. ഓരോ പ്രസ്താവനയ്ക്കും ഒരിക്കലുമില്ല, അപൂർവ്വമായി, വല്ലപ്പോഴും, മിക്കപ്പോഴും, എല്ലായ്പ്പോഴും എന്നിങ്ങനെ അഞ്ചു പ്രതികരണങ്ങൾ നൽകിയിട്ടുണ്ട്. ഓരോ പ്രസ്താവനയും ശ്രദ്ധാപൂർവ്വം വായിച്ച ശേഷം എറ്റവും ഉചിതമായ കോളത്തിൽ നിങ്ങളുടെ പ്രതികരണം ശരി അടയാളം (✓) ഉപയോഗിച്ച് രേഖപ്പെടുത്തുക. ദയവായി എല്ലാ പ്രസ്താവനകൾക്കും പ്രതികരണം രേഖപ്പെടുത്തുക. താങ്കൾ നൽകുന്ന വിവരങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കുന്നതും ഗവേഷണ ആവശ്യത്തിന് മാത്രം ഉപയോഗിക്കുന്നതുമാണെന്ന് ഉറപ്പു നൽകുന്നു.

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
1.	പഠനസംബന്ധമായി സ്കൂളിൽ നിന്നും മാനസിക സമ്മർദ്ദം നേരിട്ടാൽ എനിക്കതിനെ നിയന്ത്രിക്കാൻ സാധിക്കും					
2.	സ്കൂളിൽവെച്ച് പഠനവുമായി ബന്ധപ്പെട്ട് മനസിക സമ്മർദ്ദം നേരിട്ടാൽ എനിക്കും അതിൽ പങ്കുണ്ടാകും					
3.	പഠനവുമായി ബന്ധപ്പെട്ട പ്രവർത്തനങ്ങൾ നിശ്ചിത സമയത്തിനുള്ളിൽ പൂർത്തിയാക്കാൻ എനിക്ക് സാധിക്കാതെ വരാറുണ്ട്					
4.	പഠനപ്രവർത്തനങ്ങൾ നിശ്ചിത സമയത്തിനുള്ളിൽ പൂർത്തീകരിക്കാതിരുന്നാൽ അതിന്റെ പൂർണ്ണ ഉത്തരവാദിത്തം ഞാനേറ്റെടുക്കും					
5.	അധ്യാപകർ എന്നെ ശക്തമായി വിമർശിച്ചാൽ ഉൾക്കൊള്ളാൻ എനിക്ക് സാധിക്കും					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
6.	മറ്റുള്ളവർ കാരണം എനിക്ക് അധ്യാപകരിൽ നിന്നും വിമർശനങ്ങൾ നേരിടേണ്ടി വന്നിട്ടുണ്ട്					
7.	കുടുംബാംഗങ്ങൾ എന്റെ അഭിപ്രായങ്ങളോട് വിയോജിപ്പ് പ്രകടിപ്പിച്ചാൽ ഞാൻ നിരാശപ്പെടില്ല.					
8.	കുടുംബാംഗങ്ങളുമായി അഭിപ്രായ വ്യത്യാസമുണ്ടാകാനിടയായാൽ എനിക്കതിൽ യാതൊരു പങ്കുമുണ്ടാകില്ല					
9.	ക്ലാസ്സ്മുറിയിലെ പഠനപ്രവർത്തനങ്ങൾ മനസ്സിലാക്കാൻ സാധിക്കാതെ വരുമ്പോൾ ഞാൻ നിരാശപ്പെടാതിരിക്കും					
10.	ക്ലാസ്സ്മുറിയിലെ പഠനപ്രവർത്തനങ്ങൾ മനസ്സിലാക്കാൻ സാധിക്കാതെ വന്നാൽ അതിൽ എനിക്കും പങ്കുണ്ടാകും					
11.	പരീക്ഷകളിൽ നല്ല മാർക്ക് കിട്ടാതെ വന്നാൽ ഞാൻ മാനസികമായി തളർന്ന് പോകും					
12.	പരീക്ഷകളിൽ നല്ലമാർക്ക് നേടാനാവാതെ വന്നാൽ ഞാനതിന്റെ പൂർണ്ണ ഉത്തരവാദിത്തം ഏറ്റെടുക്കും					
13.	സുഹൃത്തുക്കൾ എന്നെ പരിഹസിക്കുന്ന സന്ദർഭങ്ങൾ ഉണ്ടായാൽ ഞാനതിനെ അവഗണിക്കും					
14.	സുഹൃത്തുക്കൾ എന്നെ പരിഹസിച്ചാൽ ഞാൻ എന്റെ പോരായ്മകൾ അംഗീകരിക്കും					
15.	സുഹൃദ്ബന്ധങ്ങൾ തകരുന്ന സന്ദർഭങ്ങളിലെ മാനസികാവസ്ഥയെ എനിക്ക് നിയന്ത്രിക്കാൻ സാധിക്കും					
16.	സുഹൃദ്ബന്ധങ്ങൾ തകരാൻ ഇടയായാൽ എനിക്കതിൽ യാതൊരു പങ്കുമുണ്ടാകില്ല					
17.	സോഷ്യൽമീഡിയ വഴിയുള്ള സൗഹൃദങ്ങൾ പ്രശ്നങ്ങൾ സൃഷ്ടിച്ചാൽ എനിക്കതിനെ ഫലപ്രദമായി കൈകാര്യം ചെയ്യാൻ സാധിക്കും					
18.	സോഷ്യൽമീഡിയയിലൂടെയുള്ള സുഹൃദ്ബന്ധങ്ങൾമൂലം പ്രശ്നങ്ങൾ ഉണ്ടായാൽ ഞാനതിന്റെ ഉത്തരവാദിത്തമേറ്റെടുക്കും					
19.	സൗന്ദര്യസംബന്ധമായ ഉത്കണ്ഠ അലട്ടിയാൽ എനിക്ക് അത് നിയന്ത്രിക്കാൻ സാധിക്കില്ല					
20.	സൗന്ദര്യസംബന്ധമായ ഉത്കണ്ഠ എന്നെ അലട്ടാൻ ഇടയായാൽ അതിനു കാരണം മറ്റുള്ളവർ മാത്രമാണ്					
21.	ആത്മവിശ്വാസക്കുറവ് എന്റെ പല പ്രവർത്തനങ്ങളേയും ബാധിക്കും.					
22.	എന്റെ ആത്മവിശ്വാസം നഷ്ടപ്പെടാൻ ഇടയാവുന്നതിൽ മറ്റുള്ളവർക്ക് നല്ല പങ്കുണ്ട്					
23.	മാതാപിതാക്കൾ എന്നോട് ദേഷ്യപ്പെട്ടാൽ എനിക്ക് എന്നെ നിയന്ത്രിക്കാനാവില്ല					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
24.	മാതാപിതാക്കൾ എന്നോട് ദേഷ്യപ്പെട്ടാൽ അതിൽ എന്റെ പങ്ക് മനസ്സിലാക്കാൻ ഞാൻ ശ്രമിക്കും					
25.	വീട്ടിൽ സന്തോഷപ്രദമായ അന്തരീക്ഷം ഇല്ലാതിരുന്നാൽ എനിക്ക് മാനസിക പിരിമുറുക്കം നിയന്ത്രിക്കാൻ സാധിക്കാതെ വരും					
26.	വീട്ടിലെ സന്തോഷപ്രദമല്ലാത്ത അന്തരീക്ഷത്തിൽ എന്റെ പങ്ക് കണ്ടെത്തിയാൽ ഞാൻ തിരുത്തും.					
27.	സ്കൂളിന്റെ സംസ്കാരവുമായി പൊരുത്തപ്പെടാൻ സാധിച്ചില്ലെങ്കിൽ അതെന്റെ മാനസികസുഖം നഷ്ടപ്പെടുത്തും					
28.	സ്കൂളിന്റെ സംസ്കാരവുമായി പൊരുത്തപ്പെടാൻ സാധിക്കാതെ വന്നാൽ അത് എന്റേതല്ലാത്ത മറ്റുപല കാരണങ്ങൾ നിമിത്തമായിരിക്കും					
29.	ഉദ്ദേശിച്ചപോലെ പരീക്ഷയ്ക്ക് തയ്യാറെടുക്കാൻ സാധിക്കാതെ വന്നാൽ ഞാൻ മാനസികമായി തളർന്നു പോകും					
30.	ഉദ്ദേശിച്ചപോലെ പരീക്ഷയ്ക്ക് തയ്യാറെടുക്കാൻ സാധിക്കാതെ വന്നാൽ എന്റെ പോരായ്മകൾ തിരുത്താൻ ഞാൻ ശ്രമിക്കും					
31.	അധ്യാപകരിൽ നിന്നും മാന്യമല്ലാത്ത പെരുമാറ്റം നേരിടേണ്ടി വന്നാൽ അതെന്നെ പലതരത്തിൽ ബാധിക്കും					
32.	അധ്യാപകരിൽനിന്നും മാന്യമല്ലാത്ത പെരുമാറ്റം നേരിടേണ്ടി വന്നാൽ എനിക്കതിന്റെ അനന്തരഫലങ്ങളെ പെട്ടെന്ന് തരണം ചെയ്യാൻ സാധിക്കും					
33.	മറ്റൊരാളുടെ കുറ്റം എന്റെ മേൽ ആരോപിച്ചാൽ അതെന്നെ പല വിധത്തിൽ ബാധിക്കും					
34.	മറ്റൊരാളുടെ കുറ്റം എന്റെ മേൽ ആരോപിച്ചാൽ അതിന്റെ അനന്തരഫലങ്ങളിൽ നിന്നും മുക്തി നേടാൻ എനിക്ക് കഴിയാതെ വരും					
35.	രക്ഷിതാക്കളുടെ പ്രതീക്ഷക്കനുസരിച്ചു ഉയരാൻ പറ്റാതിരുന്നാൽ അതെന്റെ മറ്റു പ്രവർത്തനങ്ങളിൽ നിഴലിക്കും					
36.	രക്ഷിതാക്കളുടെ പ്രതീക്ഷക്കനുസരിച്ച് ഉയരാൻ പറ്റാതിരുന്നാൽ ഞാൻ അതിനെ താത്കാലിക സാഹചര്യമായി മാത്രമേ കരുതൂ					
37.	വളർച്ചയോടനുബന്ധിച്ചുണ്ടായ ശാരീരികമാറ്റങ്ങളെ അംഗീകരിക്കാനുള്ള പ്രയാസം എന്റെ പെരുമാറ്റത്തെ ഒട്ടും ബാധിച്ചിട്ടില്ല.					
38.	വളർച്ചയോടനുബന്ധിച്ചുണ്ടായ ശാരീരികമാറ്റങ്ങളെ അംഗീകരിക്കാൻ എനിക്ക് പെട്ടെന്ന് സാധിച്ചു.					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
39.	കുടുംബാംഗങ്ങൾക്ക് പ്രയാസം നേരിട്ടാൽ അതെന്നെ പലവിധത്തിൽ ബാധിക്കും					
40.	കുടുംബാംഗങ്ങൾക്ക് പ്രയാസം നേരിടുമ്പോഴുണ്ടാകുന്ന മാനസികസമ്മർദ്ദം ഞാൻ പെട്ടെന്ന് തരണം ചെയ്യും					
41.	അധ്യാപകർ ക്ലാസ്സിൽ ചില കുട്ടികൾക്ക് മാത്രം പരിഗണന നൽകാനിടവന്നാൽ അതെന്റെ പഠനത്തെ പ്രതികൂലമായി ബാധിക്കും					
42.	അധ്യാപകർ ക്ലാസ്സിൽ ചില കുട്ടികൾക്ക് മാത്രം പ്രത്യേക പരിഗണന നൽകിയാൽ എന്നെ സംബന്ധിച്ച് അതിന്റെ പ്രത്യാഘാതം എപ്പോഴും നിലനിൽക്കും					
43.	കുടുംബാംഗങ്ങളുമായി സ്വരച്ചേർച്ചയില്ലായ്മയുണ്ടായാൽ അതെന്റെ ജീവിതത്തെ മോശമായി ബാധിക്കും					
44.	കുടുംബാംഗങ്ങളുമായി സ്വരച്ചേർച്ചയില്ലായ്മ ഉണ്ടായാൽ അതിനെ താൽകാലികമായി മാത്രമേ ഞാൻ കരുതൂ					
45.	സോഷ്യൽമീഡിയയുടെ തെറ്റായ സ്വാധീനത്തിൽ പെട്ടാൽ അതെന്റെ മറ്റു പ്രവർത്തനങ്ങളിൽ താൽപര്യക്കുറവ് ഉണ്ടാക്കും					
46.	സോഷ്യൽമീഡിയയുടെ തെറ്റായ സ്വാധീനത്തിൽപ്പെട്ടാൽ അതിൽനിന്നും എനിക്ക് ഒരിക്കലും മുക്തി നേടാൻ സാധിക്കില്ല.					
47.	മാതാപിതാക്കൾ എന്നോടൊപ്പം സമയം ചെലവഴിക്കാൻ തയ്യാറാവാതിരുന്നാൽ അതെന്റെ എല്ലാ പ്രവർത്തികളെയും ബാധിക്കും					
48.	മാതാപിതാക്കൾ എന്നോടൊപ്പം സമയം ചെലവഴിക്കാൻ തയ്യാറാവാതിരുന്നാൽ എനിക്ക് എപ്പോഴും വിഷമം തോന്നും					
49.	അധ്യാപകർ എന്നെ തെറ്റിദ്ധരിക്കാൻ ഇടവന്നാൽ അതെന്നെ എല്ലാവിധത്തിലും അലട്ടും					
50.	അധ്യാപകർ എന്നെ തെറ്റിദ്ധരിക്കാനിടവന്നാൽ എനിക്കതു പെട്ടെന്ന് മറികടക്കാൻ സാധിക്കില്ല					
51.	പരിചിതരിൽ നിന്നും പ്രതീക്ഷിക്കാത്ത തരത്തിൽ മോശം പെരുമാറ്റം നേരിട്ടാൽ അതെന്റെ ജീവിതത്തെ പ്രതികൂലമായി ബാധിക്കും					
52.	പരിചിതരിൽ നിന്നും പ്രതീക്ഷിക്കാത്ത തരത്തിൽ മോശം പെരുമാറ്റം നേരിട്ടാൽ അതെനിക്ക് എളുപ്പത്തിൽ മറക്കാൻ സാധിക്കില്ല					

