



Effectiveness of Mathematics Education at Primary Level through Collaborative Learning

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Abstract

Various educational assessment Surveys at the National and State Level (NAS/SLAS) are pointed out that quality of our student are not up to the mark. Mathematics education is considered one of the dimension of the quality education. Global Monitoring Report -2015 and Sustainable Developmental Goal have also endorsed the enhancement of learning assessments of primary education especially for literacy, numeracy and essential life skills. For this reason to equip students and teacher with 21st century various skills are needed like critical thinking, creativity, communication, Collaborative learning in mathematics class teaching and problem solving skills. West Bengal Board of Primary Education endorsed Peacock Modal at primary level to evaluation (Summative and Formative) the achievement of student of mathematics. First stage of Cognitive Apprenticeship at the classroom is collaboration. In this stage student are divided in to a small groups and they discuss their prior knowledge. They solve real life problem of mathematics as per supplied by the teacher. In this collaborative work skill of collaboration is developed among the students. Objectives of the study are i.) To find out the nature of Active and Collaborative Learning at Primary Level. ii.) To find out the importance of Collaborative Learning at Primary Level. iii.) To find out the Effectiveness of Active and Collaborative Learning at Primary Level. Primary data is collected from primary school and Primary Teacher. Secondary data is taken various Government order, books, survey reports and online sources. This is an analytical survey type study. A case study was conducted in class teaching of mathematics of class IV level. In primary education mathematics is an abstract subject. Learning of mathematics is an active process. To make class Joyful of learning students relate the new knowledge with a relation of prior knowledge. It builds students' confidence in problem solving attitude. Low performance students have been motivated with other group members and Achieve a sustainable learning outcomes. In the case study The performance of students in mathematics through Collaborative learning is very satisfactory. It indicates that high effectiveness of mathematics through collaborative learning.

Key Words: Collaborative Learning (CL), learning Outcomes (LO) NCF-2005 and NAS.

Introduction:

Improving the quality of learning has been given main focus under the Saaarva Shiksha Abhiyan (SSA), Right to Education Act 2009 and Samagra Shikha Avijan. Various educational assessment Surveys at the National and State Level (NAS/SLAS) are pointed out that quality of our student are not up to the mark. Other achievement surveys such as the Annual Status of Education Report (ASER) and PrathamWB ad Pratiche India Trust reported wide disparities in the student achievement of basic numeracy. Mathematics education is considered one of the dimension of the quality education. Global Monitoring Report -2015 and Sustainable Developmental Goal have also endorsed the enhancement of learning assessments of primary education especially for literacy, numeracy and essential life skills. For this reason to equip students and teacher with 21st century various skills are needed such as critical thinking, creativity, communication, Collaborative leering in mathematics class teaching and problem solving skills in mathematics teaching. NCERT had been fixed the learning objectives of mathematics at primary level. To achieve the learning outcomes the teachers may redesign the teaching style as per the need of different learners. As per RTE Ac 2009 continuous and comprehensive evaluation was started at the elementary level. West Bengal Board of Primary Education endorsed Peacock Modal at primary level to evaluation (Summative and Formative) the achievement of student of mathematics. First stage of Cognitive Apprenticeship at the classroom is collaboration. In this stage student are divided in to a small groups and they discuss their prior knowledge. They solve real life problem of mathematics as per supper by the teacher. In this collaborative work skill of collaboration is developed among the students. As per Smith and MacGregor (1992) remarked the "Collaborative learning is an umbrella term for a variety of educational approaches involving joint intellectual effort by students and teachers together.

At present Mathematics education means simple mathematical awareness and interest, aptitude that is incorporated in classroom mathematics educations. Mathematics operation stresses on addition, subtraction, multiplication and division. Students are made aware regarding why addition operation is used. Such as, if a student goes to market and he buys a pen with Rs. 10/ and a pencil with Rs. 5/ -, then he has to spend in total $Rs\ 10 + Rs.\ 5 = Rs.\ 15$. This is how it is expressed in mathematical term. A village student can also count their cows and goats, such as five cows + four goats = nine cattle in combination form. So, we can say that Mathematical Education = Mathematical Knowledge + Mathematical Aptitude. Mathematics knowledge is developed very effectively in classroom situation through collaborative learning.

