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A STUDY ON TEACHING MATHEMATICS IN CREATIVE AND INNOVATIVE MANNER

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ABSTRACT:

The article seeks to investigate the disposition of mathematics phobia. It studies about the fear of mathematics, its causes, symptoms and ways to overcome regarding the school level students. Out of the root causes of mathematics phobia, curriculum structure, schools facilities, instructional techniques, teachers' teaching performance, use of tools and technology and evaluation system are the main. In the same way, lack of proper incentives for mathematics teachers and the negative perception of the students and teachers about mathematics are also the important causes. The study has revealed that mathematics phobia exists among students, which are characterized into negative perception of the students towards mathematics and others too. The main causes of mathematics phobia include test and examination, individuals, teachers, parents, peers and the nature of mathematics. The only ways to overcome mathematics phobia, is the intensive efforts made by all the stakeholders.

Keywords: Mathematics, Fear, Phobia, Arithmophobia, Numerophobia

INTRODUCTION:

Mathematics is a universal, utilitarian subject that is needed for everyone in their life. It is an integral part of the curriculum throughout the countries in the world. It is an interdisciplinary language and tool that is considered as one of the fundamentals in the formal educational system (Roy, 2011). He further states that mathematics is the study of quantity, structure, space and change. It is as a human endeavor encompasses the mathematics of measurement time, distance and different system of distance measurement that developed throughout the world. Mathematics is a science about well-defined objects and notions which can be analyzed and transformed in different ways using 'mathematical reasoning' to obtain conclusions about which we are certain (OECD, 2018).It is an essential requirement in every field of intellectual endeavor and human development to cope with the challenges of life (Ihechukwu & Ugwuegbulam, 2016).

The word 'mathematics' comes from the Greek word 'mathema', which means learning, study, science and additionally came to have the narrower and more technical meaning 'mathematical study' even in classical time (Roy, 2011). Mathematics is an important subject with broad applicability to everyday life, yet mathematics is often considered as a difficult subject in schools (Kaur, 2017). As early as the 1st grade, students can start displaying negative attitudes towards learning mathematics and gradually develop it in the form of mathematics anxiety (Hornigold, 2015). Moreover, it seems that the school has not given the special attention to classroom delivery and the approaches to teaching and learning of students with mathematics learning difficulty (Khing, 2016). On the other hand, students' performance in mathematics is decreasing gradually as the students' moves to the upper grades. The reasons behind such aspects like negative attitudes, mathematics anxiety and decreasing students' performance on mathematics may be different prevailing factors. Among these different factors, somebody consider mathematics phobia is one of the important factors. It is the universal belief about mathematics as a 'difficult subject' by perception. In the Nepalese society, most of the school level students, teacher as well as parents consider mathematics as a difficult subject. So, those students who have already conditioned their minds that mathematics is a difficult subject are usually not serious in the learning of mathematics and therefore perform poorly in mathematics tests and examinations (Ihendinihu, 2013).

CONTEXT OF THE STUDY:

Mathematics achievements of the students in Nepal not only seem to be at a lower place as compared with their international status (NASA, 2013) but also are in a rather decreasing direction in recent years. According to the report of NASA (2017), the average score in grade VIII mathematics in 2017 was 49.2 while the score in 2013 was 50.8. NASA (2019) shows that huge mass of students is at the underperforming level especially in mathematics and is decreasing the students' mathematics achievement for some years. This situation also requires the necessity to enlighten the students towards those with poor in mathematics for their better performance. In spite of the continual efforts in the field of teacher development, cognitive aspect of learning and content organization, and timely amendments of the curriculum targeted at education reform in the Nepalese context, achievements in mathematics still seem to be at a lower place (Panthi & Belbase, 2017; Mahato, Morgan & Earnest, 2019; NASA, 2019). The cause of underperforming in mathematics is not clear however, there may be different factors that could influence mathematics achievement. Arguably, one reason for this is that students' perspectives are neglected in mathematics pedagogic practices and the causes may be the negative perception about mathematics, mathematics phobia that the students could be affected from the beginning of school education. In the same way, another cause may be the lack

up arousing students' positive attitude towards mathematics due to inadequate teaching materials, large classes, poorly motivated teachers, lack of laboratories and libraries, poor supervisory activities and lack of overall students' assessment system etc. As stated by Soares, Evans & Patel (2018), mathematical difficulties refer to the poor mathematics achievement of the children caused by a variety of factors from poor instruction to environmental factors, which is hypothesized to be due to an inherent weakness in mathematical cognition not attributable to socio-cultural or environmental causes.