Appendix IV

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ADVERSITY QUOTIENT SCALE (Final)

DR. Abdul Kader Parambat
Principal, GCTE

Sheni P.R.
Research Scholar, GCTE

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

Directions

Statements about your reactions to unexpected adverse situations that may arise in your life are given below. Five responses such as Never, Rarely, Sometimes, Often, Always are given for each statement. Read each statement carefully and mark your responses truthfully in the most appropriate column using a tick mark (✓). Please mark your responses to all the statements. All details furnished by you are guaranteed to be kept confidential and will be used for research purpose only.

Sl. No.	STATEMENTS	Never	Rarely	Sometimes	Often	Always
1.	I can control the mental pressure from school related to studies					
2.	If I face mental pressure from school related to studies, I may have a role in it.					
3.	I am unable to complete study related activities within the stipulated time.					
4.	I will take full responsibility if the study related activities are not completed within the stipulated time.					
5.	I can accommodate strong criticism from my teachers.					
6.	I had to face criticism from teachers caused by others.					

Sl. No.	STATEMENTS	Never	Rarely	Sometimes	Often	Always
7.	I will not be disappointed if my family members disagree with my opinions.					
8.	If there is a difference of opinion with family members, I will have no role in it.					
9.	I will not be disappointed if I am not able to understand the learning activities in the classroom.					
10.	If I am unable to understand the learning activities in the class, I also have a role in it.					
11.	If I don't get good marks in exams, I will get mentally exhausted.					
12.	If I don't get good marks in exams, I will take full responsibility of it.					
13.	If there arise instances of friends making fun of me, I ignore it.					
14.	If my friends make fun of me, I will accept my shortcomings.					
15.	I can control my mental state when friendships break down.					
16.	If friendships break down, I will have no part in it.					
17.	If friendships through social media cause problems, I can handle them effectively.					
18.	I will take responsibility if I face problem with friendships through social media.					
19.	I cannot control my anxiety related to personal appearance.					
20.	If anxiety about personal appearance bothers me, it's only because of others.					
21.	Lack of confidence affects many of my activities.					
22.	Others play a major role in losing my confidence.					
23.	If my parents get angry with me, I can't control myself.					

Sl. No.	STATEMENTS	Never	Rarely	Sometimes	Often	Always
24.	If my parents get angry with me, I try to understand my role in it.					
25.	If environment at home is not pleasant, I cannot control my stress.					
26.	If I find myself having a role in an unpleasant environment at home, I will rectify it.					
27.	If I can't adapt to the culture of the school, it affects my mental wellbeing.					
28.	If I am unable to adapt to the culture of the school, it may be due to reasons other than mine.					
29.	If I am not able to prepare for the examinations as intended, I will be mentally exhausted.					
30.	If I am unable to prepare for the examinations as intended, I will try to rectify the shortcomings on my part.					
31.	If I have to face indecent behaviour from teachers, it will affect me in various ways.					
32.	If I face indecent behaviour from teachers, I can quickly overcome from its consequences.					
33.	If someone else's fault is put on me, it will affect me in many ways.					
34.	If someone else's fault is wrongly put on me, I cannot free myself from its consequences.					
35.	If I can't live up to my parent's expectations, it affects my other activities.					
36.	If I can't live up to my parent's expectations, I consider it as a temporary situation.					
37.	Difficulty in accepting the physical changes that occur with my growing up did not affect me at all.					
38.	I could quickly accept the physical changes that occur with my growing up.					
39.	If family members face difficulties, it will affect me in many ways.					

