

# Voices of Teachers and Teacher Educators



Volume XIII Issue I July 2024 ISSN 2455-1376

# **Voices of Teachers and Teacher Educators**

Volume XIII

Issue I

July 2024

Published by:

National Council of Educational Research and Training (NCERT) on behalf of Ministry of Education, Government of India, New Delhi

Preparation of the publication at DTE, NIE (NCERT), New Delhi

Cover Design & Layout Design: Kirti Shukla

Cover Image Source: DTE, NIE (NCERT), New Delhi

## About the Journal

Voices of Teachers and Teacher Educators (VTTE), an initiative of the Ministry of Education, erstwhile Ministry of Human Resource Development (MHRD), is a peer-reviewed e-journal coordinated by the NCERT and included in the UGC-CARE List. The journal is published biannually and is bilingual (Hindi and English).

The journal highlights the vital role of teacher education in India, as the country is poised to provide quality education to all its children, irrespective of gender, caste, creed, religion, and geography. The National Curriculum Framework (NCF)-2005, National Curriculum Framework for Teacher Education (NCFTE)-2009, Right of Children to Free and Compulsory Education Act (RTE)-2009, and National Education Policy (NEP)-2020—all reflect this commitment, underline the principles that make such an effort necessary, as well as spell out the strategies for it. In this regard, we are faced with challenges that include augmenting the role of teachers in shaping the social transformation that India is witnessing, making education equitable, and effecting a long-lasting impact on the quality of education. Teachers and everyone concerned with education need to recognize that their ownership and voices are important and that they can and do learn not only from their own experiences but also from each other through collective reflection and analysis. The journal attempts to lend voice to students, teachers, teacher educators, researchers, administrators, and policymakers in varied institutions such as schools, Cluster Resource Centres (CRCs), Block Resource Centres (BRCs), District Institutes of Education and Training (DIETs), Institutes of Advanced Studies in Education (IASEs), Colleges of Teacher Education (CTEs), State Councils of Educational Research and Training (SCERTs), etc., as well as other stakeholders. The journal aims to facilitate the dissemination of their ideas and make their engagement visible in accomplishing the extraordinarily complex and diverse tasks that they are expected to perform.

Contributions to the journal are welcome in both English and Hindi. Voices is published online, and we hope to circulate it widely. The journal seeks to provide a platform and build a network for our voices, ideas, and reflections; it carries articles, research papers, critical reviews, and book reviews and covers several themes in school and teacher education, including best practices, innovations, experiments, and action research.

We look forward to suggestions and comments of our readers on the articles published.

The views expressed and the information given in this journal are those of the authors and may not reflect the views of the NCERT.

## **Call for Contributions**

This biannual publication is for all of us: teachers, teacher educators, administrators, researchers, and policymakers. It seeks to provide a platform and build a network for our voices, ideas, and reflections. To enable this journal to reflect all voices, we must contribute to it in as many ways as we can. We look forward to many contributing with different experiences, questions, suggestions, and perspectives, as well as critical comments on different aspects of teacher education and schooling. The contributions could be in the form of articles, reports, documents, pictures, cartoons, or any other forms of presentation amenable for print. We also seek comments and reflections on the current issue to improve publication and make it a participative endeavour. We must together make this journal truly reflective of our voices. We look forward to receiving your contributions for the forthcoming issue. We also look forward to your comments and suggestions. The contributions may be sent to the following: E-mail: [voicesofeducators2016@gmail.com](mailto:voicesofeducators2016@gmail.com)

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## Guidelines for Authors

'Voices of Teachers and Teacher Educators' largely gives space to contributions spanning experiences, questions, suggestions, and perspectives, as well as critical comments on various aspects of Teacher Education and Schooling. Ideas developed in the text must be clear and coherent; the argumentation must be convincing. The paper must be clear and bring out the points examined in the text so that the reader can have a clear idea of the author's(s') perspective. The language of the text should not be full of jargon or with gymnastics of technical words. It should be purposeful, relevant, and understandable for the audience of the journal.

The length of an article is expected to be around 5000 words; in extreme cases, it should not exceed 7000 words. While there is no lower limit, the contribution must not be an exposition of a point of view or an uncritical / hypercritical presentation of an experience. Preferably, the papers should be approximately 3000 words. The manuscript must include a title, author details, abstract, keywords, well-defined sections and subsections (as applicable for the manuscript type), and proper referencing.

As per the policy for inclusion of articles in Voices of Teachers and Teachers Educators, no contribution with a similarity index higher than 4 to 5% on Urkund would be taken for review. The author(s) must ensure that the paper that they submit has less than a 4 to 5% similarity index on Urkund. There are online mechanisms to check for the similarity index; authors are encouraged to check the same before submitting the manuscript. For those who are citing other authors' work or their own work, please ensure that there are not many quotes from any previously published text. You may not take any material from any published work, including your own. You must keep the amount of material you cite to the minimum and provide reference to the original. The contents of your paper should be your interpretation of the cited work, in your words. You must give credit for the work that you refer to and can, if central to your paper, make its essence available, but not through the use of text from the work as it is. We would also urge you to do the Urkund test at your end if possible and attach the report so that the process of review is quicker.

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# Editorial

Voices of Teachers and Teacher Educators, Volume XIII, Issue I, July 2024, is with you here, and this issue has 16 papers, including two book reviews, that have come from a very diverse set of authors from different backgrounds. They reflect a spectrum of aspects that concern those working in education. Due to the fact that there is a lot of energy and effort around implementing the Education Policy 2020 and the curricular frameworks developed for it, many of the papers explore the dimensions of the way the ideas in these documents can be implemented as well as explore the experiences of putting it on the ground. While the fact that these are from these documents is not explicitly stated, the focus of attention of these papers around early childhood education, arts and drama integrated processes of education, computational thinking, and indigenous methods of problem solving are areas that have been emphasised in the Education Policy 2023. Three papers are focused on the use of Art in education in general, and that includes one on Drama in particular. Apart from these, two papers are focused on another important issue flagged by the NCF 2023, that is, problem solving and computational thinking in mathematics classrooms.

The paper **‘Exploring the Effectiveness of Drama-based Learning in Elementary Education: Students’ Perceptions and Subject Preferences’** by Raj Ballav Panda\*, Ghanashyam Sahu, Meenakshi Singh, and Binod Mahakur is a study trying to understand from a conveniently available sample the areas that can be more effectively related to drama-based teaching and whether there is any distinction between the perceptions of boys and girls towards this area. The study highlights the potential of drama-based learning as an effective tool for holistic development in elementary education.

The next study linked to art and education is the paper **‘Teacher’s and Student’s Perception of Art Integration in Icchawar Block of Sehore District’**, which is the work of Shivalika Sarkar\* and Chitra Singh. The study is from a qualitative survey of a sample of teachers teaching primary classes in the Icchawar Block of Sehore District, M.P. The paper concludes that art-integrated learning can bring a positive change in learner participation, attendance, confidence, innovation, values, and cooperation, but to inculcate critical thinking and connections, real-world strategies need to be improved.

The third paper linked to art and education is **‘The Impact of Previous Knowledge and Art Exposure on Self-Efficacy in Art Education: A Study of Pre-Service Teacher Trainees’** by Devajani Duarah\*, Smritishikha Choudhury, and Dipanwita Deka. This investigates the effect of previous art knowledge and art exposure of pre-service teacher trainees on their self-efficacy in teaching and integrating art education in Assam. Employing responses from 250 participants from District Institutes of Elementary Teachers' Training (DIETs), the study suggests increased self-efficacy with exposure to art.

The two papers linked to mathematics include **‘A Comparative Study on Effectiveness of Problem-solving Method, Vedic Mathematics, and CRA Approach on Solving Mathematical Problems at the Primary Level’** by Ghanashyam Sahu\*, Garudadhwa Barik, and Alokaxmi Behera and **‘Synergistic Relationship Between Computational and Mathematical Thinking: the Role of Spreadsheets’** by Jonaki B. Ghosh.

The former aims to determine the effectiveness of problem-solving, Vedic mathematics, and the Concrete-Representational-Abstract (CRA) approach towards improving the mathematical problem-solving abilities of primary-level students of class III. Employing a purposive small sample of 60 divided into three groups, it was found that all approaches have a significant impact, with the CRA approach having an edge. They suggest future research with bigger sample sizes in this field of mathematics education.

The latter is regarding the issue of integrating computational thinking in school curriculum. The author argues that mathematical thinking (MT) and computational thinking (CT) are mutually supportive and yet distinct. This paper presents an exemplar from a larger study, where fractal explorations and simulation of problems in probability enabled by spreadsheets led pre-service teachers to develop mathematical concepts and also engage with CT practices. The evidence of success makes a strong case for incorporating this in school programs.

There are four papers that pertain to the social climate and relationships among people at school and at home.

One of these papers is by Diksha Verma\* and Kuldeep Singh Katoch, titled '**Collaborative Learning: Perceptions of Teacher Educators**'. It is a study focused on the effectiveness of collaborative learning techniques and their implementation by 28 teacher educators. The study found significant challenges in implementing collaborative learning in teacher training.