Review of Related Literature:

The report '**Learning Without Burden**' (2005) remarks that mathematics curriculum for primary classes in all parts of the country be reviewed with a view to slowing down the pace at which children arrear required to learn basic mathematical concepts, and broadening the scope of primary mathematics to include areas other than number work. the reports also points out that the tendency embedded in the syllabi and textbooks of primary mathematics to accelerate children's mathematical skills by teaching

them mechanical rules at the expense of understanding and intelligent application ought to be discouraged in future syllabi and texts.

The National Achievement Survey (NAS)2017 was conducted among 20. Million students from 110000 schools across 701 district in all States /UT .State Learning Report of West Bengal is in class 3, on an average, children are responding 71% (Mathematics) 71 % (EVS) and 75% (Language) questions correctly. Performance of the State in Learning Outcomes of Class -3 placed below;

| Learning Outcomes on Addition | Average Performance |
|--|---------------------|
| Read and write numbers up to 999 using place value | 74 |
| Compare numbers upto 999 based on their place values | 78 |
| Solve simple daily life problems using addition and subtraction of three digit numbers with and without regrouping | 66 |

The twelfth Annual Status of Education Report (ASER 2017: Beyond Basic) was released in New Delhi on January 2018 The report was conducted on age group 14-18. There was simple question How much money is this ? 76% of served youth could count money correctly, For those who have basic arithmetic skills. The figure was close to 90%. 56% could add weight correctly.

Edwards And Keith Jones (2003) remarked in “ Co-Learning in the Collaborative Mathematics Classroom “ that there are some Barrier to effective collaborative learning :

- 1) Lack of collaborative skills: The student does not know how to collaborate effectively in a particular content of mathematics. Such as accepting opposing view point, giving explanation, giving elaborate, providing and receiving help of other classmate.
- 2) Free-riding: in the collaborating learning situation in the class room some peers contributed most while other workless and some students does not participate in their own task this effects negatively in student’s collaborative experiences.
- 3) Competence state: There are different intellectual capacity in the different students like high medium and low status of intelligent. Students having high status of intelligence often influences other students. Students of low standers of intelligence are feeling low confidence.
- 4) Friendship: (i) Friendship relation in groups are an obstacle to effective collaboration, (ii) Friendship some time decreases the serious in working and constructing good arguments, (iii) In Friendship group the group her self – disciplined and critical.

In chapter 2 Learning and Knowledge NCF 2005 remarks “ children learn in variety of ways – through experiences ,making and doing things ,experimentation ,reading ,discussions ,asking ,listening ,thinking and reflecting and expressing oneself in speech ,movements or writing –both individually and with others” So classroom teaching learning process should be decorated in this way. Teacher teaches the addition classes various method.

Cooperative learning is an educational approach that promotes interaction among students and shared responsibility for academic achievement” [Stein, R. & Hurd, S. (2000).]

“Cooperative Learning procedures are designed to engage students actively in the learning process through inquiry and discussion with their peers in small groups” [Davidson, N. & Worsham, T. (1992).]

Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration
(Cambridge Journal of Education, 2018 Vol. 48, No. 1, 103-122)

Objectives of the Study:

1. To find out the nature of Collaborative Learning at Primary Level.
2. To find out the importance of Collaborative Learning at Primary Level.
3. To find out the Effectiveness of Collaborative Learning at Primary Level.

Population and Sample: Population of the study is all the primary student .Sample is taken from students of primary schools recognised by the West Bengal Board of Primary education only.

Data and Sources of Data: Primary data is collected from primary school and Primary Teacher .Secondary data is taken various Government order, books, survey reports and online sources.

Methodology: This is a analytical survey type study. A case study was conducted in class teaching of mathematics of class IV level.

Operational Definition of the Terms:

Learning Outcome (LO): learning outcomes are the statements that describes the knowledge, skills students should acquire by the end of particular assignment or class and help students understand why that knowledge and these skills will be useful to them .They focus of the context and potential application of knowledge and skills help students concerned learning in various contexts and help guide assessment and evaluation.

NCF-2005: National Curriculum Framework 2005 for school education was published from NCERT, New Delhi. It gave the reforms the school curriculum. Primary text book are written on the basis of recommendation of NCF-2005

RTE ACT-2009: Right to Free and compulsory Education Act 2009 is came to effect from April 2010.Now education is a fundamental right up to elementary level.