Sl. No.	STATEMENTS	Never	Rarely	Sometimes	Often	Always
40.	I quickly overcome the mental stress that occurs, when family members face difficulties.					
41.	If teachers give consideration only to certain children in the class, it will affect my learning adversely.					
42.	If teachers give special consideration only to certain children in the class, the adverse effects are long-lasting for me.					
43.	Disharmony with family members will affect my life adversely.					
44.	I consider disharmony with family members to be only a temporary one.					
45.	If I fall under the wrong influence of social media, it will make me lose interest in other activities.					
46.	If I fall under the wrong influence of social media, I can never overcome out of it.					
47.	If my parents are not willing to spend time with me, it will affect all my activities.					
48.	I always feel bad when my parents are not willing to spend time with me.					
49.	If teachers misunderstand me, it bothers me in every way.					
50.	If teachers misunderstand me, I will not be able to quickly overcome it.					
51.	Unexpected misbehaviour from people known to me has a negative impact on my life.					
52.	I can't easily forget unexpected misbehaviour from people known to me.					

Appendix V

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

COGNITIVE STYLE INVENTORY (DRAFT)

DR. Abdul Kader Parambat

Sheni P.R.

Research Supervisor

Research Scholar

Principal

Govt. College of Teacher Education,

Govt. College of Teacher Education, Kozhikode

Kozhikode

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

നിർദ്ദേശങ്ങൾ

വൈജ്ഞാനികശൈലിയുമായി ബന്ധപ്പെട്ട ചില പ്രസ്താവനകൾ താഴെ നൽകിയിരിക്കുന്നു. ഓരോ പ്രസ്താവനയ്ക്കും ഒരിക്കലുമില്ല, അപൂർവ്വമായി, വല്ലപ്പോഴും, മിക്കപ്പോഴും, എല്ലായ്പ്പോഴും എന്നിങ്ങനെ അഞ്ചു പ്രതികരണങ്ങൾ നൽകിയിട്ടുണ്ട്. ഓരോ പ്രസ്താവനയും ശ്രദ്ധാപൂർവ്വം വായിച്ച ശേഷം എറ്റവും ഉചിതമായ കോളത്തിൽ നിങ്ങളുടെ പ്രതികരണം ശരി അടയാളം (✓) ഉപയോഗിച്ച് രേഖപ്പെടുത്തുക. ദയവായി എല്ലാ പ്രസ്താവനകൾക്കും പ്രതികരണം രേഖപ്പെടുത്തുക. താങ്കൾ നൽകുന്ന വിവരങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കുന്നതും ഗവേഷണ ആവശ്യത്തിന് മാത്രം ഉപയോഗിക്കുന്നതുമാണെന്ന് ഉറപ്പു നൽകുന്നു.

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
PART A- SYSTEMATIC SCALE						
1.	ഏതൊരു കാര്യത്തിലായാലും അതിൽ ഇടപെടുന്നതിന് മുൻപ് ഞാനതിനെ വിശദമായി മനസ്സിലാക്കാൻ ശ്രമിക്കാറുണ്ട്.					
2.	ഏതു സാഹചര്യത്തെ വിലയിരുത്തുമ്പോഴും കിട്ടുന്ന വിവരങ്ങൾ നിലവിലെ സാഹചര്യവുമായി യോജിക്കുന്നുണ്ടോ എന്ന് ഞാൻ പരിശോധിക്കാറുണ്ട്.					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
3.	പ്രശ്നങ്ങളെ അതിന്റെ മുൻഗണനാക്രമത്തിൽ ഞാൻ കൈകാര്യം ചെയ്യാറുണ്ട്.					
4.	തീരുമാനങ്ങളെടുക്കുന്നതിന് മുൻപ് ഞാൻ പ്രശ്നങ്ങളുടെ ആധികാരികത പരിശോധിക്കാറുണ്ട്					
5.	നിലവിൽ ഏർപ്പെട്ടിരിക്കുന്ന ഒരു കാര്യം പൂർത്തിയാക്കിയതിനു ശേഷമേ ഞാൻ അടുത്തതിൽ ഏർപ്പെടുകയുള്ളൂ.					
6.	ഏതു പ്രശ്നത്തേയും സമഗ്രമായി മനസ്സിലാക്കുന്നതിന് പുറമെ ഞാനതിനെ വേർതിരിച്ചും വിശകലനം ചെയ്യാറുണ്ട്					
7.	ധൃതി കാണിക്കാതെ നന്നായി ചിന്തിച്ച ശേഷമേ ഞാനൊരു തീരുമാനം എടുക്കാറുള്ളൂ.					
8.	തീരുമാനങ്ങളെടുക്കുന്നതിനു മുൻപ് ചെറിയ കാര്യങ്ങളെ പോലും ഞാൻ പരിശോധിക്കാറുണ്ട്					
9.	എനിക്ക് വളരെയധികം വിവരങ്ങൾ ഓർത്തുവയ്ക്കാൻ സാധിക്കും					
10.	പുതിയ അറിവുകൾ നേടാൻ ഞാൻ ശ്രമിച്ചുകൊണ്ടിരിക്കും					
11.	ഏതുകാര്യവും ഞാൻ ശ്രദ്ധാപൂർവ്വമാണ് ആസൂത്രണം ചെയ്യാറുള്ളത്.					
12.	പ്രശ്ന പരിഹാരത്തിനിടയിൽ ആശയകുഴപ്പം സൃഷ്ടിക്കുന്ന കാര്യങ്ങളെ ഞാൻ മുൻകൂട്ടി മനസ്സിലാക്കാറുണ്ട്					
13.	വളരെ ശ്രദ്ധാപൂർവ്വമേ വിവരങ്ങളുടെ ഉറവിടം ഞാൻ തിരഞ്ഞെടുക്കാറുള്ളൂ					
14.	യഥാർത്ഥ വിവരങ്ങളുടെ അടിസ്ഥാനത്തിൽ മാത്രമേ ഞാൻ പ്രശ്നങ്ങൾക്ക് പരിഹാരം കാണുകയുള്ളൂ					
15.	ഏതു കാര്യവും ചിട്ടയോടുകൂടി മാത്രമേ ഞാൻ കൈകാര്യം ചെയ്യുകയുള്ളൂ					
16.	സങ്കീർണ്ണമായ പ്രശ്നങ്ങളെ അനായാസം കൈകാര്യം ചെയ്യാത്തവിധം ഞാൻ ലഘൂകരിക്കാറുണ്ട്					
17.	കൃത്യതയോടെയാണ് ഞാൻ വിവരങ്ങൾ ശേഖരിക്കാറുള്ളത്					
18.	ആവശ്യാനുസരണം സമയമെടുത്ത് മാത്രമേ ഞാൻ കാര്യങ്ങളെ കുറിച്ച് വ്യക്തമായ ധാരണയിലെത്താറുള്ളൂ					
19.	എനിക്ക് സന്ദർഭാനുസൃതമായി വിവരങ്ങൾ ഓർത്തെടുക്കാൻ സാധിക്കും					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
20.	എന്റെ പ്രവർത്തനശൈലി മറ്റുള്ളവർക്ക് പരിചിതമാണ്					
21.	ഏതൊരു പ്രശ്നത്തിന്റെയും അടിസ്ഥാന വസ്തുതകളെയാണ് ഞാൻ ആദ്യം വിലയിരുത്തുക					
22.	വ്യക്തമായ ധാരണയോടുകൂടിയാണ് ഞാൻ എല്ലാ പ്രവൃത്തികളിലും ഏർപ്പെടാറുള്ളത്					
23.	ചെറിയ കാര്യങ്ങളെ പോലും ഞാൻ സൂക്ഷ്മമായി നിരീക്ഷിക്കാറുണ്ട്					
24.	തീരുമാനങ്ങളെടുക്കുന്നതിന് മുൻപ് ഞാൻ പല പ്രാവശ്യം ചിന്തിക്കാറുണ്ട്					
PART B-INTUITIVE SCALE						
25.	ഞാൻ കാര്യങ്ങളെ മൊത്തത്തിൽ വിലയിരുത്തുകയാണ് ചെയ്യുക					
26.	പ്രശ്ന പരിഹാരങ്ങൾക്ക് സ്വീകരിക്കേണ്ട മാർഗ്ഗങ്ങൾ എന്റെ മനസ്സിൽ പെട്ടെന്ന് തെളിഞ്ഞുവരും					
27.	വിവരങ്ങളെ ഓർമ്മയിൽ ശേഖരിച്ച് വയ്ക്കുന്നതിന് എനിക്ക് എന്റേതായ തന്ത്രങ്ങൾ ഉണ്ട്					
28.	സ്ഥിരമായ ഒരു പ്രവർത്തനരീതി പിന്തുടർന്നല്ല ഞാൻ കാര്യങ്ങൾ ചെയ്യാറുള്ളത്.					
29.	സ്വന്തം ശൈലിയിൽ ധൈര്യത്തോടെയാണ് ഞാൻ പ്രശ്നങ്ങളെ കൈകാര്യം ചെയ്യാറുള്ളത്.					
30.	ഏതൊരു പ്രശ്നത്തിനും സന്ദർഭാനുസൃതമായി പരിഹാരമുണ്ടാകും എന്നാണ് എന്റെ വിശ്വാസം					
31.	പ്രശ്നങ്ങളെ ഒന്നല്ലെങ്കിൽ മറ്റൊരു തരത്തിൽ പരിഹരിക്കാൻ സാധിക്കുമെന്ന് ഞാൻ ഉറച്ചു വിശ്വസിക്കുന്നു					
32.	എന്റേതായ ഉഘ്രങ്ങളെ ആസ്പദമാക്കി ഞാൻ തീരുമാനങ്ങൾ എടുക്കാറുണ്ട്					
33.	പ്രശ്നപരിഹാരത്തിനായി ഒരേ സമയം പല ബദൽ മാർഗ്ഗങ്ങളേയും ഞാൻ പരിഗണിക്കാറുണ്ട്.					
34.	പ്രശ്നപരിഹാരത്തിന് പല ബദൽ മാർഗ്ഗങ്ങളിൽ നിന്നും അനുയോജ്യമായത് വേഗത്തിൽ തിരഞ്ഞെടുക്കാൻ എനിക്ക് സാധിക്കാറുണ്ട്.					
35.	പ്രശ്നങ്ങളെ നേരിടാനൊരുങ്ങുമ്പോൾ അതിവേഗം അതിന്റെ വരും വരായ്മകളെ കുറിച്ച് ചിന്തിക്കാറുണ്ട്					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
36.	പ്രശ്നങ്ങളെ സൂക്ഷ്മമായും കൃത്യമായും പരിശോധിച്ച് പെട്ടെന്ന് തീരുമാനമെടുക്കാൻ എനിക്ക് സാധിക്കാറുണ്ട്					
37.	വസ്തുതകളെ ഓരോതവണ വിശകലനം ചെയ്യുമ്പോഴും ഞാൻ വ്യത്യസ്ത കാഴ്ചപ്പാടുകളിൽ എത്താറുണ്ട്					
38.	ഒരു വിഷയം കൈകാര്യം ചെയ്യുമ്പോൾ അതിനെക്കുറിച്ച് ഏകദേശം ധാരണ കിട്ടാൻ ഞാൻ ശ്രമിക്കാറുണ്ട്					
39.	എനിക്ക് അതിവേഗം പ്രശ്നങ്ങൾക്ക് പരിഹാരം കാണാൻ സാധിക്കാറുണ്ട്.					
40.	ഏതു കാര്യത്തിലായാലും അതിൽ ഇടപെടുമ്പോൾ ഞാൻ ആശങ്കപ്പെടാറില്ല					
41.	വസ്തുതകൾ അന്വേഷിച്ച് കണ്ടെത്താൻ എനിക്കിഷ്ടമാണ്					
42.	സാഹചര്യങ്ങൾക്കനുസൃതമായ മാറ്റങ്ങളുമായി എനിക്ക് പെട്ടെന്ന് പൊരുത്തപ്പെടാൻ സാധിക്കാറുണ്ട്.					
43.	ജീവിതത്തിന്റെ ഏതു മേഖലയിലും റിസ്ക് എടുക്കാൻ ഞാൻ തയ്യാറാണ്					
44.	സാഹചര്യങ്ങൾ മെച്ചപ്പെടുത്താൻ പുതിയ രീതികൾ ഞാൻ സ്വീകരിക്കാറുണ്ട്					
45.	സാഹചര്യങ്ങൾക്കനുസരിച്ച് പ്രസക്തമായ തീരുമാനങ്ങൾ ഞാൻ സ്വീകരിക്കാറുണ്ട്					
46.	അനുഭവത്തിൽ നിന്നും നേടിയ അറിവുകൾ പ്രശ്നങ്ങളെ ഉചിതമായി കൈകാര്യം ചെയ്യാൻ എന്നെ സഹായിക്കാറുണ്ട്					
47.	ഏതു പ്രശ്നത്തെ നേരിടുമ്പോഴും എന്റെ ഉള്ളിൽ അനുഭവപ്പെടുന്ന ഊഹങ്ങൾക്ക് ഞാൻ പ്രാധാന്യം കൊടുക്കാറുണ്ട്					
48.	പ്രശ്നങ്ങളെ ഒരു നോട്ടത്തിൽ തന്നെ അപഗ്രഥിക്കാൻ എനിക്ക് സാധിക്കാറുണ്ട്					

