

**RELATIONSHIP BETWEEN BELIEFS AND ACHIEVEMENTS IN
MATHEMATICS**

**A
THESIS**

**BY
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LETTER OF CERTIFICATE

This is to certify that Mr. Bhim Kant Joshi student of academic year 2066/2068 BS with campus Roll No. 1450, T.U. Registration No.9-2-464-35-2006, thesis no.927 and Examination Symbol No. 281304 has completed his thesis under my supervision during the period prescribed by the rules and regulations of Tribhuvan University, Nepal and the thesis entitled **“Relationship between beliefs and achievements in mathematics”** embodies the result of his investigation conducted during the period 2013 under the Department of Mathematics Education, University Campus, Kirtipur, Kathmandu. I recommend and forward that his thesis be submitted for the evaluation as a partial fulfillment for the Degree of Master’s of Education.

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Letter of approval

A

Thesis

By

Bhim Kant Joshi

Entitled

“Relationship between students beliefs and achievements in Mathematics”

has been approved in Partial Fulfillment for the Requirement of the
Degree of Masters of Education

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Abstract

This is a survey study aimed to find out relationship between beliefs and achievement of mathematics. This study also compares such beliefs by gender, location and structure of schools to investigate the relationship between beliefs and achievements in mathematics.

A total of 200 students' from Kailali district were the participants of the study. Of the 200 students' 90 were males, 110 were females; 100 were from public school and 100 were from private school; 100 from urban area and 100 from rural area.

The main instruments used in the survey were a set of opponnaire with 40 statements. This opponnaire was composed of five point likert scale items. The scores 5, 4,3,2,1 were given in the favor of SA, A, N, D, SD respectively for positive statement. Similarly, the scoring process was reversed for negative statement. The total score of each statement of MBO was computed and they were compared with the moderate score. If the total score exceeded to moderate score, then it was concluded that statement yielded positive belief and this evaluation technique was reversed for negative statement. At the end, the t-test was used to test significant difference between belief and achievement score by gender, structure of school, and location of school. The relationship between beliefs and achievement was also tested by computing Pearson's correlation coefficient.

This research yielded that the students of grade X have positive beliefs about mathematics, male and female showed similar beliefs toward mathematics. Public and private school students showed similar beliefs and the beliefs do not differ by location of school.. There existed positive and moderate relationship between students beliefs and achievement in mathematics.

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ACRONYMS

A	:	Agree
CERID	:	Research Center for Educational Innovation and Development
D	:	Disagree
<i>df</i>	:	Degree of freedom
MBO	:	Mathematics Beliefs Opinionnaire
N	:	Neutral
SA	:	Strongly agree
SD	:	Strongly disagree
VDC	:	Village Development Committee

Chapter I

INTRODUCTION

Background of the Study

Each person is born in a family, gets different educational experiences from family life, school life, and college life of students'. S/he shares different experiences in the society throughout her/his life. If a member of the general community is posed a question: what is mathematics? We may get different answers according to the respondents' own beliefs, experiences and practices both inside and outside the class room. The common answer may invariably focus on number and operation. In connection to this, Zevenbergen, Dole and Wright (2004) state that mathematics is study of patterns and relationships, way of thinking, seeing and organizing the world, a language, a tool, a form of art, and a power. It means mathematics is more than just number and operation.

Most researches in both traditional and reform oriented curricula focused on achievement as measured by student's performance on standardized tests of procedural or problem solving skill. Such researches have generally found that students' taught using reforms oriented curricula have greater conceptual understanding and problem solving abilities than students' taught using traditional curricula, while performance on traditional standardized tests of procedural skills is comparable (Senk and Thompson, 2003). Efforts to assess the impact of reform programs must expand beyond student's performance on standardized tests (Smith and Star, 2007) i.e. standardized tests are one of the tools used in measuring achievement scores and then achievements in mathematics.

According to Richardson and Suinn(1972) students' feel mathematics as a difficult subject because of math anxiety and low achievement in mathematics. I believe that such type of students' feeling are the result of different factors such

as personality factors, intellectual factors and environmental factors, which is agreed by different personnel e.g. Fotoples(2000) says students' get anxiety in mathematics resulting from personality factors such as low self esteem, shyness and intimidation.

Beliefs are defined as students' personal knowledge about the process of learning that serve as the “assumptions from which individuals make decisions about the actions they will undertake” (Kloosterman, Raymond and Emenaker, 1996) that is students' belief plays a vital role in mathematics learning both inside and outside of the classroom. Beliefs establish the context within which resources, heuristics, and control operate (Schoenfeld 1985) which means student's beliefs are contextual.

Beliefs can have a powerful impact on how children go about learning and using mathematics, and many individuals believe that mathematics is a largely rule oriented body of knowledge that is acquired through the memorization of discrete number facts and algorithmic rules (Reyes, 1984) which means memorizing the pre-existing mathematical algorithms is one of our students' beliefs in mathematics. Beliefs made their way into studies of mathematics teaching and learning through the influences of many different disciplines, such as philosophy in particular epistemology (Scheffler, 1965) which implies that believing is considered as a condition for knowing.

Statement of the Problem

Schoenfeld (1985) tossed the idea of beliefs in mathematics and its implication to the mathematics problem solving. The significance of belief toward mathematics was concerned and shared by Lampert (1990) that many students appear to hold a lot of incorrect beliefs about mathematics. Generally most people believe in the importance of mathematics in daily life and its usefulness in career but these people were very reluctant to talk mathematics. Similarly, many people believe with the importance of optional mathematics in higher studies and its usefulness in other subjects and jobs opportunities but these people too were very reluctant to talk about optional mathematics. So, I decided to do this research related with the following problems:

1. What sorts of beliefs do students' hold about mathematics?
2. Do the students' beliefs in mathematics are related with their mathematical achievement?
3. What sort of relation exists between student's beliefs and achievements in math? By:
 - a. Gender of students'.
 - b. Structure of schools.
 - c. Location of schools.

