Mathematisation In Relation To Pedagogy of Mathematics at Secondary Level

Swachhatoya Ghosal
Research Scholar, Department of Education, Vinaya Bhavana, Visva-Bharati, West Bengal, India, PIN 731235, Email : email.toya@gmail.com

Dr. Shyamsundar Bairagya
Supervisor, Associate Professor, Department of Education, Vinaya Bhavana, Visva-Bharati, West Bengal India, PIN 731235, Email: listenssb.ugb@gmail.com

ABSTRACT

Mathematics is nothing but decoding the language of universe. Logic is the ultimate truth of nature. So, to shape the mind of our future generation with logic for holistic development of the universe, it is our responsibility to introduce this universal language vividly into our practice.

"It is more useful to know how to mathematise than to know a lot of mathematics"

--David Wheeler

To examine the fact in the classroom situation the researcher conducted a study on Mathematisation in relation to Pedagogy of Mathematics among 10th grade students in a randomly selected school of Durgapur. With the help of researcher made situational questionnaire, interview and classroom observation, the researcher found the extent of Mathematisation of the students and the types of pedagogy that were applied and their affectivity on mathematisation. Researcher examined the Mathematisation of the students in terms of Mathematical thinking ability with five parameters like Representation, Reasoning, Communication, Connection, and Problem-solving ability. To investigate their Mathematical thinking ability and the affectivity of pedagogy, the researcher applied the situational questionnaire at pre and post of teaching Mathematics. The level of mathematisation and its relation with pedagogy of Mathematics was identified.

KEY WORDS: Pedagogy of Mathematics, Mathematical Thinking, Mathematisation.

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INTRODUCTION

"Mathematics is the language with which God has written the universe."

-- Gallileo Galilei

Logic is the only truth of nature. Mathematics is all about the logic. The universe is framed with logic and hence with Mathematics. We need to think mathematically every moment, everywhere in our daily life. We need mathematics for reasoning, creative thinking, abstract thinking, problem solving, music, dance, games even if for effective communication. Thus Mathematics empowers us with more organized mind to make our life more orderly.

In support of this notion numerous policies are being developed and lots of research studies are being conducted continuously to enable us to think mathematically rather than to solve difficult sums only.

In this context Curriculum Development Centre (1982). Australian Mathematics Education program stated that the goal of Mathematics Education is to develop problem-solving ability. A learner must have a confident self-concept, constructive in solving problems, be ready to face the challenge to solve unknown problems, think of and switch from one strategy to another, to resolve unfamiliar problems. And in Indian context as per NATIONAL CURRICULUM FRAMEWORK 2005, it is obvious that significant changes are needed to be introduced in mathematics in India. It said that, meaningful and learner friendly Mathematics is the requirement of 21st century, each child should be able to understand and apply mathematics in his day to day life without any fear of failure. The NCF's vision for quality mathematics education is based upon the proposition that all the students must learn mathematics better through proper and effective implementation. The purpose of learning Mathematics shall ensure the development of the child's intellectual components and strive to make him a better thinker and an effective problem solver. To examine the learning Mathematics, assessment and evaluation are two important steps to conduct in teaching-learning system. So Kauts and Kaur (2018) have attempted to investigate and deduce the goals and objectives of Mathematics teaching with a broader vision for Mathematics and introduce various systemic reforms required in India's teaching-learning and assessment and evaluation. Also learning Mathematics is highly correlated to achievement but Mathematical achievement among children is greatly influenced by the personal and environmental factors too (Mahanta, 2014; Nicolaidou & Philippou, 2003). Unfortunately among many children, a negative attitude towards mathematics serves as an impediment in their future goals. This attitude is affected by the child's educational context at home as well as at school environment. One of the major factors that significantly contribute to low mathematics achievement is math anxiety (Woodard, 2004). As a result the downfall of learning and implementing mathematics at the tertiary level has become a concern for our Indian society (Garg & Gupta, 2003). In this regard they already stated that those who are convenient at problem-solving are confident in their abilities but math phobia is developing for the rest. In this regard the teacher must familiar with the wisdom of teaching. It is an essential aspect of the teaching-learning system. A teacher needs to have the ability to relate classroom teaching with the natural world and also be capable to teach ~~the~~ students by connecting their culture for better understanding. For this teacher must have a grounded understanding of the learners' psychology and social background. Students' intellectual, social, mental, physical, and emotional characteristics are encouraged to develop the learning environment in the classroom. Thus teaching should elicit learning and provide connections. Teacher uses skill to build students' conceptual understanding of mathematics rather than develop procedural proficiency. After arriving at the understanding level, the teacher now requires creating an environment to guide their students to implement learning. Thus implementation of the knowledge follows learning. Effective teaching also depends not only on the content knowledge but also on the realization and reflection capacity of a teacher. The Mathematical concept embedded every task of life, so clarity of concept and implementation ability is the core of learning mathematics. The teacher requires to represent Mathematics as a coherent and connected concept to the students. Positive approach towards teaching Mathematics contribute remarkably in shaping their students' attitude towards the subject as well as in mathematics performance (Mensah, et. al, 2013). And Theory into Practice, comes up with the view that, learning Mathematics with understanding occurs best in situations when students are expected to solve a problem, reason, and communicate their ideas and thinking with others. It is thought that situations of confusion and clash of ideas in which students are allowed to struggle to resolution are precisely the settings that promote learning with understanding. Wood even opines that the heart of reform as a transformation in the ways students learn and teachers teach Mathematics and that the ways of learning and teaching result in students knowing a different kind of school Mathematics. One of the by-products of this is that Mathematics helps a student to observe and reason, to explain their thinking and do more than merely memorizing the answer. Wood,T. (2001).

