EFFECT OF YOGA ON MATHEMATICS ACHIEVEMENT

A

THESIS

BY

SUDIP RAJ KUSHWAHA

IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF MASTER OF EDUCATION

SUBMITTED

TO

DEPARTMENT OF MATHEMATICS EDUCATION

CENTRAL DEPARTMENT OF EDUCATION

UNIVERSITY CAMPUS

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शिक्षा शास्त्र संकाय
शिक्षा शास्त्र केन्द्रीय विभाग
TRIBHUVAN UNIVERSITY
FACULTY OF EDUCATION
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विश्वविद्यालय क्याम्पस
कीर्तिपुर, काठमाडौं, नेपाल
फोन नं.: ४३३१३३७

UNIVERSITY CAMPUS
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Ref.

मिति:.....
Date:

LETTER OF APPROVAL

Thesis

Submitted

By

Sudip Raj Kushwaha

Entitled:

"Effect of Yoga on Mathematics Achievement" has been approved in partial fulfillment of the requirements for the Degree of Masters of Education.

Committee for the Viva-voce	**Signature**
Asso. Prof. Laxmi Narayan Yadav (Chairman)	……..……
Prof. Dr. Hari Prasad Upadhyay (Member)	……..……
Dr. B. L. Shah (Member)	……..……

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LETTER OF CERTIFICATE

This is to certify that **Mr. Sudip Raj Kushwaha**, a student of academic year 2068/69 with campus Roll Number 15, Thesis Number 1101 'B', Exam Roll Number 281220(2069), and T.U. Registration Number 9-3-28-54-2011, have completed his thesis under the rules and regulations of Tribhuvan University, Nepal. The thesis entitled **"Effects of Yoga on mathematics Achievement"** embodies the results of his investigation conducted during the period 2016, in the Department of Mathematics and computer science education, university campus, Tribhuvan University, Kirtipur, Kathmandu, Nepal. I hereby, recommend and forward that his thesis be submitted for the evaluation as the partial requirements to award the degree of Master's in Education.

…… ……

(Dr. B. L. Shah) (Asso. Prof. Laxmi Narayan Yadav)

Supervisor Chairma

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I owe my deepest gratitude to the supervisor Dr. B. L. Shah, Reader, Department of Mathematics Education, Central Department of Education, T.U., Kirtipur, Kathmandu for his invaluable suggestions, guidance and help throughout this study. It is an honor for me to complete this study under his guidance. He has supported in a number of ways by helping me in collecting surveys, providing guidance for the data analysis, editing and so on.

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I am also indebted to many of my friends and participants for their valuable time in collecting the surveys. This study not has been possible without their help and support.

.....

Sudip Raj Kushwaha

Abstract

The subject mathematics taken as complex for all people due to mathematical thinking from ancient time. In this context, this study was aimed to study the effect of yoga on mathematics learning. It was also intended to examine the mathematics achievement of yogic and non- yogic students. Research design was quantitative. Pre-test and post- test method used as data collection tools. In order to fulfill the objectives of this study, the researcher selected 30 students of grade nine from Shree Secondary School Hanumannagar Brahaman Gorchhadi, Lahan-20 Siraha district. Experimental group and control group were given pre-test and post-test before treatment and after treatment respectively. The yoga module presented 12 weeks for experimental group.

The study found that there is significance influence of yoga on mathematics achievement as well as improving low mathematics achievement. The student who practiced yoga module yielded higher achievement in mathematics than not taking yoga exercise. It is also seen that yogic students have self confidence, more concentration, fell alert an focused on subject matter. Thus, the researcher concluded that the yoga practicing effective for mathematics learning.

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Chapter I

INTRODUCION

Background of the Study

Man is always eager to know about himself and his surroundings. The great difference between man and lower animals is that men are capable of taking circuitous path for the attainment of their ends, while the lower animals have their mind so filed up with their needs that they try to seize the object they want, remove that which annoys them in a direct way. Man's all queries are not answered so he starts for searching the answer which gives birth to arts, science, medicine, mathematics etc .The development of mathematics due to man's imagination and creativity. Specifically, mathematics has become a necessary component in evolution of man. Mathematics reflects the culture and civilization of human race. It is said that history of mathematics is nothing but history of human race (sekhar and sudhakar,2006). Each and every human civilization has some forms of mathematics depending on their needs and circumstance. The gradual development of mathematics took place because of solving daily life problems. In this context, Eves writes:

"With the gradual evolution of society, simple counting exists. A tribe had to know how many members it had and how many enemies, and a men found it necessary to know if his flock of sheep was decreasing in size. Probably the earliest way of keeping a count was by some simple tally method, employing the principle of one to one correspondence. In keeping a count on sheep, for example, one finger per sheep could be turned under. Counts could also maintained by making collections of pebbles on sticks by making scratches in the dirt or on a stone, by cutting notches in a piece of wood, or by tying knots in a string. Then perhaps later, an assortment of vocal sound was developed as a word tally against the number of objects in a small group. And still later with the refinement of writing an assortment of symbols was devised to stands for numbers".

Mathematics is the science that deals with the logic of shape, quantity and arrangement. Math is all around us, in everything we do. It is the building block for everything in our daily lives, including mobile devices, architecture (ancient and modern), art, money, engineering, and even sports. Galileo Galileo (1564-1642) said, “The universe cannot be read until we have learned the language and become familiar with the character in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures,without which means it is humanly impossible to comprehend a single word. Without these, one is wending about in a dark labyrinth”. Carl Friendrich Gauss (1777-1855) referred mathematics as “the queen of the sciences”. Einstein (1879-1955) stated that “as far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality”.

The needs of math arose based on the wants of society. The more complex a society, the more complex the mathematical needs. In modern world, Mathematics is used throughout the world as an essential tool in many fields, including natural science, engineering, medicine, finance and the social sciences. Applied mathematics, the branch of mathematics concerned with application of mathematical knowledge to other fields, inspires and makes use of new mathematical discoveries, which has led to the development of entirely new mathematical disciplines, such as statics and game theory. Due to use of mathematics in every field of human life, each people needed to learn mathematical knowledge. That’s why each country has included mathematics as a compulsory subject in school curriculum. But the subject mathematics taken as complex for all people due to mathematical thinking from ancient time. Lakatossays, mathematical thinking is combination of complicated processes:guessing, induction, deduction, specification, generalization, analogy, formal and informal reasoning, verification, and so on through brain thinking.

Different learning theories, teaching materials, curriculum model has developed to make learning activities effective and easy, to solve learning difficulties etc. But, because of learner physical, psychological, social, cultural, environmental etc. factors affect their learning. So, yoga will help to solve such type of problems.

What is Yoga?