SIGNIFICANCE OF THE STUDY:

Mathematics can be a very interesting and fun provoking subject for those learners who can really enjoy their learning (Fu Sai & Chin Kin, 2017). On the contrary, mathematics can also be a frustrating subject for many children who have problems with comp utation and application (Chinn, 2015). This shows that, many people have mixed feelings about mathematics. Thus, many students feel mathematics as a boring and disengaging subject (Colgan, 2014) and they hate mathematics, and try to avoid it by the cause of mathematics anxiety. Even teachers and parents have negative attitudes towards mathematics; it is expressed as a hard subject that is inaccessible, uninteresting, and it is not for cool and engaging people, and not for girls (Boaler & Dweck, 2016). Of all the most important cause of poor performance in mathematics at school level may be the phobia in mathematics. Thus the study can help the concerned teachers and the educational administrators to run and support the students who are suffering due to the lack of support and other resources, and the perceived barriers that impact on classroom instruction and supports (Graves, 2018).

OBJECTIVES OF THE STUDY:

The objectives of the study are as follows:

i) To familiarize the concern students, parents, and teachers about the fear and phobia of mathematics
ii) To develop the ideas about the types of mathematics phobia, causes, symptoms and ways to overcome to the concern teacher

METHODOLOGY:

The methodology of this article is mainly descriptive. In this paper, the researcher has been adopted mainly the desk study method to search the different aspects of fear and phobia of mathematics. It is based on the review of the published and unpublished literatures from different sources including worldwide web. Different recent articles and the research report related to the mathematics phobia were reviewed thoroughly to describe the different aspects of mathematics phobia. The related books on theory of mathematics phobia are also reviewed to some extent.

RESULTS:

The Fear of Mathematics:

Mathematics is considered as the one of the most prominent subjects in school level education due to its importance in day to day function of the people. It has long been recognized as an essential requirement for everyday life and for most occupations. Mathematics is often considered as a difficult subject by many students in schools education (Capuno, et al., 2019). Feeling mathematics as difficult for students affects not only their liking of mathematics but also their perseverance, interest, boredom and self-efficacy beliefs related to mathematics (Gafoor & Kurukkan, 2015). Fear of mathematics is not only the case of the particular places or the persons. It is a global issue. The fear about mathematics is causing the students negative attitude towards mathematics and hindrance the learner from focusing on the problem which they are tackling. The fear of mathematics also tends to the learner get nervous especially during the time of the test or examination, fear clouds their minds and the students could not perform as well. Some of the reasons attributed to the fear of mathematics may develop earlier to the learner and may have several possible causes like: hereditary, social and environmental. Fear of mathematics may create due to the influence of the parents, teachers, classmates and seniors. In the same way, negative perception towards mathematics also may cause the fear of mathematics.

Meaning and Types of Phobia:

A type of anxiety disorder or a mental illness that makes someone very worried and affects their life is known as phobia. It involves an extreme fear of something or irrational fear of a specific situation, activity and object or that leads to compelling desire to avoid it (American Psychiatric Association, 2013). The term 'phobia' is abstracted from the Greek word "phobos" meaning fear, panic fear, or terror. In the simple terms, the meaning of phobia is "fear". Usually a person has phobias to a number of objects or situations. Phobias can be divided into three categories as: specific phobias, social phobia, and agoraphobia (Hamm, 2009). Specific phobias include the fear of certain animals, natural environment situations, blood or injury, and specific situations. Social phobia appears when the situation is fearful for the person who is worried for being judged by the other persons. In the same way, agoraphobia is a generalized fear of leaving home or a small familiar 'safe' area, and of possible panic attacks that might follow. Sometimes the phobias are produced by the negative experience with the object or situation.

Mathematics Phobia:

There are different types of phobia (fear) such as: fear of water (hydrophobia), fear of height (alto phobia), and fear of performance and so on. One of them is mathematics phobia. It is a fear of mathematics. It can be defined as a feeling of anxiety that stops one from efficiently tackling mathematical

problems. Mathematics phobia is regarded as mathematics weakness in students that deals with psychological dimension of learning (Olaniyan & Salman, 2015). Tillfors (2003) defined phobia as learned emotional responses and it causes frequent severe and intense anxiety. Many people have a negative perception about mathematics that it is an extremely hard subject which they cannot master. This negative perception weakens them from focusing on the subject and as a result they get comparatively less performance in the tests or exams. Consequently, fear increases day by day towards mathematics and eventually it develops in the form of phobia.

