Low Performing Students' Perceptions towards Mathematics: Evidence from Secondary Level Students of Public Schools in Nepal

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Abstract: *This paper presents theperceptions of low-performing secondary level students towards mathematics. In this study, the participants consisted of 180 students, 30 each from the 6 secondary schools in Nepal. Two schools from each ecological region; Hills, Mountains and Tarai were purposively selected. A Likert type survey questionnaire was developed and administered to the participants. The data thus collected were analysedcalculating the mean of the responses. The findings revealed that the low performing students' perceptions towards mathematics were negativein that they thought thatmathematicswas a difficult subject although they still perceived mathematics as a subject of value and importance.*

Keywords: Low Performing students' Perception, Mathematics, Public Schools

1. Introduction

Mathematics as one of the core subjects in the school curriculum plays a significant role in the everyday life of every human.It is a subject that deals with numbers, symbols and requires a lot of thinking. Aristotle (n.d) defined 'Mathematics as the science of quantity'. But Mathematics is not just about numbers; it is also about finding solutions to every problem even if the problem seems impossible to solve. It is a subject that may also have a direct connection with other subjects. Mathematics is an essential tool for scientific technological and economic advancement of any nation (Umameh, 2011). Mathematics is an important subject not only from the point of view of getting an academic qualification at school or college, but also a subject that prepares students for the future as regareless of what work they choose follow as part of their career (Davies and Hersh, 2012). Even when a person doesn't know mathematics, he unconsciously uses itsuch as simply looking at the watch or even counting his change after he purchases something. According to Umameh (2011), Mathematics is intimately connected to every one daily life activities and life-long planning. Mefor (2014) truly remarks that mathematics relates to everything in the universe, from the smallest to the largest. Therefore, without mathematics education human life cannot function properly and adequately.

It is necessary that learning the basics of mathematics such as simple counting, addition, numbers and subtraction. Because it gives a lot of positive effects to the child's mind. It develops logical and critical thinking in the child with the help of such practices; children use their brain for its capacity to evaluate and solve each problem, thus practicing their brain cells to work together and to explain what they don't understand. According to Cabatay, Henry, Captali and Loren (2011), mathematics is learned for more than just one reasons namely; to mastery the basic mathematical skills to cope with the demand of life, for the symbolic means of communication to many other disciplines and and so on. Therefore, mathematics education can play an important role in developing students' general decision making and problem solving skills.

However, most of the students in Nepal are still found failing in mathematics at the Secondary Education Examination (SEE). My experience as a teacher of mathematics nearly two decades suggest that it is perceived in general as one of the most difficult subjects among these offered subject at secondary level in Nepal. According to Metsamuuronen & Kafle (2013), the more positive the attitude towards mathematics, the higher is the achievement. In other words, according to their students' positive attitudes influence their achievements positively. Some students think that the length of time needed for mathematical calculations results into the loss of their interest and arouses anxiety in them. These students also experience inability to concentrate and a feeling of sickness when they are involved in mathematics. According to Oppenheim(1992) different variables such as, physical and pedagogical aspects, i.e. teaching method, materials, structure and management of the classroom, support of the school teachers' behaviour and family environmentaffect the students' attitude towards mathematics.

In the Nepalese context, achievements in mathematics not only seem to be at a lower placethan their international status (NASA, 2013) but also are in a rather decreasing direction in recent years. According to the report of NASA (2013), the lowest average achievement level of all school subjects allotted to grade 8 is in mathematics (43%). The report also points out that, in 2011, the average achievement scores in mathematics in grade 8 was lower than in the year 2009 and the figure further lowered by 8% from 2011 to 2013. Likewise, according to the NASA report (2017), the average score in grade VIII mathematics in the year 2017 was 49.2 while the score in 2013 was 50.8. This shows that the average score is decrease by 8. Therefore, the report recommends that the reasons behind such downfall in the achievement in mathematics demand further inquiry to get the root of the fact. We can argue that the students' perceptions may be one of the causes of the low achievement and there have not been any studies focusing

on the students' perceptions towards mathematics at the primary and secondary school levels. In such a context, it is necessary to investigate the reasons for the low performance of the students in mathematics. This study was conducted to bridge the same gap.