Another paper, '**Investigating the Role of Home Learning Environment in Shaping Children's Literacy Development: A Comparative Analysis of Two Families in Rural India**' authored by Sanjib Malo, is a qualitative study of families from different social and economic backgrounds and underscores the need for support to the weaker sections as per their needs.

The third paper in this area, '**The Effect of School Climate on Teaching Satisfaction: the Role of Teacher Engagement**' by Raj Kumar Pal\*, Antara Dey, and Nil Ratan Roy, is a survey of 476 secondary school educators from 49 public institutions. The finding is that there is a positive and statistically significant impact of school climate on teachers' work attitude, their engagement with their work, and their job satisfaction.

The fourth paper, '**Key Focus Areas for Enhancing Interpersonal Leadership Practices among Teachers: Insights from Teachers and Experts**' by Bindhu C.M. and Arjun R.S.\*, is aimed at finding the specific areas for enhancing interpersonal leadership practices relevant to teachers and student teachers. This investigation includes experiences, insights, suggestions from present primary school teachers and experts, and themes identified from related research documents.

There are four other research studies, which pertain to teachers and teacher education.

The first is '**Innovation in Action: Exploring the Effectiveness of a MOOC in Teacher Education**', by Shama P. Ansari\* and Ashutosh Biswal, which discusses the inclusive, self-paced, and choice-based reach possibilities of the Massive Open Online Courses (MOOCs), with the possibility of peer dialogue and learning. The study reports the implementation of such a course and finds it to be effective in enhancing pre-service teacher educators' achievement in research methodology and supports the idea that pre-service teacher educators need to be trained for developing MOOCs by utilising the various free open-source software available online.

Another paper, '**Cultivating Equity: Analysing Access to Quality Education for Tribal Students in Eklavya Model Residential School**' by Dipak Karmakar, studies the Eklavya Model Residential School (EMRS). The study noticed flaws in the governance and resourcing patterns across the EMRSs, including inter-state and inter-district disparities, as well as differential levels in functioning owing to the differential management structures. It found that massive contractual teacher appointments had led to restricting their roles and unequal effectiveness. The study found a lack of convergence between the tribal societies at the state and district levels and says that while schools function as per the circulars and papers, they miss the spirit of learning, thus aggravating inequalities that tribal and marginalised children experience.

The third paper in this category, '**What Works and Why: Insights from Science Teachers' In-Service Capacity Development Program**', by Tamralipta Patra, is focused on outlining the status of science teaching in public schools while shedding some light on a few issues that impede the teaching-learning processes in science. The paper points out the challenges for public school teachers as the large classes, shortages of teachers, non-academic engagements, inadequate infrastructure, and limited resources.

The fourth paper in this category is '**Innovative Teaching Approaches in Social Science Education: A Case Study of Government Model Middle School Pashkum, Kargil, Ladakh**', whose author is Mohd Mustafa Kamal. The paper presents experiences from a case study of a school using teaching methodologies that incorporate inquiry, research, projects, exploration, and critical thinking. This transformation has significantly enhanced student engagement, fostering a heightened motivation to attend classes regularly. The enrolment has also gone up as a result of this amalgamation of two nearby schools.

The paper by Navdeep Kaur and Monkia Rai\* with the title '**Study of Metacognition among Senior Secondary Students in Relation to Their Problem-Solving Ability and Self-Esteem**' examines how students in secondary schools use metacognition in problem-solving and their sense of self. This study with a descriptive research design is delimited to 200 randomly chosen Class IX students from Amritsar district using standardised tools available.

The issue carries two **book studies**. One is of a book for children called '**Guthli Can Fly**'. The review by Devika Sharma points out that the book, which has been translated from Hindi, has won many awards. The author recommends that the book be read by all children.

The other book study is the **review of 'Teaching the Young – the Early Childhood Development Profession in India'** by Hriday Kant Dewan. The reviewer emphasises the relevance of the book in light of the importance of early childhood education in the lives of children and its underlining in the Education Policy of 2023 as well. The reviewer says that with 22 chapters, the book is a substantial topical read, presenting many on-ground experiences with rich local flavour.

We look forward to the comments from all of you and your contribution for the next issue. We do hope many of you send studies on meaningful education issues for the journal and analytic reflections based on your work.

## Exploring the Effectiveness of Drama-based Learning (DBL) in Elementary Education: Students' Perceptions and Subject Preferences

Raj Ballav Panda\*, Ghanashyam Sahu, Meenakshi Singh, and Binod Mahakur

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### Abstract

*The National Education Policy (NEP) 2020 emphasises the importance of 21st-century skills and interactive teaching methods. This study investigated elementary-level students' perception of drama-based teaching and explored any potential differences between male and female students. A descriptive survey method was employed, in which 50 students were taught using drama. The findings suggest that drama-based learning (DBL) is both effective and engaging, especially for language-based subjects, as it promotes exploration, discovery, and problem-solving skills. There was no significant difference in perception between boys and girls, although language subjects were preferred over Mathematics, Science/EVS, and Social Science. This study highlights the potential of DBL as an effective tool for holistic development in elementary education.*

**Keywords:** *Drama-based learning, 21st-century skills, Learners' perception, Elementary education, Holistic development*

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### Introduction

Teaching, although a complex process, can be effectively implemented when teachers select appropriate pedagogical methods to convey academic subjects or theoretical concepts (Ubong, 2012; Smith et al., 2020). In addition to possessing knowledge of content, curriculum, standards, and assessment processes, teachers must also engage with their learners to understand them well and make informed instructional decisions (Lee et al., 2015; Wang et al., 2017). Pedagogy serves as the bridge that connects these various elements together, allowing skilful teachers to create meaningful learning experiences. While teachers employ different pedagogical approaches and teaching strategies, not all of them yield equally positive learning outcomes (Smith et al., 2020).

The National Education Policy 2020 recognises the importance of not only

cognitive development but also character building and equipping students with essential 21st-century skills (NEP 2020, para 4.4, p. 12). It promotes an interactive, joyful, creative, collaborative, and exploratory approach to teaching and learning, emphasising experiential learning (Brouillette et al., 2019). Therefore, teachers are encouraged to adopt pedagogical methods that are experiential, holistic, integrated, inquiry-driven, discovery-oriented, learner-centred, discussion-based, flexible, and enjoyable (Lee et al., 2015).

In recent years, interest in alternative teaching methods that actively engage students and foster a deeper understanding of academic subjects has grown (Jones & Smith, 2010; Lee et al., 2015). One such method is the incorporation of drama in the classroom, which integrates theatrical elements such as role-play, improvisation, and performance into the teaching and learning process.



The utilisation of drama in education has been found to yield numerous advantages, such as heightened student engagement and motivation, improved communication and interpersonal skills, and enhanced critical thinking and problem-solving abilities. Moreover, DBL has demonstrated effectiveness in teaching subjects that are commonly perceived as dry or challenging (Andrikopoulou & Koutrouba, 2019; Lee et al., 2015).

## Review of Related Literature

The study of related literature looks at earlier research that examined the use of drama as a teaching method in various educational contexts.

In a study conducted by Jones and Smith (2010), the researchers investigated learners' perceptions of using drama as a learning method. The study revealed that learners reported increased motivation and engagement when drama was incorporated into the learning process. Furthermore, drama was found to be particularly effective in enhancing learners' oral communication skills. Ubong (2012) proposed the use of drama as an educational approach within the classroom and as a presentation approach in extracurricular activities to teach primary school learners about environmental issues. The author suggested that drama can provide lasting lessons in environmental education.

Masoum et al. (2013) conducted a study on the role of drama in mathematics learning. The findings indicated that teaching mathematics through drama produced better outcomes than traditional teaching methods. Moreover, using drama in mathematics instruction was found to facilitate conceptual understanding and enhance learners' perception of the subject.

In a study by Wang et al. (2017) that focused on learners' attitudes towards drama-based pedagogies (DPGs) in science education, positive attitudes were observed among the participants. The study also found that the use of drama in science learning increased students' interest in the subject.

A meta-analysis by Lee et al. (2015) examined the impact of DPGs on academic outcomes. The analysis revealed that incorporating DPGs resulted in improved academic performance across various subjects, including language arts, science, and social studies.

Andrikopoulou & Koutrouba (2019) explored Greek teachers' perspectives and attitudes towards incorporating drama-based activities in primary-education classrooms, specifically in the context of environmental education. The findings indicated that drama-based environmental education had a significant impact on learners. Teachers noted that drama enhanced learners' understanding, fostered resourcefulness, developed empathy, improved social skills, and cultivated a sense of shared responsibility and commitment among learners.

Brouillette et al. (2019) conducted a review on the effectiveness of DPGs in promoting social-emotional learning. The review concluded that DPGs were successful in fostering skills such as empathy, communication and collaboration among learners.

In a qualitative study by Smith et al. (2020), the researchers explored the experiences of learners who participated in DBL activities. The study revealed that learners reported increased confidence and creativity as a result of their involvement in DBL. Furthermore, learners expressed that these activities made the learning process more enjoyable and engaging.

Ezenwosu et al. (2022) published a paper highlighting the use of drama in teaching mathematics at the basic and senior secondary levels in Nigeria to enhance literacy. The authors recommended the incorporation of drama in mathematics instruction as it facilitates the application of mathematical concepts in real-life situations, promoting a deeper understanding of the subject.