Yoga as a way of life would bring health and wealth, peace and efficiency, harmony and growth in individuals. Yoga was developed by the ancient vedic masters which are fundamentally divided into five specific forms. They are Karmayoga, Rajayoga, Bhaktiyoga, Gyanayoga and Hathayoga. This research study concern with Hath yoga. The Hathayoga has many *Kriyas as* Asana, Pranayama' Mudra, Neti, Dhouti etc. But, researcher use Pranayama and Meditation for this research study. Yoga as a life style or systematic techniques for improving the physical body and mind has so many benefits that the first and essential of them is personal discipline. When the personal discipline is stabilizing in life it affect on most of human function. So it seem if yoga techniques considered in physical education program it can be affect on all the students functions special in academic achievement .

Statement of the Problem

This Study is mainly concern with how yoga affects low mathematics achievement students. In other words, this study try to find the answer of the question "Is yoga help to improve low mathematics achievement"? So, the problem has based upon the seekanswer of the following questions.

- Is yoga practicing effect on mathematics learning?
- Does yoga practicing help to improve low mathematics achievement students?
- What is the difference between mathematics achievement of yogic and non-yogic students, statically?

Objectives of the Study

This study has intended to accomplish the following objectives.

1. To compare the mathematics achievement of yogic and non-yogic students at secondary level.
2. To find out the effect of yoga on mathematics learning?

Significance of the Study

In present days Frustration, Anxiety, Mental Stress etc. Mental related diseases are increasing in our society. Due to these diseases many persons including the students feels Isolation, Anger, Confusion, Depression, Mood disorders, Attention deficit-hyperactive disorder, Obsessive disorder, Adjustment disorder etc. Under the effect of on top of Mental related disorders the level of students' Exam's Achievements are much low.

The training of 'YOGA' will give the proper direction for the betterment in Exam's achievements & much give positive effect for living peaceful life and help educators to prepare a yoga module for students. Hence the significances of the study are follows:

- The result of this study will help to the national policy maker, mathematics curriculum designer, research persons and educational administrators.
- It will help for further research on 'Effect of Yoga' in different sectors.
- This result of this study will help teachers, trainers, educators and writers too.
- It will be helpful for resource persons.
- This study will may demand yoga program in teaching and learning process. The study will help to identify the effectiveness of yoga practicing in learning mathematics.
- This study can help to the students for doing yoga exercise in daily life.
- The yoga program is also helpful for schools curriculum and student physical and psychological issues and mood disorders.

Statement of the Hypothesis

The study attempted to seek the result of the following research hypothesis and statistical hypothesis.

Research Hypothesis

The mean achievement of the Yogic students is higher than the mean achievement of the Non-yogic students.

Statistical Hypothesis

The following statistical hypothesis has formulated:

H_0:There is no significance differences between mean achievement score of experimental and control group ($\mu_1=\mu_2$).

H_1:There is significance difference between mean achievement score of experimental and control group ($\mu_1 \neq \mu_2$).

Where μ_1 and μ_2 are mean achievement scores of yogic and non-yogic students respectively.

Delimitation of the Study

The study has following delimitations:

- This study was conducted in Siraha district.
- Based on the sample selected from any one grade of secondary level.
- Only one Public school (Shree Secondary School Godachaadi,Lahan-20) had been selected as experimental and control group.
- The study had also delimited to the student studying during 2072 B.S (2015-2016 AD) academic year only.
- The study was an experiment of 12 weeks and yoga practicing was conduct 60 minutes daily at morning time.

Definition of Related Terms

The following terms relate to yoga and its effect on student achievement:

Achievement: In this study reference to the present study, the term 'Achievement' is defined in terms of the scores obtained by the students on an achievement test prepared by the researcher.

Low Achievement: In this study**,** the students who had obtained less than 50% marks in first terminal exam given by school administration are known as low achievement students.

Yoga: Yoga is the process of using Physical exercise and mental imagery that originated in the Indian cultures more than three thousand years ago. It is the name of given to practice that helps create a union between the mind, body and spirit.

Effect: Impact of yoga on mathematics learning and achievement of students.

Pranayama (Breathing Lesson): In yoga, breath work is known as Pranayama. Pranayama increases blood circulation and reduces oxygen consumption. That brings more oxygen to the brain, and improves the way your body uses oxygen. Breathing exercises can also increase how much air you can draw into our lungs.

Meditation: Meditation is the concentration of the mind on the changeless inner reality. Mediation quiets the mind and brings on both physical and emotional relaxation, which helps reduce blood pressure, chronic pain, anxiety, cholesterol levels and increase creative thinking.

Control Group: Group of students which do not use yoga practicing.

Experimental Group: Group of students who use yoga practicing.

Chapter II

REVIEW OF LITERATURE AND CONCEPTUAL FRAMEWORK

Review of Related Literature

Recent years yoga exercises have been recommended by some researcher and there are so many researches about application and benefits of yoga but a few of research studies have shown its effectiveness on student's academic performance. Some of the literature related to this is listed below.

Krishna (2006) investigated a study with aim the effect of simplified Kunadalini Yoga on personality development and academic achievement of students. This study was conducted son 450 students in Chennai in two groups of experimental and control. Results of ANOVA showed that sex and subject studied was not significant but results of training showed significant effect on the personality and the academic achievement of the students.

According to Gates & Wolverton (2007) , yoga can produce a calming effect, which helps children get into a frame of mind conducive to learning. For example, a recent study showed that children who participated in Yoga were more relaxed, more active, and better able to concentrate. Compared with a group of students who only exercised, students who participated in yoga exhibited improved educational performance.

Siar (2005) conducted a study to measure the effects of the Super brain Yoga with fifty-six middle school students in Norristown, Pennsylvania, who were experiencing academic and behavioral problems. The results of the study showed that there is a positive relationship and significant improvement in the academic and behavioral performance of a middle school adolescent by using the Super brain Yoga.

Toyras (2013) studied the effect of incorporation yoga into a classroom on student engagement during literacy lessons. He found that before the incorporation of yoga student engagement was 80%; after the yoga intervention, student engagement was 88%.

Takhar & Sharma (2012) investigated the effect of Yoga on academic achievement. The results indicated: (1) The significant effect of yoga on academic achievement of students was found, means training of yoga can help to increase the academic achievement. (2) The academic achievement of students living in urban area was increased as a result of training of yoga. (3) The effect of yoga training on academic achievement of students studying in Std. IX. (4) Development level of students was increased after the training of yoga.

Kauts & Sharma (2009) studied the effect of yoga on academic achievement. The findings of this study reveal that the students who experienced yoga module performed better in overall academics as well as in their separate subjects than those students who did not experience yoga module.

According to studies of Wheeler & Wilkin (2007), yoga in adults improves focus, concentration and learning readiness as well as enhances health and fitness.

Omidi, Azizmalayeri&Jafari(2012) studied that Yogasana techniques has positive impact on chemistry achievement of students. So, result showed that there is a significant influence of yoga meditation on academic achievement, in traditional assessment groups scored significantly lower than students who were in meditation group.