The lack of ability in mathematics innumeracy has received increasing attention in the last few decades. The ability to use basic mathematics is more important as the modern day's society has become more complex. Some children may have some problems with mathematics due to some reasons. According to David Geary (2013), one cause of the problem in mathematics may be a fundamental deficit in the representation of numerosity. It occurs at different ages in different people for different reasons. The specific mathematics phobia which is basically comes due to the arithmetic or fear of numbers. Such phobia is called arithmophobia or numerophobia. The words arithmophobia and numerophobia both have Greek origins where the root word stands for 'numbers', and 'phobos' meaning 'deep dislike or fear'. This type of phobia affects student's attitude towards mathematics and often creates ridiculous fear of numbers. There are several reasons behind the mathematics phobia viz. the ignorance for the subject, discontinuity in concept learning, lack of concentration and practice, avoiding participating in teacher learning process, open insult by teacher, parents, and peers, low scores in the subject and the negative perception about mathematics. This fear is somewhat unusual in that it encompasses a wide variety of specific phobias, including a generalized fear of all numbers and fear of specific numbers. It is classified as an anxiety disorder.

Types of Mathematics Phobia:

The mathematics phobia is classified into two types as general and specific arithmophobia or numerophobia. General arithmophobia is the fear of all numbers that can seriously affect the ability of the students to do mathematics. This limits both educational and professional opportunities. Specific arithmophobia is the fear of some specific numbers that some people may be affected by this phobia. This type of phobia is usually rooted by superstition or religious phobias. The specific phobia is less serious than general arithmophobia. The best example of specific phobia is a fear of the 13 number, it is known as triskaidekaphobia. This fear has been linked to early Christians, and the number 13 appears in a lot of Biblical traditions. The number 13 is considered as the unlucky number in that religion. Even today, many hotels in the western society omit the 13th floor and room number with the fear of the number 13. In the same way, the number 666 is another number that's widely feared in western

cultures. It is said to be the "number of the beast" as translated into English versions of the Book of Revelation verse 18. The number 4 is considered as an unlucky number in Asia countries like China, Vietnam, and Japan because it is something of a homophone for the word "death" in the local languages. Just like in the west, hotels are prone to omitting the number 4 out of their floors and room numbers, and corporations have even followed suit, the serial numbers of Canon cameras don't include the number 4, and Samsung phones no longer use model codes with 4 either.

Many people of all over the world fear with numbers. Some might fear from one number and other fears from another number considering their culture, religion, place of birth and region. Country like Nepal, India, Bhutan and Myanmar, people who follows Hindu religion, they consider the numbers 0, 1, 8, 10, 12, 19 and 28 as unlucky numbers, bad luck or evil spirits etc. These numbers are called oudenophobia, henophobia, octophobia, decaphobia, dodecaphobia, enneadecaphobia and eikosioctophobia respectively. They always fear from these numbers. In contrary to the above, especially the people from Nepal and India assume the number 7 as the lucky number and they like to choose this number and they don't fear. In China, the number 8 and multiples of 8 are considered as the luckiest number and they believe that the number brings wealth and good luck. Similarly, Chinese young people in slang word use 520 as the symbol of conveying love (I love you) to their best friend. However, especially in Nepal and India, people used 420 to convey as the bad character. Thus, due to different religious and cultural superstition, people surrounding these places may have different understanding about the number. The understanding may be positive or negative depending on their religious and cultural superstations. Such irrational beliefs about number create fear to the each and every learner.

Causes of Mathematics Phobia:

Mathematics phobia can be occurred due to different causes. As concluded by Ihechukwu, & Ugwuegbulam (2016), lack of different aspects related to teaching learning like: good teacher-student relationship, use of students-centered/innovative approach of teaching, counseling, positive attitude towards mathematics, improved mathematics curriculum, breaking down topics into units, application of ICTs in teaching mathematics etc. can cause mathematics phobia. According to Foley, et al., (2017), mathematics anxiety is learned not from personal experience but from parents and teachers. As reported by Foley and colleagues, a study done in India found out that, parents with high mathematics anxiety unintentionally convey the idea that mathematics is difficult and anxious while helping their children's homework. In the same way, the study done in America found out that the level of mathematics anxiety depends on their teacher. The children read the subtle body cues of their elders to determine whether mathematics is something to fear or to feel good about. The students who get nervous on any occasion in the case of mathematics are

caused by mathematics phobia. Thus mathematics phobia is mainly caused by the test and examination(due to the pressure to perform well), people (individual, parents, teachers and peers) due to individual low proficiency, parents concept of difficulty, teacher poor knowledge delivery and peers negative feeling toward mathematics and nature of mathematics (due to abstract nature and not to relate all aspects in real life). The following points may be the causes of mathematics phobia:

i. Weak teaching method and weak mathematics background
ii. Teachers' aggressive, stressful and irritating characteristics
iii. Inability to solve mathematics problems
iv. Bad relationships between a teacher and a student
v. Inability to solve too much home assignment
vi. Not to understand mathematics in class
vii. Unable to solve mathematical tasks
viii. Use of abusive words by teacher
ix. Negative attitude towards mathematics
x. Not able to solve mathematics problem in time
xi. Not to be child-friendly teaching environment
xii. Mathematics learning difficulty (dyscalculia)
xiii. Community Influence (negative perception)
xiv. Low self esteem
xv. Lack of analogies