## The Study

Recognising the potential benefits of drama-based learning, we decided to investigate learners' perceptions of using drama as a

method for learning various school subjects. The study aimed to delve into learners' perceptions of DBL, specifically within the context of enhancing 21st-century skills. Furthermore, the study sought to analyse whether there are significant differences in perception between boys and girls, as well as examining potential variations in subject preferences when utilising drama as a medium of instruction. By gaining a deeper understanding of learners' perspectives on drama-based learning, educators and policymakers can make well-informed decisions regarding the integration of this innovative teaching approach, thereby ensuring that students receive a comprehensive and effective education that nurtures their holistic development (Lee et al., 2015; Andrikopoulou & Koutrouba, 2019).

The primary objectives of our work were to investigate the perception of elementary level learners regarding DBT and to determine whether there are differences in perception between male and female students as well as variations in subject preference. By exploring the nature of learners' perceptions, insights could be obtained into the effectiveness and potential of DBT in elementary education. Additionally, by analysing any gender-based disparities and subject preferences, the study sought to provide a comprehensive understanding of the impact and applicability of DBT methods in promoting inclusive and engaging learning experiences. The objectives of the study were as follows:

- To explore the nature of perception of learners on drama-based teaching in elementary level education.
- To ascertain the difference in perception between male and female students and subject preference.

## Methodology

The research design employed for this study was a descriptive survey method. The target population consisted of elementary-level learners, and a convenient sampling method was used to select a school for the study. The

Klorofeel School, located in the remote area of Ganjam District, Odisha, stands out for its unique approach to curriculum delivery. Unlike other schools, the school extensively incorporates Drama-Based Learning (DBL) as a routinely used method of teaching and learning. The school follows the curriculum guidelines outlined by the National Council of Educational Research and Training (NCERT), including the use of NCERT textbooks and focussing on the attainment of learning outcomes for the Elementary Stage.

The teachers at Klorofeel School predominantly utilise DBL as their preferred method of instruction, although its popularity varies across different subjects. DBL is particularly favoured and widely employed in specific subjects within the curriculum. This innovative approach distinguishes Klorofeel School from others in the region, highlighting their commitment to engaging and effective teaching methods. This distinctive characteristic was the primary reason for selecting this school as the research site.

Dramas were organised on the chapters based on certain learning outcomes selected from the past academic records of the students in different subjects during academic year 2022–23. Under the guidance of a team comprising a pedagogical expert (mentors), a subject expert (teacher), and a drama instructor, dramas were organised to teach various school subjects. First, specific learning objectives were determined. Then, a subject and topic that aligned with the curriculum and learning outcomes were selected, followed by the development of a concise and engaging script that incorporated the subject matter and was divided into acts or scenes as necessary. Roles were assigned to students, ensuring that everyone had a significant part to play, and rehearsals were conducted to help them understand their characters and roles.

A performance was organised, during which students presented the dramatisation, and a post-performance reflection session was facilitated to encourage insights and

connections with the subject matter. Finally, follow-up activities such as projects, quizzes, and/or discussions were planned to reinforce learning and allow students to apply their knowledge.

This approach, utilising the dramatisation method, created an interactive and memorable learning experience that actively engaged students whilst promoting a deeper understanding of the subject matter.

During the DBL sessions, students assume two types of roles. The majority of students actively engage in the enactment of various characters within the dramas, while the remaining students act as the audience,

observing the unfolding drama. Depending on the subject and course content, students have the opportunity to participate in or witness the dramatic activities as they progress through the lesson.

Purposive sampling was then employed to select 50 students (28 boys and 22 girls) from grades three to eight, who had been taught their school subjects using drama as participants.

To collect data, a self-made questionnaire consisting of 20 items on a 5-point Likert scale was administered. Assuming that each statement is equally weighted, the internal

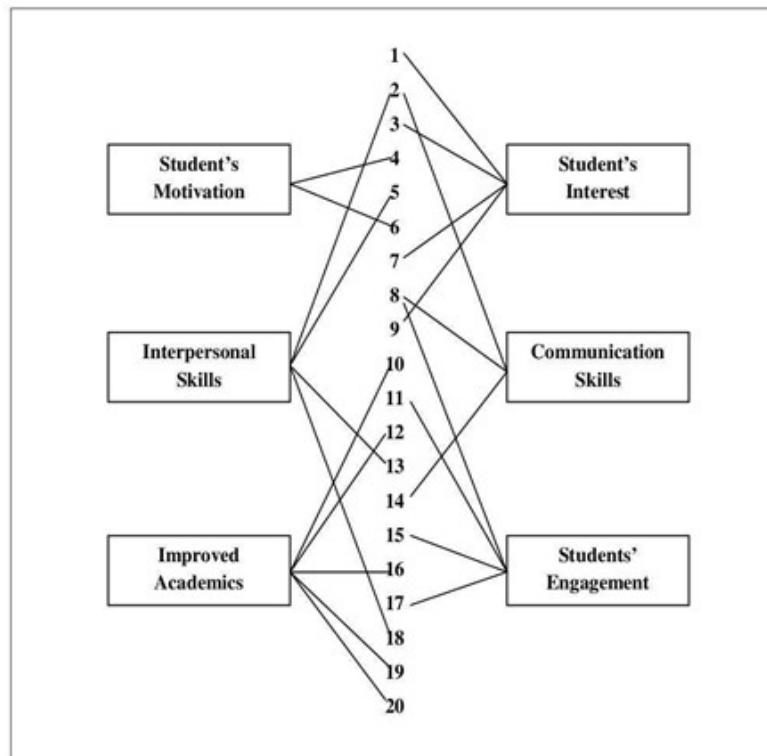


Figure 1: Distribution of items across aspects of students' perception about DBL

consistency of the survey was assessed using Cronbach's Alpha, which yielded a value of 0.89. This indicates a high level of internal consistency among the survey items, indicating that they are reliably measuring the same construct, namely the perception of drama-based learning.

The items were based on the following broad aspects of the perceptions of students:

- Students' interest
- Students' motivation
- Students' engagement
- Interpersonal skills
- Communication skills
- Improved academics

Figure 1 presents the distribution of the items into various aspects of perception of students. The tool consisted of 20 statements out of which 12 were positive (Items 1, 3, 5, 8, 10, 11, 13, 14, 15, 17,

19, and 20) and 8 were negative statements (Items 2, 4, 6, 7, 9, 12, 16, and 18).

Scoring of positive and negative items was done as given below in Table 1.

**Table 1: Scoring of Items**

Option Choice	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Positive Statement Score	5	4	3	2	1
Negative Statement Score	1	2	3	4	5

## Analysis and Discussion'

The collected data were analysed using appropriate statistical measures, including the t-test, Friedman chi-square, and Nemenyi post-hoc test. These statistical techniques were used to analyse and interpret the results of the study, allowing for a comprehensive understanding of the learners' perceptions of drama-based

learning and any significant differences observed.

The analysis aimed to provide a comprehensive understanding of learners' perceptions of drama-based teaching in elementary level education, while also examining potential differences in perception between male and female students and variations in subject preference.

**Table 2: Learning of Subjects through Drama-based Learning**

Subject (N=50)	N	Percentage
Odia	38	76.00
English	23	46.00
Hindi	19	38.00
Social Science	12	24.00
Science & EVS	11	22.00
Mathematics	3	6.00

Table 2 displays the number of students (N) and the corresponding percentages (%) of students who have participated in studying different subjects using drama-based learning. From the table, it is evident that the highest number and percentage of students engaged in drama-based learning are in the subject of Odia language, with 38 students (76%). This is followed by English with 23 students (46%) and Hindi with 19 students (38%). Social Science demonstrates

a participation rate of 12 students (24%) who studied through DBL. On the other hand, the percentages of students utilising DBL for Science/EVS and Mathematics are 22% and 6%, respectively.

It is noteworthy that the percentages of students who studied Science and Mathematics using DBL are the lowest among all the subjects. This observation may be attributed to the common perception that Mathematics is a challenging and less

engaging subject, often requiring more traditional teaching methods. However, the implementation of drama-based learning approaches has the potential to make Mathematics more captivating and aid students in grasping complex concepts

effectively. Overall, the data indicates that drama-based learning is a popular and effective pedagogical approach for teaching various subjects, particularly language-based subjects such as Odia, English, and Hindi.

**Table 3: Perception on Drama-based Learning or DBL**

Statements	Mean	SD
DBL is more interesting than traditional classroom teaching.	4.36	0.6
DBL doesn't help with communication skills development.*	4.30	0.6
Students enjoy participating in DBL activities for school subjects.	4.30	0.7
DBL doesn't generate new ideas.*	4.44	0.8
DBL helps to develop bonding with friends.	4.32	0.7
DBL doesn't encourage exploration and discovery.*	4.28	0.8
DBL is seen as a waste of time for learning a subject.*	4.20	1.0
DBL helps develop questioning skills.	4.20	0.7
Students' suggestions are not always welcomed during drama preparation.*	3.98	1.0
Discussions in DBL help with critical thinking.	3.90	0.8
DBL makes learning more flexible.	4.22	0.8
DBL does not help with academic performance.*	3.78	1.1
DBL does not make students isolated from society.	3.82	1.1
DBL makes students more confident in expressing themselves.	4.48	0.8
DBL makes learning more engaging and memorable.	4.42	0.8
DBL does not help with understanding complex concepts.*	3.80	1.0
Drama activities keep students physically active.	4.38	0.6
DBL doesn't help with understanding the feelings of others.*	4.42	0.6
DBL helps develop problem-solving skills.	4.10	0.6
DBL activities are a valuable addition to the school curriculum.	4.12	0.9
<b>Total</b>	<b>4.19</b>	<b>0.81</b>

(Items marked with \* are negative statements, for which reverse scoring has been applied.)