Manjunath & Shirley (2004) had research on 'spatial and verbal memory test scores following yoga and fine arts camps for school children' and suggested that yoga practice, including physical postures, yoga breathing, meditation and guided relaxation improves delayed recall of spatial information.

Kauts & Sharma (2012) studied the effect of yoga on concentration in relation to stress.The finding of the study is that with intervention of the yoga module, the Concentration and Short Term Memory improve which may positively affect performance of the students. It is also observed that concentration and short term memory scores tend to be more in case of Low Stress students as compared to High Stress students, which hasled to the conclusion that

yoga somehow helps in reducing stress and improving Short Term Memory and Concentration. Therefore, study suggested that yoga module should become a regular feature of the school curriculum.

Gajjar (2012) investigate the study with aim the effect of yoga exercise on achievement, memory and reasoning ability. In this study total 40-40 students were selected from two schools for experimental design. The result of this study showed that there is significant effect on academic achievement, memory and reasoning ability.

Buckenmeyer and Freltas (2007) study explored the relationship between yoga participation in schools and the effects on students' academic achievement, general health, personal attributes and relationships. The survey data included numerical representations of the effect of yoga on student achievement and related behaviors. Additional useful data emanated from the responders' open-ended responses. All responses were consistently positive. Study showed that yoga has a significant positive effect on the academic achievement, general health, personal attributes and relationships of students in Kindergarten through 5th grade.

Khanal (2008) studied on effect of co-curricular activities on mathematics achievement at primary level and found that co-curricular activities helps students to understand mathematics and consequently perform better in achievement test over traditional activities.

Harshita, Miriam &Tramr (2012) examined the Ability to reduce stress levels and test anxiety in high school students using cyclic meditation during the time of exam. They found that practice of cyclic meditation which comprises of yoga postures and supine rest reduced test anxiety, academic anxiety and academic stress in students.

The above studies have been done to find out how yoga practicing effect on different variables, what procedures and instruments has been used, how data are analyzed, what shows the result of previous research, so that getting idea to complete this research work.

Theoretical Framework

This research study has based on following previous research result.

The research done by Mind/Body Institute, Harvard Medical School and Bruce D.Hara and his team at the University of Kentucky in Lexington, U.S.(2005) revealed a positive influence of meditation on brain functioning, performance and concentration.

Holt, Caruson& Riley (1978) investigate that Transcendental Meditation has also consistently been found to increase mind-body coordination to reduce depression, hostility and emotional instability.

In another study done by Bhole M.V of Banaras Hindu University (1997), found that hatha yoga practices like asanas, kriyas, mudras, bandhans and meditation techniques helped the subjects to develop awareness within themselves by improving their intellectual and somatic functions .

Another study by Singh & Udpa (1997) has reported that six months of yogic practices resulted a feeling of wellbeing, reduction in body weight, increased vital capacity, acceleration in endocrinal functions occurred at physiological level, whereas at psychological level, there is an improvement in memory, fatigue rate and reduced neuroticism index.

Various research studies concluded that yoga and meditation influenced concentration positively. Transcendental Meditation is reported to improve short term memory. The investigation made by Palsane & Kochar (1973) proved that yogic practice improves memory of the school children.

With this background, the present study examines whether there is an effect of yoga module on mathematics achievement students.

Conceptual Framework

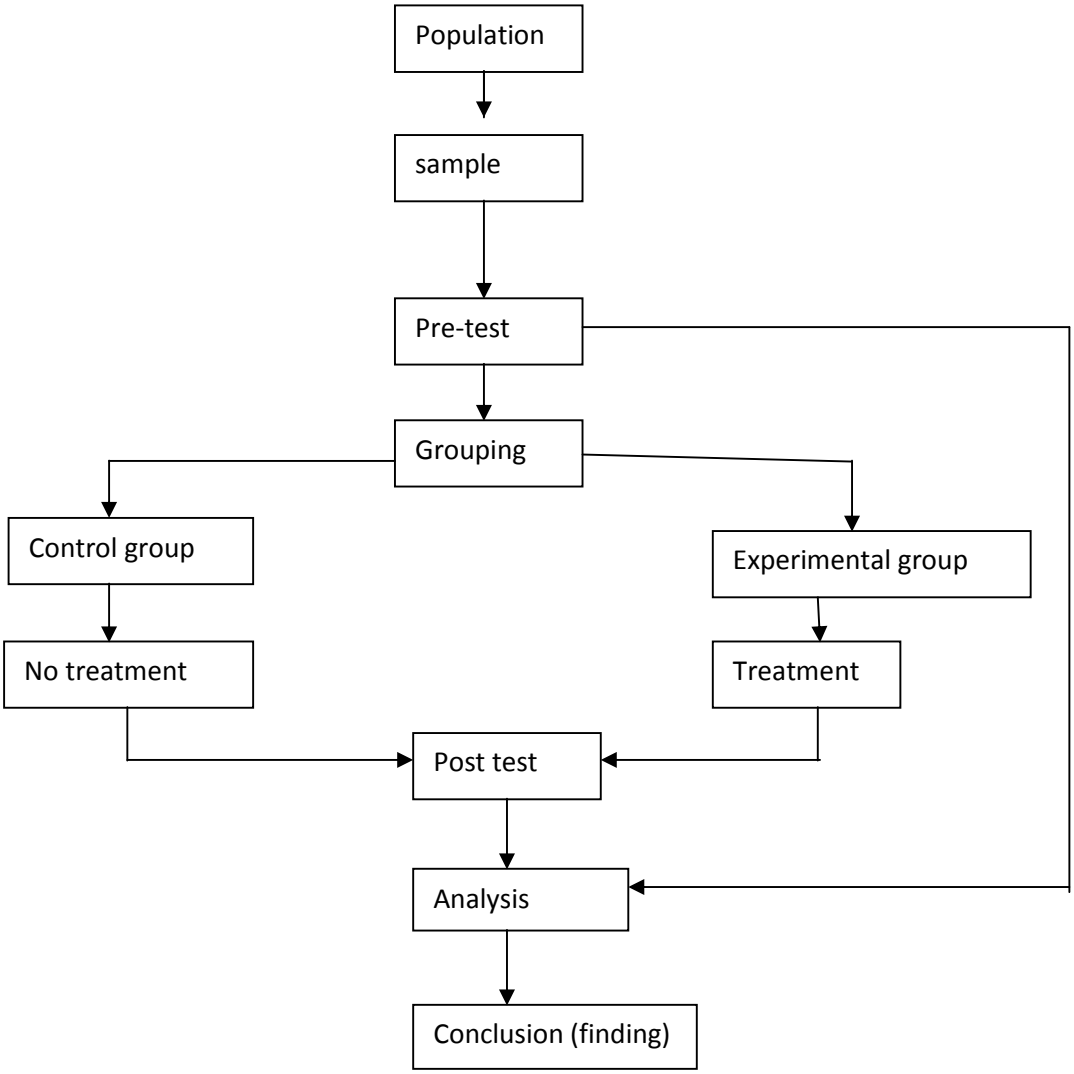
The seat of conscious functioning, the cerebrum is the largest part of our brain. It is divided into right and left hemispheres. On the physical level, the right hemisphere controls the left side of the body, and left hemisphere controls the right side of the body. On the level of the subtle body, *idanadi* (the lunar energy channel) is connected to the right half of the brain, and *pingalanadi* (the solar energy channel) is connected to the left side of the brain. Therefore, the right nostril breathing activate left brain and left nostril breathing activate right brain. Many researchers found that yogic activity improves the microstructure of white matter in the brain. White matter carries nerve signals between the gray matter in one brain region to another brain region. The more streamlined and compact our white matter is, the faster and more efficiently hour brain functions. OM mediation has shown to cause mental alertness. Mediation energizes the pre-frontal lobes of the human brain and in time, the limbic system becomes harder to arouse. This results in behavioral changes including better ego, integrity, fewer minor psychological problems, less depression and anxiety, increase concentration and memory power. (IJMR, 2012)

