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Math mania: Meaning, Problems and Ways of Effective Teaching and Learning Mathematics at Basic Level Education in Nepal

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Abstract: ***This article is related to the present context of mathematics teaching at basic level in relation to math mania. It is based on the review of different kinds of literature, classroom visits, observations, and discussions with respective basic level school teachers. The objective of this article is to carry out the meaning, importance, and ways of making mathematics learning fun at basic level mathematics classroom teaching. In this article, the context of the problem, the meaning of math mania, problems in mathematics learning, ways of making effective mathematics teaching, and ways of making mathematics learning fun have been discussed. On the basis of classroom observation and discussions with the basic level teachers, three types of mathematics learning problems related to curriculum, teachers and the learners have also been discussed. Finally, it is concluded that the fear and phobia of the students toward mathematics found to be addressed and the exciting learning environment should be created to strengthen the love, interest, and fun for mathematics.***

Keywords: Math mania, Mathematics Learning Fun, Mathematics Teaching, Satellite Learning Approach

1. Introduction

Mathematics is a unique subject and also a fundamental part of school curriculum. Regardless of the importance given to mathematics, a large number of students struggle to understand the subject (Mazana, Montero & Casmir, 2020). Many students think that mathematics is a very difficult subject to study (Capuno, Necesario, Etcuban, Espina, Padillo & Manguilimotan, 2019). 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). It is extremely important in our lives. Even without realizing it, we are using mathematical concepts, skills as well as the application in our everyday life. The laws of mathematics govern everything around us, and without a good understanding of them, one has to come across significant problems in life. Mathematics is considered as a difficult subject by most of the students due to aversive teaching style, difficulty in following the instruction, difficulty in understanding the subject, and difficulty in remembering its equations and ways to solve problem (Gafoor & Kurukkan, 2015).The perception of the students about mathematics as a difficult subject is one of the crucial issues that make them develop negative attitude towards mathematics and consequently they tend to dislike mathematics. The factor attitude is regarded as a key contributor to higher or lower performance in mathematics (Ngussa & Mbuti, 2017). Attitude refers as a learned tendency of a person to respond positively or negatively towards an object, situation, concept or another person (Sarmah & Puri, 2014). It can change and develop with time (Syyeda, 2016), and once a positive attitude is formed, it can improve students' learning (Mutai, 2011).

In the same way, negative attitude hinders effective learning and consequently affects the learning outcome henceforth performance (Joseph, 2013). So, it is necessary for a mathematics teacher to make children with positive attitude toward learning mathematics. The mathematics teachers should be aware of practicing more effective strategies in teaching so that the student can think, perceive and learn mathematics as a fun andbe interested in learning the subject. In this regard, the plausible strategies for teaching and learning mathematics can be the 'math mania' that sharpens the hidden mathematical skills and build more confidence and helps to achieve higher scores in mathematics. Liking of mathematics is associated with more positive affects like interest, positive expectations, higher self-efficacy and personal values towards mathematics, whereas dislike is associated with boredom, low self-efficacy, fear (mathematics phobia) and negative expectancies (Gafoor & Kurukkan, 2015).

1.1. Context of the Problem

After the establishment of the federal system, the education system of Nepal is governed by three levels: the federal government, state governments and local government by constitution. School education is especially regulated by local government. The framework of the school curriculum has been designed by the federal government and implementation of the curriculum like pedagogic practices, policies for hiring teachers, recruiting teachers, training, supervision and monitoring etc. are governed by the local government. In the basic level education, most of the teachers are trained in general but they have not got any special mathematics teacher training. The result of mathematics subject at basic level and Secondary Education Examination (SEE) has been reflecting very poor real situation in Nepal (NASA, 2018). The report of NASA (2017) stated that: In mathematics, the average achievement score is 57% in the private schools whereas it is 26% in the public schools. It has also focused on developing specialized teachers focusing on discipline and classroom management. However, huge mass of students is at the underperforming level especially in mathematics (NASA, 2019) and is decreasing the students' mathematics achievement for some

years. There is no any provision of interacting among the mathematics teachers. The education system of Nepal is running under the fund and management of government, public and private sector on the prescribed curriculum framework designed by the government (MoE, 2016). Very low numbers of basic level schools are running under the investment and management of private companies and institutions.

