

# RESEARCH CONTRIBUTIONS COMPENDIUM

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**N.V.K.S.D COLLEGE OF EDUCATION**  
Attoor, Kanyakumari District.  
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Department of Research and Development  
**N.V.K.S.D COLLEGE OF EDUCATION**

**2013**



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**Research Contributions Compendium**  
(Compilation of extended abstracts of Synopsis of  
Ph.D. Dissertations of faculty members).

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**PREFACE**

It is through research that we invent new knowledge and make available the educational contributions of the research work done. Research in Education is of utmost importance since the development of humanity is entirely dependent on education. Hence it is necessary to translate our research findings to pave way for educational innovations.

N.V.K.S.D college of Education strives to maintain quality in research and is always committed to the propagation of the research findings. The research department of our college is doing commendable contributions in this regard with the publication of Research contribution compendium which included the doctoral studies of our faculty members.

N.V.K.S.D college of Education is bringing out Research Contributions Compendium in which extended abstracts of doctoral research works of Dr. V.S. Mini Kumari (*Effect of Intelligence, Adjustment and Anxiety on Process Outcomes in Science of Secondary School Children*), Dr. B.C. Sobha (*Effect of Self-Esteem, Stress and Emotional Intelligence on Academic Achievement of Tenth Standard Students in Southern Districts of Tamilnadu*), Dr. S. Sreelatha (*Personality and Teacher Effectiveness - An Analytical Study on Mathematics Teachers*), Dr. A. Ravi (*Effect of Yoga on Selected Physiological Variables of Mentally Retarded Groups*), Dr. S. Praveen Kumar (*Effectiveness of Multimedia Instruction: Mitigation of Dyscalculism among Students at the Primary School Level*) and Dr. R. P. Deepa (*Effect of Co-operative Learning on Critical Thinking and Problem Solving Ability in Mathematics among Higher Secondary Students*) have been included. The research abstracts in this compendium show how changing conditions improved through understanding and application of variables. There are also pieces of research with inter disciplinary relevance.

We hope that this compendium may enlighten the prevailing educational practices and submit it for critical reading and suggestions.

Dr. B.C. Sobha (Principal)  
Dr. S. Sreelatha (Research Co-ordinator)

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## EFFECT OF INTELLIGENCE, ADJUSTMENT AND ANXIETY ON PROCESS OUTCOMES IN SCIENCE OF SECONDARY SCHOOL CHILDREN

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(2003)



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### NEED AND SIGNIFICANCE OF THE STUDY

The goal of science teaching envisages a different dimension today. In olden days teaching of science was meant purely for the mastery of subject. But now this concept has changed. Today science teaching occupies an important role in the educational programme. Adjustment to the problems which the human organism faces in modern society is impossible to achieve unless pupils are given adaptive experience in the field of science. Our youth must be prepared to make adaptation which will result in successful living in a strenuous and complicated environment.

Until recent times in our schools too much importance was given to 'product' of science and too little attention was paid to the 'processes'. As a result, students simply studied facts



and ideas from the textbooks and the curriculum was regarded as a list of subject matter or course of study which the pupils were expected to read, memorize and recite.

The new science programme all over the world lays a significant emphasis on the understanding of the processes of science as one of the major objectives of teaching science. A modern understanding of science includes an understanding of science concepts, process of science, scientific enterprise and the social implications of science. In recent years the development of the understanding of the processes of science as a major outcome of science teaching has attained a very important place in science education.

Process outcomes derive special emphasis in science education due to the fact that science is made up of a series of processes. Hence the desired outcome in science teaching should include among other things, a mastery of important processes that are used in generating new knowledge in science.

Science as an intellectual endeavour is often thought of consisting of two parts - process and product. The product of science consists of those rational beliefs derived out of observations and experiments that have not been disproved by observation and experiment. On the other hand, the process of science is sometimes interpreted narrowly as hypothesising, designing experiment, recording and analysing data, inferring etc. However, interpreted more broadly, the process of science consists of ways, scientist's attitude towards their work and inherent in all this, an awareness of the values underlying science. Science is incomplete if it consists of only answers without understanding the nature of these answers and the process by which they arrived it (Thelen, 1973).

The determinants of achievement in science are extensively scrutinised by educational researchers. In most of these studies, the concept of achievement in science has been operationalized to include only the relatively lower outcomes of the cognitive domain like knowledge and application. Educational researchers have tried to assess how some of the basic psychological variables like intelligence and different traits of personality influence achievement in science. But the question whether the same relationship will be carried to other forms of achievements like - process outcomes, affective outcomes and psychomotor outcomes remains to be investigated in detail.

The present study has been specifically designed to study the effect of intelligence, adjustment and anxiety variables on process outcomes in science. This area of research has not been explored by the research workers in India. Except a few studies, mostly connected with the construction of achievement tests in science, the entire field of the study of learning behaviour in science is open for investigation.

The relationship between intelligence and process outcomes in science is indicated by studies like those of Raun and Butts (1967), Johnson (1970), Vejvodee (1974), Ryman (1977), Doran and Sellers (1978), Andrew (1980), Bhargava (1983) Ramesh (1984) and George (1981). Poulouse (1987) found that personal adjustment and manifest anxiety had influence on process outcomes. George (1991) reported a significant positive relationship between adjustment, anxiety and process outcomes in science.

The present study is expected to be a first level exploratory study intended to investigate the association between process outcomes and certain cognitive and personality variables in combination with sex and residence of the subject.

#### OBJECTIVES

1. To assess separately the possible influence of each of the independent variables selected for the study on process outcomes in science for the total sample and relevant sub samples.
2. To assess the possible influence of the interaction effects (two-way and three-way interaction effect) of each of the independent variables sex and residence of subjects on their process outcomes in science.

#### HYPOTHESES

1. There will be significant relationship between each of the independent variables selected for the study and process outcomes in science for the total sample and relevant sub samples.
2. There will be significant mean difference of process outcomes in science when groups differing in

- Intelligence levels (high, average and low intelligence levels)
- Adjustment levels (high, average and low intelligence levels)
- Anxiety levels (high, average and low anxiety levels)

## METHODOLOGY

**Method Adopted**  
Survey method was adopted for conducting the study.

### Sample

The population for the present is the subjects attending IX<sup>th</sup> standard in secondary schools of Kerala. The sample for the present study consisted of 800 students studying in standard IX of age group 13 to 14 obtained using proportionate stratified sampling technique.

### Tools

The following tools were used for the present study.

- Test of process outcomes in science prepared and validated by the investigator.
- The Kerala university verbal group test of intelligence developed by Nair, Pillai and Amma (1968)
- The Kerala university Non-verbal group test of intelligence developed by Dr.A.Sukumaran Nair(1968)
- Kerala personal adjustment scale developed by Dr.A.Sukumaran Nair (1976)
- The Kerala university general anxiety scale developed by Dr.A.Sukumaran Nair (1976)
- The Kerala university examination anxiety scale developed by Dr.A.Sukumaran Nair(1976)

## Statistical techniques

The following statistical techniques were used for the analysis of data

- Product moment coefficient of correlation
- Analysis of variance
- Tests of significance of difference between means.

## ANALYSIS OF DATA

Variables correlated	Total	Boys	Girls	Rural	Urban	Government	Private
Intelligence and process outcome	0.5503	0.5204	0.5966	0.3833	0.5140	0.485	0.6202
Personal adjustment and process come	0.0839	0.0007	-0.2556	-0.1357	-0.0127	-0.0535	-0.1038
General anxiety and process outcome	0.1438	0.1369	0.1442	0.1029	0.1643	0.0967	0.0490
Examination anxiety and process outcome	0.1967	0.2533	0.1197	0.1514	0.2411	0.1841	0.2252

From Table 1 it is seen that the coefficient of correlation between intelligence and process outcomes in science for the total sample and sub samples is positive and significant. This indicates a direct relationship between intelligence and process outcomes in science. The correlation may be described as 'Substantial' in the case of total sample and sub samples except rural subjects. For rural subjects the correlation may be described as 'low'.

The coefficient of correlation between personal adjustment and process outcomes in science for the total sample and sub samples were found to be negative and significant. This indicates an inverse relationship between personal adjustment and process outcomes in science. The correlation may be described as negligible.

The coefficient of correlation between general anxiety and process outcomes in science for the total sample and sub sampler were found to be positive and significant. This indicates a close and considerable relationship between general anxiety and process outcomes in science.



The coefficient of correlation between Examination anxiety and process outcomes in science for the total sample and sub sample were found to be positive and significant. This indicates a direct relationship between examination anxiety and process outcomes in science

Table 2

	Intelligence	Personal adjustment	General anxiety	Examination anxiety
Main effects Independent variable(I)	43.222 **	1.193	3.748 **	6.580 **
Sex (S)	1.457	2.659	4.343 **	0.690
Residence (R)	7.186 **	67.714 **	96.826 **	94.515 **
Two-way interaction I x S	1.080	1.291	0.828	1.263
I x R	1.538	1.541	0.841	1.169
S x R	1.947	0.307	0.695	1.948
Three way interactions I x S x R	1.377	2.791	0.831	0.247

\*\*Significant at .05 level

\*\*Significant at .01 level

From the table it is seen that the main effect of intelligence on process outcomes in science (POS) is significant at 0.01 level ( $f=43.222$ ). So it can be concluded that intelligence exerts a significant influence on pos. The main effect of sex is not significant at any level ( $f=1.457$ ). This leads to the conclusion that the mean scores of pos of male and female subjects do not differ significantly. The main effect of residence is significant at 0.01 level ( $f=7.186$ ). This leads to the conclusion that the mean pos scores of rural subjects and urban subjects differ significantly.

The interaction of intelligence and sex (IXS) is not significant ( $f=1.080$ ) so it can be considered that the main effect of intelligence is independent of sex, that is there is approximately the same difference between the levels of intelligence (high, average and low) regardless of sex. Similarly I x R interaction is also not significant ( $f=1.538$ ). Hence it can be concluded that the main effect of intelligence is independent of the residence of the students. The S x R is also not significant ( $f=1.947$ ). So it can be concluded that the main effect of sex of subjects is independent of their residence. The three way interaction of Intelligence x Sex x Residence is not significant.

The main effect of personal adjustment on pos is not significant ( $f=1.193$ ). Therefore it can be concluded that personal adjustment does not exert a significant influence on process outcomes in science. The main effect of sex is not significant ( $f=2.659$ ). This leads to the conclusion that means score of pos of male subject and female subjects do not differ significantly. The main effect of residence is significant ( $f=67.714$ ). This leads to the conclusion that the mean pos scores of rural subjects and urban subjects differ significantly.

The interaction of personal adjustment and sex is not significant ( $F=1.291$ ). So it can be concluded that the main effect of personal adjustment is independent of sex that is there is approximately same difference between the levels of personal adjustment (high, average and low) regardless of sex. Similarly PAXR interaction is also not significant ( $F=1.542$ ). Hence it can be concluded that the main effect of personal adjustment is independent of the residence of the students. The SxR interaction is not significant ( $F=0.307$ ). Hence it can be concluded that the main effect of sex of the subjects is independent of their residence. The three way interaction of personal adjustment x Sex, x Residence is not significant ( $F=2.791$ ).

The main effect of general anxiety on POS is significant at 0.05 level ( $F=3.748$ ). Therefore it can be concluded that general anxiety exerts a significant influence on process outcomes in science. The main effect of sex is significant at 0.05 level ( $F=4.343$ ). The main effect of residence is significant at 0.01 level ( $F=96.826$ ). This leads to the conclusion that the mean POS scores of Rural subjects and urban subject differ significantly.

The interaction of General anxiety and sex is not significant ( $F=0.828$ ). So it can be concluded that the main effect of general anxiety is independent of sex, that is there is approximately the same difference between the levels of general anxiety (high average and low), regardless of sex. Similarly GA x R interaction is also not significant ( $F=0.841$ ). Hence it can be concluded that the main effect of general anxiety is independent of the residence of the students. The S x R interaction is also not significant ( $F=0.695$ ). The three way interaction of general anxiety X sex X Residence is not significant ( $F=0.831$ ).

The main effect of Examination anxiety on POS is significant at 0.01 level ( $F=6.58$ ). Therefore it can be concluded that Examination anxiety exerts a significant influence on POS. The main effect of sex is not significant at any level ( $F=0.69$ ). The main effect of residence is significant at 0.01 level ( $F=94.515$ ). This leads to the conclusion that the mean POS scores of rural subjects and urban subjects differ significantly.

The interaction of examination anxiety and sex is not significant ( $F=1.263$ ). This shows that the main effect of examination anxiety is independent of sex. EAXR interaction is also not significant ( $F=1.169$ ). Hence it can be concluded that the main effect of examination anxiety is independent of the residence of the subjects. The S x R interaction is also not significant ( $F=1.948$ ). Hence it can be concluded that the main effect of the sex of subjects is independent of their residence. The three way interaction of Examination anxiety X Sex X Residence is not significant ( $F=0.247$ ).

Table 3

Results of Tests of significance (Critical ratios) for the three different levels (Low - Average, High - Average, Low - High pairs) of independent variables in respect of process outcomes in science (pos)

Variables	L-A	H-A	L-H
Intelligence	10.13 **	11.01 **	16.94 **
Personal adjustment	1.94	0.17	1.46
General anxiety	1.81	2.61 **	3.37 **
Examination anxiety	2.70 **	2.61 **	4.18 **

\*\*Significant at 0.01 level

It is seen from table 3 that POS scores discriminate between the L-A, H-A and L-H pairs of independent variables such as intelligence and examination anxiety. In the case of contrasted pairs of personal adjustment the critical ratios are not significant at any level. In the case of contrasted pairs of general anxiety viz, H-A, L-H pairs the critical ratios are significant at 0.01 level. But for the L-A pair the critical ratio is not significant at any level. So it can be concluded that pos discriminate significantly between the contrasting pairs viz, H-A and L-H pairs of general anxiety.

### CONCLUSIONS

The following conclusions were drawn from the present study.

1. There existed a significant positive correlation between intelligence and process outcomes in science.

2. The correlation between personal adjustment and process and outcomes in science was found to be negative.
3. The correlation between general anxiety and process outcomes in science was found to be positive and significant.
4. The correlation between examination anxiety and process outcomes in science was found to be positive and significant.
5. The main effect of independent variables such as Intelligence, General anxiety and examination anxiety is significant. Hence it is concluded that these variables have significant influence on POS. But the variable, personal adjustment has no significant influence on POS.
6. The t- value for the main effect of sex is not significant. So sex has no influence on POS. But residence of the subjects exerts significant influence on POS.
7. The two way interactions I x S, I x R, S x R have no significant influence on POS.
8. The three way interactions have no significant influence on POS.
9. Process outcomes in science discriminate significantly between the L-A, H-A and L-H pairs of independent variables such as intelligence and examination anxiety. POS discriminate significantly between the contrasted pairs viz, H-A and L-H pairs of general anxiety. POS does not discriminate significantly between the contrasted pairs of personal adjustment.