2. Student Perception and its Components

Perception is the quality of being aware of a person, place, thing and event through the sensory organs. It is the ability to see, hear, or become aware of something through the senses, the way in which something is regarded. It is the process of identification, organization and interpretation of sensoryinformation in order to represent and understand the environment.

In this study, the term 'perceptions towards mathematics is conceptualized as a mental representation or view of mathematics, apparently constructed as a result of social experiences, mediated through interactions at school, or the influence of parents, teachers, peers or mass media.

Perceptions and beliefs about mathematics originate from past experiences; comprising both cognitive and affective dimensions (Aguilar, Rosas &Zavaleta, 2012). From a cognitive point of view, it relates to a person's knowledge, beliefs, and other cognitive representations while, from an affective dimension, it refers to a person's attitudes, feelings and emotions about mathematics. The term is also understood broadly to include all visual, verbal representations, metaphorical images and associations, beliefs, attitudes and feelings related to mathematics and mathematics learning.

It is widely claimed that, negative perceptions and myths of mathematics are widespread among the students, especially in the developed countries (Ernest, 1996,&Gadanidis, 2012). Sam (2002) claimed that many students are scared of mathematics and feel powerless in the presence of mathematical ideas. They regard mathematics as difficult, cold, abstract, and in many cultures, largely masculine (Ernest, 1996). It also refers to some kind of mental representation of the person; something originated from past experience as well as associated beliefs, attitudes and conceptions. There are several studies that focus on investigating the students' perceptions about mathematics itself e.g. (Moreau, Mendick& Epstein, 2010, Aguilar, 2012). According to Saks and Johns (2011), perception is the process of interpreting the messages of our senses to provide order and meaning to the environment. According to Saks and Johns, there are three components of perception: perceiver, target and situation (Figure 1).

The person who becomes aware of something and reacts to or perceives something from the situational context is the perceiver. The perceiver's experience, motivational state and emotions can affect his or her perceptions of the target. The information provider to perceive the information is the target. The target sometimes so the perceivers have to resolve such ambiguities to perceive the right information. Perception of the person can affect what one perceives from the situation or context. The most important effect of the situation can have is to add information about the target. The

situation can change the perception of the person even the perceiver and the target are the same. In the occurrence of perception, each of these components influences the perceiver's impression or interpretation of the target (Figure 1).
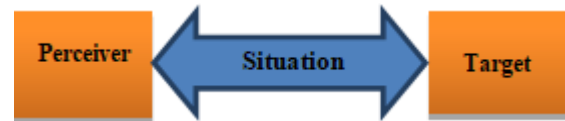

Figure 1: Components of perception

Objective of the Study
This study has sought to investigate the perceptions of the low performing grade X students towards mathematics in the Nepalese context.

3. Methods and Materials

Research Design
This research has employed a quantitative survey design. This design was used to find out the students' belief or opinion about the concept, knowledge and understanding about mathematics through a structured questionnaire. This design was specially used to capture the in-depth perception of the students about mathematics. This study is descriptive research that aims to describe a phenomenon that occurs at the time of study process.

Population and Sample
In this study, the purposive sampling technique was employed to identify and know theperceptions of the low performing grade ten students towards mathematics and to get the favourable number of low performing students of class ten from the public secondary schools from Province No. 1 of Nepal were selected as the sample for this study. Considering the ecological region of Nepal, 2 schools from each of the Hills, Mountains and Tarai regions were selected purposively. Likewise, 30 low performing students (marks getting below 60% in mathematics in the final examination of grade IX) were selected from each of the selected schools purposively with the consent of the school administration and the students themselves. Altogether, 180 students made the participants for the study. Of those 180students, 108 were girls and 72 boys. Their ages ranged from 16 to 19 years with mean of 17.4 years.