Nepal government has recently revealed the National Education Policy-2019 with a vision to develop Nepal as an educational hub providing world class education with the slogan 'educated, civilized, healthy and competent human resources: social justice, transformation and prosperity' and has set a goal to develop human resources aligning the needs of the country through competitive, technology friendly, employment intensive and production oriented education at all levels. This policy has also emphasized on the attainment of professional degree after completing the academic degree to produce qualified and self-motivated teachers. Thus, this policy has equally focused on both pedagogy and content knowledge for the teacher.

1.2. Objectives of the Study

The objectives of the article are as follows:

i) To bring out the importance of math mania and way of making mathematics learning fun at basic level (Grade, 1-5) students
ii) To carry out the real ground of mathematics teaching at basic level in the context of Nepal

2. Methodology

This study is based on the mixed method survey research design. In this course, 20 basic level schools of five different districts of Pradesh 1 and 3 were visited by the investigator. Similarly, the mathematics classroom teaching of 10 basic level teachers were observed and also discussed with the them about the mathematics teaching at basic level to find out the real ground of prevailing condition of mathematics teaching. During the discussion, the teachers' knowledge about math mania and way of teaching to make mathematics fun were also discussed. Out of the visited basic level classrooms, many positive and encouraging practices in mathematics teaching were found. Although, some schools were also found very low encouraging classroom practices including classroom management. This article is based on the review of different related literatures and the proper visit and observations of the mathematics classroom teaching and discussions with the basic level school mathematics teachers.

3. Results

3.1. Meaning of Math mania

Math mania is a popular alternative for making mathematics teaching fun, which is generally run in basic level. The word 'math mania' is the combination of the words mathematics and mania. Mania means extreme love and passion or excitement. So, math mania is related to love for the mathematics subject. The word 'mania' is a Greek word meaning an excessive enthusiasm, desire or passion. Math mania is a quiz in which the teams are asked all kinds of mathematics based questions which do not only test the mathematical ability of the students but also their logical and analytical skills. Math mania is a word for the love of all things mathematical. Everything that we can see, hear or perceive by any other sense can be expressed using numbers, mathematical operations, theorems, axioms and universal mathematical laws. In this process, we learn about the things we use mathematics to describe and our understanding of the world around us grows even more. It is a passion for all things mathematical and it inspires the learner to feel excited. In doing so, it is necessary to collect interesting information about different mathematical subjects that are fun and interesting to make them more relatable and easier to understand. Mathematics can be a very interesting and fun provoking subject for those learners who can really enjoy their learning (Fu Sai, & Chin Kin, 2017). Contrarily, mathematics can also be a frustrating subject for many children who have problems with computation and application (Chinn, 2015). Thus, the students have different feeling about mathematics learning as they perceive mathematics earlier.

Math mania is a process of learning mathematics especially for the basic level school children through mathematical demonstrations, puzzles, and hands-on activities and playing with mathematical concepts in a funny way. It helps the children to conceptualize the mathematical concepts and develop positive attitude towards mathematics as well as positive perception towards mathematics. Math mania presents a variety of interactive demonstrations, puzzles, games, art, the amazing sorting network and a number of other mathematical puzzles and paradoxes. These activities are designed to exhibit to children and their parents for learning mathematical concepts in a funny way. Math mania makes students, parents and teachers excited by exploring mathematics through the use of games. The mathematical demonstration makes it a fun, meaningful and motivating to mathematics to everybody from different cultures, different ages and stages of life.