The analysis of the mean scores (Table 3) reveals that students hold a generally positive perception of drama-based learning. The pooled mean score is 4.19, ranging from 3.78 to 4.48, indicating that students largely agree or strongly agree with statements reflecting a favourable perception of drama-based learning in various elementary school subjects.

Statements 1, 4, 5, 6, 8, 11, 14, 15, 17, 18, 19, and 20 all surpass a mean score of 4,

signifying that students strongly agree with these statements. These statements highlight the benefits of drama-based learning, including its ability to engage students, stimulate the generation of new ideas, foster exploration and discovery, develop questioning skills, make learning more flexible and memorable, promote physical activity, enhance understanding of others' emotions, cultivate problem-solving skills, and serve as a valuable addition to the school curriculum.

Statements 2, 3, and 7 receive mean scores around 4, indicating that students generally agree with these statements. Statement 2 suggests that DBL contributes to the development of communication skills, statement 3 implies that students derive enjoyment from participating in DBL activities for school subjects, and statement 7 reveals that some students perceive DBL as a waste of time for subject learning.

On the other hand, statements 9, 10, and 16 obtain lower mean scores compared to the other statements, indicating that students are less certain or disagree with these statements. Statement 9 suggests that students' suggestions are not always welcomed during drama preparation, statement 10 asserts that DBL discussions aid in critical thinking (which some

students may not agree with), and statement 16 implies that DBL does not assist in understanding complex concepts (which some students may disagree with).

Overall, the majority of statements express positive attitudes towards drama-based learning; nevertheless, there are a few statements where students may not agree or may hold different perceptions. It is crucial to acknowledge these varying perspectives when implementing drama-based learning in the classroom and to address any concerns or issues that students may have.

Upon further analysis of the various aspects of students' perceptions, it becomes evident that they hold a positive view. The items in each category and the mean score of each are shown in Table 4.

**Table 4: Aspects of students' perception and distribution of items with score in each**

Sl.No.	Aspect of students' Perception	Items	Mean Score
1.	Students' interest	1,3,7,9	4.21
2.	Students' motivation	3,4,6	4.34
3.	Students' engagement	8,11,15,17	4.305
4.	Interpersonal skills	2,5,13, 18	4.215
5.	Communication skills	2,8,14	4.32
6.	Improved academics	10,12,16,19,20	3.94

The average of each aspect exceeds the score of 4 except the perception about overall improvement in academics. Here the average is slightly less than 4 which may be attributed to items 10, 12 and 16 that have been given less preference by the participants giving each a score less than 4.0. Thus, we may infer that students

perceive a relatively less advantage in improvement in academics as compared to other aspects. It must, however, be highlighted that they perceive DBL as having a positive impact on improvement of academics albeit not as much as on engagement, motivation, communication, and interpersonal skills.

**Table 5: Difference in perception of students towards drama-based learning by gender**

Group	N	Mean	SD	Pooled SD	t-value	df	Sig.
Boy	28	4.12	0.73	0.698	1.68	48	0.100
Girl	22	4.28	0.63				

The mean value of drama-based learning score for girls is 4.28, while for boys it is 4.12. This indicates that, on average, girls have a more favourable perception of drama-based

learning compared to boys. However, it is important to note that the standard deviation of the drama-based learning score is relatively low for both groups, with

standard deviations of 0.63 and 0.73 for girls and boys, respectively. This suggests that the scores for both boys and girls are tightly clustered around their respective means.

To determine if the difference in mean values between boys and girls is statistically significant, a t-test was conducted. The calculated t-value is 1.68, which is lower than the critical value of 2.011 at a significance level of 0.05 with 48 degrees of freedom. As a result, the study does not find sufficient evidence to support a significant contrast

in the perception of drama-based learning between boys and girls.

### Difference in Subject Preference

To assess the students' preferences for subjects to be taught using drama-based learning, they were asked to rank four board subjects. In order to determine if there was a significant difference in the rankings of subject preference, the Friedman test was conducted. The results of the test are presented below.

**Table 6: Preference of Subjects**

Subject	Rank 1	Rank 2	Rank 3	Rank 4	Rank Sum
Language	23	12	9	6	50
Mathematics	4	5	11	30	50
Science & EVS	5	19	18	8	50
Social Science	18	14	12	6	50
Rank Mean	12.5	12.5	12.5	12.5	
<b>Friedman Chi-Square (x2)</b>	8.67				
Df	3				
p-value	<0.005				
<b>Nemenyi Post-hoc Test</b>					
Nemenyi Critical Difference	1.46				
<b>Pairs of subjects</b>	<b>Difference</b>	<b>q value</b>	<b>Result</b>		
Language vs Mathematics	19	13.01	Significant		
Language vs Science & EVS	18	12.33	Significant		
Language vs Social Science	5	3.42	Significant		
Mathematics vs Science & EVS	-1	-0.68	Not Significant		
Mathematics vs Social Science	-14	-9.59	Significant		
Science & EVS vs Social Science	-13	-8.90	Significant		

Based on the Friedman chi-square test statistic of 8.67, which exceeds the critical value of 7.815 at a significance level of 0.005, we can conclude that there is a significant difference in the preference of four subjects. To further analyse the differences in subject preferences, a post-hoc analysis was conducted using the Nemenyi test.

The Nemenyi post-hoc test results indicate

that the preference for Language show a significant difference ( $>2.73@0.005$ ) compared to Mathematics, Science & Environmental Studies (EVS), and Social Science. Additionally, the preference for Social Science is significantly different over Mathematics and Science & EVS. However, there is no significant difference in preference of Mathematics and Science & EVS.

These findings suggest that students have a preference for learning Language and Social Science through drama-based teaching, as these subjects were preferred significantly over Mathematics and Science & EVS.

## Suggestions

Here are some suggestions for promoting the use of drama-based teaching in school subjects:

1. Promote the use of drama-based activities in teaching school subjects, with a particular focus on developing innovative methods in mathematics and science to effectively teach complex content. By integrating drama into these subjects, students can engage with the material in a more interactive and immersive manner, enhancing their understanding and enjoyment of these subjects.
2. Encourage teachers to develop innovative ideas to incorporate drama into their respective subjects. Teachers should be encouraged to explore creative approaches that leverage dramatic techniques to make lessons more engaging and interactive. This could involve incorporating role-playing, improvisation, or other theatrical elements to bring subjects to life and capture students' interest.
3. Foster the practice of multidisciplinary and interdisciplinary drama in schools. This approach allows students to make connections between different subjects, providing a holistic understanding of how knowledge intersects across disciplines. By linking various subjects through drama, students can develop a broader perspective and see the relevance and interconnectedness of their learning.
4. Introduce drama pedagogy in pre-service and in-service teacher education programs. It is essential to equip teachers with the knowledge and skills necessary to effectively incorporate drama-based teaching methods into their classrooms. By integrating drama pedagogy into teacher training programs, educators can learn how to design and facilitate

engaging drama activities that enhance student learning and participation.

5. Provide financial assistance to support the implementation of drama-integrated teaching and learning programs both within and outside of school. This could include allocating resources for drama workshops, hiring drama specialists to collaborate with teachers, or acquiring materials and props for drama-based activities. Financial support will enable schools to create immersive and enriching learning experiences through drama.

By implementing these suggestions, schools can harness the power of drama-based teaching to create dynamic and effective learning environments. Drama can enhance student engagement, foster creativity, promote interdisciplinary learning, and ultimately contribute to a well-rounded education.

## Conclusion

Based on the findings of the study, it can be concluded that drama-based teaching is a highly effective method for enhancing the teaching and learning of school subjects, particularly in the realm of language education. The research revealed that learners experienced a notable increase in motivation, engagement, and interest when drama-based approaches were utilised. Moreover, drama was found to have a positive impact on learners' communication skills and social-emotional development. Therefore, it is strongly recommended that educators consider integrating drama into their teaching practices, especially for subjects that are often perceived as tedious or challenging to grasp. To ensure successful implementation, it is crucial for educators to receive adequate training and support in utilising drama-based pedagogies effectively and appropriately.

Furthermore, it is advisable to conduct further research to explore the potential benefits and limitations of drama-based pedagogies in diverse educational contexts and for a range of subjects. This would



contribute to a more comprehensive understanding of the efficacy of drama in different learning environments. Additionally, future studies should investigate the impact of drama-based pedagogies on learners from diverse backgrounds and with varying learning needs. Such research would shed light on the inclusivity and adaptability of drama-based approaches, allowing educators to tailor their instruction to meet the needs of all learners effectively.