### EDUCATIONAL IMPLICATIONS OF THE STUDY

The results of the present study have very significant value in the field of science education. Hence, the present study has a number of implications, which will provide the basis for the improvement of science education.

1. The study shows the influence of Intelligence, 'Adjustment' and 'Anxiety' on Process Outcomes in Science. The possibility of using these variables for predicting the process attainment in science is strongly indicated by the present study.



2. The present study provides unmistakable evidence of the fact that intelligence exerts a significant influence of Process Outcomes in Science, i.e., higher the intelligence higher will be their achievement in science processes. Therefore, the science process variables could be used for developing predictive equations, which will help in grouping the students for special instructional programmes.

3. The present science curriculum provides very little scope for developing various science process skills. The information available from the study can be used for restructuring the present science curriculum in secondary school level by giving emphasis to process learning.

4. The results of the present study indicate that the total score of Process Outcomes in Science can be helpful in grouping and guiding the students for a particular science oriented job, selecting appropriate course of study, discovering talents in science etc.

5. It is seen that in our country science process skill testing has not received due recognition that it deserves. Teachers are not aware of its importance. So it is desirable that a special orientation programme be conducted for them. With such a programme the teachers can diagnose the weakness of pupils in science processes and appropriate remedial measures may be planned.

6. The study reveals that the ability of urban pupils is superior to that of rural pupils in science process skills. So more training for the development of various science process skills must be given to rural pupils.

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# EFFECT OF SELF-ESTEEM, STRESS AND EMOTIONAL INTELLIGENCE ON ACADEMIC ACHIEVEMENT OF TENTH STANDARD STUDENTS IN SOUTHERN DISTRICTS OF TAMILNADU

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## NEED AND SIGNIFICANCE OF THE STUDY

Today we live in a competitive world, where academic excellence is a must for success in life. It is considered to be a very important factor at the secondary stage of school education.

The extra ordinary emphasis on doing well in the secondary school leaving certificate examination by schools, parents and society places a staggering emotional load on the student to meet the near impossible expectation.

Both parents and teachers in their anxiety to improve the performance of students at the public examination, pressurize the students to the maximum possible extent. Learning becomes a pain instead of pleasure at this stage. Much has been talked about too much of stress and workload in schools. Many studies show that more and more of students are being overworked

by 'zero syndrome' which is not healthy either from the social point of view or individual's point of view.

Till recently, only Intelligence Quotient (IQ) was considered as an important factor that determine the academic achievement of a child. Now researchers say that Intelligence Quotient (IQ) alone is not the measure of success; it counts only twenty percent and the rest goes for various other factors like emotional and social intelligence.

Every individual has a differently balanced portfolio of abilities, which require careful nurture and attention to develop talent to the full potential. A very tactful approach is required from parents, teachers and society. The present study focuses its attention in this dimension.

## OBJECTIVES

### Section I

1. To find the level of self-esteem of tenth standard students in southern districts of Tamil Nadu in terms of background variables.
2. To find the level of total stress and its dimensions of tenth standard students in southern districts of Tamil Nadu in terms of background variables.
3. To find the level of emotional intelligence of tenth standard students in southern districts of Tamil Nadu in terms of background variables.
4. To find the level of academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality, religion, community, nature of family, birth order, nature of school, type of school, socio economic status and district.

### Section II

1. To find the significant difference in the self-esteem of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.



2. To find the significant difference in the total stress and its dimensions of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.
3. To find the significant difference in the emotional intelligence of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.
4. To find the significant difference in the academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.

#### Section III

1. To find the significant difference among the levels of academic achievement of tenth standard students in southern district of Tamil Nadu in terms of (a) stress and its dimensions, (b) self-esteem, (c) emotional intelligence.
2. To find the significant difference among the tenth standard students of Kanyakumari, Tirunelveli and Tuticorin districts in terms of (a) stress and its dimensions, (b) self-esteem, (c) emotional intelligence and (d) academic achievement.
3. To find the significant difference among the tenth standard students of Muslim, Christian and Hindu religions in terms of (a) stress and its dimensions, (b) self-esteem, (c) emotional intelligence and (d) academic achievement.
4. To find the significant difference among the tenth standard students of High, Middle and Low socio economic status in terms of (a) stress and its dimensions, (b) self-esteem, (c) emotional intelligence and (d) academic achievement.

#### Section IV

1. To find the significant association between self-esteem of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.

2. To find the significant association between stress and its dimensions of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.
3. To find the significant association between emotional intelligence of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.
4. To find the significant association between academic achievement of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.

#### Section V

1. To find the significant relationship between self-esteem and academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of total sample, gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio economic status and districts.
2. To find the significant relationship between stress and academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of total sample, gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio economic status and districts.
3. To find the significant relationship between emotional intelligence and academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of total sample, gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio economic status and districts.

#### HYPOTHESES

##### Section I

1. The level of self-esteem of tenth standard students in southern districts of Tamil Nadu in terms of background variables is moderate.

2. The level of emotional intelligence of tenth standard students in southern districts of Tamil Nadu in terms of background variables is moderate.
3. The level of total stress of tenth standard students in southern districts of Tamil Nadu in terms of background variables is moderate.
4. The level of academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of background variables is moderate.

#### Section II

1. There is no significant difference in the self-esteem of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.
2. There is no significant difference in the total stress of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.
3. There is no significant difference in the emotional intelligence of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.
4. There is no significant difference in the academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as gender, locality and nature of family.

#### Section III

1. There is no significant difference among the levels of academic achievement of tenth standard students in southern district of Tamil Nadu in terms of (a) stress and its dimensions (b) self-esteem and (c) emotional intelligence.
2. There is no significant difference among the tenth standard students of Kanyakumari, Tirunelveli and Tuticorin districts in terms of (a) stress and its dimensions (b) self-esteem (c) emotional intelligence and (d) academic achievement.

3. There is no significant difference among the tenth standard students of Muslim, Christian and Hindu religions in terms of (a) stress and its dimensions (b) self-esteem (c) emotional intelligence and (d) academic achievement.
4. There is no significant difference among the tenth standard students of High, Middle and Low socio economic status in terms of (a) stress and its dimensions (b) self-esteem (c) emotional intelligence and (d) academic achievement.

#### Section IV

1. There is no significant association between self-esteem of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.
2. There is no significant association between stress and its dimensions of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.
3. There is no significant association between emotional intelligence of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.
4. There is no significant association between academic achievement of tenth standard students in southern districts of Tamil Nadu and their (a) parental education, (b) parental occupation and (c) parental income.

#### Section V

1. There is no significant relationship between self-esteem and academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of total sample, gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio-economic status and districts.
2. There is no significant relationship between stress and academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of total sample, gender,

locality, religion, community, birth order, nature of family, type of school, nature of school, socio-economic status and districts.

- There is no significant relationship between emotional intelligence and academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of total sample, gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio-economic status and districts.

## METHODOLOGY

### Method

The method followed for the investigation is the survey method. The stratified random sampling technique was used.

### Sample

The researcher selected 900 tenth standard students studying in State Board Schools of Kanyakumari, Tirunelveli and Tuticorin districts by the stratified random sampling technique. The schools selected include Boy's schools, Girls' schools and Co- education schools. Due representation was also given to the type of management and locality.

### Tools used

The researcher used the following tools for the collection of data

- Student Stress Scale validated by researcher and Dr.A.Amalraj.
- Scale to measure self- esteem validated by Heagly A.H
- Baron Emotional Quotient Inventory: Youth version validated by Reuven Baron and James D.A. Parker.
- Marks scored by the students in tenth standard examination conducted by State Board of School Examination for the academic achievement of the students.

## Statistics used

- Percentage Analysis
- 't' test
- ANOVA
- Association Analysis
- Correlation Analysis



## FINDINGS

### Section – I

- The level of self-esteem of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as Male (56.8%); Female (58.8%); Rural (59.0%); Urban (56.5%); Muslim (57.2%); Christian (54.4%); Hindus (61.8%); FC (62.7%); BC/MBC (55.6%); SC/ST (59.2%); First born (56.8%); Second born (57.6%); Third born (62.8%); Nuclear family (56.6%); Joint family (60.1%); Girls school (55.2%); Boys school (59.7%); Mixed school (58.3%); Government school (59.9%); Government Aided school (85.2%); Middle socio-economic status (63.8%); Low socio-economic status (57.8%); Kanyakumari (62.0%); Tirunelveli (50.0%); Tuticorin (57.7%) is found to be moderate.

The level of self-esteem of tenth standard students in southern districts of Tamil Nadu in terms of private school (75.2%) and high socio-economic status (48.5%) is low.

- The level of emotional intelligence of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as Male (57.9%); Female (64.7%); Rural (64.1%); Urban (58.5%); Muslim (59.9%); Christian (58.9%); Hindus (64.8%); FC (68.9%); BC/MBC (59.4%); SC/ST (57.7%); First born (62.6%); Second born (60.8%); Third born (59.3%); Nuclear family (61.5%); Joint family (61.0%); Girls school (57.7%); Boys school (65.3%); Coeducation school (61.6%); Government school (57.7%);



Government Aided school (84.0%); High socio-economic status (56.8%); Middle socio-economic status (66.7%); Low socio-economic status (57.8%); Kanyakumari (62.0%); Tirunelveli (65.0%); Tuticorin (57.0%) is found to be moderate.

The level of emotional intelligence of tenth standard students in southern districts of Tamil Nadu in terms of private school (59.8%) is low.

3. The level of total stress of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as Male (52.5%); Female (54.2%); Rural (51.6%); Urban (55.1%); Muslim (54.0%); Christian (56.0%); Hindus (50.0%); FC (59.8%); BC/MBC (52.8%); SC/ST (45.8%); First born (57.1%); Second born (53.0%); Third born (40.7%); Joint family (49.5%); Girls school (53.5%); Boys school (53.3%); Coeducation school (53.3%); Government Aided school (75.1%); High socio-economic status (53.7%); Middle socio-economic status (60.9%); Kanyakumari (60.7%); Tirunelveli (60.7%); Tuticorin (38.7%) is found to be moderate.

The level of total stress of tenth standard students in southern districts of Tamil Nadu in terms of Nuclear family (55.4%) and Private school (53.1%) is found to be high.

The level of total stress of tenth standard students in southern district of Tamil Nadu in terms of government school (62.3%) and low socio economic status (49.1%) is found to be low.

4. The level of academic achievement of tenth standard students in southern districts of Tamil Nadu in terms of background variables such as Male (66.7%); Female (64.9%); Rural (65.8%); Urban (65.8%); Muslim (67.4%); Christian (60.3%); Hindus (71.0%); FC (69.4%); BC/MBC (63.4%); SC/ST (69.7%); First born (68.5%); Second born (63.7%); Third born (66.3%); Nuclear family (66.3%); Joint family (64.9%); Girls school (65.1%); Boys school (70.9%); Coeducation school (63.9%); Government school (65.7%); Government Aided school (84.3%); High socio-economic status (66.8%); Middle socio-economic status (68.5%); Low socio-economic status (61.3%); Kanyakumari (51.7%); Tirunelveli (84.7%); Tuticorin (61.0%) is found to be moderate.

The level of academic achievement, stress of tenth standard students in southern districts of Tamil Nadu in terms of Private school (54.9%) is found to be low.

## Section II

1. There is no significant difference in the self-esteem of tenth standard students in Southern districts of Tamil Nadu in terms of the background variable such as gender. Whereas significant difference exists in terms of background variables such as locality and nature of family.
2. There is significant difference in the total stress of tenth standard students in Southern districts of Tamil Nadu in terms of the background variables locality and nature of family. For the variable gender the difference is non-significant.
3. There is no significant difference in the emotional intelligence of tenth standard students in Southern districts of Tamil Nadu in terms of the background variable gender. For the background variables locality and nature of family the difference is found to be statistically significant.
4. There is significant difference in the academic achievement of tenth standard students in Southern districts of Tamil Nadu in terms of the background variables locality and nature of family. Whereas no significant difference exists in terms of the background variable gender.

## Section III

1. On testing the significant difference among the levels of academic achievement of tenth standard students in Southern districts of Tamil Nadu in terms of stress and its dimensions, the following results have been obtained. The dimensions personal stress, family stress, classroom stress, social stress and examination stress are found to be significant. Stress in total is also found to be statistically significant.
2. For the variable self-esteem the difference among the levels of academic achievement of tenth standard students in Southern districts of Tamil Nadu is found to be significant.
3. There is significant difference among the levels of achievement of tenth standard students in Southern districts of Tamil Nadu in terms of the variable emotional intelligence.

4. On testing the significant difference among the tenth standard students of Kanyakumari, Tirunelveli, and Tuticorin districts in terms of stress and its dimensions, the following results have been obtained. The dimensions personal stress, family stress, classroom stress, social stress and examination stress are found to be non-significant. Stress in total is also found to be non-significant.
5. The difference among the tenth standard students of Kanyakumari, Tirunelveli, and Tuticorin districts in terms of variable self-esteem is non-significant.
6. There is significant difference among the tenth standard students of Kanyakumari, Tirunelveli, and Tuticorin districts in terms of emotional intelligence.
7. Significant difference is noted among the tenth standard students of Kanyakumari, Tirunelveli, and Tuticorin districts in terms of academic achievement.
8. On testing the significant difference among the tenth standard students of Muslim, Christian and Hindu religions in terms of stress and its dimensions, the following results have been obtained. The dimensions family stress and social stress are found to be statistically significant. The dimensions personal stress, classroom stress, examination stress and stress in total are found to be non-significant.
9. There is significant difference among the tenth standard students of Muslim, Christian and Hindu religions in terms of self-esteem.
10. For the variable emotional intelligence, the difference among the tenth standard students of Muslim, Christian and Hindu religions is found to be non-significant.
11. The difference among the tenth standard students of Muslim, Christian and Hindu religions in terms of variable academic achievement is significant statistically.
12. On testing the significant difference among the tenth standard students of High, Middle and Low socio-economic status in terms of stress and its dimensions, the following results have been obtained. The dimensions personal stress, family stress, classroom stress, social stress, emotional stress and stress in total are found to be statistically significant.

13. The difference among the tenth standard students of High, Middle and Low socio-economic status in terms of self-esteem is found to be significant statistically.
14. For the variable emotional intelligence the difference among the tenth standard students of high, middle and low socio-economic status is found to be significant.
15. In terms of the variable academic achievement the difference among the tenth standard students of high, middle and low socio-economic status is found to be statistically significant.