3.2. Problems in Mathematics Learning

In mathematics learning, there are different problems related to curriculum, teachers and the learners. The most important problem in the learners is the negative perception towards mathematics that is a sense of fear and failure among the majority of children. The learning problem is found on the children themselves that is learning disability situated in their own cognitive development. Hence, it is essential to address the need through the effective instruction and interventions that go beyond the existing classroom instruction to reduce the negative perception and attitudes toward learning mathematics and improve their performance in mathematics (Sharma, 2020). They should also focus on sound practice and best delivery of the intended outcomes. These interventions should be effective, efficient and elegant and must be based on sound principles of learning mathematics, reflecting the characteristics of the difficulty and focused on the practices that deliver outcomes envisioned (Sharma, 2020).

The curricular problem disappoints the talented minority as well as the non-participating majority at the same time (Manglik, 2020). It is due to the individual differences of the learner by different causes and organization of the subject matter. The problem related to the teacher is teachers' pedagogical and content knowledge. Mathematical difficulties may cause 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 (Soares, Evans & Patel, 2018). Most of the time, these difficulties can be overcome by a little extra support and a proper intervention. Such difficulty in mathematics does not necessarily mean dyscalculia (Hornigold, 2015).This indicates the knowledge and experiences of the teacher as well as using methods, tools and techniques in teaching. In this regard, inadequate teacher's preparation for teaching mathematics in terms of proper content and relevant pedagogy is most important for delivering mathematical concept, skill and application to the learner. This study focuses on mathematics learning problems due to an inadequate design of instruction in curricular materials (Carnine, Jitendra & Silbert, 1997).

3.3. Ways of Making Effective Mathematics Teaching

In the context of teaching, now, we even mathematics teacher are moving around the teacher dominant model, where the teacher addresses, commands and delivers the knowledge to the entire class. We do not care about the need and interest of the learner as well as their mathematical background. This process of mathematics teaching is losing the students' creativity and independency day by day so as to make them mechanical. On the other hand, technological discoveries have the greatest impact on mathematics education in terms of using new methods and resources in teaching and evaluation process. But the implementation of such technology is very low. Although in some schools, the use of new technology in the classroom has been introduced. So, effective mathematics teaching needs to make the children free from fear and mathematics phobia and it is also necessary to address the problems related to the students, teachers and curriculum for making mathematics teaching effective.

Effective mathematics teaching focuses on students' motivation, using varied mathematical representations, development of both conceptual understanding and procedural fluency (Arafeh, 2008). Effective teaching that prepares the students to absorb new knowledge, connect it with previous knowledge and make a chain of knowledge for working in the changing environment (Khan, 2012). It demands perfect relationship between subject matter knowledge and its delivery to the students.

Most of the children are not fond of mathematics. Some students in the classroom may have negative attitude towards mathematics and they also feel hard to learn new mathematics concept. Mathematics seems to be boring because children find it hard to understand due to abstract and calculic nature (Sparfeldt, Buch, Schwarz, Jachmann, & Rost, 2009). In such condition, a mathematics teacher can help and support those students who feel mathematics hard and have negative attitude towards mathematics and also make them curious to learn mathematics and love mathematics. Thus, only a teacher having a positive attitude can change the spirit of the mathematics class by incorporating several useful games, innovative assessment techniques and using modern tools and technology.

Mathematics for the children of age below 10 tends to be a source of joy. They seem to be drawn to ideas about number, shape, pattern and structure in a similar way they are drawn to language. They learn mathematics through experimentation, play and repetition. Play is very interesting and important thing to support all types of students in their learning. So, play is also known as the heart of mathematics learning. When the children are at a playful stage, they are more likely to open their curiosity, more likely to struggle, and more likely to feel a sense of ownership. So, while teaching in primary grades, the parents as well as teachers need to play with the children by using mathematics. Playing with blocks is crucial, especially for young children, since there's a physical intuition that gets built that ends up providing fundamental analogies for mathematics. Just living with questions and providing a space for questions to live is very powerful.