Development and Validation of Instruments
In order to gather the most common information about the beliefs and opinions of the students towards mathematics, an instrument (questionnaire) named 'Perception towards Mathematics Questionnaire' (PTMQ) was developed. It was adapted from two already tested different questionnaires. The questionnaire (PTMQ) was formed by using the five categories of variables related to perception towards mathematics. The questionnaire consists of the category as motivation, confidence, involvement, cooperation and value. Three categories namely, motivation in mathematics, confidence in learning mathematics and value of mathematics were developed by selecting and modifying items chosen from the scale Attitude Towards Mathematics Inventory (ATMI), developed by Tapia & Marsh, (2000). Likewise, two of the categories, involvement in mathematics

and cooperation in mathematics, were developed by selecting and modifying items chosen from the Perception of Mathematics Classroom Learning Environment Scale developed by Xinrong Yang (2013). The PTMQ included5 categories of variables each containing 3 items thus a total of 15 items all relating to students perceptions towards mathematics. The questionnaire was a 5 point Likert type response options: (1) never, (2) seldom, (3) sometimes, (4) often, (5) always.

The questionnaire was first translated into Nepali. To enhance the suitability of the questionnaire in the Nepalese context, university mathematics education researchers and highly experienced secondary school mathematics teachers were requested to make modifications to the translated draft. The modified version of the questionnaire was further checked by highly experienced secondary school mathematics teachers and experienced mathematics education researchers in Nepal. Modifications were further made according to their suggestions. The questionnaire consisted of two parts. The first part consisted of demographic variables of the students. The second part consisted of 15 questions relating to the 5 different categories of students' perception towards mathematics. The Cronbach Alpha test was used to determine the reliability of the questionnaire. The sum of the categories gives the total score of a student' perceptions towards mathematics. The maximum score of this questionnaire was 75 points. The higher the score the more positive perception of the students towards mathematics was associated. In order to find the reliability of the instrument, reliability test was conducted among the students of Province No. 1 of Nepal and was found to be 0.84 in total. This indicates that the instrument could be used in the projected area. The reliability of the instrument was judged sufficient because the alpha value was well above 0.60. (Nunnally, 1967) which is the minimum requirement. Table 1 shows the reliability of the perception categories; alpha values (α).

Table 1: Internal consistency of the perception category of the questionnaire

S. N.	Perception Category	No. of Items	α - Value
01	Motivation	3	0.85
02	Confidence	3	0.82
03	Involvement	3	0.85
04	Cooperation	3	0.84
05	Value	3	0.84
	Total	15	0.84

The data for the study were collected from the sampled students from the selected schools from all three ecological regions using the questionnaire. Visiting the sampled schools, the students' perceptions towards mathematics were explored through the questionnaire by the researcher himself.

4. Results

The results of this study were solely driven from the quantitative data gathered from the respondents using a set of questionnaire. Thequestionnaire was administered to the participantswith the help of their teachers. The data obtained from the questionnaire were analyzed using the mean responses given by the respondents in the 5- point Likert type scale. Descriptive statistics were used to determine the frequency and mean values of the data collectedusingthe research instrument. Table 2 shows the categorization of the mean scores presentedas four levels of students' perception; poor, average, good and excellent, based on the past research practice (Zainal, 2007). The perception level was used to interpret the result of the low performing students' perception towards mathematics.

Table 2: Categorization of mean values

Mean Score	Level of Students' Perception
1.0 – 2.0	Poor
2.1 – 3.0	Average
3.1 – 4.0	Good
4.0 – 5.0	Excellent

The students' perception towards mathematics was determined on the basis of the 15 questions on the five categories. Table3 presents the result of the low performing students' responses collected through the questionnaire. The results are presented in Table 3.

