

# Mathematics Laboratory in School Level Education in Nepal: An Overview

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**Abstract:** *This article seeks to discourse the mathematics laboratory in the sense of classroom teaching. The main focus of this article is to create knowledge and awareness to the mathematics teacher about the importance and use of mathematics laboratory especially in school level education. The study is descriptive in nature and is mainly based on the previous literature. In this study, a short glimpse of mathematics education and teaching mathematics has been presented to overview the mathematics laboratory more clearly and also different aspects of mathematics laboratory have been discussed. It provides the mutual support for teaching and learning mathematics and helps to overcome the constraints while transforming knowledge through classroom practice. It also provides the chance of experience sharing by working together with the use of varied modern tools and technology in the classroom. Equally, it helps to encourage the students to participate actively in the learning process as well as to make them clear in different mathematical concepts. It also suggests to the concern mathematics teachers and administrators of the school to facilitate for the establishment and utilization of mathematics laboratory for effective mathematics teaching.*

**Keywords:** Mathematics Education, Mathematics Lab, School Level Education, Teaching Mathematics

## 1. Introduction

### 1.1 Background of the Study

Mathematics is a universal subject that is needed for everyone in their life. It is an integral part of the school level curriculum almost in the world. It is the study of quantity, structure, space and change and also an interdisciplinary language and tool that is considered as one of the fundamentals in the formal educational system (Roy, 2011). 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. It is an important subject with broad applicability to everyday life, yet mathematics is often considered as a difficult subject in schools (Kaur, 2017). From the beginning of formal education, students start to form negative attitudes towards learning mathematics and gradually develop it in the form of mathematics anxiety (Hornigold, 2015). Mathematics is often considered as a difficult subject by many students in schools education (Capuno, et al., 2019). Regardless of the importance given to mathematics, a large number of students struggle to understand the subject (Mazana, Montero & Casmir, 2020). As stated by Piaget (1971) mathematics should be visualized as the vehicle to train a child to think, reason, analyze and articulate logically, apart from being a specific subject, it should be treated as a concomitant to any subject involving analysis and reasoning. In this context, mathematics laboratory can foster mathematical awareness, skill building, positive attitudes, and learning by doing experiences in different branches of mathematics. This

indicates that mathematics laboratory is extremely necessary aspect to visualize the mathematics learner to grasp the concept, facts and principles of mathematics effectively. This also helps to engage the students more actively and makes learning practical and easier. The main objectives of this study are to reflect the meaning and definition, purpose, need and importance, equipment and materials, ways of setting, administration and maintenance, and impact of mathematics laboratory in school level education. In this article, the initial outline of the mathematics education and teaching mathematics are introduced to make it clear and more meaningful before presenting the discourse of the different aspects of mathematics laboratory.

### 1.2 Mathematics Education

Mathematics education is highly regarded as a research field. It refers to the teaching and learning of mathematics to solve the problems involving learning algorithms and formulas necessary for computations. It is a common platform to learn and teach mathematics with a better way. It encompasses aspects of teaching, learning and assessment. Mathematics education referred to as the history and pedagogy of mathematics domain that can be characterized by an interesting and rich past and a vibrant and promising future (Clark, 2020). Mathematics education helps the learner to cultivate a mathematical way of thinking, understand the process and applying mathematics to real life problem and develops a favorable attitude towards the study of mathematics (Kunwar, 2019). It is primarily concerned with the actual needs of an individual, society and the overall human beings. Thus it has to pay attention to the needs, wishes, anxieties, expectations, feelings, etc. of the people, be they students, teachers or researchers. Mathematics education, by its very nature, is a highly multidisciplinary field. Thus, the variety of research methods can be employed in the field of mathematics education. Mathematics education has a reflective relationship to its objects of research. Those are not viewed as absolute but quite to the contrary the varied goal of

research is to enable their change and development. By its very nature mathematics education invariably is embedded in the varied culture and its history (Dorfler, 2003). Mathematics education must pay careful attention to teachers' perspectives, their classroom situations and the constraints they face (Bishop 1998). Thus, teachers' perspectives as stated by Kunwar (2019), the three dimensional model of mathematics teacher's knowledge (content knowledge, pedagogical knowledge and technological knowledge) can make a teacher more effective for the sake of knowledge delivery.