Appendix V

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

COGNITIVE STYLE INVENTORY (Draft)

DR. Abdul Kader Parambat
Principal, GCTE

Sheni P.R.
Research Scholar, GCTE

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

Directions

Statements related to Cognitive Style are given below. Five responses such as Never, Rarely, Sometimes, Often, Always are given for each statement. Read each statement carefully and mark your responses truthfully in the most appropriate column using a tick mark (✓). Please mark your responses to all the statements. All details furnished by you are guaranteed to be kept confidential and will be used for research purpose only.

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
PART A- SYSTEMATIC SCALE						
1.	I try to understand any matter in detail before getting involved in it.					
2.	Whenever I assess a situation, I check whether the information I get is consistent with the current situation.					
3.	I deal with issues in their order of priority.					
4.	I check the authenticity of the problems before making decisions					
5.	I engage in anew task only after completing the one at hand.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
6.	Apart from understanding any problem wholistically, I also analyse it separately.					
7.	I take a decision only after pondering over it thoroughly without being hasty.					
8.	I do examine even the minute things before making decisions.					
9.	I can memorize a lot of information.					
10.	I keep trying to gain new informations.					
11.	I plan things carefully.					
12.	I anticipate things that can create confusion during problem solving					
13.	I choose the source of information carefully.					
14.	I solve problems on the basis of genuine information only.					
15.	I handle every matter systematically.					
16.	I simplify complicated problems so that it can be easily handled.					
17.	I gather information accurately					
18.	I take sufficient time to clearly understand any matter.					
19.	I can recall information contextually.					
20.	My working style is familiar to others.					
21.	I assess the basic facts of any issue initially.					
22.	I engage in activities with a clear understanding.					
23.	I keep a close eye on even the minute details.					
24.	I think several times before making decisions.					
PART B-INTUITIVE SCALE						
25.	I evaluate things holistically					
26.	The methods to be adopted in problem solving evolves in my mind quickly.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
27.	I have my own techniques for memorizing informations.					
28.	I never follow a fixed pattern of doing things.					
29.	I handle problems boldly in my own style.					
30.	I believe that any problem will be solved contextually.					
31.	I firmly believe that problems can be solved in one or other different ways.					
32.	I make decisions based on my assumptions.					
33.	I consider multiple alternatives while seeking solutions for a problem.					
34.	I can quickly choose the most appropriate solution from among many alternatives.					
35.	When I come across problems, I instantly analyze the pros and cons of it.					
36.	I am able to analyse problems carefully and accurately, and make quick decisions.					
37.	When a fact is analyzed at each time, I arrive at different viewpoints.					
38.	While dealing with a problem, I try to get an approximate idea of its nature.					
39.	I can solve problems quickly.					
40.	I don't worry about anything when I am involved in it.					
41.	I like to investigate and find facts.					
42.	I can quickly adapt to the changes demanded by the situation					
43.	I am ready to take risks in any field in life.					
44.	I accept innovative changes to improve the situations.					
45.	I make decisions relevant to the situations.					
46.	Knowledge gained from experience helps me to handle things appropriately.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
47.	I give importance to my intuition while dealing with any problem.					
48.	I can analyze issues at a glance.					

Appendix VI

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

COGNITIVE STYLE INVENTORY (FINAL)

DR. Abdul Kader Parambat

Sheni P.R.

Research Supervisor

Research Scholar

Principal

Govt. College of Teacher Education,

Govt. College of Teacher Education, Kozhikode

Kozhikode

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

നിർദ്ദേശങ്ങൾ

വൈജ്ഞാനികശൈലിയുമായി ബന്ധപ്പെട്ട ചില പ്രസ്താവനകൾ താഴെ നൽകിയിരിക്കുന്നു. ഓരോ പ്രസ്താവനയ്ക്കും ഒരിക്കലുമില്ല, അപൂർവ്വമായി, വല്ലപ്പോഴും, മിക്കപ്പോഴും, എല്ലായ്പ്പോഴും എന്നിങ്ങനെ അഞ്ചു പ്രതികരണങ്ങൾ നൽകിയിട്ടുണ്ട്. ഓരോ പ്രസ്താവനയും ശ്രദ്ധാപൂർവ്വം വായിച്ച ശേഷം എറ്റവും ഉചിതമായ കോളത്തിൽ നിങ്ങളുടെ പ്രതികരണം ശരി അടയാളം (✓) ഉപയോഗിച്ച് രേഖപ്പെടുത്തുക. ദയവായി എല്ലാ പ്രസ്താവനകൾക്കും പ്രതികരണം രേഖപ്പെടുത്തുക. താങ്കൾ നൽകുന്ന വിവരങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കുന്നതും ഗവേഷണ ആവശ്യത്തിന് മാത്രം ഉപയോഗിക്കുന്നതുമാണെന്ന് ഉറപ്പു നൽകുന്നു.