#### Section IV

1. On testing the significant association between stress and its dimensions of tenth standard students in Southern districts of Tamil Nadu in terms of certain chosen background variables, the following results have been obtained.

##### (a) In terms of Parental education:

Parental education has impact on the dimensions of stress such as personal stress, family stress, classroom stress, social stress and examination as well as for the total stress.

##### (b) In terms of Parental occupation:

Parental occupation has impact on the dimensions of stress such as personal stress, family stress, classroom stress, social stress, examination stress and for total stress.

##### (c) In terms of Parental income:

Parental income has impact on the dimensions of stress such as personal stress, family stress, classroom stress, social stress, examination stress and for stress in total.

2. On testing the significant association between self-esteem of tenth standard students in Southern district of Tamil Nadu and certain chosen background variables, the following



results have been obtained. Parental education, parental occupation and parental income are found to have impact on self-esteem.

3. On testing the significant association between emotional intelligence of tenth standard students in Southern district of Tamil Nadu, the following results have been obtained. Parental education, parental occupation and parental income are found to have impact on emotional intelligence.
4. On testing the significant association between academic achievement of tenth standard students in Southern district of Tamil Nadu, the following results have been obtained. Parental education, parental occupation and parental income are found to have impact on academic achievement.

#### Section V

1. There is significant positive relationship between self-esteem and academic achievement of tenth standard students in Southern districts of Tamil Nadu in terms of gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio-economic status districts and total sample.
2. Significant negative relationship is found between stress and academic achievement of tenth standard students in Southern districts of Tamil Nadu in terms of gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio-economic status districts and total sample.
3. There is significant positive relationship between emotional intelligence and academic achievement of tenth standard students in Southern districts of Tamil Nadu in terms of gender, locality, religion, community, birth order, nature of family, type of school, nature of school, socio-economic status districts and total sample. The relationship between emotional intelligence and academic achievement is not significant for the private school students.

## CONCLUSION

The twenty first century is characterized by the emergence of multiculturalism due to industrialization, urbanization, globalization, and disintegration in the family system. Since education is viewed as an instrument to develop the cognitive qualities, tolerance and understanding of people, it should prepare the younger generation to understand and face the realities of globalization. Every step should be taken to teach students to find a positive for every negative, and ability to view a setback as a challenge and challenge as an opportunity. Therefore the aim of education should be to bring about an effective, holistic and sustainable development in all spheres of a student's life.

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# PERSONALITY AND TEACHER EFFECTIVENESS -AN ANALYTICAL STUDY ON MATHEMATICS TEACHERS

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## NEED AND SIGNIFICANCE OF THE PRESENT INVESTIGATION

Teachers are the builders of the society. It is their responsibility to set a strong foundation to the pillars of nation, and also raise them to great heights. But these lofty operations can come true only when they perform their duties with dedication, and sincerity which is possible only when their personality is adequately developed.

The teacher of today has to be quite different from that of his predecessors. He should make the teaching-learning process a joy ful experience, and not a sordid soulless activity for students. He should perennially be involved in the creation of new knowledge, and concepts. He should have a vision for the future; the kind of society to be built.

Researches showed that the teacher is probably the single most important factor affecting student's achievement, and the more can be done to improve student achievement by improving the effectiveness of teacher than by any other single factor.

The influence of teachers' personality on his teaching performance has been a fertile area of educational research during the past few decades. How the personality of the teacher interacts with his teaching ability is a critical factor in teacher effectiveness. The changing role of teacher from that of a dispenser of knowledge, to that of innovator, stimulator, motivator, helper, and agent of social change presumes that teachers possessing certain specific personality traits alone can perform any of these roles effectively (Baez, 1976).

Personality traits which determine teaching success could be obviously subject specific. A personality trait which influences the teaching success in one subject, for example literature, may turn out to be a hindering influence in the teaching success of another subject like Mathematics. Identification of the personality traits associated with success in teaching a particular subject has not received the attention of researchers. The present study is an attempt to identify the personality traits essential for an effective Mathematics teacher.

A glance at the present scenario of Mathematics education is quite distressing. It is generally observed that there is a sense of fear, and dislike for Mathematics in many of our students. While comparing the achievement in various subjects, majority of the students got low scores in Mathematics. Various researchers have shown that there is significant relationship between student achievement, and teacher effectiveness. So the Mathematics teaching should be effective which in turn demands certain personal traits in teachers.

The new taxonomies insist that the outcomes of instruction should go beyond cognitive domain. Newly developed Mathematics curriculum gives emphasis to affective variables like values, interest, and attitudes, in one hand, and skills like psychomotor variables, on other hand. This forced the investigator to give greater attention to the personality of Mathematics teachers.

It is also believed in this context that the present study will be useful in identifying a list of generalized personality variables which predict teacher effectiveness in Mathematics. These findings will provide insight to the Mathematics teachers, and teacher educators to modify their thoughts, and actions according to the needs, and objectives of present day Mathematics education.

## OPERATIONAL DEFINITION OF KEY TERMS

### Teacher Effectiveness

The term 'Teacher Effectiveness' refers to the degree of success of a teacher in performing instructional, and other duties specified in his contract, and demanded by the nature of his position. The scores obtained by a teacher on "An Index of Teacher Effectiveness" is taken as the score for the variable teacher effectiveness. Here for each item in the index, the investigator rates the teacher while observing his/her performance in the actual teaching-learning situation in a classroom.

**Mathematics Teacher**

The term 'Mathematics Teacher' as used in the present investigation implies the teacher who teaches mathematics in high schools.

**An Analytical Study**

The term 'an analytical study' implies the analysis of data collected for the study with the help of various statistical techniques to throw light on the hypotheses formulated for the present study. The term also implies analyses done on various categories of Mathematics teachers on the basis of personality variables and teacher effectiveness.

**OBJECTIVES OF THE STUDY**

The following were the major objectives of the investigation:

1. To find out the difference, if any, in the ten personality variables of Mathematics teachers based on the background variables, namely, sex, locality, teaching experience, type of management, religion, and community.
2. To find out the difference, if any, in teacher effectiveness of Mathematics teachers based on background variables.
3. To find out the correlation of teacher effectiveness with the personality variables, namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, Endurance, and Emotional adjustment.
4. To elicit the common factors yielded by the ten personality variables and teacher effectiveness.

**MAJOR HYPOTHESES**

The following hypotheses were formulated for this investigation:

1. There will be significant difference between Mathematics teachers categorized on the basis of sex, locality, teaching experience, type of management, religion, and community on the ten variables of personality, namely, Quality of life, Teacher attitude, Critical thinking,

Leadership style, Gregariousness, Objectivity, Stability, Autonomy, Endurance, and Emotional adjustment.

2. There will be significant difference between various categories of Mathematics teachers classified on the basis of sex, locality, teaching experience, type of management, religion, and community on teacher effectiveness.
3. The variable teacher effectiveness will correlate positively and significantly with the ten personality variables under study.
4. Factor analysis of the ten personality variables and teacher effectiveness will yield significant factors with moderate or high loadings of the variables on it.

**METHODOLOGY IN BRIEF****a. Population**

The population in the present investigation constituted Mathematics teachers working in high schools of Kanyakumari, and Tirunelveli districts of Tamilnadu.

**b. Sample**

The sample for the present investigation consisted of 300 Mathematics teachers selected from various schools of Kanyakumari, and Tirunelveli districts of Tamilnadu by using stratified sampling technique.

**c. Tools used**

The following tools were used for the study

- I. 'A Test Battery of Personality Factors' for measuring the ten personality variables, namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, Endurance, and Emotional adjustment (Constructed and standardized by S. Sreelatha, Dr. B. Krishna Prasad, and Dr. A. Amal Raj, 2006).

II. 'An Index of Teacher Effectiveness' (Constructed and standardized by S.Sreelatha, Dr. B. Krishna Prasad, and Dr. A. Amal Raj, 2006).

**d. Procedure for data collection**

The investigator used Normative Survey method for this study. After obtaining permission from the authorities, the investigator met the Mathematics teachers to collect the relevant data individually, as explained below.

Rapport was established with each teacher before the commencement of data collection. The Personal Information Schedule was being filled and then the Test Battery of Personality Factors was administered.

An appointment was fixed with each teacher for observing his/ her class, so that the Index of Teacher Effectiveness could be filled in by the investigator. For this purpose, expert opinion was sought from superiors like headmasters or principals whenever necessary. The fact that the investigator is a teacher educator evaluating the teaching competency of prospective teachers for the purpose of university examinations for more than one decade was of immense help for her to fill in the Index of Teacher Effectiveness.

The responses were scored as per instruction and were consolidated for analysis using computer facilities.

**e. Statistical techniques used for analysis**

The test of significance of difference between means of large independent samples (t-test), Analysis of Variance (Anova) followed by Scheffe procedure, Pearson product-moment method of correlation (r), and Factor Analysis were the important statistical techniques used for analysis of the data.

**DELIMITATIONS OF THE STUDY**

The delimitations of the present investigation were the following:

1. The scope of the study was limited to ten personality variables, namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, Endurance, and Emotional adjustment.
2. The sample for the investigation consisted of Mathematics teachers working in Kanyakumari and Tirunelveli districts in Tamilnadu.
3. The sample for the study was limited to three hundred Mathematics teachers of high school classes.
4. Other-rating technique (Rating by the investigator) alone was used for measuring Teacher effectiveness.

**RESULTS AND DISCUSSION**

1. Data and results of test of significance between the means of variable selected

Sl. No.	Variable	Background characteristics	t-value/F-value	Level of significance
1	Quality of life	Sex	6.32	0.01
		Locality	4.11	0.01
		Teaching Experience	2.70	0.01
		Type of Management	1.03	N.S
		Religion	1.502	N.S
		Community	6.85	0.01



	Teacher attitude	Sex	6.27	0.01
		Locality	4.14	0.01
		Teaching Experience	3.75	0.01
		Type of Management	2.25	0.05
		Religion	3.218	0.05
		Community	6.70	0.01
3	Critical thinking	Sex	2.99	0.01
		Locality	2.80	0.01
		Teaching Experience	2.03	0.05
		Type of Management	2.38	0.05
		Religion	1.819	N.S
		Community	6.07	0.01
4	Leadership style	Sex	6.54	0.01
		Locality	3.86	0.01
		Teaching Experience	2.96	0.01
		Type of Management	1.64	N.S
		Religion	1.588	N.S
		Community	4.21	0.01
5	Gregariousness	Sex	5.40	0.01
		Locality	4.28	
		Teaching Experience	2.49	0.01
		Type of Management	1.00	N.S
		Religion	2.588	N.S
		Community	4.24	0.01

6	Objectivity	Sex	5.02	0.01
		Locality	5.06	0.01
		Teaching Experience	2.42	0.01
		Type of Management	0.912	N.S.
		Religion	1.156	N.S.
		Community	9.38	0.01
7	Stability	Sex	5.26	0.01
		Locality	4.60	0.01
		Teaching Experience	4.21	0.01
		Type of Management	4.74	0.01
		Religion	4.836	0.01
		Community	4.47	0.01
8	Autonomy	Sex	6.92	0.01
		Locality	3.76	0.01
		Teaching Experience	2.25	0.01
		Type of Management	0.695	N.S
		Religion	0.908	N.S
		Community	7.76	0.01
9	Endurance	Sex	4.41	0.01
		Locality	3.56	0.01
		Teaching Experience	1.03	N.S
		Type of Management	1.00	N.S
		Religion	3.407	0.05
		Community	2.82	N.S

Sl. No.	Variable	Mean	Significance
10	Emotional adjustment	Sex	1.90 N.S.
		Locality	3.46 0.01
		Teaching Experience	3.05 0.01
		Type of Management	1.04 N.S.
		Religion	1.949 N.S.
		Community	0.242 N.S.
11	Stability	Sex	0.28 N.S.
		Locality	0.51 N.S.
		Teaching Experience	1.86 N.S.
		Type of Management	4.432 0.01
		Religion	12.312 0.01
		Community	3.29 0.05

From Table 1, it is clear that

(a) There existed significant differences between male and female Mathematics teachers on the nine variables of personality namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, and Endurance. Male Mathematics teachers possessed better Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, and Endurance compared to female Mathematics teachers. It is concluded that sex plays a vital role in the personality of Mathematics teachers.

(b) There existed significant differences between urban and rural Mathematics teachers on the ten variables of personality namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, Endurance, and Emotional adjustment. Urban Mathematics teachers showed better position in all the ten personality variables compared to rural Mathematics teachers. Locality also plays a major role on the personality of Mathematics teachers.

(c) Significant difference was noticed between Mathematics teachers having experience above ten years and experience below ten years on the nine variables of personality namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, and Emotional adjustment. Mathematics teachers having experience above ten years possessed better Quality of life, Teacher attitude, Critical thinking, Leadership style,

Gregariousness, Objectivity, Stability, Autonomy, and Emotional adjustment compared to Mathematics teachers having experience below ten years. The teaching experience influences the personality of Mathematics teachers.

(d) There existed significant difference between private and government school Mathematics teachers only on the two variables of personality namely, Teacher attitude, and Critical thinking. Type of management has no influence on the personality of Mathematics teachers.

(e) There existed significant differences between Mathematics teachers of various religions (Hindu, Christian, and Muslim) only on three variables of personality namely, Teacher attitude, Stability, and Endurance. Religion has no influence on the personality of Mathematics teachers.

(f) There existed significant difference between Mathematics teachers belonging to various communities on the eight variables of personality namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability and Autonomy. Community influences the personality of Mathematics teachers.

2. Correlations between Teacher effectiveness and ten Personality variables

Sl. No.	Variables correlated	r	Level of significance	Verbal interpretation of 'r'
1	Teacher effectiveness and Quality of life	+0.415	0.01	Marked or Substantial
2	Teacher effectiveness and Teacher attitude	+0.251	0.01	Low
3	Teacher effectiveness and Critical thinking	+0.267	0.01	Low
4	Teacher effectiveness and Leadership style	+0.301	0.01	Low
5	Teacher effectiveness and Gregariousness	+0.337	0.01	Low
6	Teacher effectiveness and Objectivity	+0.563	0.01	Marked or Substantial
7	Teacher effectiveness and Stability	+0.229	0.01	Low
8	Teacher effectiveness and Autonomy	+0.288	0.01	Low
9	Teacher effectiveness and Endurance	+0.205	0.01	Low
10	Teacher effectiveness and Emotional adjustment	+0.216	0.01	Low

Table 2 indicated that the variable Teacher Effectiveness is positively and significantly correlated to all the selected ten personality variables. In all the personality variables except Objectivity, the correlation was found to be low.

### Factor Analysis

The intercorrelations among the eleven variables under study were subjected to factor analysis. Three significant factors were elicited, and these are described below.