Thus the teachers need to enlighten the student more with thinking mathematically than to make them learn to solve mathematics mechanically.

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Rather than considering Mathematics as a body of knowledge, Wheeler, developed the idea of mathematics as an activity. He wants the children not to learn the techniques of Mathematics, instead of that to become the classroom innovator by thinking mathematically. Thus the children will be able to think and interpret mathematically rather than solve more intricate problems only. This shift in focus at Mathematics Education to be fulfilled by Mathematisation of the children. Mathematisation is such a concept that it is supposed to replace the mechanical learning of Mathematics Education and help students think and reason mathematically. The concept, Mathematisation originated from Freudenthal in 1991. After that it has been modified and taken into practice by Treffers and others in the RME (Realistic Mathematics Education) tradition. Menon (2013)

Mathematisation is such a process that uses Mathematics to solve a real-life problem by connecting a solved mathematical problem, concepts, and ideas. As per Freudnthal, Mathematisation is the Representation of real world artifacts and/or situations by mathematical forms. Freudenthal (1991)

Freudenthal Institute in the Netherlands first develop the Mathematics teaching-learning theory with a view that there must be a connection between mathematics education and real world. This connectedness shows the relevance of mathematics in our daily-life.

Axanthe Knott (2014) wrote about the Realistic Mathematics Education (RME). Realistic Mathematics Education developed six basic principles. The principals are intertwinement, level principal, reality principal, activity, interaction, and guidance.

The integration of all the principals will serve as a progressive realistic problem of mathematics education. Mathematics includes modelling as activity at the stage of concept framing. This is a part of mathematisation of a child. Mathematisation must be presumed, it is the ability to think 'mathematically' in situations where something not obviously mathematical. For example while playing building blocks, a child needs the awareness of patterns. While a child is experimenting with a Geoboard it is noticed that the child has awareness of an in the relationships between the areas of geometrical shapes.

As per the Position Paper National Focus Group on Teaching Mathematics by National Council of Educational Research and Training, the main goal of Mathematics Education is to Mathematise the child's thought process rather than fill them with procedural knowledge. In this regard, the children need a learning environment where various teaching processes must handle with individual differences. Multiple types of charts, models, patterns, visualization, representations, different methods of estimation, and problem-solving in other functions need to implement in the classroom. Most importantly, the mathematics teachers need to teach the content by giving examples connecting with the students' social culture and daily life practices. Madusise, S. (2013)

As inference, it is quite clear that the mathematisation will help all of us in two respects, namely, it will help connect the inner mathematical experience with its outer objective form; and, within the restricted classroom, it will help to manage the individuality and spontaneity of students by coming to terms with the most impersonal subject we ask them to learn. Wheeler, D. (2001).