Mathematics focuses solely on courses or contents but mathematics education incorporates general education classes and specifically focuses on the tools, methods and approaches that facilitate practice based on how to effectively deliver mathematics class. It is also concern to the curriculum and pedagogical decisions (Clements, 2012). Mathematics education focuses on the need, interest and their potential capacity of the learner of the society. Thus it also considers psychology, culture and societal aspiration with as much rigor and attention as mathematics content and processes (Lowrie, 2015). It has also stronger foundations within education discipline than it does in mathematics. It is also closely associated with teachers of mathematics in the classroom and their content knowledge and pedagogical content knowledge (Fried & Dreyfus, 2014). Mathematics education covers not only psychology but also sociology, anthropology, philosophy, ethics and other fields (Lerman, 2014). However, the central focus is, of course, the teaching and learning of mathematics. As Jorgensen (2014) indicated, we may need to build a transformative knowledge-making paradigm, which completing disrupts current (and past) pedagogical and classroom-based practices. Mathematics education involves a genuinely engaging and empowering curriculum that can be transformed into classroom practice (Wright, 2020). Thus, mathematics education deals with teaching mathematical contents as well as curriculum structure, classroom context, teachers' perspectives and other constraints they face while transforming knowledge in classroom practice.

### 1.3 Teaching Mathematics

Teaching is an intellectual work and requires specialized knowledge about the subject, which comprises the content knowledge and pedagogical skills required for effective teaching (Ball, Thames, & Phelps, 2008; Suzuka et al., 2010). The paradigm for teaching mathematics at the present context is sifted to enable students to achieve success in their life beyond school. In this context, before teaching mathematics, every mathematics teacher should develop the characteristics like: habits of thought, skills, and dispositions that are needed to succeed as a teacher of mathematics. As stated by Ma (1999), the teacher needs to have a profound, flexible and adaptive knowledge of mathematics content. As stated by Kazemi, et al. (2018), three kinds of knowledge are essential for mathematics teacher teaching at school level mathematics: knowledge of mathematics, knowledge of students, and knowledge of instructional practices (pedagogy). The knowledge of mathematics comprises mathematical facts, concepts, procedures, and the relationships among them. Knowledge of

mathematics includes reflection of the goals of mathematics instruction and provides a basis for discriminating and prioritizing those goals. Mathematics teachers should have clear concepts as well as accurate knowledge and skill to perform any mathematical problem or task. The effective classroom delivery depends upon the subject matter of content knowledge of the teacher.

In teaching mathematics, knowledge of the students is a vague term. The knowledge of students' includes general knowledge about how they learn and develop various mathematical ideas over time as well as specific knowledge with regard to mathematics. It also includes the students attitude towards learning mathematics, their interest and the condition of pre requisite knowledge about the concerning mathematical problems. It also includes the knowledge about common difficulties of the students that have with certain mathematical concepts and procedures and their learning experiences. The teacher can understand and learn their student by engaging them and examining their activity that how the students' understand about the particular subject matter.

The knowledge of instructional practice or pedagogy is the initial knowledge for the teacher for knowledge transformation. This includes knowledge of curriculum, knowledge about tasks, tools and selecting proper methodology for teaching mathematics. It is the overall implementation part of curriculum in which different methods, materials and classroom management for the effective delivery of the subject matter belong. The instructional practice should cover to all the students with various educational and other backgrounds.

Similarly, NCTM (2000) provides six fundamental principles for guidance and direction for mathematics teachers at school level education to delivery mathematical knowledge:

- **Principle of Equity:** Excellence in mathematics education requires equity high expectations and strong support for all students.
- **Principle of Curriculum:** A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well-articulated across the grades.
- **Principle of Teaching:** Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.
- **Principle of Learning:** Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.
- **Principle of Assessment:** Assessment should support the learning of important mathematics and furnish useful information to both teachers and students. It should not merely be done to students; rather, it should also be done for students, to guide and enhance their learning.
- **Principle of Technology:** Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

Thus in the present context, the teacher of mathematics needs to consider the above six principles while teaching mathematics in the classroom. All students must have the opportunity and adequate support to learn mathematics “regardless of personal characteristics, backgrounds, or physical challenges (NCTM, 2000) and focus on conceptual understanding as well as procedural fluency. Where, conceptual understanding helps students to avoid degree of errors in particular and procedural fluency denotes about the knowledge of procedures, knowledge of using appropriately, and the performing skills with flexibly, accurately, and efficiently (National Research Council, 2001). Students' motivation and active participation in mathematics classroom learning is essential. Similarly, the use of emerging technology that permits the students to focus on mathematical ideas, to reason, and to solve problems in ways that are often impossible without the use of such tools. Evidence flourishes that emerging technologies give rise not only to new ways of seeing and understanding the natural world but also to new ways of being in the world (Oliveira et al., 2019). Such technologies are using as the facilitator for new knowledge and knowledge making tools for specific purpose. Such essential tools and technology helps to motivate the learner and keep them engaged in the learning process. Research shows that the teacher with positive attitude towards mathematics can more successful in the knowledge delivery. Thus the teacher with positive attitude is also essential for teaching mathematics.