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## Teachers' and students' perception of Art Integration in Icchawar Block of Sehore District

Shivalika Sarkar\* and Chitra Singh

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### Abstract

*Art Integrated Learning (AIL) is one of the innovative and interdisciplinary approaches in teaching various subjects which promises to inculcate 21st century skills in the students. Teachers use arts to enrich the learning experiences of students through hands on activities and to move from abstract to concrete. This paper presents the teachers' and students' perception of art integrated learning as a pedagogy as well as their opinion on Attendance, Training of Teachers, Time management, Art form, Learner participation, joyful learning, discipline, parent and community support and professional development. A qualitative survey was conducted to gather the opinion of the teachers and students on the above-mentioned issues. The teachers taught primary classes in the Icchawar Block of Sehore District, M.P. The data analysis of the results of the survey revealed that AIL is capable of bringing a positive change in learner participation, attendance, confidence, innovation, values and cooperation. Students reported joyful learning in the AIL class and welcomed the use of games and toys. However, both teachers and students reported that to inculcate critical thinking and connections to real world, AIL strategies need to be improved. An AIL framework may be prepared which can be implemented in the Icchawar Block of Sehore district for further improvement in areas like development of critical thinking and interdisciplinary relations.*

**Keywords:** *Art Integrated learning, joyful learning, teacher's perception, student's perception*

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### Introduction

Art integrated Learning (AIL) is placed at the center of innovative ideas for developing the 21st century skills like critical thinking, creativity, communication, and collaboration in children. There are many researches that have proved the benefit of art integrated learning on students. Research has proven that AIL leads to improvement of conceptual understanding, academic improvement, increased student achievement, increased science vocabulary in different subjects like geography, science and also artificial intelligence (Sharma and Kaur, 2021; Basu and Mohalik, 2020).

Apart from this AIL is also known to stimulate a positive school climate (Brouillette &

Jennings, 2010; Brown & Sax, 2012; Chemi, 2014; Lynch, 2007; Snyder et al., 2014) and also provide opportunities for higher-level thinking. In the AIL class, students gain more autonomy in learning which helps to develop critical thinking and creativity [Liu and Lin (2014)].

Art integration promotes experiential and, joyful learning in different subjects. Integration of arts in learning may be difficult for teachers as they move from traditional or rote learning in their core subjects. Importance of AIL has also increased as we move from STEM to STEAM (Science, Technology, Engineering, Arts, and Mathematics). Teachers have benefited from the use of AIL (Bresler, 2011; Iiyambo, 2005) in planning teaching-learning strategies.

It has definitely helped them to teach more rigorously and adopt new strategies for teaching-learning. However, teachers also face many obstacles in the successful implementation of AIL in their classrooms.

Art integrated learning is classified into visual arts and performing arts. Visual art comprises of drawing, painting, mask making, puppet making, clay work, visual arts, and crafts, etc. Performing arts consist of a variety of folk and classical forms of music and dance, theatre, puppetry and story-telling. Regional Institute of Education, Bhopal conducted the AIL training workshop in the year 2018. In a short period of time, 681 teachers were trained on different techniques of integrating AIL in the classroom. The duration of training was from 16th July 2018 to 1st September 2018 (48 days). In 2019-20 a concurrent evaluation study was conducted for the Art Integrated Learning Program which is ongoing in the Icchawar Block of Sehore district, M.P. Improvement in the quality of school education through innovations in the teaching-learning process has been the priority areas of NCERT. Various workshops and training programs are regularly conducted by NCERT and its constituents. A survey of the learning levels of students in basic school subjects was done through learning outcome-based tests developed for National Achievement Survey in the year 2017-18. It was found that the achievement of students especially in mathematics, science and social science was below the expected level. Hence, to improve the learning achievement, it was decided by NCERT and RIE, Bhopal to train the teachers in creating AIL resources and integrating AIL in the classroom.

In this paper, we present the result of perception of teachers and students about using AIL pedagogy in the classrooms in Icchawar Block of Sehore district, M.P. These results can further help in the improvement of the program.

## Methodology

In this study, a research design involving qualitative analyses has been used to study the teacher's perception about AIL. As pointed out earlier, AIL was implemented in the Icchawar Block of Sehore district since 2018 onwards.

To best assess the impact of an initiative, baseline data and suitable comparison groups are required. Unfortunately, neither baseline data related to teacher aspects, classroom processes and students' achievement prior to the implementation of AIL nor a suitable comparison group was available. A total of 681 teachers were trained in 2018 in different batches which extended for a period of 48 days.

## Objectives

- To study the perception of teachers and students about implementation of AIL on different dimensions
- To identify bottleneck vis-a-vis suggestion for further improving the implementation of the programme.
- To provide a framework for the effective implementation of AIL in the schools of the study area i.e. Icchawar Block of M.P

## Operational Definitions

**Art Integrated Learning** - Art Integrated Learning (AIL) is an educational approach that combines the study of traditional academic subjects with the arts. It seeks to enhance the learning experience by integrating various art forms, such as visual arts, music, drama, dance, and literature, games into the curriculum across different subject areas like mathematics, science, social studies, and language.

**Qualitative Analysis**- Qualitative analysis is a research methodology used to explore and understand phenomena in-depth by examining non-numeric data, such as words, images, and observations.

**Interview Schedule-** An interview schedule is a structured plan or guide used by researchers or interviewers to conduct interviews in a systematic and organized manner.

**Focus Group Discussion-** A Focus Group Discussion (FGD) is a qualitative research method that involves a small group of individuals (usually 6 to 10 participants) engaging in an open and interactive discussion on a specific topic or research question.

**Bottleneck-** A bottleneck refers to a point of congestion or restriction in a system that hinders its overall performance or capacity.

## Research Design

### Sample

10 clusters of Ichhawa block were selected for the study. In each cluster five schools participated in the survey. Hence data was collected from 50 schools. A sample of 223 teachers and 59 students belonging to different clusters was used for the study. The clusters that were included in the study were Balondiya, Bhaukhedi, Brijesh Nagar, Dewadiya, Dhamanda, Ichhawa, Kheri, Ramnagar, Semli Jaded, Veerpur Dam.

### Tools

Finalization of the tools was done through a workshop with experts of the field. Experts had validated the tools through content analysis according to the objectives of the study. Hence the tools were validated through content validation method. Based on the evaluation questions and objectives, the following tools were developed to collect the data from teachers and students.

#### Interview Schedule for Teachers

The main aim of this tool was to examine various aspects of AIL and to ascertain the awareness of the teachers about of the

program. The tool has questions, which are open-ended in nature. Interviews were conducted privately on the school premises with AIL teachers (teaching classes 1-5). All interviews were undertaken in Hindi, and it took about 20-30 minutes to conduct each interview. The interview schedules were mostly semi-structured, containing many open-ended questions and hence aiming to collect qualitative data regarding various aspects of AIL. The field staff recorded the information during interviews on the prescribed schedules.

The interview schedule for teachers was designed to assess teachers' perceptions about various components of the AIL such as, training, learning materials, and evaluation strategies. Teachers were also asked for their opinion on the impact of AIL on schools and classrooms, teachers, children, community and achievement. Challenges faced during implementation were also probed.

#### Interview schedules for Focus Group Discussions

Interviews for Focus Group Discussions were conducted for students. Students were asked to give their opinions on various aspects of learning in AIL classrooms such as subjects taught using AIL, learning materials, classroom processes and assistance available to them. The interview schedules were mostly semi-structured, containing many open-ended questions and hence aiming to collect qualitative data regarding various aspects of AIL. The field staff recorded the information during interviews on the prescribed schedules.

## Results

Art integrated learning (AIL) is pedagogy of experiential learning. The effect and impact of this pedagogy cannot be achieved merely through theoretical interactions. For 100 per cent participation of the learner and quality