Objectives of the study

The study was intended to accomplish the following objectives:

1. To compare grade X students' beliefs about mathematics by:
 - a. Gender of the students'.
 - b. Structure of schools.
 - c. Location of schools.
2. To investigate the relationship between grade X students' beliefs and achievement in mathematics

Delimitations of the study

My objective was to find out the relationship between grade X students' beliefs and achievements in mathematics. The study was conducted among grade X students' in Kailali district. Data was collected and analyzed in brief span of time. The major delimitations of the study were:

- a. Yearly exam of grade IX was taken as standard tests and their average was taken as achievements scores.
- b. Students' rank, students' age level, classroom environments, distance of school from students' houses, extra tutorial classes taken by students', migration and aboriginal students' e.t.c., of the sample affecting the beliefs in mathematics will not be controlled.

Definitions of Terms

Gender: Male and female which show distinct body structures by sex at birth.

School: A community or institutional school

Structure of school: Structure of schools means types of schools declared by the government of Nepal that includes broadly private schools and public school.

Public school: It covers community aided, community managed and community unaided.

Private school: It covers the institutional schools supported by parents and trustees.

Community school: A school, which belongs to government and fully funded by the government.

Location of school: Location of school means V.D.C. or Municipalities in which the schools are located.

Rural School: A school located in village Development Committee.

Urban school: A school located in Municipality.

Secondary school: A school conducting 1-10, or 6-10 or 8-10 classes.

Higher education level: Level of education higher than 12 years of schooling.

Lower education level: Level of education less than or equal to 12 years of schooling

Beliefs scores: The total scores of each statement of Mathematics Beliefs Opinionnaire (MBO) obtained by the students' according to its numerical scales.

Achievement scores: The marks obtained by the students in mathematics in the final examination of grade 9 in 2069 B.S.

Moderate Score: If all sampled students' remain neutral for any statement of MBO, then the total of such statement regarding all 200 students' yields 600 marks which is, here, called the moderate score.

Research Hypotheses

I believe that students', parents and community beliefs are mainly influenced by beliefs regarding the ideal role of mathematics in society. The existing socio-cultural beliefs limits family and community support to the student for mathematics education. Traditionally mathematics was expected to exclusively assume the role of calculation, exchange and properties calculation but under socio economic change, the concept of mathematics need to change drastically but these traditional beliefs have not changed yet which creates hindrance in mathematics learning. People participating in different occupations, intellectual or labor preserve different ideas, thoughts and attitudes, which refer to beliefs that create remarkable disturbance, support in

mathematics teaching and learning and eventually in the mathematical achievements or overall achievements of the children.

It has been traditionally believed that mathematics is preferred more by boys than girls; achievement in mathematics is higher in boys than girls , higher in urban areas than in rural area, higher in intuitional school than in community school, higher in economically rich students' than poor students', higher in Brahmin and chhetri family than in others ethnic group, higher in well equipped infrastructures and well trained, qualified teacher and good mathematical environment schools and so on. I used such provisional facts as hypothesis.

The following research hypothesis was tested in the study:

- i) Male students' have more positive beliefs on mathematics than the females.
- ii) Students' belonging to private schools have more positive believes on mathematics than the publics'.
- iii) Student belonging to urban schools have more positive beliefs on mathematics than the rural school.
- iv) There is positive relation between students' beliefs on mathematics than their mathematical achievement.

Statistical hypothesis

In the course of this study, I tested the following statistical hypothesis.

- 1.a. Null Hypothesis: There is no statistical significant difference in mathematical beliefs between male and female students',

$$H_0: \mu_1 = \mu_2$$

- b. Alternate Hypothesis: There is statistical significant difference in mathematical beliefs between male and female students', $H_1: \mu_1 \neq \mu_2$
- 2.a. Null Hypothesis: There is no statistical significant difference between the belief of students' belonging to public and private school, $H_0: \mu_3 = \mu_4$
- b. Alternate Hypothesis: There is statistical significant difference between the belief of students' belonging to public and private school, $H_0: \mu_3 \neq \mu_4$
- 3.a. Null Hypothesis: There is no statistical significant difference between the belief of students' belonging to urban and rural school, $H_0: \mu_5 = \mu_6$
- b. Alternate Hypothesis: There is statistical significant difference between the belief of students' belonging to urban and rural school, $H_0: \mu_5 \neq \mu_6$
- 4.a. Null Hypothesis: There is no relationship between students' beliefs on mathematics and their mathematical achievement, $H_0: \mu_7 = \mu_8$
- b. Alternate Hypothesis: There is a relationship between students' beliefs on mathematics and their mathematical achievement,
 $H_0: \mu_7 \neq \mu_8$

Chapter II

REVIEW OF RELATED LITERATURE

Literature Review

This chapter includes the review of literature related with the context of the intended study and the theoretical framework which is taken as to form theoretical basis.