## 2. Methodology

The methodology of this article is mainly descriptive in nature followed by qualitative design. In this paper, the researcher has been adopted mainly the desk study method to search the different aspects of mathematics laboratory. It is based on the desk review of the published and unpublished literatures from different sources including worldwide web. The articles and researches of different context were reviewed meticulously. The related reference books were also viewed thoroughly and cited carefully including individual views to some extent. This article also consists of some experiences and input of the concern researcher as a consequence of his long duration of mathematics teaching experiences.

## 3. Results

### 3.1 Meaning and Definition of Mathematics Laboratory

Mathematics laboratory is a place to learn and enjoy mathematics through informal exploration. Mathematics laboratory goes beyond the place with such materials, and exceeds the space where students create, experiment and practice (Ewbank, 1971). He further states that mathematics laboratory might mean not a place but an environment of reflection and creativity. It is a learning space with different materials where students could come anytime and engage in the activities. Thus, Bittar and Freitas (2005) defined mathematics laboratory as 'it goes beyond the display of teaching material collection that is available to be contemplated. It must be a dynamic space that promotes the exchange of ideas and pedagogical practices in mathematics'. Mathematics laboratory is not considered as a

place (e.g., a computer classroom) rather than a methodology, based on various and structured activities, aims at the construction of meanings of mathematical object (Reys, Robert & Post, Thomas, 1973). In this way, the teacher facilitates the students in their activity. The facilitation could be done either by probing questions, giving an extra resource or asking to follow with other students. In mathematics laboratory, different kinds of materials are placed so as to handle or use them easily by the students. As defined by Adenegan (2003), the mathematics laboratory is a unique room or place, with relevant and up-to-date equipment known as instructional materials designated for the teaching and learning of mathematics and other scientific or research work, whereby a trained and professionally qualified person (mathematics teacher) readily interact with learners (students) on specified set of instructions.

Now a days, the term, mathematics laboratory has been used synonymously as 'mathematics corner'. Indeed, it is not the synonymous however mathematics corner can also be used in the lower grades for the similar purposes. Where different mathematics equipment and local materials can be kept and can be used when it is needed in the classroom teaching. The mathematics corner may contain some of the equipment found in the mathematics laboratory but will not be as full and well organized and assembled as what we found in mathematics laboratory. According to Dewey (1938), the environment of the laboratory is as a workshop in which the apprentices learned by doing, seeing, imitating and communicating with each other, in a word practicing.

Mathematics laboratory provides any idea or a concept presented in a simple & appropriate form and the way that is suitable to learner's ability and aptitude provides the best of understanding of it (Bruner, 1966). It is a place where students can explore mathematical objects, shapes and symbols to learn and verify mathematical facts and theorems through a variety of activities using different materials (Yeasmin, 2016). The constructive activity and their teaching learning philosophy of the psychologists and educationist like: John Dewey (1859-1952), Maria Montessori (1870-1952), John Perry (1850-1920) and Felix Klein (1849-1925) help to generate and develop the concept of mathematics laboratory. The teaching strategy and methods proposed by them and their reflections on the ways to teach mathematics contribute to this movement to innovate the idea of school laboratory. The importance of mathematics laboratory has been increasing in recent years. Mathematics laboratory is the area wherein different kinds of teaching learning materials needed to help the students learning are kept and also the learning activities may be carried out by the teacher or the students themselves to learn and explore the concepts through relevant, meaningful and constructive activities.