CONCEPTUAL FRAMEWORK

Among all compulsory school subjects, Mathematics is a subject where the teacher has an important role, as mathematical elements structure everything. Only the Mathematics books are not enough to construct the knowledge meaningfully among the students. The teacher needs to explain between the lines and elaborate the mathematical problems in multiple ways to give conceptual clarity. Here Psychology and pedagogy play an essential role to mathematise a child. Pedagogy is the art and science of teaching, and that should maintain harmony with the child psychology. So a teacher need to have an initial plan to reflects upon constructive learning. Teachers must have a bridging capacity between procedural mathematical knowledge and their conceptual understanding to mathematise a child.

Mathematisation

Mathematisation is the Representation of real world artefacts and/or situations by mathematical forms. Freudenthal (1991)

Mathematisation is a process that structures anything more mathematically than it has been earlier. Within the field of Mathematics Education, Mathematisation shows a conceptual difference in social, mental, and environmental understanding. U. Gellert, E. Jablonka (2007)

The process of observing, structuring, and expressing anything mathematically is known as Mathematisation. Without Mathematisation no one can learn Mathematics. (Grigoras, 2008)

In the Encyclopedia of Mathematics Education, Mathematization refers to decision-making, management, communication, insightful thoughts, and ability to apply techniques. Skovsmose O. (2014)

As per Biccard, P. & Wessels, D. (2017), Mathematisation is building the mathematical concepts and insight through learning experiences of the students.

Collin Dictionary says that Mathematisation is the "act of interpreting or expressing mathematically or the state of being considered or explained mathematically."

In Merriam Webster Dictionary, Mathematisation is defined as "reduction to mathematical form."

Thus Mathematisation of a child is an ability to think mathematically and draw a connection between the classroom and natural phenomena to solve real-life problems. To mathematize a child it is necessary to nurture his/her Mathematical thinking.

As per the National Council of Teachers of Mathematics (NCTM, 2000) there are five key areas of Thinking Mathematically. The areas are Representation, Reasoning, Communication, Connection, and Problem-solving ability.

Representation

It is the diagrammatic interpretation of any problem or statement logically. It is the act of serving on behalf of another.

Reasoning

It is the application part of logic. It is applied when something seems logical. The Reasoning may be inductive or deductive. Thus, reasoning is that process that stirs an individual's mentality to explore the cause and effect relationship of an occasion by adopting some sorted systematic steps based on previous experience and the present observation.

Communication

It is the way of explaining any problem or statement clearly to make others understand or realize by self. The process of exchanging information mainly through some common system of signs, symbols, or even behavior.

Connection

It is the bridge between a classroom problems to a real-life situation. Else it is the link between an old problems to a new one.

Problem-Solving ability

It is the ability to reflect of different strategies abstractly and creatively to face and solve unfamiliar situations. Problem-solving is the act of identifying, prioritizing, and selecting alternatives for a solution and implementing a solution after understanding the problem and the cause of it.

Logical Thinking

It is the systematic argument between the assumptions and their conclusion. It is the capacity of being able to reason in a convincing and compelling manner.

Abstract Thinking

It is the thought process that one can feel without experiencing that. Else it is the thought process that one can think about the situation without experiencing that. Thinking characterized by the ability to make and understand generalizations, use concepts in an orderly manner.

Pedagogy of Mathematics

The method of teaching is generally termed as Pedagogy. It comprises of the teacher's belief in teaching and comprises of the reciprocity between culture and the various other methods of

Learning. This in turn helps the students to build on their potential for learning by creating meaningful and friendly classroom environment.

Pedagogy refers to the various approaches to teaching and their impact upon the learners. It is essential to plan the pedagogy effectively as it shall make the students more interested to learn and shall also strive to develop their thinking skills. (Glossary)

Methods of Pedagogy of Mathematics

Inductive- Deductive method.
Conceptualizing generalization from many specific examples refers to the Inductive method of teaching. And moving from general form to specification is known as Deductive method.

Analytic-Synthetic method.
Dividing into parts the unknown concepts and moving from unknown to known concept is defined as Analytic method. Synthetic method is the piling of known information from unknown.