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
PART A-SYSTEMATIC SCALE						
1.	ഏതൊരു കാര്യത്തിലായാലും അതിൽ ഇടപെടുന്നതിന് മുൻപ് ഞാനതിനെ വിശദമായി മനസ്സിലാക്കാൻ ശ്രമിക്കാറുണ്ട്.					
2.	ഏതു സാഹചര്യത്തെ വിലയിരുത്തുമ്പോഴും കിട്ടുന്ന വിവരങ്ങൾ നിലവിലെ സാഹചര്യവുമായി യോജിക്കുന്നുണ്ടോ എന്ന് ഞാൻ പരിശോധിക്കാറുണ്ട്.					
3.	തീരുമാനങ്ങളെടുക്കുന്നതിന് മുൻപ് ഞാൻ പ്രശ്നങ്ങളുടെ ആധികാരികത പരിശോധിക്കാറുണ്ട്					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
4.	നിലവിൽ ഏർപ്പെട്ടിരിക്കുന്ന ഒരു കാര്യം പൂർത്തിയാക്കിയതിനു ശേഷമേ ഞാൻ അടുത്തതിൽ ഏർപ്പെടുകയുള്ളൂ.					
5.	ഏതു പ്രശ്നത്തേയും സമഗ്രമായി മനസ്സിലാക്കുന്നതിന് പുറമെ ഞാനതിനെ വേർതിരിച്ചും വിശകലനം ചെയ്യാറുണ്ട്					
6.	ധൃതി കാണിക്കാതെ നന്നായി ചിന്തിച്ച ശേഷമേ ഞാനൊരു തീരുമാനം എടുക്കാറുള്ളൂ.					
7.	തീരുമാനങ്ങളെടുക്കുന്നതിനു മുൻപ് ചെറിയ കാര്യങ്ങളെ പോലും ഞാൻ പരിശോധിക്കാറുണ്ട്					
8.	എനിക്ക് വളരെയധികം വിവരങ്ങൾ ഓർത്തുവയ്ക്കാൻ സാധിക്കും					
9.	ഏതുകാര്യവും ഞാൻ ശ്രദ്ധാപൂർവ്വമാണ് ആസൂത്രണം ചെയ്യാറുള്ളത്.					
10.	പ്രശ്ന പരിഹാരത്തിനിടയിൽ ആശയകുഴപ്പം സൃഷ്ടിക്കുന്ന കാര്യങ്ങളെ ഞാൻ മുൻകൂട്ടി മനസ്സിലാക്കാറുണ്ട്					
11.	വളരെ ശ്രദ്ധാപൂർവ്വമേ വിവരങ്ങളുടെ ഉറവിടം ഞാൻ തിരഞ്ഞെടുക്കാറുള്ളൂ					
12.	യഥാർത്ഥ വിവരങ്ങളുടെ അടിസ്ഥാനത്തിൽ മാത്രമേ ഞാൻ പ്രശ്നങ്ങൾക്ക് പരിഹാരം കാണുകയുള്ളൂ					
13.	ഏതു കാര്യവും ചിട്ടയോടുകൂടി മാത്രമേ ഞാൻ കൈകാര്യം ചെയ്യുകയുള്ളൂ					
14.	സങ്കീർണ്ണമായ പ്രശ്നങ്ങളെ അനായാസം കൈകാര്യം ചെയ്യത്തക്കവിധം ഞാൻ ലഘൂകരിക്കാറുണ്ട്					
15.	കൃത്യതയോടെയാണ് ഞാൻ വിവരങ്ങൾ ശേഖരിക്കാറുള്ളത്					
16.	എന്റെ പ്രവർത്തനശൈലി മറ്റുള്ളവർക്ക് പരിചിതമാണ്					
17.	ഏതൊരു പ്രശ്നത്തിന്റെയും അടിസ്ഥാന വസ്തുതകളെയാണ് ഞാൻ ആദ്യം വിലയിരുത്തുക					
18.	വ്യക്തമായ ധാരണയോടുകൂടിയാണ് ഞാൻ എല്ലാ പ്രവൃത്തികളിലും ഏർപ്പെടാറുള്ളത്					
19.	ചെറിയ കാര്യങ്ങളെ പോലും ഞാൻ സൂക്ഷ്മമായി നിരീക്ഷിക്കാറുണ്ട്					
20.	തീരുമാനങ്ങളെടുക്കുന്നതിന് മുൻപ് ഞാൻ പല പ്രാവശ്യം ചിന്തിക്കാറുണ്ട്					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
PART B- INTUITIVE SCALE						
21.	ഞാൻ കാര്യങ്ങളെ മൊത്തത്തിൽ വിലയിരുത്തുകയാണ് ചെയ്യുക					
22.	പ്രശ്ന പരിഹാരങ്ങൾക്ക് സ്വീകരിക്കേണ്ട മാർഗ്ഗങ്ങൾ എന്റെ മനസ്സിൽ പെട്ടെന്ന് തെളിഞ്ഞുവരും					
23.	വിവരങ്ങളെ ഓർമ്മയിൽ ശേഖരിച്ച് വയ്ക്കുന്നതിന് എനിക്ക് എന്റേതായ തന്ത്രങ്ങൾ ഉണ്ട്					
24.	സ്ഥിരമായ ഒരു പ്രവർത്തനരീതി പിന്തുടർന്നല്ല ഞാൻ കാര്യങ്ങൾ ചെയ്യാറുള്ളത്.					
25.	ഏതൊരു പ്രശ്നത്തിനും സന്ദർഭാനുസൃതമായി പരിഹാരമുണ്ടാകും എന്നാണ് എന്റെ വിശ്വാസം					
26.	പ്രശ്നങ്ങളെ ഒന്നല്ലെങ്കിൽ മറ്റൊരു തരത്തിൽ പരിഹരിക്കാൻ സാധിക്കുമെന്ന് ഞാൻ ഉറച്ചു വിശ്വസിക്കുന്നു					
27.	എന്റേതായ ഊഹങ്ങളെ ആസ്പദമാക്കി ഞാൻ തീരുമാനങ്ങൾ എടുക്കാറുണ്ട്					
28.	പ്രശ്നപരിഹാരത്തിനായി ഒരേ സമയം പല ബദൽ മാർഗ്ഗങ്ങളേയും ഞാൻ പരിഗണിക്കാറുണ്ട്.					
29.	പ്രശ്നപരിഹാരത്തിന് പല ബദൽ മാർഗ്ഗങ്ങളിൽ നിന്നും അനുയോജ്യമായത് വേഗത്തിൽ തിരഞ്ഞെടുക്കാൻ എനിക്ക് സാധിക്കാറുണ്ട്.					
30.	പ്രശ്നങ്ങളെ നേരിടാനൊരുങ്ങുമ്പോൾ അതിവേഗം അതിന്റെ വരും വരായ്മകളെ കുറിച്ച് ചിന്തിക്കാറുണ്ട്					
31.	പ്രശ്നങ്ങളെ സൂക്ഷ്മമായും കൃത്യമായും പരിശോധിച്ച് പെട്ടെന്ന് തീരുമാനമെടുക്കാൻ എനിക്ക് സാധിക്കാറുണ്ട്					
32.	വസ്തുതകളെ ഓരോതവണ വിശകലനം ചെയ്യുമ്പോഴും ഞാൻ വ്യത്യസ്ത കാഴ്ചപ്പാടുകളിൽ എത്താറുണ്ട്					
33.	ഒരു വിഷയം കൈകാര്യം ചെയ്യുമ്പോൾ അതിനെക്കുറിച്ച് ഏകദേശം ധാരണ കിട്ടാൻ ഞാൻ ശ്രമിക്കാറുണ്ട്					
34.	വസ്തുതകൾ അന്വേഷിച്ച് കണ്ടെത്താൻ എനിക്കിഷ്ടമാണ്					
35.	സാഹചര്യങ്ങൾക്കനുസൃതമായ മാറ്റങ്ങളുമായി എനിക്ക് പെട്ടെന്ന് പൊരുത്തപ്പെടാൻ സാധിക്കാറുണ്ട്.					
36.	സാഹചര്യങ്ങൾ മെച്ചപ്പെടുത്താൻ പുതിയ രീതികൾ ഞാൻ സ്വീകരിക്കാറുണ്ട്					

ക്രമ നമ്പർ	പ്രസ്താവനകൾ	ഒരിക്കലുമില്ല	അപൂർവ്വമായി	വല്ലപ്പോഴും	മിക്കപ്പോഴും	എല്ലായ്പ്പോഴും
37.	സാഹചര്യങ്ങൾക്കനുസരിച്ച് പ്രസക്തമായ തീരുമാനങ്ങൾ ഞാൻ സ്വീകരിക്കാറുണ്ട്					
38.	അനുഭവത്തിൽ നിന്നും നേടിയ അറിവുകൾ പ്രശ്നങ്ങളെ ഉചിതമായി കൈകാര്യം ചെയ്യാൻ എന്ന സഹായിക്കാറുണ്ട്					
39.	ഏതു പ്രശ്നത്തെ നേരിടുമ്പോഴും എന്റെ ഉള്ളിൽ അനുഭവപ്പെടുന്ന ഊഹങ്ങൾക്ക് ഞാൻ പ്രാധാന്യം കൊടുക്കാറുണ്ട്					
40.	പ്രശ്നങ്ങളെ ഒരു നോട്ടത്തിൽ തന്നെ അപഗ്രഥിക്കാൻ എനിക്ക് സാധിക്കാറുണ്ട്					

Appendix VI

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

COGNITIVE STYLE INVENTORY (Final)

DR. Abdul Kader Parambat

Research Supervisor

Principal

Govt. College of Teacher Education, Kozhikode

Sheni P.R.