The fundamental thing for a teacher to be considered while questioning is just to make them curious rather than getting correct answer. It is better to ask the students like "how are you thinking about this?" or "what do you think about this?" instead of "do you know the answer?" such questions make them curious. If we ignore the children's intuition and make them follow the instructions to get the answers, we are damaging their foundation for mathematical thinking. So, the teaching should be focused on sense/creation driven rather than answer driven.

3.4. Ways of Making Mathematics Learning Fun

Generally, mathematics is supposed as a hard and boring subject. Although, it's important as well as necessary for human life and also its importance is increasing day by day due to the growing use of technology. There are evidences that have love of mathematics also have fun, although a poor understanding of mathematics produces fears and unpleasant consequences. According to Marie Curie, as quoted by Sutton,(2016), 'Nothing in life is to be feared, it is only to be understood, and now is the time to understand more, so that we may fear less'. Thus, it is necessary to make mathematics learning fun to weaken the fear of mathematics and strengthen the fun. The following steps can be used to make mathematics learning fun.

3.4.1 Making Broader Mindset: According to Dweck (2006), there are two type of mind set: growth mindset and fix mindset. Growth mindset covers full of opportunity and success and the fix mindset is fix as word shows. The growth mindset is also known as broad mindset. Dweck (2006) has found that mindset is a key factor in making positive changes in life that plays a significant role in determining achievement and success. In school, a growth mindset can contribute to greater achievement and increased effort. The students who have fixed mindset like "I am poor in mathematics and it is difficult me to pass mathematics"

should be minimized by making them realize that they can get better and pass mathematics. Such fixed mindset and hopeless feeling towards mathematics can be reduced through telling successor's story and encouraging them more and more for solving mathematics problem. If they continue to solve mathematics problems, they will eventually be successful and do celebrate those successes. If there is continuity in this process they are able to solve new problems and also create more positive attitude toward mathematics. Gradually, the fixed mindset will be broadening and they go for further success in mathematics.

3.4.2 Use of Guided Approach: Direct instructions to the students in the classroom make able to solve the mathematical problem but loose the students' creativity and affect the independent learning. Thus, the guided approach that assists the students in some difficulty during independent practice is overwhelming. This approach can help for quick learners as well as the slow learners as they need so that it does not affect the students' independent learning and losing their creativity. In guided approach, teachers organize the subject matter and guide the students by helping them to conclude a generalization through submitting questions (Wulandari, Sadijah, Asari & Rahardjo, 2018). In this approach, the learning process is directed by the guidance of teachers and with the help of teachers, the students solve the problem. This also helps the teacher to distinguish the students' individual needs. Guided approach also helps the students to engage in different activities according to their need and interest so that every teacher can address the weak students in a small group setting to make mathematics learning fun.

3.4.3 Use of Collaborative Learning: In learning mathematics, the collaborative learning approach can be implemented in which different groups of students involve in working together to solve the given problem or the task. In this approach, the groups of students are given certain clues that are required for solving the given problem and they collaborate with other students for the result. Collaborative learning is a group work of two or more learners working together to solve problems, complete tasks, or learn new concepts. In this learning, the learners actively engage to process and synthesize information and concepts, rather than using rote memorization of facts and figures (Chandra, 2015). This method also helps those students who are not motivated in mathematics and inspires them to engage and enjoy with mathematics.

3.4.4 Use of Fun Mathematical Games: The method to help the students love mathematics is the use of mathematical games. There are so many fun mathematical games to be played in the classroom. Students in the mathematics classroom may be bored by only doing mathematical activity and they need extra energy or motivation for grasping the new things. So, in such situation, students have so much fun playing the games and reviewing important mathematical skills. Mathematical games can be used to enhance students' attitudes towards mathematics. In many classrooms, the teacher's willingness to incorporate games or different pedagogies in their lessons could be a key to success in improving the classroom environment and students' attitudes towards mathematics (Afari, 2012). So, mathematical fun game can help the students be refreshed and help to exercise their brains which develop the memory power too.