Symptoms of Mathematics Phobia:

Mathematics phobia is a feeling of anxiety that appears due to the fears of solving different mathematical problems. Some people call mathematics phobia as a tension, panic, helplessness, and mental disorganization. The feeling of phobia in long term can have a negative impact on health of the person and also lose the desire to learn the subject further. Hence, any types of phobia should be eliminated at the very beginning stage not to evolve into more serious problems. In the same way, mathematics phobia has the following symptoms:

- Apparent choking sensation and Anxiety, depression.
- Sweating, trembling or getting hot flushes and Problems with breathing
- Breathing rapidly and tightness in the chestausea, headache and fainting
- Unable to express one's thoughts clearly and Immediate desire to leave classroom
- Get detached from reality and Shows avoidance behaviour
- Getting nervous and stressed when assigned to solve mathematical problems and Skips classes and irrational thinking.

Way to Overcome Mathematics Phobia:

It is fair to say that mathematics is not everyone's favorite subject. Some students have the feelings of tension and anxiety or fear toward mathematics.

Such negative feeling towards mathematics suffers them day by day and it can be difficult to shift from a mindset of failure to a more positive attitude. Different research shows that if teachers as well as the parents deal with the mathematics phobic student in time by different way to shift into positive mindset, it is not impossible. So many students may have suffered from mathematics phobia due to the result of several negative experiences and perception in the past. It can be overcome by controlling anxiety, improving mathematics skills and developing positive attitude towards mathematics. The following steps are the main way forward from mathematics phobia and perhaps find a way to view mathematics in a more positive light.

- Reinforce the child's sense of intelligence and skill in mathematics learning
- Create a supportive environment for learning mathematics
- Encourage the child to tackle in mathematics
- Explain the child about positive uses of mathematics
- Familiarize the child into mathematics teaching aids
- Make mathematics teaching fun with games and puzzles
- Avoid to compare the child's abilities to others
- Increase the use of instructional materials in teaching
- Use of innovative and contemporary teaching approaches
- Develop and maintain close student-teacher relationship
- Motivate students to treat mathematics positively
- Provide access of reference material
- Use of modern facilities, devices, and tools
- Use of ICT in teaching learning situation
- Make enough and effective practice of mathematics.

BLENDED LEARNING:

Hybrid learning joins the two learning strategies — conventional learning and digital platforms means electronic learning. Every area of education like content matter, and understanding the individual differences of learners the lesson plans can be prepared in step by step organized pattern which carries traditional ways and independent learning modes like computer based training web links etc. This makes teachers technocrats and gives new vision and new platforms to their thoughts.

Although role-playing with immediate face-to-face feedback is available in the classroom, online learning provides customized, self-paced learning with e-Learning/m-Learning components that lend themselves to interactive media such as skill-building, games, videos, tutorials, quizzes, and social media

components, all accessible from the learner's home page in the Learning Management System (LMS).

Blended Learning Models:

Its very important to teach students according to their learning level and style so that they can grasp the concept in a better way. A blended learning model can help you to adapt your subject matter for time constraints, learning proficiency, and even custom-built orientation, but you can also use a hybrid learning model to think more clearly, envision content, and implement it more effectively.

Blended Learning Methods:

- **Face-to-Face:** in conventional method different sessions on learnign can be organised to motivate students to learn better at their own pace Role-playing, mentoring, hands-on instruction, and reviews are all benefits.
- **Rotation:** Students can simply rotate from formal learning to non-formal learning according to their understanding and interest levels. Learning stations, labs, and the flipped classroom are all examples of how learners can practise a lesson before attending face-to-face training.
- **Flex:** The individualised learning and flex learning are interchangeable terms Students guide their learning journey by accessing means of learning incorporation in a Learning Management System (LMS) and choosing what they want to learn. The teacher is usually present to answer questions and serve as a guide
- **Gamification:** Allowing students to play is one of the most important ways to inspire them. Learners feel a sense of competitiveness and are more inspired to explore the content on their own time when game play elements such as points or levels are used. Online Lab: This blended learning model takes place before, during, or after a training and is completely interactive, with little or no teacher interaction. Students can easily learn through their mobile gadgets. The learning can be easily understandable
- **Self-Blended Learning:** Self-blended learning is widen the content area like —webinars, white papers, industry blogs, or video tutorials—that enables self-motivated learners to delve deeper into a subject. To promote curiosity and development, a robust LMS may bring together multiple thoughts and ideas into one framework.
- **Online Driver:** These programs are entirely base on personalized learning. Students may communicate with an instructor through chat, email, or a message board. It offers a flexible schedule and customized learning, but it lacks the face-to-face engagement that other blended learning methods do. An LMS is the great option to guide students according to their own learning styles while also the progress of child can be tracked as they watch videos and ultimately participate in classroom discussions. You have the