Research Scholar

Govt. College of Teacher Education,

Kozhikode

PERSONAL DATA

Name of the Student :

Name of the School :

Gender : Male Female

Locale : Rural Urban

Directions

Statements related to Cognitive Style are given below. Five responses such as Never, Rarely, Sometimes, Often, Always are given for each statement. Read each statement carefully and mark your responses truthfully in the most appropriate column using a tick mark (✓). Please mark your responses to all the statements. All details furnished by you are guaranteed to be kept confidential and will be used for research purpose only.

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
PART A-SYSTEMATIC SCALE						
1.	I try to understand any matter in detail before getting involved in it.					
2.	Whenever I assess a situation, I check whether the information I get is consistent with the current situation.					
3.	I check the authenticity of the problems before making decisions					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
4.	I engage in anew task only after completing the one at hand.					
5.	Apart from understanding any problem wholistically, I also analyse it separately.					
6.	I take a decision only after pondering over it thoroughly without being hasty.					
7.	I do examine even the minute things before making decisions.					
8.	I can memorize a lot of information.					
9.	I plan things carefully.					
10.	I anticipate things that can create confusion during problem solving					
11.	I choose the source of information carefully.					
12.	I solve problems on the basis of genuine information only.					
13.	I handle every matter systematically.					
14.	I simplify complicated problems so that it can be easily handled.					
15.	I gather information accurately					
16.	My working style is familiar to others.					
17.	I assess the basic facts of any issue initially.					
18.	I engage in activities with a clear understanding.					
19.	I keep a close eye on even the minute details.					
20.	I think several times before making decisions.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
PART B-INTUITIVE SCALE						
21.	I evaluate things holistically					
22.	The methods to be adopted in problem solving evolves in my mind quickly.					
23.	I have my own techniques for memorizing informations.					
24.	I never follow a fixed pattern of doing things.					
25.	I believe that any problem will be solved contextually.					
26.	I firmly believe that problems can be solved in one or other different ways.					
27.	I make decisions based on my assumptions.					
28.	I consider multiple alternatives while seeking solutions for a problem.					
29.	I can quickly choose the most appropriate solution from among many alternatives.					
30.	When I come across problems, I instantly analyze the pros and cons of it.					
31.	I am able to analyse problems carefully and accurately, and make quick decisions.					
32.	When a fact is analyzed at each time, I arrive at different viewpoints.					
33.	While dealing with a problem, I try to get an approximate idea of its nature.					
34.	I like to investigate and find facts.					
35.	I can quickly adapt to the changes demanded by the situation					
36.	I accept innovative changes to improve the situations.					

Sl. No.	Statements	Never	Rarely	Sometimes	Often	Always
37.	I make decisions relevant to the situations.					
38.	Knowledge gained from experience helps me to handle things appropriately.					
39.	I give importance to my intuition while dealing with any problem.					
40.	I can analyze issues at a glance.					

Appendix VII
LEARNING OUTCOMES

Unit 1- Sets

Sl. No	Learning outcomes
1.1	Realizes that a collection with no elements is also a set
1.2	Justifies equality of two sets
1.3	Writes the subsets of a set
1.4	Find the difference of specified sets
1.5	Interprets some familiar contexts as resulting in set difference
1.6	Interprets negation of statements as complements with respect to a suitable universal set
1.7	Writes powerset and cardinality of various sets
1.8	Solve real life problems on the number of objects in different categories using sets and Venn diagrams

Unit 2- Relations and Functions

Sl. No	Learning Outcomes
2.1	Explains Cartesian product
2.2	Writes different relations
2.3	Identifies domain and range of a relation
2.4	Identifies if $n(A)=p$ and $n(B)=q$ then $n(A \times B)=pq$
2.5	Evaluates number of relations from a set to the other set
2.6	Identifies functions

2.7	Finds the domain and range of a given function
2.8	Writes the algebra of functions
2.9	Identifies different functions and sketches the graphs.

Appendix VIII

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN MATHEMATICS (Draft)

DR. Abdul Kader Parambat

(Research Supervisor)

Principal

Govt. College of Teacher Education, Kozhikode

Sheni P.R.

Research Scholar

Govt. College of Teacher Education,
Kozhikode

Class XI

Time: 1 hour

Marks: 30

Answer all questions.

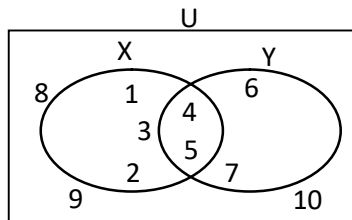
(Questions from 1 to 8 carry 1 mark each)

- A relation R from a nonempty set B to a nonempty set A is a subset of
 - A
 - B
 - $A \times B$
 - $B \times A$
- Which of the following is equal to $\{x : x \in \mathbb{R}, 1 < x \leq 4\}$
 - $\{2,3\}$
 - $\{2,3,4\}$
 - $(1,4]$
 - $[1,4)$
- Two sets P and Q are disjoint the which one of the following is true.
 - $P \cap Q = \{0\}$
 - $P \cap Q = P$
 - $P \cap Q = Q$
 - $P \cap Q = \Phi$
- From the sets given below select equivalent sets
 $\{0,1\}, \{a,b\}, \Phi, \{\Phi\}$
 - $\{0,1\}$ and $\{a,b\}$
 - Φ and $\{\Phi\}$
 - Both a and b
 - None of these
- If $n(A)=P$ then the number of relations from set A to Set A is
 - P
 - 2^P
 - P^2
 - 2^{P^2}
- $A - (B \cup C) =$
 - $(A - B) \cap (A - C)$
 - $(A - B) \cup (A - C)$
 - $A \cap (B \cup C)$
 - None of these
- Examine each of the following relations given below and select the relation which is not a function
 - $R = \{(3,1), (4,7), (-3,2)\}$
 - $R = \{(2,2), (3,3), (4,4), (4,5)\}$
 - $R = \{(2,3), (5,3), (7,3), (11,3)\}$
 - $R = \{(1,1), (-1,1), (3,1), (-3,1)\}$
- Let $C = \{x : x \text{ is an integer}, \frac{1}{2} < x < \frac{5}{2}\}$, $D = \{2,3,4\}$, then number of elements in the power set of $C \cup D$ is
 - 2^4
 - 2^6
 - 2^2
 - 2^8

Answer all questions.

(Questions 9-16 carry 2 marks each)

9. Let $U = \{a, b, c, d, e, f, g, h, i, j\}$, $A = \{a, b, c, d, e, f\}$ and $B = \{b, d, g, h\}$. then find $(A-B)'$ and $(B-A)'$.
10. Let $A = \{x : x^2 - 5x + 6 = 0\}$, $B = \{2, 3, 4, 5\}$ and $C = \{6, 8\}$.
Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
11. Define a relation R by $R = \{(x, 2x + 5); x \in \{0, 1, 2, 3\}\}$. Find the domain and range of R.
12. Find x such that $f(2x) = f(x)$ where $f(x) = 2x^2 - 3x + 1$.
13. Using Venn Diagram verify $(X \cup Y)' = X' \cap Y'$.



14. Let $(0, -1)$ and $(0, 2) \in A \times A$ and $n(A \times A) = 9$. Then write $A \times A$.
15. Find the domain and range of $f(x) = \sqrt{16 - x^2}$.
16. Let $f(x) = 3x^2 + 2x + 1$ and $g(x) = -2x$ be two real functions. Calculate $(f+g)(x)$ and $(f.g)(x)$.

Answer all questions.

(Questions 17-18 carry 3 marks each)

17. 30 people uses product A, 24 people uses product B, and 28 people uses product C, 16 people uses both product A and B, 14 people uses both product B and C, 14 people uses both product A and C, 46 people uses at least one of the 3 products. Find the number of people who uses
- All the products
 - Product C only
 - Product A only
18. Define the modulus function.
- using the above definition complete the table given below.

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y											

- Draw the graph of the above function.