Problem-Solving Method
This method empower the learner to think and interpret the situation in sequential and systematic steps to move towards the solution by using different effective strategies.
Activity-based learning is a joyful learning method in which the students are provided different types of experiential learning tasks. The students gain knowledge playfully. This method helps in both Cognitive development and Motor learning. The activities helps to motivate and make the students interested in Mathematics. Also the students are able to understand the implementation by connect classroom Mathematics with those.
Example: Different types of worksheets, Mathematical games, model making and puzzles. (NCERT, 2011)

SITUATIONAL QUESTIONNAIRE

As per Encyclopaedia of Survey Research Methods, Questionnaire is a set of questions or items related to the corresponding survey or research. It is one of the best tool to be used for collection of data.

Situational Questionnaire is a type of questionnaire in which the items are based on different real-life situations to check how well one can think of handling a situation with his/her Mathematical, logical and abstract thinking.

ABOUT THE STUDY

To check whether Mathematics Education resulting in the Mathematisation of the school students or not, the researcher conducted a study by raising the questions on the pedagogy of Mathematics Education of the Mathematics teachers on Mathematical Achievement and Mathematisation of the students.

Mathematisation is the ability to think 'mathematically' in situations where something not obviously mathematical. Wheeler, D. (2001)

And also, the researcher examined the Achievement Score of the students in mathematics and investigated the development of mathematical thinking ability of the students to after learning the Mathematical concepts. Finally, the researcher studied whether there is any connection between the students' mathematical achievement score and the Mathematisation of the students or not.

RESEARCH QUESTION

- What types of Pedagogy of Mathematics are applied for the secondary level students?
- Do the secondary level students have Mathematical Thinking ability?
- Is Mathematisation of the students related to Pedagogy of Mathematics?

OBJECTIVES OF THE STUDY

1. To study the types of Pedagogy of Mathematics those are applied for secondary level students.
2. To examine the Mathematical Thinking ability of the secondary level students.
3. To study the relation between Mathematisation of the students and the Pedagogy of Mathematics.

METHODOLOGY

Descriptive survey study was conducted at Durgapur, Paschim Burdwan, West Bengal, India. During pandemic situation, only few schools were running their online teaching-learning system in an uninterrupted way from those one school has been selected at random. This school is one of the leading schools of Durgapur, named Carmel Convent High School. All the students of the school were attending the online classes regularly with proper types of equipment. As a result, accurate and reliable data was collected from that school.

Only the students of grade 10 were considered for this study. Carmel Convent High School had

114 students in grade 10 with two sections and one mathematics teacher who used to take mathematics of grade 10 in both sections.

A questionnaire on the Pedagogy of Mathematics was prepared for the teacher of the respective school by the researcher. The questionnaire consisted of items on different pedagogical methods and different pedagogical resources as per the content. And an interview was conducted with the math teacher to know the responses of the students while applying different methods of Pedagogy. With due permission researcher used observation technique also through online mode.

As per the content and concept of Mathematics syllabus, the researcher formed one situational questionnaire on Mathematisation of the students and collected the responses through Google Form. The questionnaire prepared for the students to study Mathematisation was divided into Representation, Reasoning, Communication, connection, problem-solving ability. The questionnaire consisted of different open as well as close-ended items based on the mathematical thinking ability along with the application of logical and abstract thinking. As Mathematisation refers to the ability to think mathematically to give structure to a problem to draw a connection for solving the problem, without abstract thinking and logical thinking, this mathematical thinking will not be developed.

The situational questionnaire was given to the 10th grade students at the beginning of their new session. Once again the same questionnaire was given to the students after four months of their online classes were taken. To check the affectivity of Pedagogy in Mathematics for corresponding development among students, the questionnaire was given two times and recorded the responses pre and post of teaching Mathematics.

Apart from the questionnaire interview was taken to verify the decision-making ability, communication, mathematical thinking, abstract thinking, etc. And also, for focus group discussion, few allotted mathematics classes from each of the sections were taken.

The researcher collected all the data from the students through virtual contact. And reflected upon it, keeping in mind the backgrounds of the learners. As backgrounds of them are essential for their motivation for attitudes and performance. Vithal and Skovsmose (1997)

DATA ANALYSIS AND INTERPRETATION

The teacher was given a questionnaire and also was interviewed and was observed by the researcher. Thus the data was collected through triangulation to increase its validity and reliability.