Joshi (1997) conducted a research on “Determinant of mathematics achievement of grade x students” for PhD with sample of 431 boys and 423 girls and found that the achievement scores of boys were higher than the average scores of girls in all tests and subset level of mathematics (arithmetic, algebra and geometry). CERID(1988) did a research during the development of standardized test in mathematics and found that mean achievement of secondary students' was 42.02% (as cited in Bajracharya, 2008)

Pandit(1999) did his thesis on “A study of attitude of secondary level students' and teachers toward geometry” with samples 9 public and 4 private secondary schools on 9th grade students' and concluded that

1. A positive attitude of secondary students' was found towards geometry.
2. Teachers had negative attitudes towards secondary level geometry
3. Boys had better attitude than girls regarding geometry.

Neupane (2001) did a research on “Mathematics achievement of primary school children of various ethnic groups in Nepal” for PhD with the sample of 250 boys and 250 girls from ethnic groups and found that the boys were better than the girls in mathematics

Rai (2004) studied on "Attitudes of teacher and students' toward secondary level mathematics and students' achievement and concluded that

1. Trained teacher had positive attitudes than the untrained teacher of mathematics
2. The students' had similar attitude whether they using taught by trained and untrained teachers.
3. The urban students' had positive attitudes than the rural students' regarding geometry.
4. The students' taught by trained teachers had higher achievement than the students' taught by untrained teachers.

Gomez-Chacon (2006) conducted a research on "Spanish high school student's mathematics related beliefs system : A comparative study" on the four hundred students from different fifty six schools and founded that individuals with higher scores on academic test possess more positive beliefs about themselves.

Sharma (2009) did his masters dissertation on "Relationship between grade IX student's beliefs and achievements in mathematics". He conducted his research in Lalitpur district on two hundred students from different location and concluded that there is no significant difference in the beliefs of secondary level students toward mathematics by gender, structure of school and location of school. He also concluded that there is moderate relationship between the beliefs about mathematics and achievement in mathematics of grade IX students.

Mathematical Beliefs

Kloosterman (2002) talks about beliefs as an individual's feeling and understandings. A belief is any simple proposition conscious or unconscious,

inferred from what a person says or does, capable of being preceded by the phrase

Pehkonen (2003) argues that beliefs have a component in both cognitive and affective domains in what he calls the “twilight zone”. i.e. interplay between the thinking and the feeling is unavoidable because on the one hand beliefs are a part of person’s knowledge that is highly subjective and on the other hand the conceptions feelings and beliefs are often overlapping and cannot be distinguished.

Students' mathematics related beliefs which implicitly or explicitly hold subjective conceptions students' hold to be true about mathematics education, about themselves as mathematicians, and about the mathematics class context. These beliefs determine in close interaction with each other and with problem solving in class (Op'tEynde, De corte and Verschaffel, 2002, p.27)

Theoretical Framework of the Study

In this study, the researcher had considered an unifying framework for research on students' beliefs provided by Op't Eynde, De Corte and Verchaffel (2002) that allows a better understanding of the interactions between different type of beliefs. These authors point a three basic components that constitute a belief system: beliefs regarding the object, the self and the social context. They were provided a Mathematics Beliefs Opinionnaire (MBO) framed according to this perspective. The questionnaire was designed as part of a research project that aimed to analyze the relationship between several factors: working memory, reading comprehension, cognitive reflection and deductive reasoning, and mathematical belief systems. This led to the prioritization of four dimensions in the development of the opinionnaire, three of which were covered by the above mentioned studies. I also added another non-integrated dimension found in opinionnaire as the domain of excellence. In this way the dimensions

in the MBO turn into : students' beliefs about role and function of their mathematics teacher, students' beliefs about the significance and competence in mathematics, students' beliefs on mathematics as social activity and beliefs on mathematics as a domain of excellence.

In summary, I have tried to highlight the importance and appropriateness of assessment tools for investigating beliefs in mathematics teaching and learning. This complex structured system has significant implications for the individual that affects their behavior and mathematics performance.

Chapter III

METHOD AND PROCEDURES

Design of the Study

The design of the study was survey design concerning with both primary and secondary data. The primary data was collected by structured opinionnaire technique from sampled students' of grade X while secondary data was collected from the administrative records of the sampled schools.

The population of Study

All the students who were studying in grade X including both private and public schools of Kailali district in 2070 B.S. was taken as the population of this study.

Sample Design

The samples was selected by stratified random sampling. Broadly there were two strata: rural schools and urban school. Further both rural and urban schools were divided into two strata: public schools and private schools two hundred students were selected from 6 secondary schools including 3 from two V.D.C.(Rural area) and 3 from municipality (Urban area) with 100 students' from each stratum in first stage: and then 50 students' from each of the private and public schools were selected in second stage. Primary data was collected by opinionnaire technique from 200 sampled students' while secondary data was collected from 6 (3 from rural including 2 private and 1 public; 3 from urban including 2 private and 1 public) sampled schools as shown in table 3.1

Table 3.1
Sample Design of the study

Total Number of students', $N = 200$			
Number of students' from Rural Secondary schools, $N_1=100$		Number of students' from Urban Secondary schools, $N_2=100$	
Public school students' $N_{11}=50$	Private school students' $N_{12}=50$	Public school students' $N_{21}=50$	Private school students' $N_{22}=50$

Sample size

Each student was considered as the sample unit of this study. As shown in the sampling design, total number of samples from rural schools were 100 students', total number of samples from urban schools were 100 students', total number of samples from public schools were 100 students' and total number of samples from private schools were 100 students' respectively. In this way the totality of 200 students' were surveyed in this study.

Sampling procedure

Since there are 42 VDC and 2 municipalities in Kailali district, the researcher used two stage stratified random sampling techniques treating VDC and municipalities as two stratum. Two VDC's and one municipality were selected randomly. Again 2 private and 1 public schools were selected randomly from each stratum so that 100 students' were allocated in different strata.