Factor analysis of the ten personality variables and the variable Teacher effectiveness yielded three significant factors with moderate or high loadings of the variables on it.

#### I. Factor 1 : Diplomatic Personality

The variables with significant loadings on the factor were: Gregariousness (0.932), Leadership style (0.924), Autonomy (0.919), Teacher attitude (0.916), Stability (0.824), Objectivity (0.728), Quality of life (0.651), and Endurance (0.596).

#### II. Factor 2 : Teacher Integrity

The variables with significant loadings on the factor were: Teacher effectiveness (0.867), Emotional adjustment (0.539), Objectivity (0.461), and Quality of life (0.458).

#### III. Factor 3 : Mature Adaptability

The variables with significant loadings on the factor were: Critical thinking (0.842), Emotional adjustment (0.581), and Endurance (0.563).

### CONCLUSIONS

The following are the conclusions based on the findings of this study:

- 1) Out of the six background variables selected, namely, sex, locality, teaching experience, type of management, religion, and community, four variables, namely, sex, locality, teaching experience, and community influence the personality of Mathematics teachers. The other two variables, type of management and religion have no significant influence in the personality of Mathematics teachers

2. Out of the six background variables selected, type of management, religion, and community of Mathematics teachers influence Teacher effectiveness. Sex, locality, and teaching experience, has no influence on the Teacher effectiveness of Mathematics teachers.

3. The variable Teacher effectiveness correlated positively and significantly with all the ten personality variables, namely, Quality of life, Teacher attitude, Critical thinking, Leadership style, Gregariousness, Objectivity, Stability, Autonomy, Endurance, and Emotional adjustment.

4. Factor analysis of the ten personality variables and the variable Teacher effectiveness yielded three significant factors with moderate or high loadings of the variable, on it. These factors were identified as Diplomatic Personality, Teacher Integrity, and Mature Adaptability.

The conclusions presented above on the basis of the results clearly indicate that teacher effectiveness has a significant interrelationship with all the ten personality variables studied in one way or the other in the case of Mathematics teacher.

### EDUCATIONAL IMPLICATIONS OF THE STUDY

Mathematics is generally considered as a difficult subject. Some students have a fear, and dislike towards Mathematics. The dislike towards Mathematics, in turn, results in their poor achievement. The specific backwardness in Mathematics is because of its abstractness and poor methods of teaching. The present investigation extracted the essential personality factors which contribute to the effective teaching in Mathematics, namely, Diplomatic Personality, Teacher Integrity and Mature Adaptability. If the Mathematics teachers possess the above said personality factors, Mathematics teaching can be made more effective and thus dislike, fear and poor achievement of students in Mathematics can be avoided.

The identification of the three personality factors essential for effective teaching in Mathematics and the other findings of the investigation will contribute to the present day Mathematics education in the following ways:

- For the selection of students to teacher education programmes.
- In recruitment of Mathematics teachers for high schools.
- While framing curriculum for teacher education programmes, due weightage should be given for the development of above personality factors in student teachers.



- Inservice, and preservice programmes should structure personality development programmes for Mathematics teachers.
- To set guidelines for professional development of Mathematics teachers.
- To provide awareness to the policy makers, curriculum planners, resource persons, teacher educators, and head of the institutions regarding the essential personality factors contributing effective teaching in Mathematics.
- Mathematics teachers themselves can be made aware about the need of inculcating essential personality factors for improving their teacher effectiveness.

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## EFFECT OF YOGA ON SELECTED PHYSIOLOGICAL VARIABLES OF MENTALLY RETARDED GROUPS

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### INTRODUCTION

Man is the most intelligent and admirable being among all the creations of God. His quest for knowledge is eternal and insatiable and education completely modifies the behaviour and personality of the individual.

Mental retardation is the impairment in intelligence from early life, slow mental development during the growth period, reduced learning ability, lack of social and behavioral adjustment.

It is a state of mental defect from birth or an early age, because of which a person is unable to perform his duties as a member of the society. His span of attention is less and rate of learning and ability to retain what is learnt is also less. His speech is also retarded because speech is something he has to learn from what he hears. Therefore, because of limited ability he learns to speak late and at a slower level. What he speaks may also be defective because his ability to discern is faulty.

It is a learning disorder in which the abilities of brain's memory recall, thought and reasoning are impaired. Parrot fashion learning of simple musical tunes, nursery rhymes as well as some activities of daily living can be achieved but normal language, comprehension and schooling can never be present in severely retarded children. The cognitive learning is delayed even in a mildly retarded child.

Mental retardation is not a disease. It is a disability. It is not infectious. It can happen to any normal couple, rich or poor, educated or uneducated, urban or rural. Mental illness and mental retardation are two different entities. The mentally retarded behaves like a person much younger than himself. He remains child like when grown up.

The movements of the different parts of the body are controlled by the brain. The characteristics of the mentally retarded persons vary, depending upon the level of retardation. The terms currently used to describe the various degrees of mental retardation are mild, moderate, severe and profound.

### CLASSIFICATION OF THE MENTAL RETARDATION

1. Mild retardation
2. Moderate retardation
3. Severe retardation
4. Profound mental retardation

#### 1. Mild Retardation ( I Q 55 - 75 )

- 80 % of the mentally retarded is mildly retarded
- When mentally retarded is grown up their I.Q is equivalent to just that of 10 year old.
- Social adjustment is just that of adolescent
- Walking, talking, feeding etc..are one year later than the normal.

#### Characteristics

- Exhibits immature behavior
- Poor control over impulse
- Lack of judgment
- Fail to anticipate the consequences of actions

- Sexual behavior is unpredicted which creates problems
- Educable
- Trainable

### 2. Moderate Retardation ( IQ 40 - 54 )

- 10% of the mentally retarded belong to this category
- When become adult they have intellectual level of six year old.
- Physically clumsy, dull, difficulty in motor co-ordination
- Manage to speak, rate of learning is too slow

#### Characteristics

- Can't do works which need thinking
- Need attention and support always

### 3. Severe Retardation ( IQ 25 -39 )

- 3.5% of the mentally retarded belong to this category
- Never attain intellectual level greater than four year old
- Mortality rate is high
- Severe motor and speech deficiency
- Sensory defects and handicaps are common

#### Characteristics

- Majority not able to feed, dress
- Neither educable nor trainable
- Dependent of other

### 4. Profound Mental Retardation (IQ 00 -24 )

- 1.5% of mentally retarded belong to this category
- Intellectual level not greater than of two years

- Retarded growth, physical deformities speech deficiency
- Motor co-ordination and deafness

#### Characteristics

- Not able to do physical activities
- Life span is very short
- Care must be given just like an infant



### CAUSES FOR MENTAL RETARDATION

#### 1. Organic or Biological Factor

#### 2. Socio - Psychological Factor

#### 1. Organic Or Biological Factor

##### Genetic

At the time of conception either through the transmission of some of the defective genes in the chromosomes of one or both the parents.

##### Infection

- Syphilis, Rubella
- After birth
- Sometimes blindness, deafness
- Paralysis and epilepsy

##### Intoxication

- Toxic agents like carbon monoxide, mercury
- Large dose of X-rays on pregnancy
- Drugs administered to the mother during pregnancy
- Overdose of drugs to infant

##### Trauma

- Brain injuries prior to birth at the time of delivery



- Deprivation of oxygen, because of umbilical cord
- Abnormal delivery, use of forceps
- Premature birth
- Post mature birth
- Delayed breathing of the new born
- Psychological Factor
- Early childhood deprivation like lack of adequate mothering and parental care
- Deprivation of basic necessities of life
- Poverty
- Riddden
- Crowed
- Family environment
- Failure of school system

In a mentally handicapped child, the brain develops very slowly because it has been damaged, due to various reasons. This can happen before, during or after birth. Because of this damage the child's development is flow slow.

The yoga training should educate towards quality leisure functioning and using leisure. Yoga helps to habilitate and to rehabilitate the physical, social, emotional and intellectual quality of mentally retarded individuals.

#### STATEMENT OF THE PROBLEM

It is generally accepted that any systematic and regular conditioning programe causes modifications in the physiological functions of the different systems of the body. Hence it is considered worth to study the effect of Yoga on selected physiological variables of mentally retarded groups of subjects.

#### DEFINITION AND EXPLANATION OF THE TERMS

##### 1. Yoga

The word yoga is derived from the Sanskrit root "YUJ" meaning to bind, join attach and yoke, to direct and concentrate one's attention on, to use and apply. It also means the union or communion. It is the true union of our will with the will of God. (Iyengar 1989).

The practice of Yoga is aimed at improving general health, span of attention, mother co-ordination and social interaction of the mentally retarded children.

##### 2. Asana

Asana has been defined by Patanjali, the foremost exponent and of the yoga system, as that "bodily pose which not only confirms to steadiness but which is also equally pleasant and comfortable".

Asanas are not movements but postures to be developed and hold, most are relaxing rather than demanding effort, refreshing rather than fatiguing they are non competitive, they require no special equipment or clothing. They can be performed by men and women and persons of all groups.

##### 3. Mental Retardation

Mental retardation refers to a chronic condition present from birth or early childhood which is characterized by both impaired intellectual functioning as measured by standardized tests and impaired adaptation to the daily demands of the individuals' social environment.

Mental retardation refers to significantly sub average general intellectual functioning existing concurrently with deficits in adaptive behaviors and manifested during the developmental period.

Sen defines mental retardation as "a condition of arrested or incomplete development of mind, existing before the age of eighteen years, whether arising from inherent causes or induced by disease or injury.

##### 4. Physiological variables

###### a. Vital capacity

Vital capacity is defined as the larger volume of air that can be exhaled after the deepest possible inhalation. (Clerk, 1975)

Vital capacity is the maximum volume of gas that can be forcefully exhaled from the following maximal inspiration (Devries 1967).

###### b. Maximum Expiratory Pressure

It is the capacity of the individual to maintain the mercury level of the sphygmomanometer for at least three seconds by blowing as forcefully as possible preceding a deep breath (Flyman 1971).

**c. Breath holding time:**

Breath holding time has been defined as an individual's ability to hold the breath voluntarily forced maximal inhalation, without inhaling or exhaling during the period of holding the breath. (More Bose and Miller, 1976).

"Breath holding time has been defined as the duration of time through which one can hold his or her breath without inhaling or exhaling". (Robson 1972).

**d. Blood pressure:**

"Blood pressure is the lateral pressure exerted by the blood on the vessel walls flowing through it". (Chatterjee, 1980).

Blood pressure is a pressure exerted on the walls of the arteries as the heart pumps the blood through the body (Clerk, 1972).

**e. Pulse rate:**

Pulse rate is the rate of beats on heart per minute (More Bose and Miller 1976).

**OBJECTIVES****Section I**

1. To find the Effectiveness of Yoga on Vital Capacity for the total Sample, age group 13-14 and age group 15-16
2. To find the Effectiveness of Yoga on Maximum Breath Holding Time for the total sample, age group 13-14 and age group 15-16
3. To find the Effectiveness of yoga on maximum expiratory pressure for the total sample, age group 13-14 and age group 15-16
4. To find the Effectiveness of yoga on systolic blood pressure for the total sample, age group 13-14 and age group 15-16.
5. To find the Effectiveness of Yoga on Diastolic Blood Pressure for the total sample, age group 13-14 and age group 15-16
6. To find the Effectiveness of yoga on pulse rate for the total sample, age group 13-14 and age group 15-16

**Section II**

1. Comparison of vital capacity for the yoga group and the control group for the total sample, for the age group 13-14 and for the age group 15-16
2. Comparison of maximum breath holding time for the yoga group and the control group for the total sample, for the age group 13-14 and for the age group 15-16
3. Comparison of maximum expiratory pressure for the yoga group and the control group for the total sample, for the age group 13-14 and for the age group 15-16
4. Comparison of systolic blood pressure for the yoga group and the control group for the total sample, for the age group 13-14 and for the age group 15-16
5. Comparison of diastolic blood pressure for the yoga group and control group for the total sample, for the age group 13-14 and for the age group 15-16
6. Comparison of pulse rate for the yoga group and control group for the total sample, for the age group 13-14 and for the age group 15-16

**Section III**

1. Comparison of percentage change in vital capacity under Yoga based on age
2. Comparison of percentage change in maximum breath holding time under yoga based on age.
3. Comparison of percentage change in maximum expiratory pressure under yoga based on age
4. Comparison of percentage change in systolic blood pressure under yoga based on age
5. Comparison of percentage change in diastolic blood pressure under yoga based on age
6. Comparison of percentage change in pulse rate under yoga based on age

**HYPOTHESIS**

It is hypothesized that yoga training improves the fitness levels of the mentally retarded children on the physiological variables.

**SELECTION OF SUBJECTS**

One hundred and twenty mentally retarded male children from the total population of one hundred and fifty students of C.S.I mentally retarded school, Kotticode, Kanyakumari District were taken for the present study. Mentally retarded children ranking from Intelligence Quotient of fifty to fifty five percent and with thirteen to sixteen years of age were randomly selected as subjects. They were divided into four groups each consisting of thirty subjects. The groups were designated as group

A (Age 13 - 14),

B (Age 15 - 16) experimental group and

C (Age 13 - 14),

D (Age 15 - 16) control group.

#### SELECTION OF VARIABLES

Cardio-respiratory endurance plays a vital role to carry out normal daily activities. Cardio-respiratory endurance involves the co-ordinate function of the heart, lungs, blood and blood vessels to supply sufficient amount of oxygen to the working tissues. The best indicator of how efficient the Cardio-respiratory functions is the maximal rate at which the oxygen can be used by the tissues.

Heart rate is directly related to the rate of oxygen consumption. It is therefore possible to predict the intensity of the work in terms of the rate of oxygen used by monitoring heart rate. The functional capacity of the cardio vascular and pulmonary systems is based on the objective measurement of certain well known physiological parameters. The chief of these are heart rate and rhythm, blood pressure, vital capacity, maximum respiratory breath holding, maximum expiratory pressure, etc

The physiological variables chosen for the study were

#### Vital Capacity

Purpose : To measure the vital capacity

Instrument : A spirometer was used to assess the vital capacity

#### Maximum Breath Holding Time

Purpose : To find out the ability of the subject to hold his breath for some time.

Instrument : A stop watch, a nose clip

#### Maximum Expiratory Pressure

Purpose : To find out the highest pressure maintained for some time.

Instrument : A Sphygmomanometer without the bulb.