Appendix IX

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN MATHEMATICS - Draft

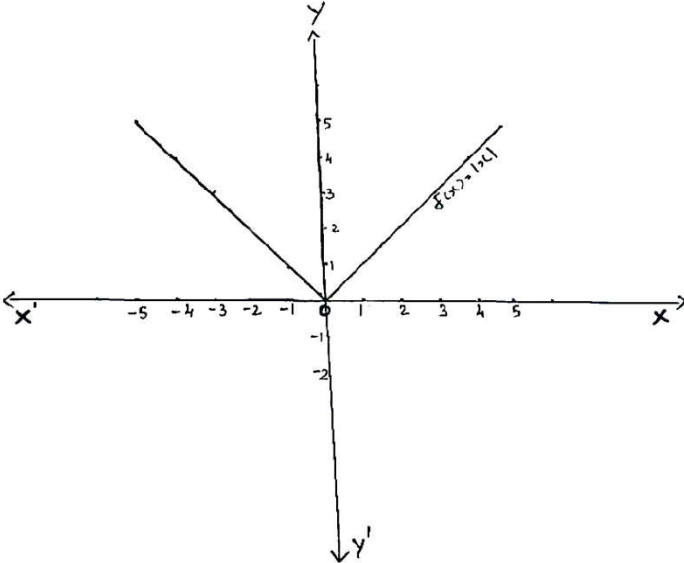
SCORING KEY

Q. No.	Scoring Indicator	Score	Total
1.	$B \times A$	1	1
2.	$(1,4]$	1	1
3.	$P \cap Q = \Phi$	1	1
4.	$\{0,1\}$ and $\{a,b\}$	1	1
5.	2^{P^2}	1	1
6.	$(A-B) \cap (A-C)$	1	1
7.	$R = \{(2,2), (3,3), (4,4), (4,5)\}$	1	1
8.	2^4	1	1

MARKING SCHEME

Q. No.	Value Points	Score	Total
9.	$A - B = \{a, c, e, f\}$ $(A - B)' = U - (A - B)$ $= \{b, d, g, h, i, j\}$ $(B - A) = \{g, h\}$ $(B - A)' = U - (B - A)$ $= \{a, b, c, d, e, f, i, j\}$	1 1	2
10.	$A \times (B \cap C) = \{-2, -3\} \times \Phi = \Phi$ $(A \times B) \cap (A \times C) = \{(-2, 2), (-2, 3), (-2, 4), (-2, 5), (-3, 2),$ $(-3, 3), (-3, 4), (-3, 5)\} \cap \{(-2, 6), (-2, 8), (-3, 6), (-3, 8)\}$ $= \Phi$ Therefore $A \times (B \cap C) = (A \times B) \cap (A \times C)$	1 1	2

Q. No.	Value Points	Score	Total
11.	$R = \{(x, 2x+5); x \in \{0,1,2,3\}\}$ Given $y = 2x+5, x \in \{0,1,2,3\}$ $\Rightarrow \text{Domain} = \{0,1,2,3\}$ $\Rightarrow \text{Range} = \{5,7,9,11\}$	1 1	2
12.	$f(x) = 2x^2 - 3x + 1$ $f(2x) = f(x) \Rightarrow$ $2(2x)^2 - 3(2x) + 1 = 2x^2 - 3x + 1$ $\Rightarrow 2 \times 4x^2 - 6x + 1 = 2x^2 - 3x + 1$ $\Rightarrow 8x^2 - 6x + 1 = 2x^2 - 3x + 1$ $\Rightarrow 6x^2 - 3x = 0$ $\Rightarrow x(6x - 3) = 0$ $\Rightarrow x = 0 \text{ or } 6x - 3 = 0$ $\Rightarrow x = 0 \text{ or } x = \frac{1}{2}$	1 1	2
13.	From the Venn Diagram $X \cup Y = \{1,2,3,4,5,6,7\}$ $(X \cup Y)' = U - (X \cup Y)$ $= \{8,9,10\}$ $X' = \{6,7,8,9,10\}$ $Y' = \{1,2,3,8,9,10\}$ $X' \cap Y' = \{8,9,10\}$ Therefore $(X \cup Y)' = X' \cap Y'$	1 1	2
14.	Let $(0,-1)$ and $(0,2) \in A \times A$ and $n(A \times A) = 9$ $\Rightarrow n(A) \times n(A) = 9$ $\Rightarrow n(A) = 3.$ $n(A) = 3, (0,-1)$ and $(0,2) \in A \times A$ $\Rightarrow \{0,-1,2\} \in A$ Therefore $A \times A = \{(0,0), (0,-1), (0,2), (-1,0), (-1,-1), (-1,2), (2,0), (2,-1), (2,2)\}$	1 1	2

Q. No.	Value Points	Score	Total																								
18.	<p>The function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by</p> $f(x) = x , x \in \mathbb{R}$ <p>is called modulus function ie., $f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$</p> <table border="1" data-bbox="343 526 1125 654"> <tr> <td>x</td> <td>-5</td> <td>-4</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>y=f(x)</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </table> 	x	-5	-4	-3	-2	-1	0	1	2	3	4	5	y=f(x)	5	4	3	2	1	0	1	2	3	4	5	1	3
x	-5	-4	-3	-2	-1	0	1	2	3	4	5																
y=f(x)	5	4	3	2	1	0	1	2	3	4	5																
		1																									
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Appendix X

QUESTION WISE ANALYSIS

Sl. No	Unit	Learning Outcome No.	Thinking Skills HOTS/LOTS	Specific Thinking Skills	Form of Questions	Score	Time (Min)
1	Relations and Functions	2.2	LOTS	Recognising	Objective	1	1
2	Sets	1.3	LOTS	Remembering	Objective	1	1
3	Sets	1.1	LOTS	Remembering	Objective	1	1
4	Sets	1.2	LOTS	Understanding	Objective	1	1
5	Relations and Functions	2.5	LOTS	Understanding	Objective	1	1
6	Sets	1.4	LOTS	Understanding	Objective	1	1
7	Relations and Functions	2.6	HOTS	Analysing	Objective	1	1
8	Sets	1.7	LOTS	Understanding	Objective	1	1
9	Sets	1.5	LOTS	Applying	Short Answer	2	4
10	Relations and Functions	2.1	HOTS	Analysing	Short Answer	2	4
11	Relations and Functions	2.3	LOTS	Understanding	Short Answer	2	4
12	Relations and Functions	2.8	LOTS	Applying	Short Answer	2	4
13	Sets	1.6	HOTS	Analysing	Short Answer	2	4
14	Relations and Functions	2.4	HOTS	Analysing	Short Answer	2	4
15	Relations and Functions	2.7	HOTS	Analysing	Short Answer	2	4

Sl. No	Unit	Learning Outcome No.	Thinking Skills HOTS/LOTS	Specific Thinking Skills	Form of Questions	Score	Time (Min)
16	Relations and Functions	2.8	LOTS	Applying	Short Answer	2	4
17	Sets	1.8	HOTS	Evaluating	Essay	3	10
18	Relations and Functions	2.9	LOTS	Applying	Essay	3	10

Appendix XI

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN MATHEMATICS (Final)

DR. Abdul Kader Parambat

(Research Supervisor)

Principal

Govt. College of Teacher Education, Kozhikode

Sheni P.R.

Research Scholar

Govt. College of Teacher Education,

Kozhikode

Class XI

Time: 45 Min

Marks: 25

Answer all questions.

(Questions from 1 to 8 carry 1 mark each)

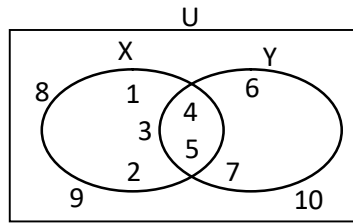
- A relation R from a nonempty set B to a nonempty set A is a subset of
 - A
 - B
 - $A \times B$
 - $B \times A$
- Which of the following is equal to $\{x : x \in \mathbb{R}, 1 < x \leq 4\}$
 - $\{2,3\}$
 - $\{2,3,4\}$
 - $(1,4]$
 - $[1,4)$
- From the sets given below select equivalent sets
 $\{0,1\}, \{a,b\}, \Phi, \{\Phi\}$
 - $\{0,1\}$ and $\{a,b\}$
 - Φ and $\{\Phi\}$
 - Both a and b
 - None of these
- If $n(A)=P$ then the number of relations from set A to Set A is
 - P
 - 2^P
 - P^2
 - 2^{P^2}
- $A - (B \cup C) =$
 - $(A - B) \cap (A - C)$
 - $(A - B) \cup (A - C)$
 - $A \cap (B \cup C)$
 - None of these
- Examine each of the following relations given below and select the relation which is not a function
 - $R = \{(3,1), (4,7), (-3,2)\}$
 - $R = \{(2,2), (3,3), (4,4), (4,5)\}$
 - $R = \{(2,3), (5,3), (7,3), (11,3)\}$
 - $R = \{(1,1), (-1,1), (3,1), (-3,1)\}$
- Let $C = \{x : x \text{ is an integer; } \frac{1}{2} < x < \frac{5}{2}\}$, $D = \{2,3,4\}$, then number of elements in the power set of $C \cup D$ is
 - 2^4
 - 2^6
 - 2^2
 - 2^8

Answer all questions.

(Questions 8-13 carry 2 marks each)

- Define a relation R by $R = \{(x, 2x+5); x \in \{0,1,2,3\}\}$. Find the domain and range of R.
- Find x such that $f(2x) = f(x)$ where $f(x) = 2x^2 - 3x + 1$.

10. Using Venn Diagram verify $(X \cup Y)' = X' \cap Y'$.



11. Let $(0,-1)$ and $(0,2) \in A \times A$ and $n(A \times A) = 9$. Then write $A \times A$.

12. Find the domain and range of $f(x) = \sqrt{16 - x^2}$.

13. Let $f(x) = 3x^2 + 2x + 1$ and $g(x) = -2x$ be two real functions. Calculate $(f+g)(x)$ and $(f \cdot g)(x)$.

Answer all questions.

(Questions 14-15 carry 3 marks each)

14. 30 people use product A, 24 people use product B, and 28 people use product C. 16 people use both product A and B, 14 people use both product B and C, 14 people use both product A and C, 46 people use at least one of the 3 products. Find the number of people who uses

- a) All the products
- b) Product C only
- c) Product A only

15. Define the modulus function.

a) using the above definition complete the table given below.

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y											

b) Draw the graph of the above function.