Instruments

In this study two types of instruments were used. They were MBO and administrative records. The MBO measured students' belief in four dimensions that are: beliefs about the role and function of their own teacher, beliefs about the significance of mathematics and competence in mathematics, beliefs on mathematics as a social activity and beliefs on mathematics as a domain of

excellence. The question in the MBO under the first three dimension of beliefs were taken from belief system purposed by Op't Eynde, De Corte and Verchaffel (2002) and the questions of the fourth dimension were taken from the MBO of S. L. Sharma. In this way the whole MBO was sub-divided into four sections corresponding to the area of beliefs to be measured and the number of belief questions for each respective beliefs were twelve, twelve, eight and eight.

Reliability and Validity of Data Collection Instrument

To find out reliability of the MBO, a pilot test was conducted on twenty five students of grade X in Kailali district where fifteen students were taken from Shree Tribhuvan Higher Secondary School, Boradandi, Dhangadhi, Kailali and ten students were taken from Shree Broad Vision English Boarding School, Chatakpur, Dhangadhi, Kailali. The test-retest method was applied to test reliability of MBO and the coefficient of reliability was found 0.75 which was substantial. Since this scale have been widely used to measure beliefs of students and all the questions included meet Nepalese context, so the validity is assured.

Data collection Procedure

Beliefs score were collected with MBO. I personally visited the schools purposively; consulted to the principal/head master and mathematics teacher of each school, clarified them the objectives of the study and took permission for filling up the opinionnaires by the students' of grade X. After all I entered into the class room with the math teacher, I introduced myself and the objectives of the research to the students', distributed the MBO to the students', read thoroughly in order to clarify each statements and the terminologies used in the opinionnaire, and requested them to return back next day after filling up the opinionnaire completely. In this way I collected the filled opinionnaires next day. Among the opinionnaires I

got back after being filled up, I only excluded required number of opinionaires filled with no serious intention or filled jokingly or only for fun. Here for each positive statement of MBO; SA, A, N, D and SD were implied for 5,4,3, 2 and 1 marks respectively where the scoring process was reversed in case of negative statement. The data related to the achievement scores were directly obtained from the schools administrative records on the paper sheet.

Data Analysis Techniques

Correlation is the relationship between two or more paired variables or more sets of data, the degree of two or more sets of data. The degree of relationship was measured and represented by the Spearman's rank correlation method as the data were in ordinal scale. According to Best and Kahn, (2002) coefficient of correlation can be interpreted as following:

Correlation Coefficient (r)	Relationship
0.0 - 0.20	Negligible
0.20- 0.40	Low
0.40- 0.60	Moderate
0.60- 0.80	Substantial
0.80- 1.00	High to very high

To analyze the relationship between student's beliefs scores' and achievement scores', coefficient of correlation according to various categories as mentioned in the objectives was calculated. The correlation coefficients between beliefs system and students' achievements was obtained and their significance was tested using t-test (two-tailed) at 0.05 level of significance. Mean, standard deviation, and independent sample t-test at 0.05 level of significance were used for analyzing the comparisons of students' beliefs about mathematics between different categories.

Chapter IV

ANALYSIS AND INTERPRETATION OF DATA

Introduction

This is a survey study conducted in Kailali district. The purpose of this study was to find out beliefs of secondary level students' toward mathematics, to find out relationship of such beliefs with their mathematical achievement and to compare beliefs and achievements by gender of students', structure of schools and location of schools. Then, t-test and Pearson's correlation coefficient method were applied to analyze the obtained data. Since this chapter deals with the analysis and interpretation of data; so, the data obtained are analyzed under following headings.

- I) The beliefs of grade X students' toward mathematics.
- II) Comparison of students' beliefs in mathematic by
 - a) Gender of the students'
 - b) structure of the school
 - c) Location of school
- III) Relationship between grade X students' beliefs and achievements in mathematics.

The beliefs of grade X students' toward mathematics

The first objective of this study was to find out beliefs of secondary level students' toward mathematics. To full fill the objective a MBO was administered. Total score of each statement of the opinionnaire was calculated at 0.05 level of significance. Since the total score (see appendix B) of each positive statement of MBO exceeded the moderate score and that of negative statement lowered so it was concluded that the grade X students' have positive belief toward mathematics.

Comparison of students' beliefs

The second objective of this study was to compare students' beliefs toward mathematics by their gender, structure of schools and location of schools. For the purpose the researcher did t-test at 0.05 level of significance given as following :-

Comparison of beliefs by gender

In order to compare students' belief by gender, the mean, variance and corresponding t value of the belief score of boys (see appendix-C) and girls (see appendix-D) of grade X were calculated which is presented in the following table

Table No 4.1
Students' beliefs scores in mathematics by gender

Gender	Number	Mean	Variance	df	t-value	conclusion
Male	90	151.77	187.37	198	1.65	<1.96 (not significant)
Female	110	154.86	155.05			

The data presented in the above table shows that there were 90 and 110 male and female students' respectively. The mean of belief score of all statements in the MBO regarding male and female students' are 151.77 and 154.86 respectively. Again the respective variances were 187.37 and 155.05. It showed that there were a little bit difference in the belief of male and female students' about mathematics and as belief score of females exceeded the males it implied that the females have stronger belief than males. It was tested whether there was significant difference or not between the beliefs of boys and girls about mathematics. The above table shows that the calculated t-value 1.65 is less than the tabulated value 1.96 at 0.05 level of significance with 198 degree of freedom. So the null hypothesis was accepted. Thus the researcher concluded

that there was no significant difference in the belief of male and female students' toward mathematics at grade X.