The above discussion about breathing work and meditation shows that it helps for better function in brain work. And, mathematical work is directly related to brain work in which memory and concentration plays vital role. Therefore, yoga exercise helps for better achievement in mathematics.

Procedural Framework

The procedural framework of this study as follows:

Chart 2.1: Frame of Research Process



The main purpose of this research is specifying effectiveness of yoga in improving of mathematics achievement. The population of this study is who secured less than 50% marks in first terminal examination of Brahaman Godchadi Secondary school. Thirty students selected a sample from random sampling method. This group is divided in two groups having each group fifteen students. Pre-test is given for all thirty students. After grouping

experimental and control group, experimental group practicing yoga as treatment. Then post-test given to all students for analysis and conclusion.

Chapter III

RESEARCH METHODS AND PROCEDURES

This chapter has designed for describing the methods and procedures. It includes the description of the research design, population and sample, sampling procedure, data collection tools, data collection procedure and analysis process of the collected data.

Design of the Study

The pre-test, post-test equivalent group designed was adopted for the purpose of this study. The paradigm of the study is as follows:

Table No.1

Group	Pre-test	Treatment	Post-test
E	T_1	Yoga practicing	T_2
C	T_1	Without yoga	T_2

Where, E=Experimental group

C=Control group

T=Treatment

T_1=Pre-test given to the students

T_2=Post-test given to the students

This design is one of the most effective in minimizing the threats to experimental validity. Two groups were made homogenous as possible on the basis of pre-test result. After establishment of two non-equivalent groups E and C, experimental group were received for the experimental treatment (T) whereas control group was not receive. Treatment group were practiced yoga with the help of yoga expert, twelve weeks. After that, post-test was given to students for data collection and data will be analyzed for result of research.

Population and Sample of the Study

The students of secondary level from Shree Secondary School Hanumannagar Brahaman Godchhadi, Lahan-20 of Siraha district was the population of this study. This School was selected based on their easy accessibility and close proximity to each other. The students who secure less than 50% marks in first terminal exam given by school was the population of the study and 30 students selected as sample by using simple random sampling. Again, among 30 students 15/15 students had divided into two group for experimental and control by using simple random sampling.

Data Collection Tools

An achievement test was prepared by the researcher with guidance of expert or supervisor as the main instruments of collecting data for the study depending upon the objectives. To measure the effect of yoga on low mathematics scores, researcher develop two achievement test: pre-test (before treatment) and Post-test (after treatment) for collecting data. For the qualitative analysis, classroom observation and questionnaire method used as tools .

Reliability and Validity of Test

To determine the reliability of test, split half method has used. And, to insure good quality of tests, content validity is more important, what it means that the test must have the items which truly asses the skill and abilities as indicated by given learning outcomes. There are many ways of ensuring content validity of achievement test, as previous explain, at first colleagues then subject experts and supervisor could judge their aspect of test. The researcher used curriculum, textbook and teacher's guide to establish achievement test paper. To develop this paper, school subject teachers and supervisor had helped researcher. The test measures what it purpose to measure, which is indicate test has content validity. The half

reliability of test was found 0.87. It indicates that test was reliable and by Spearman Brown Prophecy formula the reliability of whole test was 0.93, which shows the test has high reliability.

Data Collection Procedure

The procedures of data collection indicate how the relevant data will gathered. The study was mainly based on quantitative data obtain from achievement test. For this, researcher had met school administration, subject teacher and take permission for test in selected school. Before given to test, students are informed for response. Among 82 students 45 students (In Appendix-A)were selected as population who has less than 50% marks in first terminal examination and then, 30 students were selected as sample by lottery method. Then pretest was taken among 30 students. After collecting and scoring all the answer sheets, the scores was tabulated. After that thirty students had selected for experiment as mentioned in sampling method. Then Yoga module had used as an intervention treatment for the experimental group for an hour daily in the morning for 12weeks from 2015-11-18 to 2016-2-12. The yoga module presented in Appendix-C.

Academic performance test had used as a pretest and posttest for the experimental as well as control groups to assess the effect of yoga module on the mathematics achievement of the experimental group and to compare it with the control group, who never practiced yoga module.

Intervention:

A Yoga module (breathing and meditation) was shared daily for an hour in the morning with experimental group for 12 weeks, presented in Appendix-C.

Data Analysis Procedures

An Experimental Method was used to know the effect of Independent Variable for this study. In this Method, experimental simple equivalent group pre-test, post-test

experiment design had introduced for entire study. With the help of both groups ‘pre and post-test’s score, data will be analyzed and interpreted by using following statistical procedures.

- Mean, Standard deviation and Variance has calculated for both groups with their secured marks in the test.
- T-test had used to investigate the significant difference between the achievements of two groups of sample students.

Chapter IV

ANALYSIS AND INTERPRETATION

This chapter deals with the analysis and interpretation of data obtained from the achievement test of the sample students. These data are analyzed by using two tail t-test for difference between two means. The data sores on achievement test are analyzed by using quantitative technique. The main focus of this study in to explore the effectiveness of yoga practicing in mathematics learning.

Comparison of mean achievement scores of experimental and control group on pre-test

Scores of the pre-test of students of the experimental and control groups have been given in Appendix E-1 together with the statistical calculation of mean, variance and standard deviation. The t-test analysis for the comparison of mean achievement scores of pre-test has been presented in table – 2.