The mathematics teacher tried to use all sorts of technology in her best possible ways for conducting online classes more constructive and meaningful. Though technology has been introduced long ago to improvise the teaching-learning system and to make it more effective. But usually the traditional methods of teaching used to follow everywhere.

As technology has many exciting tools to make the teaching-learning more interesting and meaningful, the teacher responded positively to the students on the attention span, motivation, understanding, conceptualization, solving sums, etc.

The teacher was very much satisfied with that classroom setup as the teacher could apply various types of online tools like PPT, Diagrams, Videos, Work Sheets, data Analytics etc. So the mode of instructions were innovative and interesting to the students. So visualization of the content in a realistic way has made the teaching-learning more constructive.

Response of the Mathematics teacher

Teachers used the Inductive method of teaching and started with specific examples and have come to the generalization. Specific examples gave the students a better understanding, and they did not get lost with general forms. Teacher intended to teach Connections, Reasoning.

For instance, teacher taught a general formula in Algebra. To make them understand that the teacher used specific numbers in the formula first then generalized them with Algebraic form. More than 80% of the students responded correctly while applying this method.

Similarly, the teacher gradually used the Synthetic method for mensuration to proceed from the known concept to the unknown concept so that the students could build connections with real life. More than 80% of the students responded correctly while applying this method.

Another teaching method the teacher applied was the Problem-Solving method. For using this method, students needed to handle abstraction to think about the solution hypothetically of the problem in advance. While thinking this, the students would also have divergent thinking and formulated different strategies for getting the solution of a particular problem. Teacher intended to teach Communication, Reasoning, multiple strategies making to move forward to the solution. Students could follow the class well while teacher showed problem solving. More than 75% of the students tried in a correct way to get the solution but rest could not think about it abstractly. They could not think abstractly the solution. For instance, teacher gave to calculate the volume of a void cuboid without using the formula. The students could think and communicate about the solution in multiple ways.

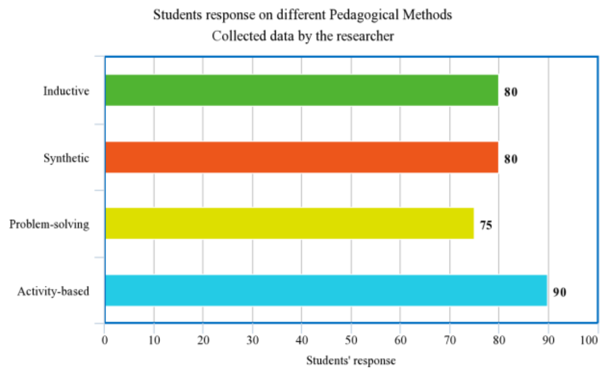
The teacher used another most important and effective teaching method, activity-based teaching, which is nowadays a prevalent method for teaching Representation and Communication, Reasoning, Connection, and solving the sum.

There are various types of worksheets available online. Those worksheets have self-assessing characteristics. The learner can do it at his/her own pace. Immediate feedback is shown after their responses are given, then there is an option for reinforcement and self-evaluation. The students need to apply logical thinking and Reasoning here, and they can construct their own knowledge and communicate. This activity is like a game; if you are successful in step one, you can move onto the next one. It is pretty obvious that the students would like this type of activity.

The teacher used lots of worksheets for self-judgment and constructive learning playfully.

The worksheet is a common practice for every school now. Here also, the teacher gave worksheets to them. Math Puzzle box on pattern learning was another activity that the teacher gave the students to nurture their knowledge about Reasoning, Connection, Communication and Representation. 90% of the students actively responded with correct answer.

Collaborative learning needs proper Communication among the group. When the teacher played a role as a facilitator, the communication skill of students developed.



Pedagogical Resources

Pedagogical resources were PPT, chart, worksheets from Google and teacher-made video clips, e-puzzles, home assignments on model making, group discussion through Google meet.

While interviewing the teacher, the fact has come up that there was a difference between offline and online classroom situations. As the students were of the senior class and attended classes from home through Google meet, they are more attentive and disciplined in the class. Most importantly, this teacher already took Math class in their previous class to have a good rapport.