NAS-2017: National Achievement Survey (NAS) conducted by National Councils of Education research and Training ,New Delhi .Here the s a survey report of year 2017 of learning outcomes on the students of schools students is considered..

Collaborative Learning (CL) : CL is a teaching strategy that is used in a group of students together to impart learning in a effective and positive way. Peer learning is also a type of collaborative learning that engaged students working in pair or small group to reach a desired goal through discussion. In this activity students teach each other and correct their misunderstandings and clarifying misconception.

Analysis and findings:

[The nature of Collaborative Learning at Primary Level.]

Base of collaborative learning is on the base of Lew Vogotasky's concepts of learning called Zone of Proximal development. In this theory importance of learning through communication and interaction with others rather than through independent work. This has made way for the ideas of group learning. One of which effective is collaborative learning.

According to Golub (1985) “Collaborative learning allows for students talk in which students are supposed to talk with each other, and it is in this talking that much of learning occurs.”

| Sl.No. | Examples of Collaborative Learning |
|--------|--|
| 1. | Collaborative Networked Learning (CNL) |
| 2. | Computer-Supported Collaborative Learning (CSCL) |
| 3. | Learning Management System |
| 4. | Collaborative learning Development |

There are various techniques in CL like three- step Interview. Dyadic Essay Confrontation (DEC) and Think- pair – Share. Think –Pair –Share developed by Frank Lyman (1981) is very effective in mathematics classroom teaching..... It helps to think higher order thinking (analysis, evaluation/ synthesis)

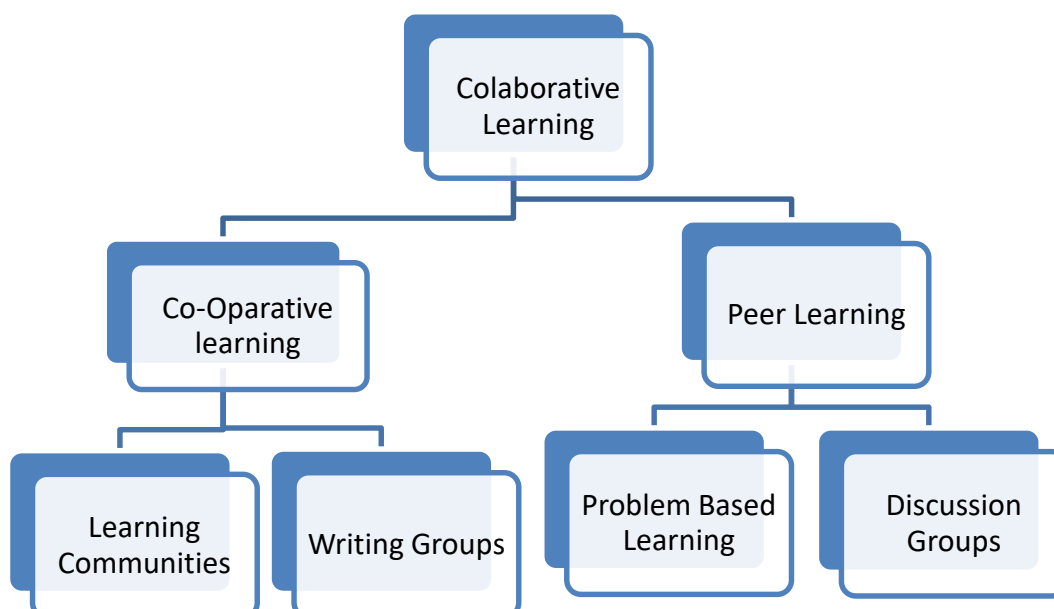
These four elements form the basis of collaborative learning in which social structures provide for egalitarian contributions to the processes of learning,

| Sl.No | four elements of collaborative learning |
|-------|---|
| 1. | Refutation of mathematics as a set of ‘truths’ and recognition of mathematical knowledge as socially constructed, |
| 2. | Open-ended and problem-solving opportunities which allow process rather than knowledge to prevail, |
| 3. | Social and environmental contexts for learning, |
| 4. | Collaborative learning situations |