Table 3: Students' item wise response on perception towards mathematics

S.N.	Items	Always (5)	Often (4)	Sometimes (3)	Seldom (2)	Never (1)	Mean Response
01	I am confident that I could learn advanced mathematics.	-	-	5	15	160	1.13
02	I would like to avoid using mathematics in college.	142	22	15	1	-	4.86
03	I am willing to take more than the required amount of mathematics.	2	6	32	60	70	1.77
04	Mathematics makes me feel uncomfortable.	166	8	5	1	-	4.88
05	I believe I am good at solving mathematics problems.	4	6	10	20	140	1.41
06	I cannot learn mathematics easily.	120	40	10	8	2	4.48
07	I have usually enjoyed studying mathematics in school.	1	4	17	28	130	1.43
08	I would prefer to do an assignment in mathematics than to write an essay.	2	8	62	98	10	1.85
09	I feel comfortable answering questions in math class.	4	6	10	20	140	1.41
10	I cooperate with other students on mathematics class activities.	150	10	16	3	1	4.69
11	I enjoy explaining mathematics to others	-	1	6	9	162	1.12
12	I can do mathematics better when I am alone.	-	-	5	15	160	1.13
13	Mathematics is a very worthwhile and necessary subject.	90	50	35	5	-	4.25
14	Mathematics is important in everyday life.	85	45	30	15	5	4.05
15	Mathematics is one of the most important subjects for people. People to study	154	16	8	2	-	4.78

As displayed in the table, all five categories of the low performing students' perceptions towards mathematics have the mean values ranging at 4 levels:1.0 to 2.0 (poor), 2.1 to 3.0(averages), 3.1 to 4.0 (good) and 4.0 to 5.0 (excellent). It was found that the mean responses to the 15 itemsspreadover 5 different categories.Item 1(the students' perception towards mathematics) was totally negative. The items having positive statements,(1, 3,5,7,8,9,11 and 12),in which the corresponding mean responses are 1.13, 1.77, 1.41, 1.43, 1.85, 1.41, 1.12 and 1.13 respectively, indicate the poor or low level of perception. It means that the responses of the low performing students in mathematics had an opposite reaction. They did not like or prefer mathematics. Similarly, the responses to statements 2, 4, 6 and 10, are on the negative scale in which the corresponding mean scores are 4.86, 4.88, 4.48 and 4.69 respectively. It means that, the respondents opposed to the negative statement. So it can be concluded that the low performing students' perceptions towards mathematics were found to be negative.However, the participants accepted the value of mathematics since they responded positively to items 13, 14 and 15, which were related to the value of mathematics. So, even the students who were poor at mathematics and reacted mathematics as a difficult subject also accepted the value of mathematics at the meantime.

This study sought to know the perception of the low-performing grade ten students in Nepal. The results showed that in general, the low performing students' perceptionstowards mathematics werenegative. Most of the participants perceived mathematics as a difficult subject. They did not seem to understand and did not perform well in the subject. This may be the misconception about mathematics as a difficult subject and this is why the students might have fear and anxiety during learning the subject. This contradicted with what Matudi (2014) discussed, that students thought that studying mathematics was just questioning of one's ability instead of an effort and led them not to believe in their natural ability in the subject. Although the participants in this research found mathematics as a difficult subject they had several ways of coping up with it like studying hard and asking for help.

5. Discussion and Conclusion

After the findings, it can be concluded that one of the causes of low performance in mathematics may be the learners' negative perceptions towards mathematics, rather than being the subject itself difficult. In this study, most of the students who participated werefoundunenthusiastic in learning or doingmathematics. Theydid not accept mathematics as usual and easy as the other subjects. It is obvious that the students had both negative and positive perceptions towards mathematics. The researcher found that although most of the students had negative views towards mathematics as a difficult subject, the possibility of changing their negative perceptions into positive ones is high since they still accepted the value of the subject. They know that studying mathematics is important. Although they found mathematicsas a very difficult subject to understand, they still tried their best to cope with the lessons and the educational requirements.Unless if the basic foundation of mathematics could be established in the learners,

complexities of the subject are very likely to increase as they step up to higher education.

Although the students conceive mathematics as a difficult subject they still convinced the value and the importance of studying mathematics and were willing to expand their abilities. They had an interest in studying mathematics for they knew that it would help them not only for passing their tests but also in their everyday life and future carrier. Hence, the students had their own techniques in dealing with the requirements like listening to their teachers, asking for help, studying hard and trying to do all the needed work on time.Some of the high performing students still thought that mathematics is easy if it is well practised.

6. Acknowledgements

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