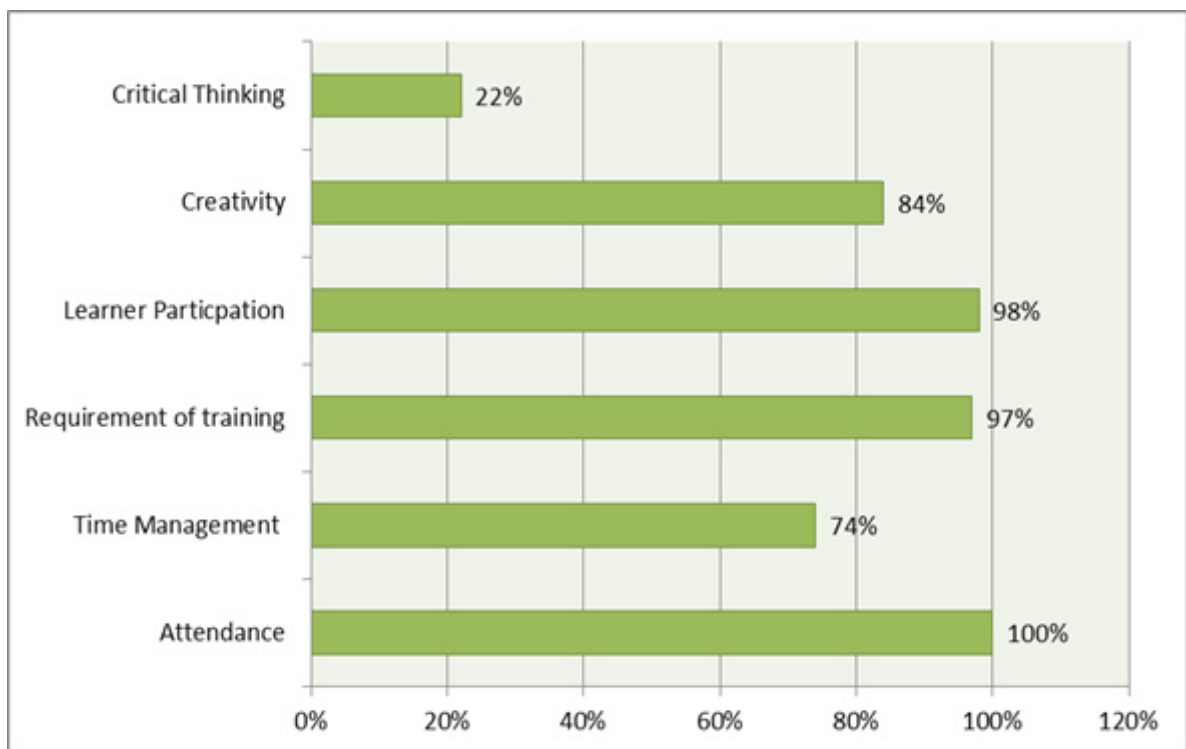
learning, it has to be a completely hands-on practice — a pedagogy, where art becomes the basis of teaching-learning process. An opportunity for students to experience visual as well as performing arts to build their understanding of different concepts and subjects. Understanding of ‘Arts’ as a pedagogical tool and its impact on the holistic development of a child is an area of study. Skill of planning and organizing age-appropriate art experiences to make learning of different subjects appealing is a challenging task.

AIL utilizes the possibilities of Visual (painting, photography, print-making, stage-art, clay-modeling, sculpture, applied art and craft) as well as Performing arts (dance, vocal music, instrumental music, theatre, puppetry, mime, storytelling,

martial arts, magic performance, cinema etc). In AIL, we work with the arts at the center of the curriculum. The abstract concepts of subject are explored using different art forms.

### ***Perception of Teachers***

Teachers gave their opinion on various benefits of integrating arts in their lessons as shown in Figure 1. The major areas which had substantially improved were learner participation, attendance and creativity of the students. However, a large number of teachers believed that critical thinking of the students had not improved despite of using the AIL pedagogy. 97 per cent teachers felt that they would require training for better art integration.



*Figure 1: Perception of teachers on various attributes*

**Development of communication skills and cooperation through AIL**

A majority of teachers felt that through AIL lessons, better values have been

imbibed in the students and cooperation among them has improved. However, the communication and leadership skills of the students would require further improvement (Figure 2).

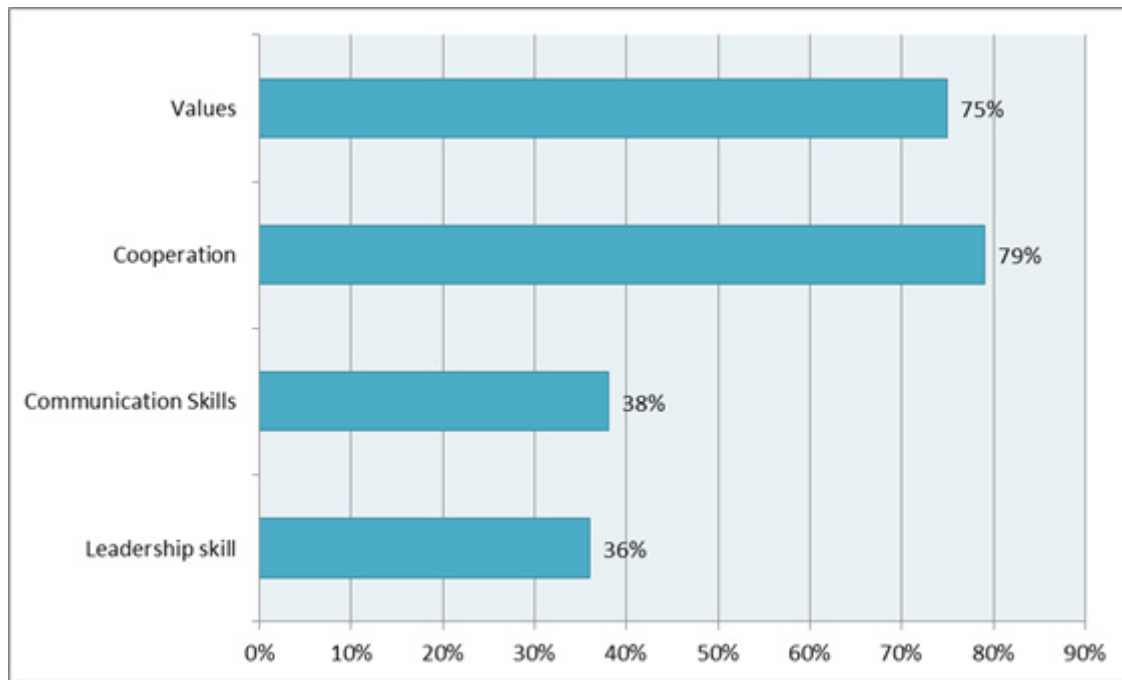


Figure 2: Teacher's response of development of various skills through AIL among students

**Discipline**

Figure 3 shows teacher's response to maintaining discipline in the AIL class. 64 per cent teachers reported that there was

no problem in maintaining discipline in the AIL class. 21 per cent said that they faced difficulty in maintaining discipline and 15 per cent said that sometimes discipline is an issue (Figure 3).

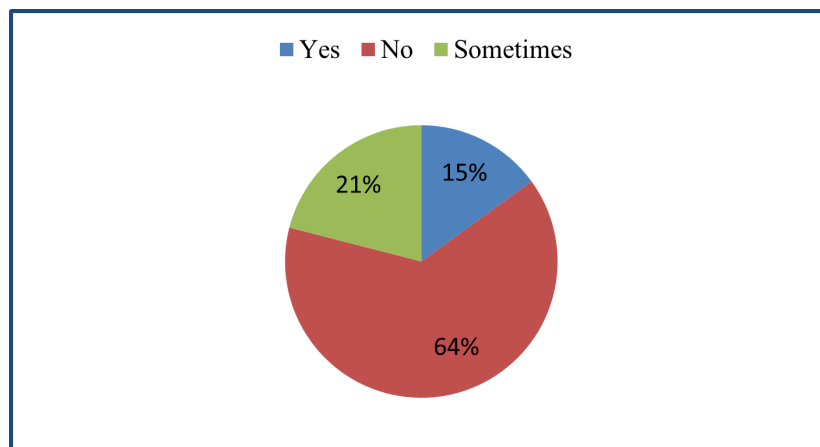


Figure 3: Discipline in the AIL class

### Professional Development of teachers

A key element in understanding teachers' perceptions of art integration lies in understanding their perceptions of their own abilities as a teacher of the arts. After receiving training on AIL teachers felt more

innovative and confident in designing the AIL lessons (Figure 4). Their leadership skills had also improved. However, they were still struggling with communication skills and understanding of technologies which needed to be improved.

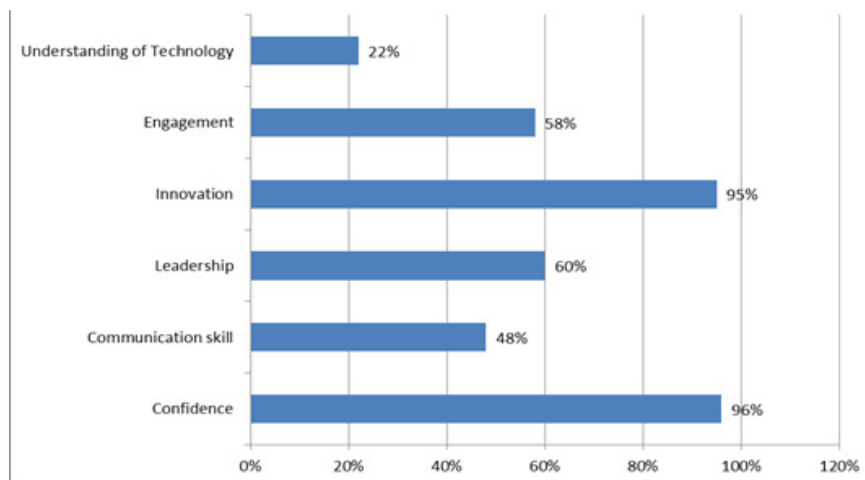


Figure 4: Teacher's beliefs about different factors related to professional development

### Perception of Students

The perception of students was collected with the help of focus group discussions (FGD) by the field investigators. The following domains were discussed.