Strategies for teacher for successful transaction of effective collaborative learning

| Sl No | Strategies for teacher |
|-------|---|
| 1. | Setting clear group goal |
| 2. | Divided group with enough diversity for divergent for thinking |
| 3. | Establish flexible group rule |
| 4. | Encourage for open communication and building trust |
| 5. | For large task create group norms |
| 6. | Arrange a pre-test and post test |
| 7. | Considering the learning process itself as part of assessment |
| 8. | Considering the jigsaw strategy |
| 9. | Create a positive of learning experience and reduce anxiety |
| 10. | Fix real world problem |
| 11. | Focus on critical thinking skill and enhancing problem solving capacity |

Collaborative Learning Approaches:



[Importance of Collaborative Learning]

As per Gorlack (1994) , “Collaborative learning is based on the idea that learning is naturally social act in which participant talk among themselves.’

In child centric classroom collaborative learning takes on a variety of forms and is practiced by teachers of different disciplines and It is very important in the mathematics classroom also. There are a numbers of importance underlying the nature about learners and learning process :

| Sl. No | Importance underlying the nature about learners and learning process : |
|--------|---|
| 1. | In primary education mathematics is a abstract subject. Learning of mathematics is an active process. To make class Joyful of learning students relate the new knowledge with a relation of prior knowledge. |
| 2. | Mathematics learning is a constructive process. When teacher learns a new information, concepts, skills , students have to work actively to a purposeful ways. They want to integrate this new idea with what they already know or use. |
| 3. | In mathematics teaching students requires challenges that opens the door to actively engage with his/ her peers and to process. synthesize information rather than memorize and regurgitate is very much needed. |
| 4. | Students comes various socio economic backgrounds .Their culture are different. The benefit when exposed to diverse viewpoints from others with varied backgrounds. |
| 5 | CL holds in a social environment where their knowledge conservation between learners takes place. |
| 6. | In shorter amount of time a lot more done. |
| 7. | Each students of the group contribute something unique. |
| 8. | Low performance students have been motivated with other group members. |
| 9. | Students interact each other , mathematics becomes very enjoyable. |
| 10. | Achieve a sustainable learning outcomes |
| 11. | Develop public speaking and active listening skills |
| 12. | Individuals learn how to think critically. |

Collaborates learning is needed for the following reason:

| Sl.No. | Collaborates learning is needed |
|--------|--|
| 1. | Students learn qualities and sympathy , self control fair play , leadership style. |
| 2. | It builds students ‘s confidence in problem solving attitude |
| 3. | It enhances the students satisfaction in mathematics learning |
| 4. | Students develop social skills and oral communication |
| 5. | Increase self esteem in development a community of learning |
| 6. | Retention ability in sustainable learning outcomes |

In the primary level CCE has been started ,There are two type of evaluation Formative and Summative as per Guidelines of WBBPE. At first Task Framing is done by the teacher There are five type indicator are used to measure students learning outcomes

| SL. No | Five type indicator are used to measure students learning outcomes |
|--------|--|
| 1. | Participation |
| 2. | Questioning and Experimentation |
| 3. | Interpretation and Application |
| 4. | Empathy and Cooperation |
| 5. | Aesthetic and Creative Expression |

[The Effectiveness of Collaborative Learning at Primary Level]

The performance of students in mathematics through Collaborative learning (A Case study)

| Sl.No | Name of The Schools | Raghunathpur Primary Schools |
|-------|---------------------|------------------------------|
| 1. | District | Howrah |
| 2. | Circle | Bally West |
| 3. | Class | IV |
| 4. | No of Students | 20 |
| 5. | No of the Teacher | 1 |
| 6. | Subject | Mathematics |
| 7. | Book | My Mathematics |
| 8. | Content | Let's make teams and play |
| 9. | Page | 191 |
| 10. | Period of Class | 40 minutes |

Learning Outcomes - Students can Find out the Prime numbers from 1 to 100 EFINING

- i) Twenty students were divided into 4 groups which are named as Barkat, Salam, Rafik & Jabbar. (As that day was International Mother Language day).
- ii) 4 sheets were given to all groups to write the numbers among 1-100 consecutively. Then it was told to cross mark to the number '1' because it was neither prime number nor compound number.
- iii) Then make round the number '2' and cut the multiples of '2'. After making round of these numbers 3,5,7 like that way they cross all the multiples of those prime numbers.
- iv) In this way all the multiples of prime numbers were crossed and the numbers which were not crossed were rounded .
- v) The numbers which are rounded are prime numbers and which are crossed are compound numbers.