Comparison of beliefs by structure of school

In order to compare students' belief by structure of school the mean, variance and corresponding t value of the belief score of students' studying in public school (see appendix-E) and students' studying in private school (see appendix-F) of grade X was computed which is presented in the following table.

Table No 4.2

Students' beliefs scores in mathematics by structure of school

Structure of school	Number	Mean	Variance	df	t-value	conclusion
Public	100	154.14	205.48	198	1.07	<1.96 (not significant)
private	100	152.05	174.53			

The data presented in the above table shows that there were 100 students' studying at public schools and 100 students' studying at private schools respectively. The mean of belief score of all statements in the MBO regarding public school students' and private school students' are 154.14 and 152.05 respectively. Again the respective variances were 205.48 and 174.53. It showed that there was a little bit difference in the belief of public school students' and private school students' about mathematics and as belief score of private school students' did not exceeded the public school students' it implies that the public school students' have stronger belief than private school students'. It was tested whether there was significant difference or not between the beliefs of public school students' and private school students' about mathematics. The above table shows that the calculated t-value 1.07 is less than the tabulated value 1.96 at 0.05 level of significance with 198 degree of freedom. So the null hypothesis

was accepted. Thus the researcher concluded that there was no significant difference in the belief of public school students' and private school students' toward mathematics at grade X.

Comparison of beliefs by location of school

In order to compare students' belief by structure of school, the mean, variance and corresponding t value of the belief score of students' studying in rural school (see appendix-G) and students' studying in urban school (see appendix-H) of grade X was calculated which is presented in the following table

Table No 4.3

Students' beliefs scores in mathematics by location of school

Location of school	Number	Mean	Variance	df	t-value	conclusion
Rural school	100	152.56	138.53	198	0.68	<1.96 (not significant)
Urban school	100	153.83	215.28			

The data presented in the above table shows that there were 100 rural school students' and 100 urban school students'. The mean of belief score of all statements in the MBO regarding rural and urban school students' are 152.56 and 153.83 respectively. Again the respective variances were 138.53 and 215.28. It shows that there was a little bit difference in the belief of rural school students' and urban school students' about mathematics and as belief score of urban school students' exceeded the rural school students' it implies that the urban school students' have stronger belief than rural school students'. It was tested whether there was significant difference or not between the beliefs of students' regarding location of school. The above table shows that the calculated t-value 0.68 is less than the tabulated value 1.96 at 0.05 level of significance

with 198 degree of freedom. So, the null hypothesis was accepted. Thus the researcher concluded that there was no significant difference in the belief of students' by location of school toward mathematics at grade X.

Test of relationship between beliefs and achievement

To find out the relationship between beliefs and achievement scores, the Spearman's rank correlation coefficient and corresponding t-value were calculated which is presented in the following table.

Table No 4.4
Relationship between beliefs and achievement

Number	Correlation Coefficient	t-value	conclusion
200	0.41 (positive but negligible relationship)	6.33	>1.96 (significant)

This table shows that there is moderate relationship between students' beliefs and achievement in mathematic. Since the calculated t-value exceeded the tabulated t-value, so the null hypothesis was not accepted. Thus it was concluded that there is significant relationship between belief and achievement of mathematics .

Chapter 5

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATION

After the analysis and interpretation of collected data; an attempt has been made to summarize, to enlist the findings, to draw the conclusion and to recommend the suggestions for further study.

Summary

The purpose of this study was to find out beliefs of grade X students' toward mathematics, to compare such beliefs by gender, location and structure of schools and to investigate the relationship between beliefs and achievements in mathematics.

A total of 200 students' from the various location of the kailali district took part in the survey. Of the 200 students' 90 were males, 110 were females; 100 were from public school and 100 were from private school; 100 from urban area and 100 from rural area. The limitation of this study were that it only considered 200 students' of kailali district and the students' who took part in the survey were only from grade X.

The scores 5, 4,3,2,1 were given in the favor of SA, A, N, D, SD respectively for positive statement. Similarly, the scoring process was reversed for negative statement. The total score of each statement of MBO was computed and they were compared with the moderate score. If the total score exceeded to moderate score, then it was concluded that the students' yielded positive belief and this evaluation technique was reversed for negative statement. The t-test was employed to test significant difference between belief by gender, structure of school and location of school. The relationship between beliefs and achievement was computed by Spearman's rank correlation coefficient and then tested by independent sample t-test.

Findings

The statistical analysis of the collected data yielded the following results about the beliefs of grade X students' and its relationship with achievement as the finding of study.

-) Grade X students' hold positive beliefs toward mathematics.
-) There is no significant difference in beliefs by gender.
-) There is no significant difference in beliefs by structure of school.
-) There is no significant difference in beliefs by location of school.
-) There is moderate relationship between belief and achievement of students' and the relationship is significant.

The all five findings of the study matched to the findings of Sharma (2009). Again the last finding matched with the finding of Gomez-Chacon (2006).

Conclusion

As a conclusion, this study shows that students' show positive beliefs towards mathematics and positive relationship exists between students' beliefs and achievements. So, each mathematics teacher should be aware of the students' beliefs corresponding to the four domain of mathematics (beliefs about the role and function of their own teacher, beliefs about the significance of mathematics and competence in math, beliefs on mathematics as a social activity, beliefs on mathematics as a domain of excellence). By knowing the factors influencing students' beliefs in mathematics found from this study, the teachers may modify teaching learning activities; evaluation tools, social, moral and personal characters, which will help to promote students' achievements in mathematics and develop teachers professionalism and will make parents and others to change their gender biased feelings about mathematics and encourage students' for learning and improving mathematics achievements.