Table-2

Mean, SD and variance of pre-test result

Group	N	Mean	SD	Variance	t-value	α
E	15	15.6	2.33	5.43	0.19	0.05
C	15	15.8	3.28	10.82		

$t_{0.025, 14} = 2.14$

The mean achievements of both groups were compared statistically using t-test with two tailed at 0.05 level of significance. It was found that the calculated t-value at 0.05 is 0.22 which is less than the tabulate value i.e. 2.14 with degree of freedom 14 (N-1). The researcher used the t-test for unequal variance. Therefore, Null hypothesis is accepted hence there is no significance difference between mean achievement score of E group and C group on pre-test.

Comparison of mean achievement scores of experimental and control group on post-test

The past-test was administered to both experimental and control groups after the treatment was given. The post-test scores of students of experimental and control group have been presented in Appendix E-2.The calculation of mean, standard deviation and variance, Correlation have also been made to calculate t-value as mentioned is Appendix E-2

The summary of t-test analysis for the comparison of mean scored of experimental and control group have been given in table 3

Table – 3

Mean, SD, variance, correlation and t-value of post-test

Group	N	Mean	SD	Variance	t-value	α
E	15	33.53	4.34	18.91	5.08	0.05
C	15	26.46	3.17	10.11		

t 0.025, 14 =2.14

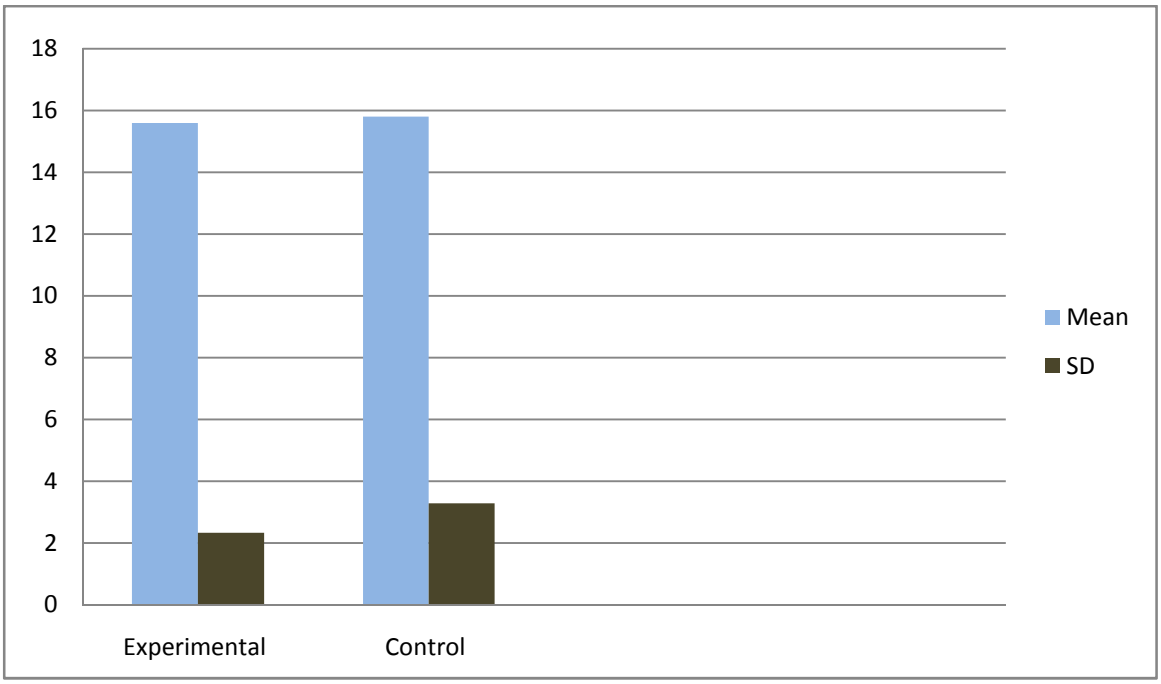
Above table indicates that both means and standard deviation are different. The scores of experimental group ranged from 41 to 26 with the mean score 33.53 and control group ranged from 31 to 20 with the mean score 26.46 also SD are 4.34 and 3.17 respectively. The difference in the mean achievement between experimental group and control group is found to be 7.07. The test analysis indicates that the difference in mean are found significant at 0.05 levels. The calculated t-value is 5.08 which greater than tabulated value 2.14. So the result does not support the null hypothesis that there is no significance difference between mean achievement scores of experimental and control group on post-test scores. Rather it supports alternative hypothesis of their existence of the difference (in favor of experimental group) analysis of the pre-test scores indicated that the groups were comparable at α=0.05 level of significance. So, the better performance of experimental group over control group on the

post-test scores might have been attributed due to new treatment (practicing yoga) given to experimental group.

Comparative Bar graph of pretest and posttest

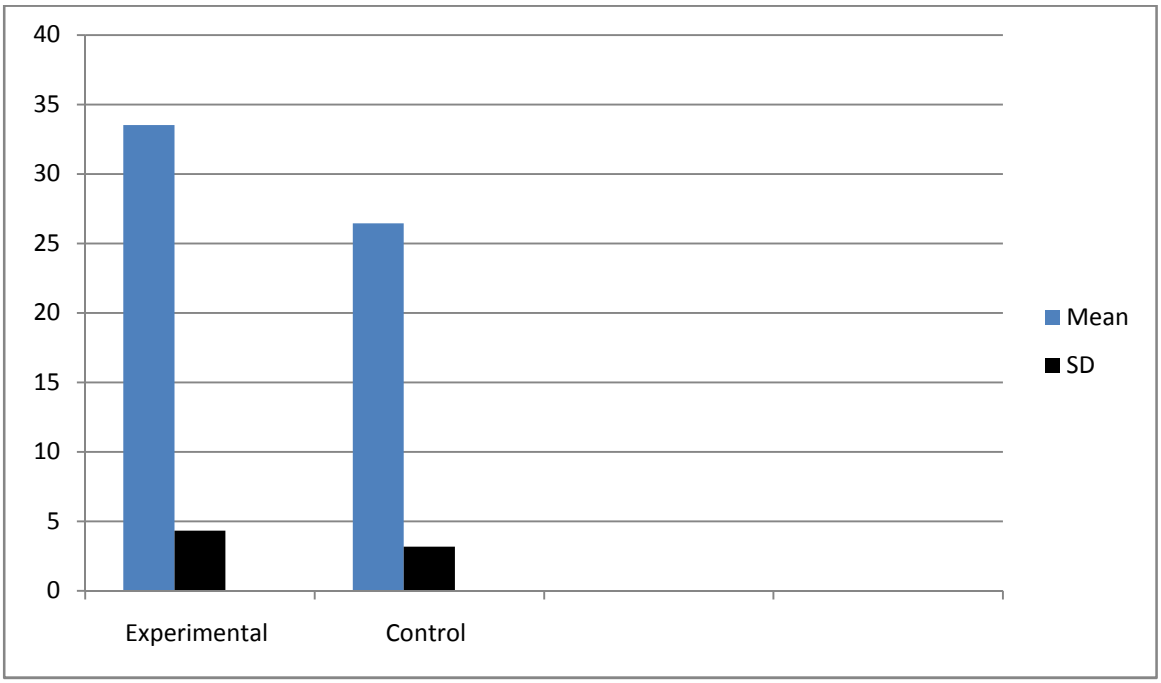
In addition to the advance statistics, data are presented in visual form to understand this result/difference more effectively .