#### Joyful Learning

In Figure 5, students were asked in which subjects they enjoy learning through the AIL approach. The subject in which they enjoyed the most was Hindi followed by EVS,

Maths and English. In Hindi, teachers were using a variety of art forms like storytelling, songs, role play, flash cards for akshar gyan. In EVS, teachers mostly used charts, pictures, leaves and other surrounding materials available for art integration. In Mathematics, games using pebbles, match sticks, flash cards, seeds were used for art integration. In English, although teachers used a variety of art forms like storytelling, songs, role plays, flash cards but students did not enjoy much.

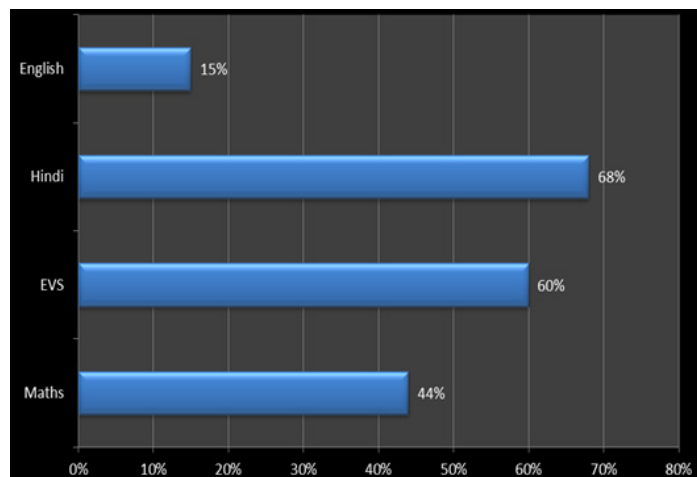


Figure 5: Student responses to Joyful Learning in different subjects using AIL approach

**Art forms which best spark your creativity**

The next question assessed different art forms that would best spark their creativity. These art forms included: Performing Arts, Visual Arts, Games or they had the option of

choosing none. The results of this survey are shown below in Figure 6. This information was helpful as it allowed us to become more familiar with the form of art students felt they could be creative with. This could be helpful in planning future art integrated lessons.

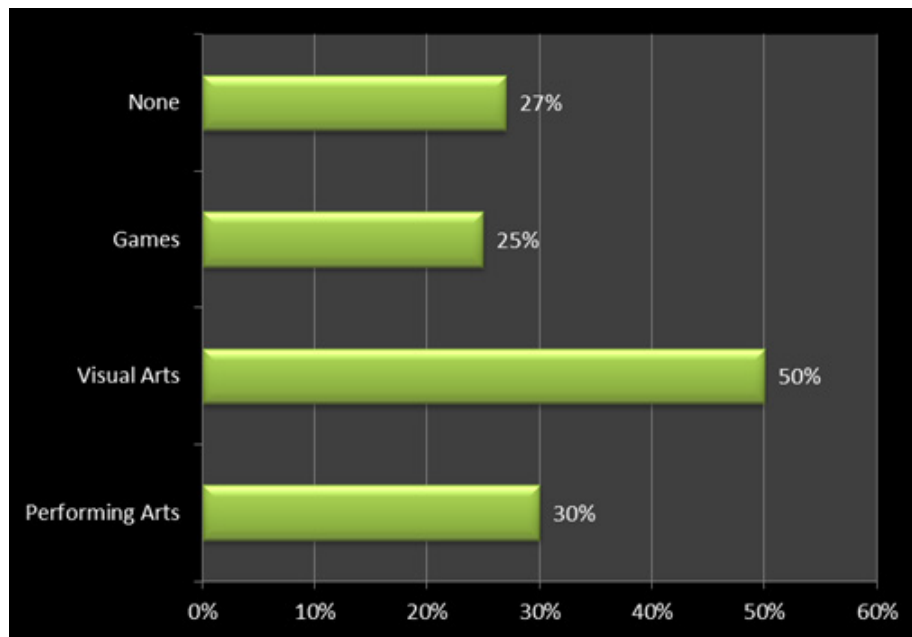


Figure 6: Student's response to art forms which best sparks their creativity

**How art integration in the lessons helped the students**

After reviewing the data from our research, the findings show that integrating the arts into the curriculum had a positive effect on student learning through increasing motivation,

staying focused and creative response. When it comes to expressing ideas and thoughts, a majority of the students reported that the lessons provided them with the opportunity to express their creativity in a variety of ways. However critical thinking and connections to real world need to be improved (Figure 7).

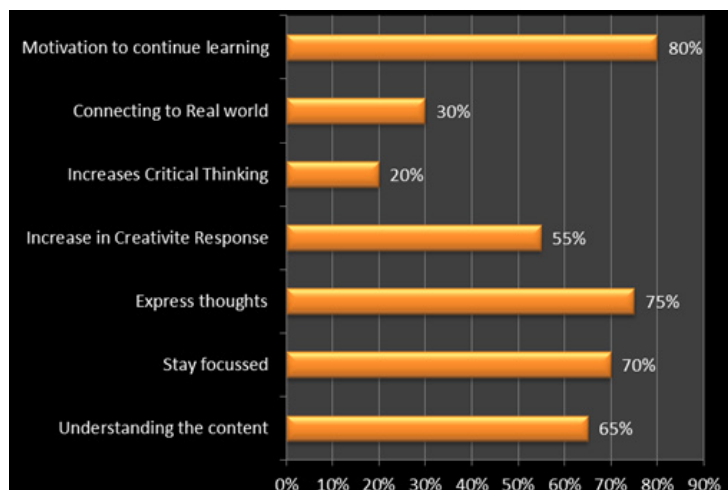


Figure 7: Student's response to how art integration in the lessons helped them



### 3.2.4 Difficulties encountered by students in the AIL class

As shown in Figure 8, most of the students responded that they still struggle with the general content of the lesson and on focusing. Most students named a personal struggle that they faced, such as, understanding the basic details of Mathematics and English. Some students also reported of fear during

the AIL class. When asked about what kind of fear they had, they said that it was fear of not being able to express themselves and also fear of teachers. Students expected the teachers to behave in a friendlier manner during the lessons. There were some students, however, who simply answered “nothing.” Although this wasn’t necessarily the answer we were looking for, the students were being honest with what they thought at the time.

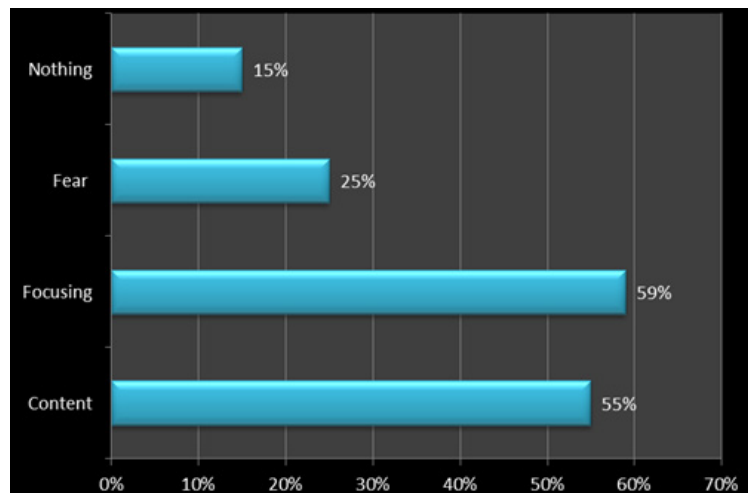


Figure 8: Difficulties encountered by students in the AIL class

### Suggestions of students to improve the effectiveness of AIL integration

A majority of students felt that hands-on activities during AIL lessons would be

helpful in improving the effectiveness of AIL. Use of games and toys was also welcomed by the students. Lowest reported category was the use of visuals in art integrated lessons (Figure 9).

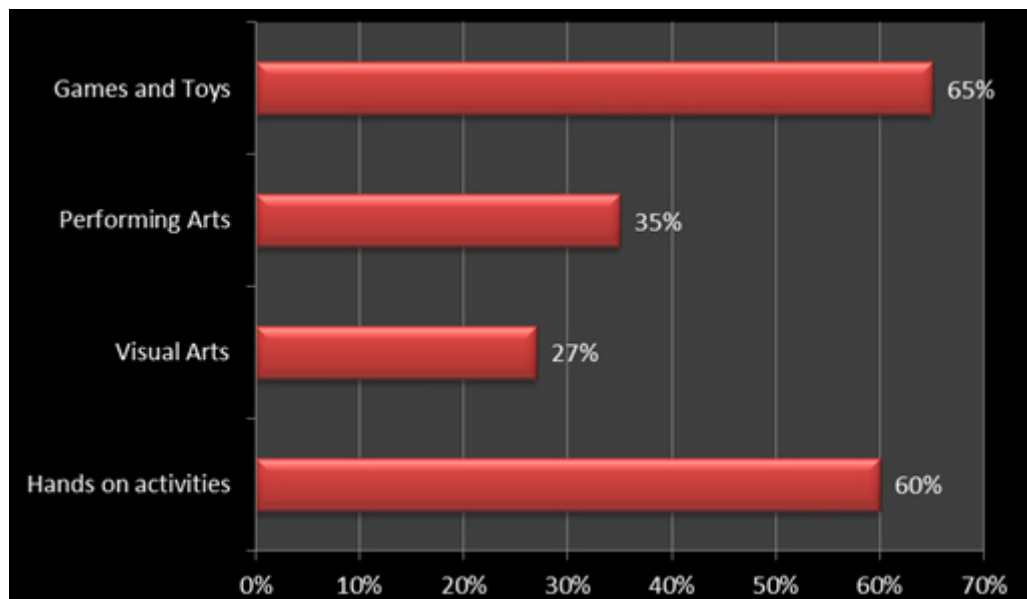


Figure 9: Suggestions of students to improve the effectiveness of AIL integration