Recommendation

This study was limited in several aspects due to various circumstances. The finding of this study are valid only in Kailali district and may not be generalized to other district of Nepal. On the basis of this study following recommendations can be drawn for further study.

-) This research could be expanded regionally and nationally.
-) Similar study could be conducted at any class or level and sample can be drawn from various districts.
-) The replication study to this research could be conducted.

The new finding which does not support existing literature review will open new door for further research study.

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Appendix A

Mathematics Beliefs Opinionnaire

S.N.	Statements	Likert scale point technique of scoring				
		SA	A	N	D	S.D
Beliefs about the role and function of their own teacher						
1	Our teacher is friendly to us.					
2	Our teacher listens carefully when we ask or say something.					
3	Our teacher understands the problem and difficulties we experience.					
4	Our teacher appreciates it when we have tried hard, even if our results are not so good.					
5	Our teacher really wants us to enjoy learning new things					
6	We do a lot of group works in this math's class.					
7	Our teacher always tries to make the math's lesson interesting.					
8	Our teacher gives us time to really explore new problems and to try out possible solution strategies.					
9	Our teacher doesn't understand the problem and difficulties we experience.					
10	Our teacher wants to understand the content of this math's course not just memorize it.					
11	Our teacher explains why mathematics is important.					
12	We do not do a lot of group works in this math's class.					
Beliefs about the significance of math's and competence in math's.						
13	I can understand even the most difficult problems presented in math's course.					
14	I am very interested in math's, so I like doing it.					
15	I believe that, I will receive this year an excellent marks in the math's.					

16	I am not very interested in math's, so I don't like doing it.					
17	I can understand the course material in math's.					
18	If I try hard enough, then I will understand the course material of the math's class.					
19	Math's is an important subject to me.					
20	I prefer the math's tasks for which I have to exert myself in order to find the solutions.					
21	Math's learning is mainly for memorizing.					
22	It is just a waste of time when the teacher makes us think on our own about how to solve a new math's problem.					
23	Group work facilitates the learning of math's.					
24	Math's learning is not mainly for memorizing.					
Beliefs on mathematics as a social activity						
25	I think I will be able to use what I learn in math's also in other courses.					
26	Math's enables man/women to better understand the world.					
27	Solving a math's problem is demanding and requires thinking also from smart students.					
28	Math's is used by a lot of people in their daily life.					
29	Making mistake is a part of learning math's.					
30	There are several ways to find the correct solution of math's problem.					
31	Anyone can learn math's.					
32	Math's is not used by a lot of people in their daily life.					

Beliefs on mathematics as a domain of excellence					
33	My measure concern when learning math's is to get good marks.				
34	I want to do well in math's to show the teacher and my fellow students how good I am in it.				
35	By doing the best in math's, I want to show the teacher that I am better than most of the other students.				
36	There is only one way to find the correct solution of math's problem.				
37	There who are good in math's can solve any problem in a few minutes.				
38	Those who are good in math's can get job easily in society.				
39	I am only satisfied in result when I get good marks in math's.				
40	Those who are good in math's can't get job easily in society.				

Appendix B

Mathematics Beliefs Opinionnaire

S.N.	Statements	Likert scale point technique of scoring					Total score
		SA	A	N	D	S.D	
Beliefs about the role and function of their own teacher							
1	Our teacher is friendly to us.	96	101	0	2	1	889
2	Our teacher listens carefully when we ask or say something.	89	92	4	11	4	851
3	Our teacher understands the problem and difficulties we experience.	91	87	3	12	7	843
4	Our teacher appreciates it when we have tried hard, even if our results are not so good.	102	91	2	4	1	889
5	Our teacher really wants us to enjoy learning new things	96	92	6	1	5	873
6	We do a lot of group works in this math's class.	85	88	20	5	2	849
7	Our teacher always tries to make the math's lesson interesting.	79	96	9	14	2	836
8	Our teacher gives us time to really explore new problems and to try out possible solution strategies.	71	69	43	11	6	788
9	Our teacher doesn't understand the problem and difficulties we experience.	8	10	4	87	91	843
10	Our teacher wants to understand the content of this math's course not just memorize it.	85	98	12	3	2	861
11	Our teacher explains why mathematics is important.	96	88	8	7	1	871
12	We do not do a lot of group works in this math's class.	2	5	20	88	85	849
Beliefs about the significance of math's and competence in math's.							
13	I can understand even the most difficult problems presented in math's course.	67	74	3	50	6	746
14	I am very interested in math's, so I like doing it.	58	66	14	57	5	715

15	I believe that, I will receive this year an excellent marks in the math's.	48	69	4	47	32	654
16	I am not very interested in math's, so I don't like doing it.	7	53	14	65	61	720
17	I can understand the course material in math's.	45	63	7	70	15	653
18	If I try hard enough, then I will understand the course material of the math's class.	87	98	5	8	2	860
19	Math's is an important subject to me.	76	96	3	13	12	811
20	I prefer the math's tasks for which I have to exert myself in order to find the solutions.	52	68	62	14	4	750
21	Math's learning is mainly for memorizing.	37	49	6	68	40	575
22	It is just a waste of time when the teacher makes us think on our own about how to solve a new math's problem.	13	8	3	80	96	362
23	Group work facilitates the learning of math's.	73	87	14	12	14	793
24	Math's learning is not mainly for memorizing.	38	69	6	51	36	578
Beliefs on mathematics as a social activity							
25	I think I will be able to use what I learn in math's also in other courses.	81	60	36	18	5	794
26	Math's enables man/women to better understand the world.	93	72	18	12	5	836
27	Solving a math's problem is demanding and requires thinking also from smart students.	82	71	38	3	6	820
28	Math's is used by a lot of people in their daily life.	81	66	24	19	10	789
29	Making mistake is a part of learning maths.	70	64	12	28	26	724
30	There are several ways to find the correct solution of math's problem.	94	73	12	8	13	827
31	Anyone can learn math's.	72	69	15	18	26	743
32	Math's is not used by a lot of people in their daily life.	10	17	24	69	80	792