The teacher also mentioned that the teacher taught them the chapters of Geometry, Mensuration, etc., with slides of realistic examples for making their concept clear. At this age, the students of class X easily could connect the bridging. Since as per Jean Piaget, the students of class X are in the Formal Operational stage. They can think logically, abstractly, inductively, and deductively.

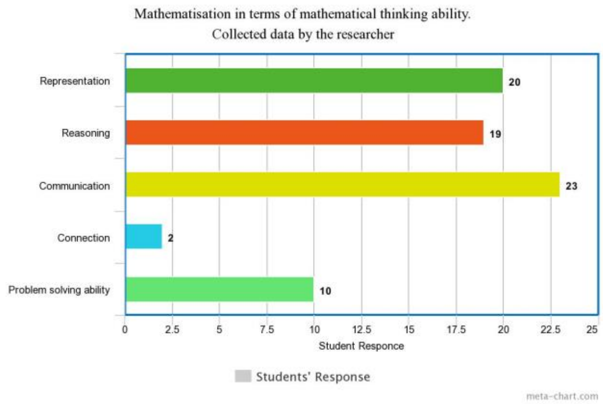
The students were happy with the online Math class as the teacher made the class very interesting and innovative by using multiple pedagogical resources. The students loved to attend the math class. The teacher gave the students conceptual clarity with various activities like worksheet, puzzle, model making, etc. Every day she used different tool to make her math class constructive and meaningful. And also as the virtual classes gave a feeling of abstractness and an unreal feeling, so to break the rigidity and to make it more practical, the teacher always tried to put an example of the real world to keep the connection valid between math classroom problems and real-world phenomena.

Response of the students

The students were given a situational questionnaire on mathematical thinking ability through Google Form at the beginning of the session of 10th grade. All 114 students responded to it. The questionnaire consisted of different open and close-ended items based on Mathematical thinking ability which was further divided into the parameters like Representation, Reasoning, Communication, connection, and problem-solving ability as per NCTM (2000).

On the diagrammatic Representation of some daily-life activities and conversion of one form of Representation to another form 20% of the students responded correctly. 19% of the students responded correctly on finding similarities, differences logically. 19% had proper reasoning skill. The next responses of the items were on conveying strategies clearly and the ability to shift quickly from old technique to new one and also on stating the thinking of handling a problematic situation. 23% of the students responded for proper Communication. Only 2% of the students responded for building Connections. The subsequent responses of the item were on recognizing and linking the classroom problems outside of the classroom situation and establishing a connection in terms of a trick to memorize anything and connecting surroundings with learned mathematical models and concepts. Only 10% of the students responded correctly. The subsequent responses of the items were on situational problem-solving ability.

Parameter wise responses of the students showed very poor performance. As they did not have content knowledge and concept with realistic approach so on the situational questionnaire they could not reflect mathematically.



The students were given a situational questionnaire on mathematical thinking ability through Google Form again after four months in the same session. The students experienced four months teaching and then all 114 students responded to it. As the questionnaire consisted of different open and close-ended items based on Mathematical thinking ability which was further divided into the parameters like Representation, Reasoning, Communication, connection, and problem-solving ability as per NCTM (2000), the responses were also recorded parameter wise and analyzed.

The questionnaire contained items on the diagrammatic Representation of some daily-life activities and conversion of one form of Representation to another form. 78% of the students responded correctly on Representation and explained elaborately while interviewing.

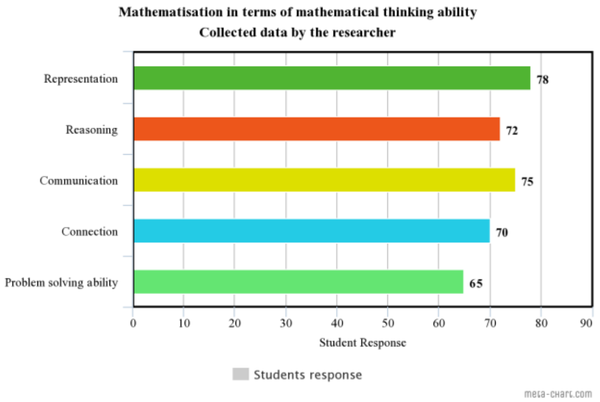
The next responses of the items were on finding similarities, differences and handling a given situation logically to study the Reasoning capacity of the students and think logically about the reason behind any spoiled task and behave accordingly. Here 72% of the students responded correctly on Reasoning.