#### Blood Pressure

Purpose : To measure the blood pressure

Instrument : A sphygmomanometer and a stethoscope

#### Pulse Rate

Purpose : To find out the normal pulse rate

Instrument : A stop watch

These variables are related to circulatory and respiratory systems and are vital for the physical fitness of the subjects

#### YOGA TRAINING

Sixty chosen subjects were given training according to the following schedule

No of subjects : 60 (male mentally retarded students)

(30 age group 13-14)

(30 age group 15-16)

Duration : 12 weeks

5 days a week

one hour per day

#### Details Of Yoga Training

General warming up was given for five to ten minutes and the Asanas were given for thirty five to forty five minutes on all the training days. The following Asanas and Pranayamas were given





1. Long Sitting Position

1. Padmasana
2. Paschimottasana
3. Matsyasana
4. Yogamudhra
5. Vakrasana
6. Vajrasana
7. Ardha - Matsyendrasana

2. Prone Position

1. Bhujangasana
2. Dhanurasana
3. Salabhasana

3. Supine Position

1. Sarvangasana
2. Vibarethakarani
3. Halasana
4. Savasana

4. Standing Position

1. Thadasana

5. Pranayama

6. Breathing Meditation

STATISTICAL TECHNIQUES

Paired t-test

ANCOVA

t-test

A paired difference t-test was used to find out the effect of yoga on variables then analysis of covariance to used to find out the significance of the variables. Finally t-test was used to compare which group response the training significantly.

RESULTS & DISCUSSION

Effectiveness of yoga in the total sample  
(Paired t-test)

S. No	Variables	Pre Vs Mid	Pre Vs Post	Mid Vs Post
1	Vital Capacity	3.08**	24.11**	23.51**
2	Maximum Breath holding time	2.73**	35.1**	37.2**
3	Maximum Expiratory Pressure	0.22*	25.08**	26.84**
4	Systolic blood pressure	0.57*	1.02*	0.34*
5	Diastolic blood pressure	1.43*	1.16*	0.13*
6	Pulse Rate	2.32**	16.38**	15.77**

\*\* Significant of 0.05 level

\* Not-significant



Effectiveness of yoga in the age group 13-14  
(Paired t-test)

S. No	Variables	Pre Vs Mid	Pre Vs Post	Mid Vs Post
1	Vital Capacity	1.98**	18.7**	18.12**
2	Maximum Breath holding time	2.41**	31.11**	31.13**
3	Maximum Expiratory Pressure	2.11**	40.64**	39.14**
4	Systolic blood pressure	1.57*	0.44*	1.48*
5	Diastolic blood pressure	0.57*	1.59*	1.32*
6	Pulse Rate	2.11**	13.13**	11.9**

\*\* Significant at 0.05 level

\* Not-significant

Effectiveness of yoga in the age group 15-16  
(Paired t-test)

S. No	Variables	Pre Vs Mid	Pre Vs Post	Mid Vs Post
1	Vital Capacity	2.41**	18.18**	17.85**
2	Maximum Breath holding time	2.09**	24.88**	38.63**
3	Maximum Expiratory Pressure	0.72*	13.61**	14.96**
4	Systolic blood pressure	0.72*	0.92*	1.31*
5	Diastolic blood pressure	1.32*	0.41*	0.55*
6	Pulse Rate	1.0*	13.17**	13.45**

\*\* Significant at 0.05 level

\* Not-significant

Analysis of co-variance for the age groups 13-14 AND 15-16  
(ANCOVA)

S. No	Variables	Age group 13-14	Age Group 15-16
1	Vital Capacity	333.91**	298.1**
2	Maximum Breath holding time	968.09**	643.23**
3	Maximum Expiratory Pressure	1551.25**	183.37**
4	Systolic blood pressure	0.19*	0.12*
5	Diastolic blood pressure	3.95*	0.98*
6	Pulse Rate	153.63**	112.77**

\*\* Significant at 0.05 level

\* Not-significant

t-test for the variables

S. No	Variables	t-test
1	Vital Capacity	3.48**
2	Maximum Breath holding time	2.07**
3	Maximum Expiratory Pressure	5.05**
4	Systolic blood pressure	0.74*
5	Diastolic blood pressure	0.32*
6	Pulse Rate	3.51**

\*\* Significant at 0.05 level

\* Not-significant

After the yoga training, on measuring the vital capacity of mentally retarded children with the age groups 13-14 and 15-16, the mean percentages of the age group 13-14 was 3.6 and the age group 15-16 was 2.7. This shows that the mean percentages for the age group 13-14 is higher than the age group 15-16. Thus, the age group 13-14 has shown significant improvement in vital capacity than the age group 15-16.

After the yoga training, on measuring the maximum breath holding time of mentally retarded children with the age groups 13-14 and 15-16, the mean percentages of the age group 13-14 was 20.6 and the age group 15-16 was 17.6. This shows that the mean percentages for the age group 13-14 is higher than the age group 15-16. Thus, the age group 13-14 has shown significant improvement in maximum breath holding time than the age group 15-16.

After the yoga trainings on measuring the maximum expiratory pressure of mentally retarded children with the age groups 13-14 and 15-16, the mean percentages of the age group 13-14 was 10.1 and the age group 15-16 was 7.0. This shows that the mean percentages for the age group 13-14 is higher than the age group 15-16. Thus, the age group 13-14 has shown significant improvement in maximum expiratory pressure than the age group 15-16.

After the yoga training, on measuring the systolic blood pressure of mentally retarded children with the age groups 13-14 and 15-16, the mean percentages of the age group 13-14 was 0.0 and the age group 15-16 was 0.2. This shows that the mean percentages for the age groups 13-14 and 15-16 are almost equal. Thus, the age group 13-14 and 15-16 haven't shown any significant improvement over the other in systolic blood pressure.

After the yoga training, on measuring the diastolic blood pressure of mentally retarded children with the age groups 13-14 and 15-16, the mean percentages of the age group 13-14 was 0.2 and the age group 15-16 was 0.1. This shows that the mean percentages for the age group 13-14 and 15-16 are almost equal. Thus, the age group 13-14 and 15-16 haven't shown any significant improvement over the other in diastolic blood pressure.

After the yoga training, on measuring the pulse rate of mentally retarded children with the age groups 13-14 and 15-16, the mean percentages of the age group 13-14 was 3.5 and the age group 15-16 was 2.4. This shows that the mean percentages for the age group 13-14 is higher than the age group 15-16. Thus, the age group 13-14 has shown significant improvement in pulse rate than the age group 15-16.

#### DISCUSSION AND FINDINGS

The present investigation and findings were supported by many researches through their studies as explained below one after another

Kerstin and others (2007) conducted a study on, Iyengar Yoga increases Cardiac Parasympathetic Nervous Modulation among healthy Yoga practitioners. Relaxation techniques are established in managing of cardiac patients during rehabilitation aiming to reduce future adverse cardiac events. It has been hypothesized that relaxation-training programs may significantly improve cardiac autonomic nervous tone.

Shirley Telles and others (2007) conducted a study on, How Yoga Reduces Symptoms of Distress in Tsunami Survivors in the Andaman Islands. A month after the December 2004 tsunami the effect of a one week yoga program was evaluated on self rated fear, anxiety, sadness and disturbed sleep in 47 survivors in the Andaman Islands. Polygraph recordings of the heart rate, breath rate and skin resistance were also made. Among the 47 people, 31 were settlers from the mainland (i.e. India, ML group) and 16 were endogenous people (EP group). There was a significant decrease in self rated fear, anxiety, sadness and disturbed sleep in both groups, and in the heart and breath rate in the ML group, and in the breath rate alone in the EP group. This suggests that yoga practice may be useful in the management of stress following a natural disaster in people with widely differing

#### MAJOR FINDINGS OF THE STUDY

1. In general, as was hypothesized the group that was given yoga practice (age 13-14) showed much improvement in their physiological traits.
2. The yoga group age 13-14 category has shown significant improvement compared with the yoga group age 15-16. In other words within the group, the significant improvement has been observed in the younger yoga group.
3. Yoga training can shoot up the physical fitness level of the subjects with respect to the four variables, vital capacity, and maximum breath holding time, maximum expiratory pressure and pulse rate.
4. Since there was no significant difference for the first six weeks for both the group (age 13-14 and age 15-16) it is confirmed that the period is not sufficient to show the significant differences on the selected variables.

#### CONCLUSIONS

The chosen six variables were monitored for significant improvement during mid-training period and post-training period. It was observed that two variables systolic blood pressure and diastolic blood pressure revealed no significant improvement either at mid-test



level or at post-test level. However, there was good and considerable improvement in the other four variables namely vital capacity, maximum breath holding time, maximum expiratory pressure and pulse rate at the post-test level.

Thus the yoga training provides an opportunity to increase fundamental perceptual motor skills, rhythm, eye-hand and eye-foot co-ordination, gross and fine motor control, endurance, strength, motor planning and skill performance. Participation in yoga training encourages improved additional behaviors, balance, attending and task orientation, discrimination, transfer and generalization of skills, sense perception and comprehension of body function. Improved motor performance leads to a more active role in self-care, social interaction and expression of feelings. Thus, there is no more education than the yoga training in performing wonders for the severely and profoundly retarded individuals.

#### RECOMMENDATIONS

On the basis of the conclusions, the following recommendations are made :

1. The present study shows that there is significant improvement in vital capacity, maximum breath holding time, maximum expiratory pressure and pulse rate, due to the influence of twelve weeks of yoga training. Hence yoga training could be included as one of the daily training methods to develop the physiological variables of mentally retarded children.
2. Further, it is recommended that the yoga training could be included in the mentally retarded school curriculum.
3. Similar study can be undertaken for other age groups too.
4. Similar study can be undertaken for mentally retarded girls and women.
5. Compulsory yoga education (training) could be imparted in schools and colleges.
6. The students who practice yoga can certainly concentrate more on their studies and score well and achieve a lot.
7. Elders and parents can get a lot of benefits from yoga to lead an illness free life.
8. Society can get illness free citizen through the practice of yoga.

Since yoga gives well-being of the body, mind and soul, it is a complete healing technique to the people of all ages and types.

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## EFFECTIVENESS OF MULTIMEDIA INSTRUCTION: MITIGATION OF DYS CALCULISM AMONG STUDENTS AT THE PRIMARY SCHOOL LEVEL

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### NEED AND SIGNIFICANCE OF THE STUDY

The study aims at identifying the learning difficulties faced by certain students and devising ways and means to overcome them through innovative teaching strategies in the teaching-learning paradigm. Learning disability is a widespread issue in today's society. Children with learning disabilities are found in most schools. Children with such problems may be slow learners, average learners or even gifted ones. They may also have normal hearing and vision. But they may lack the ability to acquire the basic academic skills. These children suffer from severe learning problems in the same way as experienced by mentally or physically handicapped children in terms of their mental or physical abilities respectively. These children are ignored in the classroom due to lack of skills and may be often considered to be lazy, inattentive or less intelligent by their parents and teachers.

If any subject area of study presents problematic situations for sensitive learners in this category and evokes wide critical or satirical comments in school or at home, it is mathematics. It has become quite the social norm for most pupils to say that mathematics is a hard subject. An important subject like mathematics is disliked or feared by quite a large number of students. It is to be doubted whether the fault lies in the nature of the subject or in the methods followed in its teaching. Pupils with mathematical disabilities are children with special educational needs. They have as much right as others to learn mathematics and their needs have to be addressed seriously. The conceptual world of mathematics can bring great joy to these children and it is the responsibility of educators not to deprive them of the pleasure of such an education.

Learning-disabled children in mathematics cannot be considered to be less intelligent. Learning disability can be found in a person of any IQ, from the lowest to the highest level. Some great men are known to have faced learning disability in their student days and later on they rose to the peak of excellence in their respective fields. It is therefore essential for such children to overcome their learning obstacles and to receive the highest quality of mathematics education possible. They need to be specially helped to confront their difficulties through different attitudes and teaching methods. If these children are given the right type of support, they will prove their mettle and win laurels. The awareness that there are certain teaching methods and practical approaches which are effective with such children is essential for schoolteachers at all levels.

The study will be of relevance to teachers in different educational environments who deal with children facing difficulties in mathematics. This study will be highly beneficial in the current educational scenario as it seeks to ensure the right teaching method for the learning-disabled to assimilate mathematical concepts through multimedia aids. The investigator being a student of mathematics, felt the need for adopting a new instructional strategy which would enable the mathematically disabled students to enhance their mathematical ability. Moreover it would be a real contribution to society as it would bring awareness to parents and teachers regarding different types of learning disorders in mathematics found among children and the methods to overcome them. Therefore a study on the effectiveness of multimedia instruction pertaining to the mathematical ability of dyscalculics at the upper primary level is considered to be significant.



## OBJECTIVES OF THE STUDY

The objectives of the study are:

- 1) To identify the dyscalculics studying in Standard V.
- 2) To establish the homogeneity of the control and experimental groups with regard to mathematical ability and intelligence.
- 3) To find the effectiveness of multimedia instruction on the achievement of dyscalculics in mathematics.
- 4) To find out the significant difference, if any, between the control and experimental groups in the achievement gain and retention scores.
- 5) To identify the influence, if any, of intelligence on the achievement of dyscalculics in mathematics.
- 6) To find out the significant difference, if any, between the attitude of the experimental group before and after treatment.

## HYPOTHESES FORMULATED

In the light of the above objectives, the following research hypotheses were formulated for the present study.

- 1) There is homogeneity between the control and experimental groups with regard to mathematical ability and intelligence.
- 2) There is significant difference in the achievement in mathematics between the control and experimental groups studying in Standard V.
- 3) There is significant difference between the gain scores and retention scores of the control and experimental groups.
- 4) There is significant difference in the achievement of the control and experimental groups with regard to the level of intelligence.
- 5) There is significant difference between the attitude of the experimental group towards mathematics before and after treatment.

## METHODOLOGY IN BRIEF

### Method

The method used for the investigation was the experimental method.

The investigator employed the Pretest-Posttest Equivalent Group Design for the present study. The two groups of students studying in Standard V who are equivalent with regard to the aspects namely intelligence and mathematical ability were selected as the control and experimental groups respectively.

### Sample

The investigator selected two matriculation schools of Kanyakumari district in Tamil Nadu to serve as both experimental and control groups respectively. There were 23 Standard V students in each group. All the sample students in both the groups were identified as dyscalculics by conducting a mathematical ability test developed and validated by the investigator for screening those children.

### Tools used

- 1) PrWi's Mathematical Ability Test (PMAT)
- 2) PrWi's Achievement Test in Mathematics (PATM)
- 3) Coloured Progressive Matrices (CPM) by Raven
- 4) Attitude Towards Mathematics Scale (ATMS)

### Statistical Techniques used

t tests for independent and dependent means

## ANALYSIS AND DISCUSSION

The analysis was done to find out the effectiveness of multimedia instruction on mitigation of dyscalculism among students at the primary school level. The collected data from the dyscalculics of Standard V was analysed and interpreted by the investigator. The t-tests for independent means and dependent means were the statistical techniques employed for the



analysis of data to draw conclusions. The data were analysed with a level of significance established at 0.05 or 0.01 levels. In this chapter, the symbol \* denotes significant difference at 0.05 level and \*\* denotes significant difference at 0.01 level.