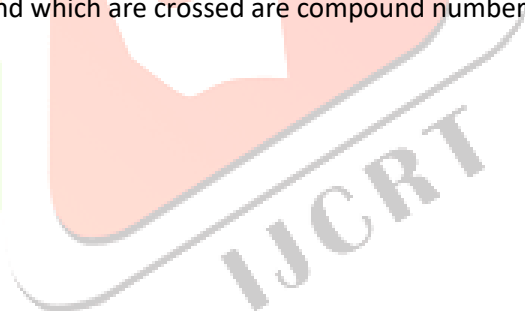
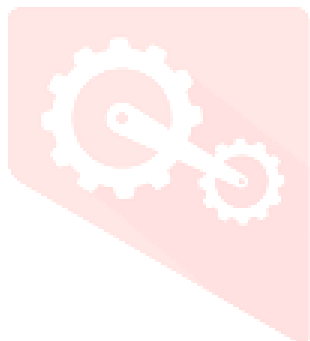


Table of Prime Numbers in Between 1 to 100

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|
| 1 | ② | ③ | 4 | ⑤ | 6 | ⑦ | 8 | 9 | 10 |
| ⑪ | 12 | ⑬ | 14 | 15 | 16 | ⑰ | 18 | ⑱ | 20 |
| 21 | 22 | ⑳ | 24 | 25 | 26 | 27 | 28 | ㉑ | 30 |
| ⑳ | 32 | 33 | 34 | 35 | 36 | ㉓ | 38 | 39 | 40 |
| ④ | 42 | ④ | 44 | 45 | 46 | ④ | 48 | 49 | 50 |
| 51 | 52 | ⑤ | 54 | 55 | 56 | 57 | 58 | ⑤ | 60 |
| ⑥ | 62 | 63 | 64 | 65 | 66 | ⑥ | 68 | 69 | 70 |
| ⑦ | 72 | ⑦ | 74 | 75 | 76 | 77 | 78 | ⑦ | 80 |
| 81 | 82 | ⑧ | 84 | 85 | 86 | ⑧ | 88 | ⑧ | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | ⑨ | 98 | 99 | 100 |

Teacher's Role: In this grid all the numbers circled this way are prime numbers and all the numbers struck out / are composite numbers. Greek mathematician Eratosthenes in 3rd century BC founded this easy technique of finding prime numbers from 1 to 100 without doing factors. This method is called Sieve of Eratosthenes. Teacher checks their today's knowledge ask write some new questions in their worksheet.

- i) Which is the smallest prime number?
- ii) Which is the even prime number?
- iii) Which is the biggest prime number?

iv) How many compound numbers in between 50 and 70?

v) How many compound numbers in between 30 and 50 ?

Findings :

Response of the students class work are analysed below.

| Question No | Correct response | Percentage of Correct response |
|-----------------|------------------|--------------------------------|
| Question No.- 1 | 18 | 90% |
| Question No.-2 | 15 | 75% |
| Question No.-3 | 20 | 100% |
| Question No.-4 | 16 | 80% |
| Question No.-5 | 17 | 85% |

All children actively and spontaneously participate in the activity. Back –benchers were also participated actively with interest. With the help of activity based learning fear towards mathematics removed from the mind of the students. Activity based learning is very useful to keep interest in mathematics. Performance of class indicates the masterly level learning in class teaching through collaborative learning.

Conclusion:

Today's mathematics teaching is very much ITC based. After the Covid -19 world blended learning is very much acceptable in the teaching learning process. In this situation Collaborative learning in virtual worlds by heir characteristics provide an excellent opportunity. In virtual worlds classroom meeting and lectures was restricted similar to traditional counterparts in real life, In the large classroom there are some obstacles in collaborative learning, In the mathematics class transaction period some peers contributed most while other workless and some students does not participate in their own task this effects negatively in student's collaborative experiences. In virtual world spaces, Collaborative learning has a unique features such as ability to record and map flow of ideas ,use three dimensional models and virtual worlds mind mapping tools. Collaborative learning stimulate both pupils and teachers,

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