### 3.2 Purpose of Mathematics Laboratory

The purpose of setting mathematics laboratory in school is to provide the opportunity to the students that they can learn and explore mathematical concepts and verify mathematical facts and theorems through a variety of activities using different materials. Such activities may be carried out by the students or the teacher. These activities help the learner to explore or learn and to stimulate interest and develop

positive attitude towards learning mathematics. It makes teaching mathematics interesting, quicker and easy, and better understanding. The main purposes of the mathematics laboratory that can contribute to the learning mathematics are as follows:

- To make clear concept about the abstract mathematical ideas
- To emphasis on learning by doing through readily accessible rich manipulative materials
- To develop confidence in students for learning mathematics
- To generate interest and positive attitude towards the subject
- To make the students divergent thinkers and becoming autonomous learners
- To make children look for pattern and make them curious for asking questions
- To provides opportunity for exhibiting the relatedness of mathematical concepts with everyday life

### 3.3 Need and Importance of Mathematics Laboratory

The essential equipment and materials concerning to the mathematics classroom learning activities are kept in mathematics laboratory. The main aim of the mathematics laboratory is to provide facilities for effective teaching and making the learning easier through the use of concrete materials and the real object to grasp the abstract mathematical concept. It is also expected that mathematics lab helps mathematics learning quicker and better understanding as well as improve mathematical reasoning. It also makes learning effective and more interesting to the students by adopting practical way of acquiring knowledge and skills about mathematical contents and facts. It is multi-sensory approach to learning. So, it enables the students arousing their interest in mathematics and to apply mathematical facts and principles in actual life. In developed countries mathematics laboratory is an integral part of the curriculum. However, in Nepal the real practice of mathematics laboratory has not been utilized properly and also not formally provisioned in the school level curriculum. Some school and college have set of mathematics laboratory in their own efforts and initiations. Although the importance of mathematics laboratory is increasing day by day to make mathematics learning effective and learner centered.

At the present context, the term "laboratory method" is commonly used to refer as an approach to teaching and learning mathematics. It provides the opportunity of learning by doing as well as learning by observation. It is based on psychological principles of learning. This approach makes the learning process more active, dynamic, interesting and meaningful too. In this method, the students can participate actively using manipulative materials and can do group work themselves. The children can also work in an informal manner, move around, discuss and choose their materials and method of attacking a problem, assignment or task. Some major importance of mathematics laboratory are stated below:

- Helps to create motivation and the interest to the students
- Helps to implement students centered methods in teaching mathematics

- Helps to engage the learner with active participation
- Provides the opportunity to learn mathematical facts, concepts and principles more effectively and clearly
- Helps to promote the creativity and reasoning of the learner
- Helps to create favorable attitudes towards learning mathematics
- Encourages and develops problems solving ability and skills
- Helps to create the math manic learning environment
- Helps to reduce the fear of learning mathematics
- Helps to inspire the learner for new innovations and explore their potentialities
- Helps to learn the students with dyscalculia and learning disability.

### 3.4 Materials in Mathematics Laboratory

**3.4.1 Concrete Materials:** Concrete materials can be used to connect with simple arithmetical and geometrical topic such as stick, pebbles, ball frames, number cards, balances, coins, weights, measuring tapes apparatus etc. These materials may be wooden, metal, and plastic or made of other materials.

**3.4.2 Charts and Papers:** A number of mathematical charts, graphs, flash cards, etc. can be kept in the mathematics laboratory. It can be used to explain different mathematical concepts, drawing, picture, number and numerals graphs and charts etc. Charts and paper can be used for different purpose. It can be used as paper folding, drawing, designing, making charts and graphs, and other different topics of percentage, fractions, average and statistical data also can be presented. Similarly, pins & threads, chart papers, glazed papers, sketch pens and other stationery are also kept in the mathematics lab.

**3.4.3 Pictures and Photographs:** The pictures and photographs of various mathematicians, their prominent work and historic events are importantly displayed in the mathematics lab. It may be much useful if the contributions of these mathematicians are also indicated on such charts which help to inspire the learner.

**3.4.4 Models:** Several mathematical models such as triangles, squares, cylinder, pyramids, solids blocks, and different Geometric shapes or solid shapes real or model etc. that can be kept in the mathematics laboratory. These models help the learner to understand the abstract mathematical concepts and principles.

**3.4.5 Materials concerning Mathematics and other Subjects:** The equipment or materials that are used in other subjects and also related to mathematics illustrating the application of mathematics like: Barometer, Hydrometer, Weight Machine, Pendulum, Geo-board, Rubber Band, Bulletin Board, Whiteboard, Measuring Tape, Workbooks, Textbooks, Teacher's books, Curriculum, Teaching Manuals, Flannel Boards etc. are also kept in mathematics laboratory.