Beliefs on mathematics as a domain of excellence							
33	My measure concern when learning math's is to get good marks.	80	74	16	18	12	792
34	I want to do well in math's to show the teacher and my fellow students how good I am in it.	68	77	23	17	15	766
35	By doing the best in math's, I want to show the teacher that I am better than most of the other students.	36	49	25	57	33	598
36	There is only one way to find the correct solution of math's problem.	21	15	8	72	84	417
37	Those who are good in math's can solve any problem in a few minutes.	12	9	17	86	76	395
38	Those who are good in math's can get job easily in society.	60	54	16	49	21	683
39	I am only satisfied in result when I get good marks in math's.	71	68	24	26	11	762
40	Those who are good in math's can't get job easily in society.	20	51	16	55	58	680

Appendix C
Belief scores of male students

154	145	170	169	131	162	177	153	155
145	129	153	167	163	167	138	137	131
176	147	150	137	137	155	141	167	156
154	151	164	169	150	145	147	168	160
156	130	156	149	145	170	133	143	162
135	172	117	171	140	143	142	123	163
146	143	139	144	151	151	149	156	185
155	150	144	164	159	153	142	167	138
164	165	165	159	169	171	141	134	156
161	163	143	149	152	141	123	132	166

Mean=151.77

Variance=187.37

N=90

Appendix D

Belief scores of female students

153	164	166	138	175	157	142	154	154	167	169
125	168	162	146	156	167	157	160	159	139	191
166	155	152	156	143	149	164	140	157	168	171
163	140	148	160	134	155	152	142	168	144	162
156	152	134	151	159	151	156	159	171	127	149
153	159	169	173	172	157	161	157	154	151	169
146	152	150	150	154	138	145	162	154	140	166
151	142	157	168	164	157	152	150	174	166	144
165	155	166	157	166	147	163	148	138	155	136
127	110	130	161	148	147	163	174	168	172	159

Mean=154.86

Variance=155.05

N=110

Appendix E

Belief scores of students from public school

153	146	154	153	164	156	145	167	166	167
164	170	163	138	157	169	167	175	160	131
154	150	177	139	142	137	162	159	157	138
191	153	164	154	166	155	167	155	131	169
152	147	125	156	176	168	143	145	162	149
129	150	148	151	157	137	160	156	168	137
134	159	108	155	155	171	172	141	152	127
159	167	142	149	108	156	168	153	172	160
144	159	140	168	162	169	135	156	173	139
152	172	171	134	157	163	151	161	140	159

Mean=154.14

Variance=205.48

N=100

Appendix F

Belief scores of students from private school

157	154	151	169	146	152	142	145	141	151
162	160	150	156	134	167	142	153	159	164
144	162	155	159	168	150	150	154	138	145
154	162	140	141	157	171	168	169	164	159
165	164	155	161	161	143	166	151	142	157
168	164	157	152	150	174	166	144	165	155
166	157	166	147	163	145	170	133	143	162
163	123	142	143	140	135	151	151	144	139
143	146	135	172	117	171	149	156	185	138
148	138	155	127	110	130	161	148	147	163

Mean=152.05

Variance=174.53

N=100

Appendix G

Belief scores of students from rural school

150	148	151	157	137	160	156	168	137	134
159	108	155	155	171	172	141	152	127	159
167	142	149	156	168	144	159	159	168	162
169	135	156	173	139	152	172	171	134	157
163	151	161	140	159	140	157	154	151	169
146	152	142	145	141	151	162	160	150	156
134	167	142	153	159	164	144	162	155	159
168	150	150	154	138	145	162	154	140	141
171	169	159	165	165	164	155	161	161	143
166	151	142	157	168	164	144	161	153	134

Mean=152.56

Variance=138.53

N=100

Appendix H

Belief scores of students from urban school

153	146	154	153	164	156	145	167	166	167
170	163	138	157	170	163	138	157	169	167
175	160	131	138	157	159	162	137	142	139
177	150	154	191	153	164	154	166	155	167
155	131	169	152	147	125	156	176	168	143
157	152	150	174	166	144	165	155	166	166
157	166	147	163	145	170	133	143	162	163
123	142	143	140	135	151	148	151	138	144
155	139	127	143	110	146	130	135	161	172
148	117	147	171	163	149	174	156	185	138

Mean=153.83

Variance=215.28

N=100

Appendix I

Belief score of students

154	145	170	169	131	162	177	153	155	169
145	129	153	167	163	167	138	137	131	191
176	147	150	137	137	155	141	167	156	171
154	151	164	169	150	145	147	168	160	162
156	130	156	149	145	170	133	143	162	149
135	172	117	171	140	143	142	123	163	169
146	143	139	144	151	151	149	156	185	166
155	150	144	164	159	153	142	167	138	144
164	165	165	159	169	171	141	134	156	136
161	163	143	149	152	141	123	132	166	159
153	164	166	138	175	157	142	154	154	167
125	168	162	146	156	167	157	160	159	139
166	155	152	156	143	149	164	140	157	168
163	140	148	160	134	155	152	142	168	144
156	152	134	151	159	151	156	159	171	127
153	159	169	173	172	157	161	157	154	151
146	152	150	150	154	138	145	162	154	140
151	142	157	168	164	157	152	150	174	166
165	155	166	157	166	147	163	148	138	155
127	110	130	161	148	147	163	174	168	172