3.4.5 Use of Modern Technology: Information Communication Technology (ICT) is a great motivator and tool of rapid function for the students in teaching learning activities. ICT in education has multiplier effect throughout education system, by enhancing learning and providing students with new set of skills; by reaching students with poor or no access (especially those in rural and remote regions); by facilitating and improving the training of teachers; and by minimizing costs associated with traditional instruction(UNESCO-UIS, 2015). It can be employed to accelerate, enrich and deepen basic skills in reading, writing, arithmetic and the sciences beside motivating and encouraging students to learn as they become more independent and responsible for their learning. The use of modern technology is a powerful learning tool. The main use of technology is to enable students learn better through increasing their engagement in educational activities (da Rocha Seixas & de MeloFilho, 2016; Pellas, 2014). It is used in the learning process which makes learning faster, easier and fun. It can be used everywhere in and out of the school. It can create a global platform to the learners and it also provides better opportunities for the special needs children to play, enjoy and learn mathematics and other fun activities. Hence, for the effective implementation and access to its delivery, the use of ICT should be enhanced.

3.4.6 Use of Child Friendly Learning Theory: The use of proper learning theories influences on how teacher teaches in the mathematics classroom. According to Pandey, (2017) The most often utilized learning theories in the classroom are behaviourism (what to do), cognitivism (what to think) and constructivism (how to construct).The new learning theory 'connectivism' emerged after the development of internet technology which is also known as a learning theory for the digital age is now being popular and emergent for teaching learning. Connectivism is one of the most prominent of the network learning theories that has been developed for e-learning environments Goldie (2016) In this theory connectivism (connection between individual mind and the outside world), the role of the teacher shifts from 'expert' or 'spoon feeder' to facilitator, observer and organizer for the collaborative learners. The child friendly parameters are the quality of physical characteristics, curriculum, materials and learning and the quality of human resources (Arkan & Ozturk, 2019).In the mathematics classroom, students with different experience, learning ability and intelligence learn in different ways. So, the use of different teaching strategies helps them to make mathematics learning more fun.

3.4.7 Rapport Building: The intimate relationship between the mathematics teacher and the student is expected to develop positive attitude towards mathematics. Such intimate relationship may be helpful for the students to be motivated and eventually supportive to increase in performance in the subject. Some aspects like the teacher's personality, his/her attitude, teaching techniques, dealing with students, problem solving ways etc. seem to be

responsible to develop and maintain rapport building between the teacher and the students (Dyrenforth, 2014). So the concerned teacher must be aware of this matter.

3.4.8 Use of Satellite Learning Approach: It is the way to identify the logical and number smart students and using them to teach the other ones. In this approach, the students who are good at mathematics by aptitude should be identified and selected from the class. Then those selected children are separately taught by the teacher in a small group and they are asked to teach the rest of the students in the class. Each of the selected students should teach a small group of friends with certain number and tries his/her best to make them know/solve the given task. It is a kind of peer teaching and seems to be fruitful as the weaker ones can get chance to learn from friend without hesitation. It also inspires the best ones as they get more practiced and may feel relaxed for teaching the friends.

4. Conclusions

In this study, the present context of mathematics teaching at basic level students is discussed. In the federal government system in Nepal, the basic level education system, process of curriculum designing, implementation, teacher training provision, school administration and supervision policy etc. mainly are governed by the local government. This article concludes the different aspects of math mania based on the related literatures, class observations and discussions on the respective basic level teachers. On the basis of observation report and the results of discussions with the basic level schools teacher, different types of mathematics learning problems related to curriculum, teachers and the learners are found. It was also found some ways of making mathematics learning fun. These different ways of making mathematics learning fun certainly help to weaken the fear of mathematics and strengthen the love for mathematics. In the same way, for the effective teaching mathematics, fear and phobia of the students towards mathematics and problems related to the students, teachers and curriculum are necessary to address for effective teaching mathematics and to focus on building students' creativity. In short, math mania, extreme love and passion towards mathematics, inspires the learners and creates excitement towards mathematics and helps to diminish the anxiety and phobia of mathematics in the learners.

Declaration of Conflicts of Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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