The data collected was studied from different angles. The data analysis was grouped into seven sections namely i) Analysis for Establishing Homogeneity, ii) Pretest Analysis, iii) Posttest Analysis, iv) Pretest-Posttest Analysis, v) Gain Score Analysis, vi) Delayed Posttest Analysis and vii) Attitude Score Analysis.

**Table 1**

**Difference in the Pretest Scores between the Control and Experimental Groups**

Group	Size	Mean	SD	t value	P value
Control	23	17.96	4.81	0.271	0.788
Experimental	23	17.61	3.82		

Since P value is greater than 0.05, the null hypothesis is accepted at 5% level of significance. Hence it is concluded that there is no significant difference in the pretest scores between the control and experimental groups.

**Table 2**

**Difference in the Posttest Scores between the Control and Experimental Groups**

Group	Size	Mean	SD	t value	P value
Control	23	44.65	5.19	2.65	0.011*
Experimental	23	48.61	4.92		

Since P value is less than 0.05, the null hypothesis is rejected at 5% level of significance. Hence it is concluded that there is significant difference in the posttest scores between the control and experimental groups. The mean scores show that the experimental group performed better than the control group in the posttest.

**Table 3**

**Difference between the Pretest and Posttest Scores of the Control Group**

Category	Size	Mean	SD	t value	P value
Pretest	23	17.96	4.70	19.919	0.000**
Posttest	23	44.65	5.19		

Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance. Hence it is concluded that there is significant difference between the pretest and posttest scores of the control group. The mean scores show that the control group performed better in the posttest than in the pretest.

**Table 4**  
Difference between the Pretest and Posttest Scores of the Control Group with regard to Learning Objectives

Learning Objective	Category	Size	Mean	SD	t value	P value
Knowledge	Pretest	23	25.96	22.40	2.969	0.007*
	Posttest	23	53.61	37.32		
Understanding	Pretest	23	19.87	5.93	13.974	0.000*
	Posttest	23	44.74	7.30		
Application	Pretest	23	15.30	12.13	2.061	0.051
	Posttest	23	26.22	17.94		
Skill	Pretest	23	2.91	13.97	7.812	0.000*
	Posttest	23	56.43	25.38		

Since P value is greater than 0.05 in the case of the learning objective 'application', it is concluded that there is no significant difference between the pretest and posttest scores of the control group with regard to the learning objective 'application'.

But P value is greater than 0.01 in the case of the learning objectives 'knowledge', 'understanding' and 'skill'. Hence it is concluded that there is significant difference between the pretest and posttest scores of the control group with regard to the learning objectives 'knowledge', 'understanding' and 'skill'. The mean scores show that the control group achieved significantly higher in the posttest than in the pretest with regard to the learning objectives 'knowledge', 'understanding' and 'skill'.

**Table 5**  
Difference between the Pretest and Posttest Scores of the Experimental Group

Category	Size	Mean	SD	t value	P value
Pretest	23	17.61	3.97	19.916	0.000**
Posttest	23	48.61	4.92		

Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance. Hence it is concluded that there is significant difference between the pretest and posttest scores of the experimental group. The mean scores show that the experimental group performed better in the posttest than in the pretest.

**Table 6**  
Difference between the Pretest and Posttest Scores of the Experimental Group with regard to Learning Objectives

Learning Objective	Category	Size	Mean	SD	t value	P value
Knowledge	Pretest	23	33.13	20.13	6.82	0.000**
	Posttest	23	72.65	19.20		
Understanding	Pretest	23	18.78	5.68	14.278	0.000**
	Posttest	23	46.57	6.47		
Application	Pretest	23	14.57	12.53	7.410	0.000**
	Posttest	23	42.04	15.81		
Skill	Pretest	23	5.09	12.74	11.308	0.000**
	Posttest	23	57.30	20.62		

Since P value is less than 0.01 in the cases of the learning objectives 'knowledge', 'understanding', 'application' and 'skill', it is concluded that there is significant difference

between the pretest and posttest scores of the experimental group with regard to all the learning objectives 'knowledge', 'understanding', 'application' and 'skill'. The mean scores show that the experimental group achieved significantly higher in the posttest than the in the pretest with regard to all the learning objectives 'knowledge', 'understanding', 'application' and 'skill'.

**Table 7**  
Difference in the Gain Scores between the Control and Experimental Groups

Group	Size	Mean	SD	t value	P value
Control	23	26.70	6.43	2.096	0.042*
Experimental	23	31.00	7.47		

Since P value is less than 0.05, the null hypothesis is rejected at 5% level of significance. Hence it is concluded that there is significant difference in the gain scores between the control and experimental groups. The mean scores show that the experimental group performed better than the control group with regard to gain scores.

**Table 8**  
Difference in the Gain Scores between the Control and Experimental Groups with regard to the Learning Objectives

Learning Objective	Group	Size	Mean	SD	t value	P value
Knowledge	Control	23	27.65	44.67	1.082	0.285
	Experimental	23	39.52	27.79		
Understanding	Control	23	24.87	8.54	1.105	0.275
	Experimental	23	27.78	9.33		
Application	Control	23	10.91	25.39	2.563	0.014*
	Experimental	23	27.48	17.78		
Skill	Control	23	53.52	32.86	0.158	0.875
	Experimental	23	52.22	22.15		

Since P value is greater than 0.05 in the cases of the learning objectives 'knowledge', 'understanding', and 'skill', it is concluded that there is no significant difference in the gain scores between the control and experimental groups with regard to all the learning objectives 'knowledge', 'understanding', and 'skill'.

But P value is less than 0.05 in the case of the learning objectives 'application'. Hence it is concluded that there is significant difference in the gain scores between the control and experimental groups with regard to the learning objective 'application'. The mean scores show that the experimental group earned higher gain score than the control group with regard to the learning objective 'application'.

**Table 9**  
Difference in the Scores of Delayed Posttest I between the Control and Experimental Groups

Group	Size	Mean	SD	t value	P value
Control	23	37.35	6.55	5.709	0.000**
Experimental	23	45.61	4.24		

Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance. Hence it is concluded that there is significant difference in the scores of delayed posttest I between the control and experimental groups. The mean scores show that the experimental group performed better than the control group in delayed Posttest I.



**Table 10**  
Difference in the Scores of Delayed Posttest I between the Control and Experimental Groups with regard to Learning Objectives

Learning Objective	Group	Size	Mean	SD	t value	P value
Knowledge	Control	23	50.74	26.53	3.084	0.004*
	Experimental	23	74.00	24.59		
Understanding	Control	23	37.61	10.29	3.333	0.002*
	Experimental	23	46.09	6.54		
Application	Control	23	21.09	18.23	2.820	0.007*
	Experimental	23	37.61	21.38		
Skill	Control	23	42.83	20.06	0.944	0.350
	Experimental	23	36.91	22.36		

Since P value is greater than 0.05 in the case of the learning objective 'skill', it is concluded that there is no significant difference in the scores of delayed posttest I between the control and experimental groups with regard to all the learning objective 'skill'.

But P value is less than 0.01 in the cases of the learning objectives 'knowledge', 'understanding' and 'application'. Hence it is concluded that there is significant difference in the scores of delayed posttest I between the control and experimental groups with regard to the learning objectives namely knowledge, understanding and application. The mean scores show that the experimental group performed better than the control group in delayed posttest I with regard to the learning objectives 'knowledge', 'understanding' and 'application'.

**Table 11**  
Difference in the Scores of Delayed Posttest II between the Control and Experimental Groups

Group	Size	Mean	SD	t value	P value
Control	23	37.48	7.85	2.215	0.032*
Experimental	23	41.30	6.89		

Since P value is less than 0.05, the null hypothesis is rejected at 5% level of significance. Hence it is concluded that there is significant difference in the scores of delayed posttest II between the control and experimental groups. The mean scores show that the experimental group performed better than the control group in Delayed Posttest II.

**Table 12**  
Difference in the Scores of Delayed Posttest II between the Control and Experimental Groups with regard to Learning Objectives

Learning Objective	Group	Size	Mean	SD	t value	P value
Knowledge	Control	23	62.35	29.09	0.704	0.485
	Experimental	23	56.65	25.65		
Understanding	Control	23	35.61	7.98	2.445	0.019*
	Experimental	23	41.70	8.89		
Application	Control	23	23.91	19.85	1.269	0.211
	Experimental	23	31.96	23.01		
Skill	Control	23	49.39	24.78	0.112	0.911
	Experimental	23	48.61	22.34		

Since P value is greater than 0.05 in the cases of the learning objectives 'knowledge', 'application' and 'skill', it is concluded that there is no significant difference in the scores of delayed posttest II between the control and the experimental groups with regard to the learning objectives 'knowledge', 'application' and 'skill'.

But P value is less than 0.01 in the case of the learning objective 'understanding'. So it is concluded that there is significant difference in the scores of delayed posttest II between the control and the experimental groups with regard to the learning objective 'understanding'. The mean scores show that the experimental group performed better than the control group in delayed posttest II with regard to the learning objective 'understanding'.

**Table 13**  
Difference between the Attitude towards Mathematics of the Experimental Group before and after Treatment

Attitude	Size	Mean	SD	t value	P value
Before Treatment	23	54.30	5.94	12.163	0.000**
After Treatment	23	78.30	6.27		

Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance. Hence it is concluded that there is significant difference in the attitude towards mathematics of the experimental group before and after treatment. The mean scores show that the experimental group had better attitude towards mathematics after the treatment than before the treatment.

**FINDINGS OF THE STUDY**

- 1) There was no significant difference in the pretest scores between the control and experimental groups.
- 2) There was no significant difference in the pretest scores between the control and experimental groups with regard to the learning objectives – 'knowledge', 'understanding', 'application' and 'skill'.
- 3) The experimental group performed better than the control group in the posttest.
- 4) The experimental group performed better than the control group in the posttest with regard to the learning objectives – 'knowledge' and 'application' but not with regard to the other objectives – 'understanding' and 'skill'.
- 5) The control group performed better in the posttest than in the pretest.

- 6) The control group achieved significantly higher in the posttest than in the pretest with regard to the learning objectives – 'knowledge', 'understanding' and 'skill' but not with regard to 'application'.
- 7) The experimental group performed better in the posttest than in the pretest.
- 8) The experimental group achieved significantly higher in the posttest than in the pretest with regard to all the learning objectives – 'knowledge', 'understanding', 'application' and 'skill'.
- 9) The gain score of the experimental group was more than that of the control group.
- 10) The experimental group earned higher gain scores than the control group with regard to the learning objective 'application' but not with regard to the other objectives – 'knowledge', 'understanding' and 'skill'.
- 11) The experimental group performed better than the control group in Delayed Posttest I.
- 12) The experimental group performed better than the control group in Delayed Posttest I with regard to the learning objectives – 'knowledge', 'understanding' and 'application' but not with regard to 'skill'.
- 13) The experimental group performed better than the control group in Delayed Posttest II.
- 14) The experimental group performed better than the control group in Delayed Posttest II with regard to the learning objective – 'understanding' but not with regard to the other objectives – 'knowledge', 'application' and 'skill'.
- 15) The experimental group had better attitude towards mathematics after the treatment than before the treatment.

## INTERPRETATION AND DISCUSSION

The pretest scores indicated that both the control and experimental groups were equal in their subject knowledge prior to experimentation, whatever may be the learning objective. This showed that the two groups were homogeneous.

The experimental group scored higher than the control group in the posttest. This may be due to the fact that the multimedia instruction is more effective than the traditional method of teaching. The students of the experimental group scored higher than the students of the control group in terms of learning objectives - 'knowledge' and 'application'. It shows the effectiveness of multimedia instruction.

The gain score of the experimental group was significantly higher than that of the control group. This shows that multimedia instruction is more effective. With regard to the learning objectives, the gain score of the experimental group was found to be higher than that of the control group in the dimension of 'application'. This implies again that multimedia instruction helped the students better for the 'application' type of questions.

The scores of the two delayed posttests of the experimental group were higher than those of the control group. The scores of delayed posttest I of the experimental group were significantly higher than those of the control group with regard to the learning objectives - 'knowledge', 'understanding' and 'application', and the scores of delayed posttest II of the experimental group were significantly higher than those of the control group with regard to the learning objective - 'understanding'. These findings imply that the use of multimedia instruction caused more prolonged retention than the conventional method of instruction. This shows that the retention ability of the experimental group is better than the control group due to the effectiveness of multimedia instruction.

The experimental group showed a better attitude towards mathematics after the treatment than before the treatment. This shows that the multimedia instruction enhanced not only the academic achievement of the dyscalculics but also made their attitude towards mathematics more favourable.

## EDUCATIONAL IMPLICATIONS

The findings of the study contribute to day-to-day classroom teaching. The results indicate that multimedia instruction may be introduced in schools for the benefit of dyscalculic

students. Multimedia instruction fosters better understanding and retention and hence helps to improve the mathematical skills of the learners concerned. Therefore multimedia instruction could be implemented in all educational institutions, especially for the benefit of students who face severe learning problems.

### i. To the School Administrators:

School administrators are not much aware of learning disabilities like dyscalculia which is very much prevalent these days and does a lot of harm through delay in intervention. Early intervention programmes help in the provision of services to such educationally handicapped children for the purpose of lessening the effects of this disorder and it is the duty of school administrators to organize such programmes. There is close to no effort on the part of school administrators for correct treatment or adoption of strategies to remove the learning blocks that hamper their educational progress. It is highly desirable that schools sensitize their staff to develop in these children the skills they normally fail to develop. The school administrators should not hesitate to seek help from qualified professionals in consultation with the parents of the pupils concerned. Special education services can be organized by the school administrators to help the dyscalculic learners to overcome their problems.

The school administrators have to provide the impetus and support to make inclusive education possible. Along with their staff and parents, the administrators need to plan and have a vision to provide equal opportunities to all the students. As a first step, they can facilitate cross-disciplinary collaboration. Staff training, continuing education and ongoing professional development are the next step. Administrators can support teachers in inclusive schools by providing in-service training that addresses teacher-identified needs. Competent personnel may be employed to impart this training, with the use of diverse methods and this programme may be conducted with the participation of institutions from other districts and incentives may be offered to the teachers concerned for their participation.

School administrators can implement certain academic accommodations and modifications to help the educationally backward children to catch up with the rest of the class. For instance, introducing mathematical laboratories may go a long way in helping these learners to resolve their problems. Students can benefit from conversations and also pronunciation of words through tapes, earphones etc. They can also benefit from visual representations of pictures, diagrams etc. and the use of various media. Innovations in the



design and use of such material must be encouraged by the administrators so that their use makes school mathematics enjoyable and meaningful.