Appendix XII

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN MATHEMATICS - Final

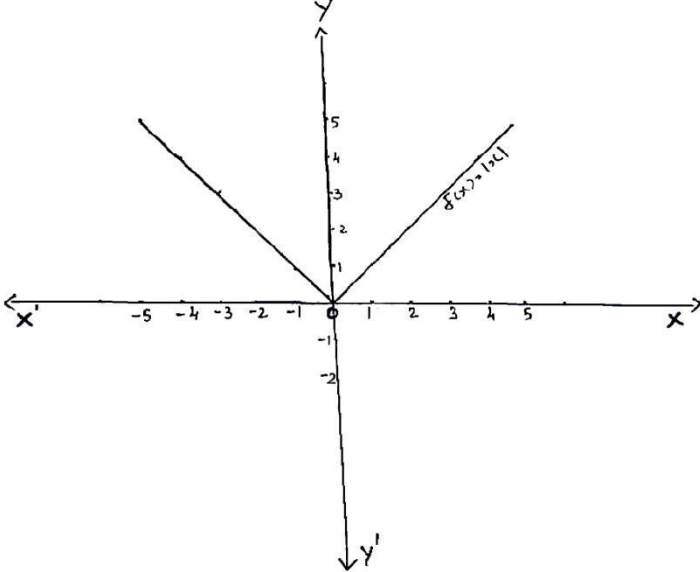
SCORING KEY

Q.No.	SCORING INDICATOR	SCORE	TOTAL
1.	$B \times A$	1	1
2.	$(1,4]$	1	1
3.	$\{0,1\}$ and $\{a,b\}$	1	1
4.	2^{P^2}	1	1
5.	$(A-B) \cap (A-C)$	1	1
6.	$R = \{(2,2), (3,3), (4,4), (4,5)\}$	1	1
7.	2^4	1	1

MARKING SCHEME

Q.No.	Value Points	Score	Total
8.	$R = \{(x, 2x+5); x \in \{0,1,2,3\}\}$ Given $y = 2x+5, x \in \{0,1,2,3\}$ \Rightarrow Domain = $\{0,1,2,3\}$ \Rightarrow Range = $\{5,7,9,11\}$	1 1	 2
9.	$f(x) = 2x^2 - 3x + 1$ $f(2x) = f(x) \Rightarrow$ $2(2x)^2 - 3(2x) + 1 = 2x^2 - 3x + 1$ $\Rightarrow 2 \times 4x^2 - 6x + 1 = 2x^2 - 3x + 1$ $\Rightarrow 8x^2 - 6x + 1 = 2x^2 - 3x + 1$ $\Rightarrow 6x^2 - 3x = 0$ $\Rightarrow x(6x - 3) = 0$ $\Rightarrow x = 0$ or $6x - 3 = 0$ $\Rightarrow x = 0$ or $x = \frac{1}{2}$	1 1	 2
10.	From the Venn Diagram $X \cup Y = \{1,2,3,4,5,6,7\}$ $(X \cup Y)' = U - (X \cup Y)$ $= \{8,9,10\}$ $X' = \{6,7,8,9,10\}$ $Y' = \{1,2,3,8,9,10\}$ $X' \cap Y' = \{8,9,10\}$ Therefore $(X \cup Y)' = X' \cap Y'$	1 1	 2

Q.No.	Value Points	Score	Total
11.	<p>Let $(0,-1)$ and $(0,2) \in A \times A$ and $n(A \times A) = 9$ $\Rightarrow n(A) \times n(A) = 9$ $\Rightarrow n(A) = 3.$ $n(A) = 3, (0,-1)$ and $(0,2) \in A \times A$ $\Rightarrow \{0,-1,2\} \in A$ Therefore $A \times A = \{(0,0), (0,-1), (0,2), (-1,0), (-1,-1), (-1,2), (2,0), (2,-1), (2,2)\}$</p>	1	2
12.	<p>$y = \sqrt{16 - x^2} \geq 0$ $16 - x^2 \geq 0 \Rightarrow x^2 \leq 16$ $\Rightarrow x \leq \pm 4$ $\Rightarrow x \in [-4, 4]$ Therefore domain $= [-4, 4]$ $y^2 = 16 - x^2$ $\Rightarrow x^2 = 16 - y^2$ $\Rightarrow x = \sqrt{16 - y^2}$ $\Rightarrow 16 - y^2$ x is real for $16 - y^2 \geq 0$ ie., $y \in [-4, 4]$ since y is positive $y \in [0, 4]$ therefore range $= [0, 4]$</p>	1	2
13.	<p>$f(x) = 3x^2 + 2x + 1$ $g(x) = -2x$ $(f+g)(x) = 3x^2 + 2x + 1 - 2x$ $= 3x^2 + 1$ $(f.g)(x) = 3(-2x)^2 + 2(-2x) + 1$ $= 3(4x^2) - (4x) + 1$ $= 12x^2 - 4x + 1$</p>	1	2
14.	<p>a) $n(A \cap B \cap C) = n(A \cup B \cup C) - n(A) - n(B) - n(C) + n(A \cap C) + n(B \cap C) + n(A \cap B)$ $= 46 - 30 - 24 - 28 + 16 + 14 + 14$ $= 8$</p> <p>b) Number of people who uses product C only $= 28 - (6 + 8 + 8) = 8$</p> <p>c) Number of people who uses product A only $= 30 - (8 + 8 + 6) = 8$</p>	1	3

Q.No.	Value Points	Score	Total																								
15.	<p>The function $f:\mathbb{R}\rightarrow\mathbb{R}$ defined by</p> $f(x) = x , x \in \mathbb{R}$ <p>is called modulus function</p> <p>ie., $f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$</p> <table border="1" data-bbox="368 495 1131 580"> <tr> <td>x</td> <td>-5</td> <td>-4</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>y=f(x)</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </table> 	x	-5	-4	-3	-2	-1	0	1	2	3	4	5	y=f(x)	5	4	3	2	1	0	1	2	3	4	5	1	
x	-5	-4	-3	-2	-1	0	1	2	3	4	5																
y=f(x)	5	4	3	2	1	0	1	2	3	4	5																
		1																									
		1	3																								

Appendix XIII

Certificates of Expert Validation of the Tool 'Adversity Quotient Scale'

DR. R. Krishnakumari.

(Rtd. Principal, Govt. College of Teacher Education, Kozhikode)

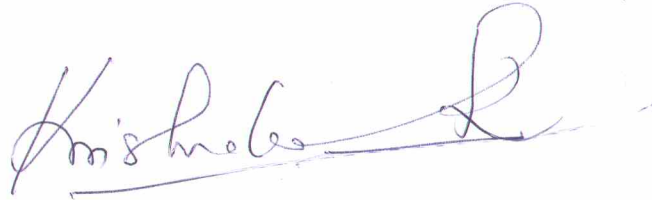
Research Guide

Department of Life Long Learning and Extension

University of Calicut

CERTIFICATE

This is to certify that the tool 'ADVERSITY QUOTIENT SCALE' constructed by **Mrs. Sheni. P.R.**, Research Scholar in Education, Govt. College of Teacher Education, Kozhikode, under the supervision of **Dr. Abdul Kader Parambat** is a valid tool to measure Adversity Quotient of higher secondary school students, and can be used for her research work titled "ADVERSITY QUOTIENT, COGNITIVE STYLES AND ACHIEVEMENT IN MATHEMATICS AMONG HIGHER SECONDARY SCHOOL STUDENTS IN KERALA"



Kozhikode

28/12/2018

Dr. R. Krishnakumari

(Rtd. Principal, GCTE, Kozhikode)

Research Guide

Department of Lifelong learning and Extension

University of Calicut

Dr. Rajeswari. K

Asso. Professor in Physical Science

Govt. College of Teacher Education, Kozhikode

University of Calicut

CERTIFICATE

This is to certify that 'ADVERSITY QUOTIENT SCALE' developed by **Mrs. Sheni. P.R.**, Research Scholar in Education, Govt. College of Teacher Education, Kozhikode, under the supervision of **Dr. Abdul Kader Parambat** is valid, and can be used for her research work titled "ADVERSITY QUOTIENT, COGNITIVE STYLES AND ACHIEVEMENT IN MATHEMATICS AMONG HIGHER SECONDARY SCHOOL STUDENTS IN KERALA"

Kozhikode

14/12/2018


Dr. Rajeswari. K

Asso. Professor in Physical Science

Govt. College of Teacher Education

Kozhikode

Dr. M.B. Syamala Devi

Asso. Professor in Mathematics

Govt. College of Teacher Education, Kozhikode

University of Calicut

CERTIFICATE

Certified that 'ADVERSITY QUOTIENT SCALE' developed by **Smt. Sheni. P.R.**, Research Scholar in Education, Govt. College of Teacher Education, Kozhikode, under the guidance of **Dr. Abdul Kader Parambat** is a valid tool and can be used for her research work titled "ADVERSITY QUOTIENT, COGNITIVE STYLES AND ACHIEVEMENT IN MATHEMATICS AMONG HIGHER SECONDARY SCHOOL STUDENTS IN KERALA"

Kozhikode

07/01/2019



Dr. M. B. Syamala Devi

Asso. Professor in Mathematics

Govt. College of Teacher Education

Kozhikode