**3.4.6 Proportional Dividers, Slide Rules and Calculating Machines:** The most useful instruments in the study of geometrical shapes and figures are also kept in a mathematics laboratory. Such instruments can use to

magnify or reduce figures, graphs, maps etc. Slide rules are quite useful in mathematical calculations. Training in mathematical calculations can be provided by using simple calculating machines.

**3.4.7 Survey Instruments:** The work associated with survey is also related to the field of mathematics. The instruments used in survey like: angle mirror, plane table, level meter, hypsometer and clinometers, and transit also are kept in a mathematics laboratory.

**3.4.8 Over-head Projector and Projective Aids:** Different projective aids and projecting devices such as magic lantern, epidiascope, transparencies, film-strip projector, etc. should also be kept in mathematics laboratory. The overhead projector is an important electronic teaching aid that projects an image from a transparency. The picture and the information of transparencies are reflected on a screen.

**3.4.9 Computer and other Electronic Devices and Software:** Computer and mathematics software are the best things for teaching mathematics in the 21st century that can be used quite efficiently. Computer software, audio-visual instructional materials such as projector, electronic starboard, radio, television set, tape recorder, video tape etc. These applications not only solve the mathematical problems easily but also help to learn the subject deeper as well as better. There is different mathematics software online and offline related to mathematics teaching and learning. Among them, most of the software is useful to learn mathematics in a much easier way. Such as: Math for child, Math Practice, Talking Math, Mathematica, Mathalicious, Matlab, Geogebra, etc.

### 3.5 Setting Mathematics Laboratory

The setting of mathematics laboratory depends on the size, design and general layout of laboratory room. The schools may change the design and general layout to suit their own requirements. The setting of the laboratory also depends upon the available equipment, materials and the furniture. The setting of the laboratory is not a permanent matter but it can be changed according to the needs and desire to meet its own requirements. However, the laboratory room should be spacious, lighted and well ventilated for the safeguard of the materials and to manage the equipment and materials properly for the ease carry out the different activity like group work and other presentation. The arrangement of the materials should be managed properly so that everyone can easily find and use the materials and the equipment. The quantity, quality and size of the furniture should be appropriate according to the size of the laboratory room and the number of students in the classes of the concern school. Some furniture is also required to keep the essential equipment, raw materials and other necessary things as well as to carry out the teaching learning activities effectively. The way of setting mathematics laboratory so as to manage remarkably and setting with catalogue, we can follow the list of action.

- Identify the materials by labeling them with name tags required in the laboratory

- Put the electronic and non-electronic equipment or materials on the different place. viz. geometric objects should not be placed with audio-visual materials
- Put the concrete materials one side and other semi-concrete materials other side
- Put the bulletin board close at the entrance door for the effective display of the information
- Make arrangement of the benches and tables so as to allow for free movement in the laboratory
- Keep the relevant pictures and charts on picture handrails and boards with non-overlapping
- Keep the white board so as to fix the position that every student can freely see it
- Make proper partitioned or safe enclosure for keeping portable and dedicated materials
- Keep electronic display materials such as projector, television, computer etc. so as to see easily by each student properly
- Make proper electrification for lighting as well as comfortable and safe use while operating electronic materials
- Display small materials on tables in an certain order and organized manner
- Set the laboratory room with well-ventilation as well as air circulation
- Keep handy materials in a cabinet or separate shelve that can be easily destroyed
- Arrange the materials safely in the respective places like: tables, shelves, board, etc. in such a way that they can be easily accessed when needed and returned appropriately after the use
- Keep the local, low cost and no cost materials in the aside of the laboratory
- Keep heavy and weighty materials in the lower part of the rack or in the floor level of the laboratory room.

### 3.6 Administration and Maintenance of Mathematics Laboratory

The effectiveness of the mathematics laboratory depends on the administration, management and its proper maintenance. It is desirable that the mathematics laboratory should be managed to care, maintain and execution by a trained personnel (laboratory assistant) with adequate knowledge about handling laboratory and with great eager to work with students. He/she is also expected to have special skills and interest to carry out practical work in the subject. When the concerned mathematics teacher accompanies the class to the laboratory then the teacher and the laboratory assistant both could jointly conduct the desired activities. The teacher as well as the laboratory assistant, needs to develop familiarity and adeptness to their students. As stated by Rigby et al., (2018) mathematics laboratory requires skilled facilitation to engage the students in activity and to elicit their ideas. They further states that the students can pursue more complex and persistent problems of practice, develop more coherent instructional practices within and across grade levels, and tackle emerging questions about student learning.