*ii. To the Teachers:*

Awareness of the difficulties that dyscalculics face can enable teachers to open their eyes more to the ways of helping them. Teachers have to become aware of the compensatory strategies that they can use to make these students complete the mathematical tasks and to learn mathematics successfully and joyfully. As a teacher learns about the difficulties faced by each student in learning mathematics, he/she can adopt the right kind of instruction to cater to their specific needs. The task of teaching mathematics to dyscalculics is indeed challenging and by becoming aware of the strategies that can mitigate the difficulties, instructors can grow in confidence in accomplishing this complex task. If schoolteachers gain the insight into the difficulties their pupils face and display the qualities of leadership needed to bring these children out of their isolated world and help them bring out their best, these children can be enabled to integrate into the rest of society and achieve positions of eminence.

Children with learning disabilities require special assistance on the part of teachers. Many students need individual attention to fully grasp certain concepts and it is the duty of teachers to provide individual care and attention to them to help them cope with their learning. The dynamics of teaching has changed with the times. It is necessary that teachers have to change their roles and understand the psychology of each child rather than considering them as herd. The teacher has to identify the challenges faced by the children instead of discouraging them with senseless homework and needs to be a facilitator rather than be a mere instructor. Special educational programmes can be designed by teachers to meet the special needs of these learners. With proper care and teachers' guidance, dyscalculics can be made to do arithmetic calculations in correct ways.

It is necessary for teachers to get rid of technophobia and be familiar with all aspects of technology. It is essential for teachers to be acquainted with the new technologies, learn more about them, and also determine how they may be most appropriately used to facilitate learning. It is essential that teachers adopt different kinds of technologies in the classroom to meet the needs of dyscalculics so as to overcome their learning problems in mathematics and attain tangible improvement in mathematical abilities. By specialized approaches to teaching

most dyscalculic learners can be helped to learn normally. There is a great challenge on the part of teachers to deal with those children with arithmetic disorders by using innovative teaching strategies. By these specialized approaches to teaching, most dyscalculic learners can be helped to learn normally. With more and more emphasis on classroom performance in this era of perfect competition, teachers need to apply the best known techniques to make the children intellectually superior. When properly applied, such techniques help to overcome learning difficulties in mathematics.

*iii. To the Researchers:*

Mathematical skills are indispensable for academic excellence and more researches in this area are becoming increasingly needed. Dyscalculia is seen to be a specific learning disability and requires diagnosis as well as support apart from classroom teaching. It is to be noted that very few research studies have been done in the field of learning disabilities like dyscalculia. It is imperative that researchers come forward to study these learning disorders and adopt certain ways and means to treat these academic sufferers.

Awareness of learning disabilities like dyscalculia is very much essential to investigate about new technologies that can be most appropriately used to facilitate the learning of disabled children. Technologies have the potential to create a conducive atmosphere to active learning by the students. Experimental studies, both culture fair and culture specific, on innovative methods of instruction which may benefit these arithmetic-disabled children other than the computer technologies are also to be done widely for the sake of developing countries. Hence researchers need to come forward to carry out more intensive studies on this area and suggest suitable measures to treat these disabled learners.

*iv. To the Parents:*

Parents also are not optimally aware of learning disabilities like dyscalculia which hinders their child's performance in arithmetic. Awareness of learning disabilities alone helps parents to give the right type of guidance and emotional support to their children. Parents should not discourage them when they lag behind in their studies and they must find out with the help of experts what hampers their children's progress. When they notice that their children have severe problems with arithmetic, they must consult with their teachers and create a friendly environment which is conducive to their learning. Parents should get involved actively in their child's education. They need to understand that children with special needs have to practice at home what they learn at school. They need to provide individual attention to their children to fully grasp mathematical concepts. Parents should make them work with individual

care after school hours and they can be provided with a place to work without distractions. They have to accept the fact that their children can learn only at their own pace of learning and also understand that it is no use pushing them beyond their ability to learn. With proper parental care, dyscalculics can be made to do mathematical calculations in correct ways and to develop their academic skills for optimum achievement.

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## EFFECT OF CO-OPERATIVE LEARNING ON CRITICAL THINKING AND PROBLEM SOLVING ABILITY IN MATHEMATICS AMONG HIGHER SECONDARY STUDENTS.

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#### NEED AND SIGNIFICANCE OF THE STUDY

Learning Mathematics develops the skills of reasoning, logical thinking and problem solving. Many students consider learning Mathematics as a difficult task. Some students even develop hatred towards mathematics. All these because, a majority of the teachers follow traditional methods of instruction. Hence, the need of the hour is to adopt learner centered approaches like co-operative learning in the class room. In Co-operative learning students work together and use their skills for the success of their group. Co-operative learning approach makes students to think critically, analyze problems and use appropriate learning resources. Co-operative learning encourages interaction among learners and teachers, and develops critical thinking and problems solving abilities. Critical thinking involves making students analyse information and to deal with cognitive and reasoning abilities. Students should be prepared to solve their problems on their own. Dave Atals (2000) views that combining critical thinking and problem solving to the area of co-operative learning will enhance process acquisition and develop affective domain. Students need to develop their critical thinking skills and problem solving abilities for their survival in a rapidly changing world.

#### STATEMENT OF THE PROBLEM

Effect of Co-operative Learning on Critical Thinking and Problem Solving Ability in Mathematics among Higher Secondary Students.



## OPERATIONAL DEFINITIONS OF KEY TERMS

### Effect

Here 'effect' means the difference between mean scores obtained by the students in critical thinking and problem solving ability in Mathematics when taught through the co-operative learning approach and the traditional method.

### Co-operative learning

Co-operative learning is a teaching approach, in which small groups of learners each with different levels of ability, work together as a team to complete a task. Each member of a team is responsible not only for learning what is taught but also for helping team-mates to learn.

Here it means, teaching Mathematics for the first year higher secondary students following the co-operative learning approach. For this the investigator prepared lesson plans in plus one Mathematics for the topics 'Functions and Graphs', and 'Analytical Geometry' and taught the students for 30 working days with a duration of 90 minutes per day.

### Critical thinking

Critical thinking is the ability to decide rationally what to believe or do.

Here, Critical thinking means the scores obtained by the first year higher secondary Mathematics students in the critical thinking ability test (having statements in areas of assumption, interpretation, deduction and the evaluation), constructed and administered by the investigator.

### Problem solving ability in Mathematics

Problem solving ability is a deliberate act on the part of an individual to realize the set goals through some planned steps for the removal of obstacles in the path.

Here, Problem solving ability refers to, the scores obtained by the first year higher secondary Mathematics students in the Problem solving ability test constructed and administered by the investigator. The test consisted of Mathematical formulation, Arithmetic reasoning, Numerical ability and Non-verbal Problems.

### Higher secondary students

Higher secondary students here means the first year English medium Mathematics group students who studied in Higher Secondary Schools of Kanyakumari District in Tamil Nadu following State Board syllabus during the academic year 2010-2011.

## OBJECTIVES OF THE STUDY

- To prepare lesson plans in Co-operative learning approach for teaching plus one Mathematics for the units 'Functions and graphs' and 'Analytical Geometry' for the first year Higher Secondary students.
- To construct and validate Critical Thinking Ability test and Problem Solving Ability test in Mathematics at Higher Secondary level.
- To construct and validate an Attitude Scale towards Co-operative Learning Approach.
- To investigate the effectiveness of co-operative learning approach on critical thinking ability and Problem solving ability among the higher secondary students with respect to gender, locality, and achievement level.
- To find out the Gap Closures in the performance in critical thinking ability and problem solving ability in Mathematics of the experimental group and the control group.
- To compare the Attitude scores of the co-operative learning group and the traditional group among the higher secondary students with respect to gender, locality and achievement level in the pre test and post test level.
- To find out whether there is any significant difference in the ratings of teachers and students on the comparative efficacy of co-operative learning approach and traditional method in realizing educational outcomes in Mathematics.
- To find out the extent of using co-operative learning approach by the higher secondary Mathematics teachers in their teaching – learning process.
- To study the suitability of co-operative learning approach in terms of existing curricular and administrative factors such as (i) syllabus (ii) time table (iii) examination.

## HYPOTHESES

- \*  $H_1$  There will be significant difference between the effectiveness of the co-operative learning approach and the traditional method on critical thinking ability and Problem solving ability with respect to (i) Total sample, (ii) Gender, (iii) Locality and (iv) Achievement level, in the pre test, post test and adjusted post test levels.
- \*  $H_2$  There will be significant difference between the pre test and the post test of critical thinking ability and Problem solving ability of the co-operative learning approach and the traditional method groups with respect to (i) Total sample, (ii) Gender, (iii) Locality and (iv) Achievement level.





- $H_1$  There will be significant difference between the experimental group and the control group in their attitude towards Co-operative Learning with respect to (i) Total sample, (ii) Gender, (iii) Locality and (iv) Achievement level in the pre test and post test levels.
- $H_2$  There will be significant difference between the co-operative learning approach and the traditional method in the comparative efficacy of realising educational outcomes under three domains in Mathematics with respect to teachers and students.

### METHODOLOGY IN BRIEF

#### Method Adopted in the Present Study

Experimental cum Survey Method.

#### Design of the Experiment

For the present study the investigator adopted the 'Equivalent group Pre test - Post test design'. Matched Group technique was adopted for equating the groups. Groups were equated in terms of Gender, Age, Intelligence, Socio Economic Status, and Previous Achievement in Mathematics. After equating the two groups, the experimental and control groups were formed through random assignment of subjects.

#### Population

Higher Secondary English medium Mathematics group students studying in various schools of Kanyakumari District following Tamil Nadu State Board syllabus and Higher Secondary School Mathematics teachers.

#### Sample

The Sample taken for the study was of 214 Mathematics group students of class XI from two Government Aided schools namely St. Joseph's Higher Secondary school, Mulagumoodal (urban) and St. Mary Goretti Higher Secondary School, Manalikkaran (rural) in Kanyakumari District of Tamilnadu. Since the investigator had to collect data from boys, girls, rural and urban students, stratified sampling technique was used. There were 107 students in the Experimental group and 107 students in the control group.

#### Instrumentation

Tools constructed and validated by the investigator and the Guide for the study:

- Lesson plans on Co-operative learning approach
- DEESA Critical Thinking Ability Test



- DEESA Problem Solving Ability Test
- DEESA Attitude Scale towards Co-operative Learning
- DEESA Co-operative Learning Opinions for teachers
- DEESA Rating Scale on comparative efficacy of the Co-operative learning approach and the traditional method in learning Mathematics

#### Procedure Adopted for the Experimentation

- Formation of experimental and control groups through random selection
- Administration of the Pre test for both groups.
- Treatment for 30 days with duration of 10 minutes to both groups.
- Administration of the post test for both groups.
- Administration of the attitude scale for both groups.
- Administration of Co-operative learning Opinions for teachers
- Administration of Rating Scale for rating the comparative efficacy of the co-operative learning approach and the Traditional Method.

#### Statistical Techniques Used

- \* t-test
- \* ANCOVA
- \* Percentage

#### DELIMITATIONS OF THE STUDY

- Duration of the study was delimited to only 30 working days
- Only two units were selected
- Study was limited to English medium Mathematics plus one students of Kanyakumari dist.

#### FINDINGS

The mean scores of Critical Thinking Ability of the Co-operative Learning Approach group and the Traditional Method group at the pre-test level.

There was no significant difference in the mean scores of critical thinking ability of the students of the co-operative learning approach group and the traditional method group in the

pre test level. Also boys and girls, rural and urban, and high, middle and low achievers of the experimental and the control groups did not differ significantly in their mean scores critical thinking ability in the pre test level.

**The mean scores of Critical Thinking Ability of the Co-operative Learning Approach group and the Traditional Method group at the post -test and adjusted post test level.**

The post test t value on the mean scores of critical thinking ability of the higher secondary students showed remarkable difference between the co-operative learning approach group and the traditional method group ( $t=16.45, p<0.01$ ). The ANCOVA analysis showed that the mean scores of critical thinking ability of the students of the co-operative learning approach group was higher than the students of the traditional method group ( $F = 420.02, P<0.01$ ). Hence the co-operative learning approach was more effective than the traditional method in developing critical thinking ability among the higher secondary students.

**Effectiveness of the Co-operative Learning Approach on Critical Thinking Ability with respect to gender in the post test level.**

The post test t value for critical thinking ability for boys showed remarkable difference between the two groups ( $t=8.96, P<0.01$ ). The ANCOVA analysis showed that the boys of the co-operative learning group possessed higher critical thinking ability than that of the traditional group method ( $F=112.572, p<0.01$ ). And the post test t value for critical thinking ability of girls who studied through co-operative learning approach was higher than that of the traditional method group ( $t=14.77, p<0.01$ ). Analysis of covariance revealed that F value was statistically significant at 0.01 level ( $F=438.913, p<0.01$ ). Thus the co-operative learning approach was more effective than the traditional method in developing the critical thinking ability of both the boys and the girls.

**Effectiveness of the Co-operative Learning Approach on Critical Thinking Ability with respect to locality in the post test level.**

The co-operative learning approach group and the traditional method group differed significantly in critical thinking ability among the urban students ( $t=11.66, p<0.01$ ). From the analysis of covariance, it was evident that the critical thinking ability of the urban students was significantly higher in the co-operative learning approach group than in the traditional method group ( $F = 184.079, p<0.01$ ). Rural students also differed significantly in their critical thinking ability in the co-operative learning group and the traditional method group ( $t = 11.85, p<0.01$ ). The analysis of covariance revealed that the critical thinking ability of the rural students was

significantly higher in the co-operative learning approach than in the traditional method group ( $F = 239.802, p<0.01$ ). Hence the co-operative learning approach was more effective than the traditional method in developing the critical thinking ability among the urban and the rural students.

**Effectiveness of the Co-operative Learning Approach on Critical Thinking Ability among high, middle and low achievers in the post test level.**

The t value for the high achievers on critical thinking ability showed remarkable difference between the two groups ( $t=10.74, p<0.01$ ). The ANCOVA analysis showed that the high achievers of co-operative learning group were better than that of traditional group in their critical thinking ability ( $F=160.360, p<0.01$ ). The t value for the middle achievers on critical thinking ability showed remarkable difference between the two groups ( $t=15.16, p<0.01$ ). ANCOVA analysis showed that the middle achievers of co-operative learning group were better in their critical thinking ability than that of the traditional method group ( $F=326.166, p<0.01$ ). And the t value for low achievers on critical thinking ability showed remarkable difference between the two groups ( $t=5.65, p<0.01$ ). The ANCOVA analysis showed that the low achievers of the co-operative learning group were better in their critical thinking ability than the students of the traditional method group ( $F=77.149, p<0.01$ ). Thus it was concluded that the co-operative learning approach was more effective than the traditional method in developing critical thinking ability among the high, the middle and the low achievers

**Gap Closure of the Co-operative Learning Approach group and the Traditional Method group.**

The gap closure on critical thinking ability for the co-operative learning approach group students was higher than those of the traditional method group students.