Figure – 1: Mean, score and SD distribution of pretest



The figure shows that the mean score and SD of experimental group is 15.6 and 2.33 respectively. Similarly mean score and SD of control group is 15.8 and 3.28 respectively. The difference between mean is 0.2, which shows that these both group experimental and control are nearly equal. Hence, there is no difference in achievement scores in mathematics between experimental and control group of students.

Figure – 2: Mean, score and SD distribution of post test



The figure shows that mean score and SD of experimental group is 33.53 and 4.34 respectively. Similarly, mean score and SD of control group is 26.46 and 3.17 respectively. The difference between mean is 7.07, which shows that there is great impact on experiment group with practicing yoga than not practicing marks of experimental group is more than control group given in Appendix E-2 shows yoga module improve low achievement scores.

Qualitative Analysis

When observing class room activities of the students, it is seen that the students who had practiced yoga module seemed to be more focused on their mathematical work, active and more concentration to the class room learning than other students. Student voices really bring life to the finding in this study. Sarita says," math is really hard for me and when I take time to do yoga, it is easier for me. Several times through classroom discussions, students had said that yoga helped them relax their brains, so they could think. The common voice of the yogic student is that they fell more relaxed and less tired, they do mathematics without difficulty and in exam they don't feel nervous. Class teacher also said that yogic student is high

concentration to the class work and they struggle with completing their work on time. His response is, " every students must do yoga to improve their doing mathematics and creative thinking".

Logical Discussion

It is evident from the results that the students who were exposed to yoga module, they improved their low achievement in mathematics by improving concentration power and memory. In mathematics, concentration and memory power plays great role. The result are in tune with the earlier findings, which reported that yogic practice revealed a positive influence of meditation on brain functioning , performance and concentration (Research done by Harvard medical School, U.S (2005)) .

Limitation of the Study

The limitations of the current study are as follows:

- In this present study, the findings had depended upon the sample of 30 students of Lower Secondary Level from grade nine.
- Some extraneous variables like classroom situation, home environment etc. cannot be controlled which affect the result of the study.

Exercise to Control the Extraneous Variable

The following exercise had done to control the effect of extraneous variables.

- **Subject matter**: Same subject matter was present in classroom learning.
- **Evaluation Applied**: Same test had provided on both groups (control and experimental) at pre-test and post-test.
- **Students**: Students are regular and not taking the extra or tuition class and physical exercise.
- **Teacher**: Same class teacher has taken classroom teaching on both group.

Chapter -V

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATIONS

As stated in the introduction, the purpose of the study was to test the effect of yoga on mathematics logrolling. In this chapter, summary finding, conclusion and recommendation are mentioned as follows

Summary

The study was an experimental. In order to conduct the experimental study on the effectiveness of yoga in mathematics learning at secondary level, the researcher developed yoga modal with the help of yoga teacher for experimental group. The control group was not provided yoga modal. At the end of yoga module practicing latter 12 weeks, a standardized achievement test was administered on the groups. The scores obtained in the test by the students analyzed and obtained the findings.

Findings

This study investigated the effects of yoga techniques on mathematics achievement of secondary level and analysis of result showed that there is significance influence of yoga on mathematics achievement as well as improving low mathematics achievement in traditional assessment groups scored significantly lower than students who were in yoga group. Thus the researcher concludes that the yoga practicing effective for improving mathematics learning.

Conclusion

It is included from finding of the study that with intervention of the yoga module, the concentration and memory and brain working improve which may positive effect on performance of students in mathematics learning. It is also said that yoga practicing is effective way to improve low achievement score in mathematics.

Recommendations

On the basis of finding of this study some measures have been recommended as follows:

For the improvement of mathematics instruction:

- Yoga practicing should be made compulsory at school level.
- This study helps to the students for doing yoga exercise daily life.
- Government should encourage the research projects to enhance memory, Reasoning ability and yoga of rural areas students.
- Schools should use the material related to yoga exercise.
- The yoga exercises programme is also helpful for schools curriculum and students. physical and psychological issues and mood disorders.

Suggestion for further study:

The following suggestions are made for further study:

- This study was confined only at secondary level. So, further study should be done in different level.
- Study may be on effect of yoga on concentration and memory for mathematics learning.
- This study only includes berthing and meditation in yoga module. So for further study should include different form of yoga, physical posture, prayer different types of meditation etc.
- Further study should be done in different area. This study was confined only to the Siraha district of Nepal

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Appendix – A

1st terminal marks (< 50 %)

S.N.	Name	Seured marked	Total mark
1	Manjay Ram	22	50
2.	Ramesh Kumar Sah	18	50
3.	Priyank Kumari yadav	17	50
4.	Ritesh Kumar sha	14	50
5.	Samjhan Kumari Chaudhary	19	50
6.	Chandan Kumar Yadav	18	50
7.	Chandara Kala Yadav	18	50
8.	Dharmendra Sha	15	50
9.	Amit Kala Yadav	21	50
10.	Sarita Sarma	24	50
11.	Usha Kumari Mahato	28	50
12.	Rubi Kumari Yadav	17	50
13.	Karan Kumar Chaudhary	19	50
14.	Santosh Kumar Chayadahary	20	50
15.	Dipesh Kumar Chaudhary	20	50
16.	Mukesh Kumar Yadav	21	50
17.	Malika Kumari Saday	18	50
18.	Anish Kumar Chaudhary	14	50
19.	Binod Kumar Ram	15	50
20.	Rabina Kumari Yadav	17	50
21.	Anish Kumar Yadav	20	50

22.	Umesh kumar chaudhary	21	50
23.	Ramsufal Das	22	50
24.	Ramesh Chaudhary	24	50
25.	Pinkej Kumari Sha	17	50
26.	Bira Kumari Paswan	18	50
27.	Dhiraj Kumar Chaudhary	23	50
28.	Harerm Mahato	17	50
29.	Shivsankar das	15	50
30.	Shivprakash Mahato	16	50
31.	Gaytri Chaudhary	18	50
32.	Kalpana Kumari Mahato	23	50
33.	Sonita Kumari Yadav	20	50
34.	Anish Saday	21	50
35.	Dhiraj Kumar Yadav	22	50
36.	Kali Yadav	24	50
37.	Ramesh Kumar Yadav	18	50
38.	Ramsagar Yadav	20	50
39.	Anju Kumar Yadav	19	50
40.	Md. Ajad	21	50
41.	Susma Sadaya	18	50
42.	Sabita Kumari Yadav	17	50
43.	Mukes Kumar Yadav	16	50
44.	sanjana yadav	13	50
45.	Durganand sha	12	50

Appendix B-1

Pre-test Achievement test paper :

कक्षा :- ९ पूर्णाङ्क - ५०

उतिर्णाङ्क-२०

समय : २ घण्टा

सबै प्रश्नको उत्तर लेख ।

खण्ड - क १०x२ =२०

१. समुह भनेको के हो र खाली समुह (Null set) का परिभाषा लेखि उदाहरण दिनुहोस् ।

२. एउटा बटुवालाई ५६ कि.मि. हिड्न जम्मा ४ दिन लाग्छ भने उसलाई १५४ कि.मि. हिडन कति दिन लाग्छ ?