Appendix J

Achievement score of students

61	62	52	44	62	39	47	56	48	64
49	56	61	62	72	71	62	56	76	61
56	62	60	65	70	65	64	66	60	57
43	64	75	59	67	41	75	61	59	66
37	53	67	68	48	47	68	49	52	79
65	56	49	39	50	38	49	58	46	61
60	57	56	46	56	58	57	46	40	48
57	63	76	57	50	42	63	60	66	56
72	76	63	58	55	57	52	56	58	55
74	58	51	54	67	40	51	63	70	45
53	40	35	60	50	55	35	72	62	64
76	55	59	37	74	63	70	81	64	38
62	63	41	88	61	62	49	59	70	62
48	60	48	42	57	59	45	77	65	63
62	63	65	50	45	63	60	55	67	63
51	56	52	51	53	52	60	71	67	63
68	55	54	68	48	68	57	54	55	56
76	62	62	52	72	76	66	68	55	62
58	33	55	58	59	59	52	74	55	53
57	65	62	57	58	58	68	64	57	65

Appendix K

Rank of the Corresponding Belief Score

98	53	184.5	181.5	11.5	141	198	92	105	181.5
53	8	92	170.5	146.5	170.5	25	21	11.5	200
197	60.5	73.5	21	21	105	35	170.5	113	187.5
98	80	152.5	181.5	73.5	53	60.5	194.5	134	141
113	9.5	113	68	53	184.5	14	44	141	68
18	191	2	187.5	31.5	44	39	3.5	146.5	181.5
57	44	28.5	48.5	80	80	68	113	199	162
105	73.5	48.5	152.5	129	92	39	170.5	25	48.5
152.5	157	157	129	181.5	187.5	35	16	113	19
137	146.5	44	68	86.5	35	3.5	13	162	129
92	152.5	162	25	196	121.5	39	98	98	170.5
5	194.5	141	57	113	170.5	121.5	134	129	28.5
162	105	86.5	113	44	68	152.5	31.5	121.5	194.5
146.5	31.5	64	134	16	105	86.5	39	194.5	48.5
113	86.5	16	80	129	80	113	129	187.5	6.5
92	129	181.5	193	191	121.5	137	121.5	98	80
57	86.5	73.5	73.5	98	25	53	141	98	31.5
80	39	121.5	194.5	152.5	121.5	86.5	73.5	194.5	162
157	105	162	121.5	162	60.5	146.5	64	25	105
6.5	1	9.5	137	64	60.5	146.5	194.5	194.5	191

Appendix L

Rank of the corresponding achievement score

118.5	128.5	49	18	128.5	8.5	25.5	75	29.5	149.5
35	75	118.5	128.5	183.5	180.5	128.5	75	193.5	118.5
75	128.5	111.5	156	177.5	156	149.5	161.5	111.5	86
17	149.5	189.5	104	166	13.5	189.5	118.5	104	161.5
4.5	54.5	166	172	29.5	25.5	172	35	49	198
156	75	35	8.5	39.5	6.5	35	96	23	118.5
111.5	86	75	23	75	96	86	23	11	29.5
86	141	193.5	86	39.5	15.5	141	111.5	161.5	75
183.5	193.5	141	96	64.5	86	49	75	96	64.5
187	96	43.5	58	166	11	43.5	141	177.5	20
54.5	11	2.5	111.5	39.5	64.5	2.5	183.5	128.5	149.5
193.5	64.5	104	4.5	187	141	177.5	199	149.5	6.5
128.5	141	13.5	200	118.5	128.5	35	104	177.5	128.5
29.5	111.5	29.5	15.5	86	104	20	197	156	141
128.5	141	156	39.5	20	141	111.5	64.5	166	141
43.5	75	49	43.5	54.5	49	111.5	180.5	166	141
172	64.5	58	172	29.5	172	86	58	64.5	75
193.5	128.5	128.5	49	183.5	193.5	161.5	172	64.5	128.5
96	1	64.5	96	104	104	49	187	64.5	54.5
86	156	128.5	86	96	96	172	149.5	86	156

Appendix M
Statistical Formulae

$$1. \quad t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

Where

\bar{X}_1 = Mean of first sample

\bar{X}_2 = Mean of second sample

N_1 = No. of students in first sample.

N_2 = No. of students in second sample

S_1^2 = Variance of first sample

S_2^2 = Variance of second sample

$$2. \quad r = \frac{\sum D^2 - \frac{1}{12} (m^3 - 3m) - \frac{1}{12} (n^3 - 3n) - \frac{1}{12} (p^3 - 3p) - \dots}{N(N^2 - 1)}$$

Where

D = Difference between paired rank

N = Number of paired rank

m, n, p = number of repeated rank

$$3. \quad t = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}}$$

Where

$N-2$ = Degree of freedom

r = Pearson's correlation coefficient

Appendix N

Name of the Sampled Schools

	Urban School	Rural School
Public School	Panchodaya Higher Secondary School, Dhangadhi-5, Kailali	Malika Higher Secondary School, Chaumala-3, Kailali
Private School	Aishwarya Bidhya Niketan, Dhangadhi-5, Hasanpur Broad Vision International Academy, Dhangadhi-3, Kailali	Mohana Manteshwori English Boarding School, Malakheti-6, Kailali Cambridge English Boarding School, Malakheti-5, Kailali