Laboratory assistant with appropriate qualification and preferred knowledge in the subject can be the extra benefit for the mathematics knowledge transformation. The time

allocation for the laboratory depends upon the subject matter (contents) and the level of the students. It is generally about 15% - 20% of the total available time for mathematics class can be used in the learning activities on laboratory. The total available time of mathematics class can be divided cautiously considering the theory classes and practical work.

The attractive and well managed setup of the laboratory also motivates the learner and helps to create constructive, explorative and logical skills and understand the basic concepts of mathematics. The provision for visiting and working to the students in the laboratory individually or in group should be allowed within the school hours. The management and maintenance of the laboratory is equally importance. Thus it is necessary to record the all equipment and materials available in the laboratory. The record of the visitors as well as students and teachers should also manage and suggestion book should be kept for the visitors for the betterment of the laboratory. The equipment and materials should be up-to-date and also added and upgraded too if it is necessary. The laboratory assistant should be prepared and submitted the technical report to the mathematics teacher and school administration regularly.

### 3.7 Impact of Mathematics Laboratory

Mathematics laboratory provides the learning opportunity not only from the teacher but also provides from the peers. It helps the teacher to deliver the class working together with their students in a creative way. To support learning from the classroom experience, the work in a mathematics laboratory is organized around a learning cycle with four phases: learning together, co-planning a lesson, enacting the lesson together, and debriefing together (McDonald, Kazemi, & Kavanagh, 2013). In this learning cycle, the students learn in group, plan the lesson together, act and perform instructional activity that provides the practical means for focusing student and teacher learning together and at last they also debriefing together. Throughout these classroom presentations, teachers experiment together with new teaching practices and learn together about students' mathematical thinking. As stated by Fernandez (2002), teachers spend time together in classrooms. However, in a mathematics laboratory teacher's work together to experiment with instruction during both planning and the classroom enactment by collectively discussing instructional decisions in the moment (Gibbons, Kazemi, Hintz & Hartmann, 2017). Thus mathematics laboratory helps the teacher to modify their role as the facilitator that might play in supporting them to collectively learn in and from practice. Hence the mathematics laboratory may have impact on teacher's role, teaching strategy, students' assessment technique and classroom instruction. Some impacts of mathematics laboratory are as follows:

- It shifts the teacher as a learner in the classrooms, which enables the teacher to see their learners in new ways
- It focus on instructional activities that support teacher and make them feel more prepared for implementing in their own classroom and to develop a sense of alignment with their colleagues

- Mathematics laboratory may influence the students and teacher on activity based learning rather than the traditional teacher centered method
- It makes the teacher as a supportive role play or as a facilitator and makes the students as a major part of the learning process
- Learning may be easier and permanent due to activity based learning and more time consuming
- The teaching activity plans are collectively created and possessed by the participating teachers
- It helps to create positive attitude towards learning mathematics in both students and teacher
- It helps the students to develop to work in group, collaborate with each other and socialization
- It helps to develop problems solving skills and encourage the students to promote creativity
- It helps the students to motivate for learning, developing cooperation and coordination skills among them.

## 4. Findings and Conclusions

Education is imparted for achieving certain ends and goals. Various subjects of the school curriculum have different means to achieve these goals. Each subject has some certain goals that are attached and have expectation to be achieved through teaching and learning of that subject. Thus mathematics education also has some certain goals that are also expected to acquire through mathematics teaching and learning. To achieve such goals, like all efforts to achieve equitable learning experiences of students, mathematics laboratory can be a useful resource if teachers and students are empowered to experience school as spaces where their ideas are heard (Yeasmin, 2016). Considering these above all aspects of mathematics laboratory, it can be best utilized as a means of achieving the goals of mathematics education at school level curriculum. Also, it helps to enhance activity based teaching learning process in mathematics and it can be an essential learning space for the students as well as the teachers.

This study focuses on the initiation of using mathematics laboratory in teaching mathematics at school level education. It revealed that mathematics laboratory could be an appropriate platform for creating positive attitudes towards mathematics learning as well as promoting active participation in learning mathematics. The study also suggests that only the traditional teacher centered methods of teaching do not facilitate mathematics learning effectively. Thus the use of mathematics laboratory provides the students to relate their knowledge with real life through active participation. This also impact on teacher's role, classroom instruction and student assessment techniques. Hence, this paper strongly recommend to all school level mathematics teachers and headmasters to facilitate for the establishment of the mathematics laboratory in their schools and the proper utilization of it in mathematics teaching.

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