३. ८० को ३/५ र ८० को ३०% को फरक निकाल्नुहोस् ।

४. एक जना शिक्षकको मासिक तलब रु. १३५०० छ, वार्षिक रु.१४०००० सम्मको आयमा आयकर छुट छ । त्यस भन्दा माथीको आयमा १५% आयकर लाग्छ भने, उनले आयकर तिरी एक महिनामा कति रकम प्राप्त गर्दछन् ?

५. कति ब्यजदरमा रु. ६०० ऋण दिदाँ २ वर्ष पछि रु. ७२ ब्याज हुन्छ ।

६. रमेश एक महिनामा रु ७५०० कमाउछन र रु ५००० खर्च गर्दछ भने उसले कति प्रतिशत कमाउछ ।

७. खण्डीकरण गर्नुहोस : x^4+x^2+1

८. $7x+9y=41$ र $2x+3y=13$ लाइ हटाउने विधिद्धरा हल गरी जाँच ।

९. सुत्र प्रयोग गरी हल गर : $x^2-10x+21$

१०. ΔABC मा यदि $<BAC=50^0$ र $<ABC=60^0$ भए सबैभन्दा लामो भुजा र सबै भन्दा छोटो भुजा कुन हो ?

खण्ड - ख

११. ६ मि. लामो र ४ मि.चौडा कोठामा ज्ञ.छ मि. चौडा कार्पेट विछ्याउन कति लामो कार्पेट चाहिएला ?

१२. कति सावाँको ब्याज ४ बर्षमा ८% का दरले रु. १९२ हुन्छ ।

१३. एउटा फोटोकपी मेसिन रु ६०००० मा बेचदा २०% घाटा हुन्छ । उक्त मेसिन १२% नाफा कमाउन कतिमा बेचनुपर्ला ?

१४. ४०० जना कामदाले २५ दिन सम्म निरन्तर १२ घण्टा सम्म प्रति दिन कार्य गर्दा ५ कि.मि. बाटो बनाउन सकेछन् । सोही बाटो पीच गर्न ३०० कामदारले ३२ दिनमा सिद्धयाउन दिनको कति घण्टा काम गर्नु पर्छ ?

१५. कक्षा ९ को अन्तिम परिक्षामा सम्मिलित १०० विद्यार्थी मध्ये ७५ जना गणितमा र ६५ जना नेपालीमा उर्तिण र १० जना दुबैमा उर्तिण भएभने चित्र बनाई दुबै विषयमा उर्तीण हुने संख्या पत्ता लगाउ ।

Appendix B- 2

Post-test Achievement test paper :

कक्षा :- ९ पूर्णाङ्क - ५०

उतिर्णाङ्क-२०

समय : २ घण्टा

सबै प्रश्नको उत्तर लेख ।

खण्ड - क १०X२ =२०

१. ५०० जनामा ३२५ जनाले फिलटर गरेर , २३० जनाले उमालेर पानि पिउदा रहेछन भने कति जनाले फिलटर र उमालेको दुबै खाले पिउछन । भने चित्रमा देखाउ ।

२. खण्डीकरण गर र गुणन गरेर जाँच $9t^2 - 25p^2$

३. यदि $\frac{3a\,\mathrm{Z}5b}{3a\,\Gamma 5b}\mathrm{X}\frac{1}{4}$ भए $\frac{a}{b}$ को मान निकाल्नुहोस ।

४. क्रमागत भित्रिकोणको परिभाषा लेख त्रिभुज अनरुप हुने स्वयमसिद्ध तथ्यहरु लेख ।

५. कुनै धनको वार्षिक व्याज १६% का दरले कति वर्षमा मुलधनको दोब्बर हुन्छ ?

६. ७ मि. लामो र २.५ मि. अग्लो पर्खालमा ५६ से.मि.चौडा कागज पस्न कति मिटर लामो कागज चाहिएला ?

७. एउटा नृत्य कार्यक्रम देखाउन रु २५००० खर्च लागछ । नृत्य टोलीले रु १२००० नाफा गर्नुपर्छ । ३७० जना दर्शकले पैसा तिरेर नृत्य अवलोकन गरे भने एक जनाले कति पैसा तिर्छ ?

८. रु ४५० अङ्कित मूल्य भएको एउटा पुस्तकमा १०% छुट दिएर बेच्दा कतिमा बेचन सकिन्छ ?

९. सरल गर: $\sqrt{1296x^8y^1}$

१०. हल गर: $2\sqrt{3}\cos\theta=3$

खण्ड - ख ५×६ =३०

११. ६० जना विद्यार्थीहरु संग गरिएको सवैछात्रमा ३० जनाले दुध, २५ जनाले दही, १० जनाले दुध तथा दही दुबै पिउछन् भने

क) उक्त चित्रलाई भने चित्रमा दृखाउ ।

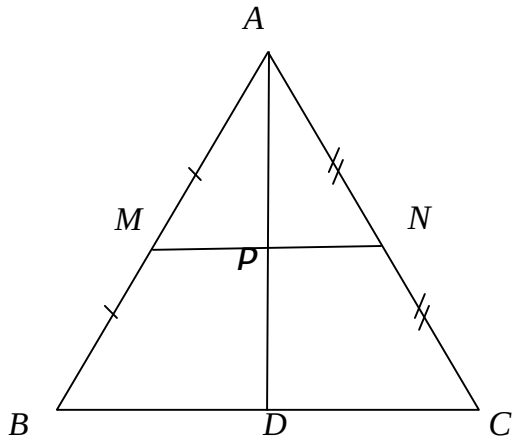
ख) दुबै विषयमा अनुतिर्या विद्याथीए संख्या पत्ता लगाउ ।

१२. खण्डीकरण गर : $\frac{x^2}{y^2}\Gamma 1\Gamma\frac{y^2}{x^2}$

१३. दुईजना मानिसहरुको हलको उमेरको अनुपात ३:४ छ । ४ वर्ष वडी यो अनुपात ७ : ९ हुन्छ भने तिनीहरुको हालको उमेर कति होला ?