option of using one of the current learning management systems or having one built specifically for your needs.

TOOLS OF BLENDED LEARNING FOR MATHEMATICS:

- **Khan Academy.:-**Khan Academy allows for students to self-pace through material, and scales material based on student progress, something that is impossible in a traditional classroom. Students can be linked to "coaches" who can be their classroom teacher, a parent, a tutor, or a peer-tutor.
- **Power School.-** Its an award winning student system software. PowerSchool SIS is the leading student information software solution for K-12 educational institutions. It powers your operation with flexible, innovative, easy-to-use technology that plays an important roll in school.
- **3 PLEARNING:-** It is a blended teaching community which create learning experiences that stick with blended learning tools for mathematics and literacy..
- **ST Math.:-** It is a program for conceptual understanding they believe that every students can understand and truly love mathematics. It's a visual instructional program that leverages the brain's innate spatial- temporal reasoning ability to solve mathematical problems.It is a unique, patented approach provides students with equitable access to learning through challenging puzzles, non-routine problem solving, and informative feedback.
- **ALEKS.:-** ALEKS is a tried-and-true online platform that helps educators and parents completely comprehend each student's knowledge and learning progress, as well as provide the individualised instruction that each student needs to master the skills.
- **Illuminate Education.:-** They all accept that the world has changed. Much more data is needed to inform instructional and intervention decisions. Illuminate is a unified approach that aids educators in assessing learning, identifying needs, coordinating personalised supports, and monitoring student progress.
- **i-Ready.:-** It is an online evaluation and instruction platform that assists teachers and students in excelling in mathematics.

BENEFITS OF USING BLENDED LEARNING

- It's Cost-efficient: You can reduce training costs and increase ROI by using blended learning. Forget about missing lectures, paying for flights, or taking time off work to attend daily trainings. Classroom trainings and pre-registered courses can easily be combined. You may also have a live online training session so that your students are up to date with everything.
- Be Consistent In Activities Also Pre-training: Before the in-class training even begins, everybody should be on the same page. So they can come

prepared, give them reading materials, recordings, and pre-course questionnaires.

- Access the Content From Anywhere, Anytime, on Any Device : Your students will be able to remain linked to your content at all times. They can even download courses so that they can use them even though they don't have access to the internet.
- Increase User Engagement Easily: The perfect formula for a rich learning environment is the combination of digital and instructional design. What matters the most? Learners will return to the courses as much as they like in order to obtain excellent results over time.
- Get insightful reports about your learners: Analyze the students' operation and see where they are succeeding and where they are failing. You can then customise the content as required.

CONCLUSIONS:

Whether mathematics is interesting or boring, it is widely used in the human life formally or informally. It is also the important part of the school level curriculum in the world. The school level students may have mathematics phobia due to different aspects like: teacher, parent, peer, senior, poor mathematics background, ineffective teaching methods, students' negative perceptions towards mathematics, abstract nature of mathematics and religious and cultural aspects etc. Teacher is the central part of teaching and learning. It is said that when a student likes a teacher, then there is greater probability of liking the subject he or she teaches. In any case, it is important to do possible intervention to eliminate the mathematics phobia among the students. However, it is important to eliminate the mathematics phobia of the students from the very beginning; otherwise, a simple mathematics phobia may gradually become a serious psychological problem. Mathematics phobia is a real problem that students and teachers are facing today. So, the mathematics teachers and parents especially need to understand the causes and effects of mathematics phobia as well as the ways to help students to overcome it. The students' support system from home and school should be increased to develop positive attitude towards mathematics. The more a teacher understands mathematics phobia the more s/he will be able to prevent it and help the students to overcome it.

"Hybrid learning is a learning model that blends formal (classroom) and non-formal (online) methodologies which makes mathematics easy to learn anywhere and anytime. All the different digital platforms are very helpful and student can use according to their pace.

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