**Problem Solving Ability in Mathematics between the Co-operative Learning Approach and the Traditional Method at the pre-test level.**

There was no significant difference between the students of the co-operative learning approach group and the traditional method group in their problem solving ability at the pre test level. Also boys and girls, rural and urban, and high, middle and low achievers of the co-operative learning approach group and the traditional method group did not differ significantly in their problem solving ability in Mathematics at the pre test level.

There was no significant difference between the students of the co-operative learning approach group and the traditional method group in their problem solving ability at the pre test level. Also boys and girls, rural and urban, and high, middle and low achievers of the co-



operative learning approach group and the traditional method group did not differ significantly in their problem solving ability in Mathematics at the pre test level.

There was no significant difference between the students of the co-operative learning approach group and the traditional method group in their problem solving ability at the pre test level. Also boys and girls, rural and urban, and high, middle and low achievers of the co-operative learning approach group and the traditional method group did not differ significantly in their problem solving ability in Mathematics at the pre test level. **Effectiveness of the Co-operative Learning Approach on Problem Solving Ability in Mathematics for the total sample at the post test level.**

It was evident from the post test t value, scores on problem solving ability in Mathematics of higher secondary students showed a remarkable difference between the two groups ( $t=13.12, p<0.01$ ). The ANCOVA analysis showed that the problem solving ability in Mathematics of students of the co-operative learning approach group was better than that of the traditional method group ( $F=368.11, p<0.01$ ). Thus it was concluded that the problem solving ability in Mathematics of the students of the co-operative learning approach group was greater than the traditional method group.

**Effectiveness of the Co-operative Learning Approach on Problem Solving Ability with respect to gender in the post test level.**

The t value for the problem solving ability of the boys showed a remarkable difference between the two groups in the post test level ( $t=7.56, p<0.01$ ). The ANCOVA analysis showed that the problem solving ability of the co-operative learning approach group was higher than that of the traditional method group for boys ( $F=151.343$ ). Thus it was proved that the co-operative learning approach was more effective than the traditional method in developing problem solving ability of the boys.

The post test t value for rural students on problem solving ability in Mathematics showed a remarkable difference between the two groups ( $t=10.14, p<0.01$ ). The ANCOVA analysis showed that the problem solving ability of rural students of the co-operative learning approach was higher than that of the traditional method group ( $F=226.053, p<0.01$ ). Hence the co-operative learning approach was more effective than the traditional method in developing the problem solving ability in Mathematics among the rural students.

**Effectiveness of the Co-operative Learning Approach on Problem Solving Ability with respect to achievement level in the post test level.**

The post test t value indicated that the co-operative learning approach group and the traditional method group differed significantly in developing the problem solving ability for the high achievers ( $t=6.19, p<0.01$ ). The ANCOVA analysis showed that, the high achievers of the

co-operative learning approach had better problem solving ability than that of the traditional method group ( $F=45.359, p<0.01$ ). Hence the co-operative learning approach was more effective than that of the traditional method in developing problem solving ability among the high achievers.

There was significant difference between the co-operative learning approach group and the traditional method group in their problem solving ability of the middle achievers ( $t=11.36, p<0.01$ ). The ANCOVA analysis showed that the middle achievers in the co-operative learning approach showed better problem solving ability than the traditional method group

( $F=200.433, p<0.01$ ). Hence, the co-operative learning approach was more effective than that of the traditional method in developing problem solving ability in Mathematics among the middle achievers.

There was significant difference between the co-operative learning approach group and the traditional method group in the problem solving ability of the low achievers ( $t=6.91, p<0.01$ ). The ANCOVA analysis showed that the low achievers in the co-operative learning approach showed better problem solving ability than the traditional method group ( $F=97.487, p<0.01$ ). Hence the co-operative learning approach was more effective than the traditional method in developing the problem solving ability in Mathematics of the low achievers.

**Gap Closure of the Co-operative Learning Approach group and the Traditional Method group.**

The gap closure for the problem solving ability of the experimental group students was greater than the control group students.

**Attitude towards Co-operative Learning between the Experimental group and the Control group at the pre-test level.**

There was no significant difference between the students of the co-operative learning approach group and the traditional method group in their attitude towards co-operative learning at the pretest level. Also boys and girls, rural and urban, and high, middle and low achievers of the experimental and the control group did not differ significantly in their attitude towards co-operative learning. Both the co-operative learning approach group and the traditional method group were similar in their attitude.

**Change in Attitude towards Co-operative Learning Approach for the total sample**

The post test attitude scores of the cooperative learning approach group differed significantly at 0.01 level ( $t=53.96, p<0.01$ ). Thus there was significant change in attitude of the experimental group after the experiment. The change was in a positive direction towards the cooperative learning approach.



**Change in Attitude towards Cooperative Learning Approach with respect to gender**

There was a significant difference between the pre and the post test mean scores of attitude towards co-operative learning of the experimental group boys. The t value was significant at 0.01 level ( $t=41.24, p<0.01$ ), and it was in favour of the post test. It showed a positive change in attitude towards the co-operative learning among the experimental group boys.

There was a significant difference between the pre and the post test mean scores of attitude towards co-operative learning of the experimental group girls. The t value was significant at 0.01 level ( $t=36.02, p<0.01$ ) and it was in favour of the post test. It showed a positive change in attitude towards co-operative learning among the experimental group girls.

**Change in Attitude towards the Co-operative Learning Approach with respect to locality.**

There was a significant difference between the pre and the post test mean scores of the experimental group urban students in their attitude towards co-operative learning. The t value was significant at 0.01 level ( $t=33.19, p<0.01$ ), and it was in favour of the post test. It showed that the urban students had a positive change in attitude towards the co-operative learning.

There was a significant difference between the pre and the post test attitude scores of the experimental group rural students. The t value was significant at 0.01 level ( $t=47.98, p<0.01$ ), and it was in favour of the post test. It showed that the rural students of the experimental group had a positive change in attitude towards the co-operative learning.

**Change in Attitude towards Co-operative Learning with respect to achievement level.**

There was a significant difference between the pre and the post test attitude scores of the high achievers of the experimental group. The t value was significant at 0.01 level ( $t=29.42, p<0.01$ ), and it was in favour of the post test. It showed that the high achievers of the experimental group had a positive change in attitude towards co-operative learning approach.

There was a significant difference between the pre and the post test attitude scores of middle achievers of the experimental group. The t value was significant at 0.01 level ( $t=40.58, p<0.01$ ) and it was in favour of the post test. It showed that the middle achievers of the experimental group had a positive change in attitude towards cooperative learning.

There was a significant difference between the pre and the post test attitude scores of the experimental group low achievers. The t value was significant at 0.01 level ( $t=22.32, p<0.01$ ) and it was in favour of the post test. It showed that the low achievers of the experimental group had a positive change in their attitude towards co-operative learning.

**Attitude of the Control group students towards Co-operative Learning.**

There was no significant difference between the pre and the post test attitude scores of the control group. The t value was not significant at 0.01 level ( $t=1.76, p>0.05$ ). It showed that there was no change in attitude of the control group students (total as well as sub samples namely gender, locality and achievement level) towards co-operative learning.

**Ratings of Teachers on the Comparative Efficacy of the Co-operative Learning Approach and the Traditional Method in Realizing Educational Outcomes.**

From the ratings of the teachers it was evident that the co-operative learning approach was significantly higher than that of the traditional method in realizing all the educational outcomes ( $t=13.95, p<0.01$ ). It indicated that the co-operative learning approach was superior in developing educational outcomes with respect to the cognitive, affective and psycho motor aspects of learning in Mathematics.

**Ratings of Students on the comparative efficacy of the Cooperative Learning Approach and the Traditional Method in realizing educational outcomes.**

From the ratings of the students it was evident that the co-operative learning approach was significantly higher than that of the traditional method in realizing all the educational outcomes ( $t=28.16, p<0.01$ ). It indicated that the co-operative learning approach was superior in developing educational outcomes with respect to the cognitive, affective and psycho motor aspects of learning in Mathematics.

**Opinion on the Extent of using the Co-operative Learning Approach**

Regarding the extent of using co-operative learning approach in teaching, 84% of the teachers reported that they never used the co-operative learning approach in their teaching-learning process. And 16% of the teachers used sometimes (for some particular topics) in their teaching-learning process.

**Opinion on the Suitability of using the Co-operative Learning Approach in teaching Mathematics.**

Regarding the suitability of the existing time table, a great majority, i.e. 76% of the teachers reported that the existing time table is not at all suitable for implementing the co-operative learning approach in schools. 60% of the teachers reported that the present syllabus is suitable only to some extent for implementing the co-operative learning approach in schools and 52% of the teachers reported that the present system of examination is not at all suitable for implementing the co-operative learning approach in schools.

### Opinion on the Reasons for not using the Co-operative Learning Approach in teaching Mathematics.

With respect to the reasons for not using the co-operative learning approach, 84% of the teachers reported that due to lack of training in the co-operative learning approach, they were not using it in their teaching – learning process. 76% reported that due to lack of time they were not using this in their teaching – learning process. 56% of the teachers reported that due to lack of suitable reference materials they were not able to use it in their teaching learning process and 40% of the teachers reported that implementing co-operative learning was a laborious work for them to a great extent.

### Opinion on the Practical difficulties encountered while using Cooperative Learning Approach in teaching Mathematics

With regard to the practical difficulties likely to be encountered, 80% of the teachers viewed that the main practical difficulty encountered was inadequate knowledge about this approach. 60% of the teachers reported that the practical difficulty encountered to a great extent was the rigid time table. 10% felt that to a some extent difficulty in maintaining discipline, 36% of teachers reported that to a some extent the overcrowded class room, and 10% of the teachers opined that to a great extent it affected the examination oriented teaching.

### Opinion on Attaining the objectives in teaching Mathematics while using Co-operative Learning Approach.

As regards attaining of the objectives in teaching and learning and Mathematics a great majority of the teachers i.e., 88% reported that the co-operative learning approach was effective and suitable method for attaining the objectives namely to develop interest in Mathematics. 92% of the teachers reported that it helped to develop scientific attitude. 80% of the teachers viewed that it helped to develop skill in doing mathematical problems. 68% of the teachers reported that it helped to develop speed and accuracy. 60% of the teachers reported that it provided better achievement. 76% of the teachers mentioned that it helped to develop higher order thinking. 72% of the teachers reported that it helped to develop scientific approach in problem solving. 64% of the teachers reported that it helped to solve daily life problems. 76% of the teachers reported that it helped to inculcate scientific values. And 84% of the teachers reported that it provided a better co-operation among the students

### SUGGESTIONS FOR IMPLEMENTING THE CO-OPERATIVE LEARNING APPROACH.

The following suggestions were given by the teachers for the successful implementation of the cooperative learning approach in schools.

- i. Provide adequate training in co-operative learning approach.
- ii. Provide adequate reference materials related to this approach.
- iii. Reduce teacher-pupil ratio.
- iv. Reduce the content.
- v. Revise the curriculum to suit this approach.
- vi. Modify the timetable.
- vii. Reform the Examination system.

### DISCUSSION

- Ø The findings of the study supports the already available literature regarding cooperative learning approach as advocated by Hooper (1992), Johnson and Johnson (1993), Slavin(1995), Klein and Doran (1999) and Webb (1982).
- Ø In this approach, the heterogeneous cooperative groups the low achievers scored more, and the middle and the high achievers did not lower their performance. This is in consistent with the findings of Johnson and Johnson (1993), Simisek and Tsui (1992) Paraston (1994) and Amstrong(1994).
- Ø Co-operative learning approach group possessed more critical thinking ability since they were responsible, committed, cooperative, helpful in their work and comprehended the material well. These findings are in tune with Gokhale,A.(1995), Dee Fink.,(2004), and Karen Yeok-Hwa (1998).
- Ø Co-operative learning approach group possessed more problem solving ability since there was team work, negotiation, thinking, peer teaching and group interactions. This is inconsistent with Ismail, Nor azilah Nagah (2010), Sean,P(2)10, Tarim (2009), and Adeyemi (2008).

### EDUCATIONAL IMPLICATIONS

- From the results found out in this study, the co-operative learning approach remains to be more effective one to enhance critical thinking and problem solving ability in Mathematics among Higher Secondary students.
- It brings out all human potentialities such as motivation, sharing, self expression, team spirit, brotherhood and individual accountability . Therefore the teaching learning process should always include Co-operative learning approach.



- Co-operative learning environment is conducive for children to learn better and faster from peers. The students who are weak and not able to follow the teachers in the classroom often learn from their peers and such a practice need to be encouraged in all educational contexts.
- Developing critical thinking skill and problem solving ability requires, adequate pedagogical treatment like co-operative learning. Hence, teachers should have a positive attitude towards cooperative learning approach and the students should be given chances to do group works, discussions, and presentations and peer learning in the regular teaching- learning process.
- Critical thinking helps in solving problems. So schools should place higher emphasis on developing critical thinking ability of the students instead of encouraging rote memorization.
- Cooperative learning increases critical thinking ability and the mental ability of the students, which tends to resolve problems associated with life. So it is advisable for the teachers to adopt co-operative learning approach in Faculty improvement programmes namely orientation courses, refresher courses, seminars and workshops could be organized for teachers to familiarize them with the various aspects and techniques of co-operative learning approach.
- Teachers could be provided with resources to teach Mathematics using co-operative learning approach and to overcome administrative and curricular problems.
- Faculty improvement programmes namely orientation courses, refresher courses, seminars and workshops could be organized for teachers to familiarize them with the various aspects and techniques of co-operative learning approach.
- Changes in the present syllabus and existing examination system can be brought for the effective implementation of co-operative learning.
- Flexible time table for implementing co-operative learning approach effectively may be designed in schools.
- For implementing co-operative learning approach, every school and college may be equipped with suitable contents, literature related to it and other reference materials.
- Government and other agencies, the central and states should take the responsibility to have remedial measures and give encouragement to teachers to promote co-operative learning approach in schools

- The present B.Ed. and M.Ed. curriculum could be reconstructed so as to include the importance, use and practice of co-operative learning approach in it.
- The teacher pupil ratio may be reduced for providing individual attention when the students are working in groups.
- Ample time could be allotted for students for discussion, doing exercises, reflection and planning critical thinking and problem solving strategies.

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