१४. प्रमाणित गर : समदिवाहु त्रिभुजमा शीर्ष विन्दुबाट आधारको मध्यविन्दुसंग जोडने रेखा आधारमा लम्ब भइए शिर्षकोणलाई आधा गर्छ ।

१५. चित्रमा : M र N क्रमशः AB र AC का मध्यविन्दुहरु हुन् । P, MN को कुनै विन्दु हा । प्रमाढित गर्नुहोस ।



AP = PD

Appendix – C

Yoga module:

Yoga science of breathing is called pranayam. It is essential for the integrity of the brain, nerves,. glands and internal organs. pranayam yoga must be performed in empty stomach. The best time for practice is the early morning.

In this study following types of pranayam are exercised.

1. Nadisodhan (15 min) : Following stapes are instruct on how to perform the nadisodhan pranayam:
    - Sit down in a comfortable place assuming a cross legged position.
    - Now use your thumb (right hand) to close the right side of your nose. Inhale deeply using the left nostril.
    - Now close the left nostril and exhale using the right one .
    - In the same way, now with the left nostril still closed, inhale using the right nostril and exhale with the left.
2. Anulom –vilom (20min):
    - Sit in a comfortable balanced meditative pose.
    - Use the right hand thumb to close right nostril.
    - Inhale from the left nostril.
    - Close left nostril with right hand's index and middle fingers.
    - Exhale from the right nostril
    - Do the reverse: inhale with the right nostril.
    - Close right nostril with right hand thumb.
    - Exhale with the left nostril.

3. Bhramripranayham (5 min):
    - Sitting in the sukhasan and pressing traugs with thumb.
    - Place index fingers on the forehed and with the remaining fingers closing eyes.
    - Start inhaling through both the nostril deeply and slowly.
    - By keeping mouth close, exhale by making a humming sounds like “human.....;..” While making humming sound say ‘om’ in soft humming sounds.
4. Om meditation (10 min): Sit in a meditative pose and shoulders should be relaxed. In addition to chanting the sound of OM, this meditation involves and exhaling while chanting ' om' in a very specific mudra.

Appendix – D

Statistical formulas and symbols used for data analysis :

1. Mean (X) = $\frac{fx}{N}$ where N= f

2. Variance ($\frac{(x \mathrm{Z} x)^2}{N}$

3. S.D = $\frac{\sqrt{\quad f\ } (x \mathrm{Z} y)^2}{N}$

4. T-test formula for unequal variance (t) = $\frac{(\overline{x}_1 \mathrm{Z} \overline{x}_2) \mathrm{Z}(\text{«}1 \mathrm{Z} \text{«}2)}{\sqrt{\frac{s_1^2}{n_1} \Gamma \frac{s_2^2}{n_2}}}$

Where, degree of freedom is equal to the smaller of n_1-1 or n_2-1

$\overline{x}_2$ = Men of experimental group

$\overline{x}_2$ = mean of control group

s_1^2 = Variance of E-group

s_2^2 = Variance of C-group

N_1 = No. of students of E-group

N_2 = No. of students in C-group

R= Coefficient correlation

Where , $x \mathrm{X} X \mathrm{Z} \overline{X}$

$y \mathrm{X} Y \mathrm{Z} \overline{Y}$

Appendix E-1

pretest scores of experimental and control groups

Experimental group				Control group				
S.N.	Obtained Mark	$X_1=(x-\bar{x}_1)$	X_1^2	S.N.	obtained	$X_2=(x-\bar{x}_2)$	X_2^2	X_1X_2
1	19	3.4	11.56	1	21	5.2	27.04	17.68
2	19	3.4	11.56	2	21	5.2	27.04	17.68
3	18	2.4	5.76	3	19	3.2	10.24	7.67
4	18	2.4	5.76	4	19	3.2	10.24	7.67
5	17	1.4	1.96	5	19	3.2	10.24	4.48
6	17	1.4	1.90	6	17	1.2	1.44	1.68
7	16	0.4	0.16	7	17	1.2	1.44	0.48
8	16	0.4	0.16	8	15	-0.8	0.64	-0.32
9	15	-0.6	0.36	9	15	-0.8	0.64	0.48
10	15	-0.6	0.16	10	13	-2.8	7.84	1.68
11	14	-1.6	2.56	11	13	-2.8	7.84	4.48
12	13	-2.6	6.76	12	12	-3.8	14.44	9.88
13	13	-2.6	6.76	13	12	-3.8	14.44	9.88
14	12	-3.6	12.96	14	12	-3.8	14.44	13.68
15	12	-3.6	12.96	15	12	-3.8	14.44	13.68
Total	234		81.54		237		162.4	110.78

$N_1 = 15$

Mean $\overline{X}_1 = 15.6$

Variance $(S_1^2) = 5.43$

SD $(S_1) = 2.33$

$N_2 = 15$

Mean $\overline{X}_2 = 15.8$

variance $\overline{S_2^2} = 10.82$

SD $(S_2) = 3.28$

Appendix E-2

Post test scores of experimental and control groups

Experimental group				Control group				
S.N.	Obtained Mark	$X_1=(x-\overline{X_1})$	X_1^2	S.N.	obtained	$X_2=(x-\overline{X_2})$	X_1^2	X_1X_2
1	36	1.47	2.16	1	30	3.54	12.53	56.20
2	40	6.47	41.86	2	27	0.54	0.29	2.91
3	34	0.47	0.22	3	256	-1.46	2.13	-0.68
4	33	0.53	0.28	4	20	-.46	41.73	-3.42
5	30	-3.53	12.467	5	26	-0.46	0.21	1.62
6	41	7.46	55.80	6	31	4.54	20.61	33.86
7	38	4.47	19.98	7	34	7.54	56.85	33.70
8	36	2.47	5.10	8	27	0.54	0.29	1.33
9	27	-6.53	42.64	9	26	-0.46	0.21	3.003
10	28	-5.53	30.58	10	26	-0.46	0.21	2.54
11	31	-2.53	6.40	11	25	-1.46	2.13	3.69
12	36	2.47	5.10	12	24	-2.46	6.05	-5.07
13	33	0.53	0.28	13	24	-2.46	6.05	-1.30
14	35	1.47	2.16	14	27	0.54	0.29	0.79
15	26	-7.53	56.70	15	25	-1.46	2.13	10.99
Total	503		281.72		397		151.71	88.16

$N_1 = 15$

Mean $\overline{x_1} = 33.53$

Variance $s_1^2 = 19.91$

SD (s_1) = 4.34

$N_2 = 15$

Mean $\overline{x_2} = 26.46$

variance $\overline{S_2^2} = 10.11$

SD (S_2) =3.17