The next responses of the items were on conveying strategies clearly and the ability to shift quickly from old technique to new one and also on stating the thinking of handling a problematic situation with friend. 75% of the students responded for proper Communication.

The subsequent responses of the item were on recognizing and linking the classroom problems outside of the classroom situation and establishing a connection in terms of a trick to memorize anything and connecting surroundings with learned mathematical models and concepts.

70% of the students responded adequately to build Connections.

The subsequent responses of the items were on situational problem-solving ability, including leadership ability. To give the correct response one must have the strong abstract thinking ability to think of anything in advance and plan the right strategies. Only 65% of the students responded correctly. Thus only 65% of the students had abstract thinking.



CONCLUSION

Constant modification of the teaching-learning system is going on in our education system through various policies and researches. Among all other changes, one of the remarkable changes is due to technology. Technology has been introduced long back in the arena of education. It has not just the capacity to help the process updated but also has the capacity to make the understanding in a greater dimension. Still the teaching-learning system follows traditional methods in every classroom situation. During pandemic, online teaching-learning system boosted the use of technology again, and that has not only ignited to the cognitive domain but also the affective and psychomotor domain of the students.

In this pandemic juncture, this system of online classes through the techie platform has made things easier and convenient. It has also made everything accessible to the students within a range of a click.

Hence, this platform of online classes had resulted effectively to improvise this teaching-learning system productively, adequately, and even more convincingly.

While teaching Mathematics in the offline mode, most of the teachers use only lecture methods with blackboard work. Only a few schools have smart classrooms for every class so that technology can support learning. Very few schools have a Math-Lab setup for experiential learning. Field trips are almost impossible activities for the schools. So during the pandemic, pedagogy by computer assistance was very impactful through breaking the abstractness of mathematics with realistic visualisation of every content. Pedagogy is the most important part of education system. For developing heuristic attitude to find solution of any problem independently, correct pedagogy is required. Pedagogy plays a leading role to develop mathematical perspective for observing the logic in everything and act accordingly.

On the basis of the response of the teacher through questionnaire, interview, and observation, it can be concluded that the teacher made the math class attractive and interesting to the students by using multiple technological tools. Online classes were not making barriers to the teaching-learning system rather the math teacher utilized all sort of technological availabilities to make her teaching more meaningful, clear, and conceptual. The math teacher also used relevant teaching methods like Inductive, Synthetic, Problem-solving methods, Activity-based teaching to develop Representation, Reasoning, Communication, Connection, and Problem-solving ability of the students. Overall the teacher intended for Mathematisation of the students by eliciting the Mathematical thinking among them. The teacher got less scope to show them harder sums through board work but the students have learned the concept of the chapters well with PPT, incidental video clips, model, etc. Most importantly they could connect their classroom content with their daily-life practices.

As per the collected data on Mathematical Thinking ability prior to the teaching given 20% of the students could make Representation, 19% of them could do Reasoning, 23% of them could make Communication, 2% of them could make Connections and 10% of the students had Problem-Solving ability.

After experiencing teaching, 78% of the students could make Representation, 72% of them could do Reasoning, 75% of them could make Communication, 70% of them could make Connections but only 65% of the students led to Problem-Solving ability. They could represent, reason, communicate, and connect logically with existing things but not able to think about unfamiliar or unexperienced things.

Thus after the teacher applied pedagogy, the correct response of the students increased on the different parameters of mathematical thinking ability. Hence Mathematisation have developed.

Computer generated tools are more accurate, relevant, realistic and have precision to give conceptual clarity and to make connection with real phenomenon. Hence the main goal of Mathematics Education is being fulfilled by developing mathematisation through computer assistive Pedagogy. Thus the Pedagogy has highly positive correlation with Mathematisation. Overall the collected data cleared the fact that the teacher has a great role to mathematize a child by adopting proper pedagogy.

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