## Discussion

Data analysis reveals that AIL as pedagogy has been able to promote joyful and experiential learning in the primary schools of Ichchawar block of Sehore district. As mentioned in the NCERT's Guidelines on Art Integrated Learning, an impact study of AIL was conducted by a team of teacher educators. Resource persons involved in this study opined positively on the capacity of teachers to comprehend and apply AIL pedagogy in their schools. They reached a consensus of AIL being an effective innovation that has the ability to create a long-lasting symbiotic relationship between the teacher and the taught. Apart from this several other works have proved the effectiveness of AIL in promoting inclusive education, joyful and experiential learning. (Basu, 2020; Niranjana and Arjun, 2021). However, art integration should not merely decorate the classroom; rather it should be used as a cross-curricular pedagogical approach that utilizes various aspects and forms of art and culture as the basis for learning of concepts across subjects. Many of the works shown by the teachers that were created by the students showed that art was not being fully integrated into the lesson with integrity. Art integration was often used to fill up extra class time in the schedule and was viewed as fun busy-time doings. Although being busy in school implies something positive, such as, working hard. If the busy work does not reflect learning or critical thinking, then it is mundane and without thought. For example, in EVS, student's artwork mostly comprised of posters and they were involved in drawing and coloring only. The data also shows that only 22 per cent teachers themselves think that art integration promoted critical thinking. Students also felt that critical thinking and connections to real world required improvement. To improve critical thinking, students need to participate more intensely in the learning process and take charge of their learning (Robert, 2011). Also, a majority of the students responded that they still struggle with the general content

of the lesson and on focusing. In light of the results presented in the paper, the following suggestions are given:

- **Training of teachers in AIL pedagogy**

Capacity building of teachers in planning different activities, which empower students to learn through discovery and developing the ability to construct knowledge themselves. This allows learners to experience the challenges, joys and satisfaction of breaking new ground or discovering something new. NCERT in collaboration with the Regional Institute of Education, Bhopal has already provided training to teachers of schools of Ichchawar Block. Training of teachers on hands-on experiences using methods and materials of different art forms, planning of subjects/stage-wise activities, mock sessions and presentations was conducted. Training workshops, covering a range of topics from defining art integration, to music in the classroom, to art integration with technology, to develop strategies for AIL is an interdisciplinary approach, to using arts education incorporating a variety of art forms (art, theater, dance, music) and using it effectively to deliver the subject content should be planned on a regular basis. These workshops may be attended by classroom teachers, arts teachers, and administration together. Participants should also be given the opportunity and support to develop Art integration lessons that would match their content background. Artists from different art-forms background may be invited and paired with the selected teacher. Teachers who attend these workshops should be encouraged to present new ideas and strategies to the other teachers in the school.

- **Planning before conducting AIL activities should be done by the teachers**

Teachers are not planning the art integrated lesson plans in advance. They do not have written record of

lesson plans. As reflected from the data, teachers are mostly using games for art-centered learning. Different techniques and methods to engage children in group activities with a variety of art forms are to be used by the teachers. These techniques and methods should lead to stimulated thinking through the arts and higher-level cognitive abilities, e.g., integrating knowledge and ideas and problem solving in creative and effective ways. This can easily be done if the teachers from different disciplines including arts, health and physical collaborate with each other. Orientation of teachers may be done in preparing model lesson plans. Collaboration with teachers of different disciplines including art, health and physical education should be encouraged while preparing the lesson plans. NCERT has already prepared an exhaustive package on the guidelines of Art Integrated Learning in both English and Hindi. These guidelines are meant to apprise all our stakeholders of school education with Art Integrated Learning as pedagogy and its innate relevance to education. It systematically explains all aspects of the innovative pedagogy of Art Integrated Learning: if followed in true spirit, they can help create vibrant AIL classrooms where we can hear the students singing, or see them dancing, acting, and creating works of art—all in ways that reflect a growing understanding of their core scholastic concepts. This document has some activities for planning AIL lessons in subjects like Hindi, English and Mathematics. For planning the ice breaker activities, training package on Art Education for Primary Teachers is also available. Also, the art integrated lesson should be aligned with learning outcomes developed by NCERT for different stages of school education. The raw materials required for the planning the AIL activities may include different colored chart papers, pencils, sketch

pens, markers, flip charts, thumb pins, brown sheets or drafting paper, string to arrange displays, colors, drawing sheets, clay for modelling, scissors, glue, sound producing instruments, raw materials for preparing costumes, necessary items for stage setting, etc. as per the need of activity etc. While organizing the materials, it is recommended to go for low-cost or no-cost locally available materials. Orientation of School Heads and teachers on project-based learning activities, skill of presentation and exhibition of children's work needs to be done.

- **Formulating interdisciplinary connections through AIL activities**

In the primary stage, arts should be integrated with all subjects and used as an approach for teaching and learning of different concepts. This will help children freely express their ideas and emotions. They will also develop all the senses through keen observation, curious exploration and spontaneous expression. As is the system in most of our primary schools, one teacher teaches all subjects to her class which gives her the freedom and scope to plan art experiences in a way that cater to learning of multiple disciplines. While planning activities for this stage, the teacher should keep in mind that students are able to form interdisciplinary connections during the activities. Orientation of teachers in planning interdisciplinary activities especially STEM and STEAM activities is essential. These activities should be able to improve the analysis abilities of students by using approaches from different disciplines.

## Conclusions

The data analysis of the results of the survey revealed that AIL is capable of bringing a positive change in school climate based on teachers' and students' perception. However, an AIL framework may be prepared which

can be implemented in the Icchawar Block of Sehore district. This framework should include the design and implementation of an instructional model that integrates the learning of different art forms into the core content areas. This model should also include teacher-driven activities that include sustained and focused professional development, curriculum writing, and

curriculum implementation. Also, suggestions for art-related enrichment activities in different subject areas may be included in the framework with more involvement of the community.

**Acknowledgement:** Authors would like to thank the anonymous reviewers for their comments for the improvement of the paper.

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# The Impact of Previous Knowledge and Art Exposure on Self-Efficacy in Art Education: A Study of Pre-Service Teacher Trainees

Devajani Duarah\*, Smritishikha Choudhury, and Dipanwita Deka

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## Abstract

*This research investigated the effect of art knowledge and art exposure of pre-service teacher trainees on their self-efficacy in teaching and integrating art education in Assam, India, with 250 participants at District Institutes of Elementary Teachers' Training (DIETs). Arts knowledge correlates positively with increased self-efficacy, with art exposure also positively influencing self-efficacy. Significantly, art knowledge emerges as the more accurate predictor of self-efficacy. Implications for teacher education include prioritizing comprehensive art education with hands-on experiences and interdisciplinary strategies, in light of India's National Education Policy (NEP) 2020 and the National Curriculum Framework for School Education (NCFSE) 2023, thereby advancing art education for educators and students*

**Keywords:** *Art education, pre-service teacher training, self-efficacy, arts integration, previous knowledge, art exposure, NEP 2020*

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## Introduction

Art education is crucial for fostering creativity, imagination, and self-expression of students, thereby contributing to their overall development. Various educational policies and frameworks around the globe have acknowledged the importance of art in education. Within the Indian context, previous policies on education, namely the National Policy on Education, 1986, and its Programme of Action, 1992, recognized the importance of art in fostering the aesthetic and cognitive growth of students (MHRD, 1992). With the commencement of NEP 2020, however, there is a renewed emphasis on Art Education, with the aim of integrating art into all levels of school education in a more comprehensive and inclusive manner. As per the objectives specified in NEP 2020, the educational landscape in India is set to go through significant transformations, with a particular focus on the enhancement

of art education. To improve the effective implementation of these changes, the National Curriculum Framework for School Education (NCFSE), 2023 has been carefully developed (NCERT, 2023).

Notably, NCFSE 2023 emphasizes the utmost significance of the arts as a fundamental component of the academic curriculum. This entails the seamless integration of the arts into pedagogical methodologies across diverse academic disciplines, in addition to the teaching and learning of the arts as a separate subject. Schools are responsible for ensuring that arts-integrated learning becomes an integral component of the instructional approach across all subjects, with equal emphasis placed on cultivating artistic proficiency.

Given the elevated importance accorded to art education and its inclusion in NEP 2020 and its supplementary document, NCFSE 2023, it is essential for educators and aspiring

teachers to have a thorough comprehension of this field. In light of this imperative, the present research, which investigates the influence of prior knowledge and exposure to art on the self-efficacy (Bandura, 1977) of pre-service teacher trainees in teaching and integrating art education, aligns perfectly with the stated goals of NEP 2020. In an effort to improve art education in India, this study seeks to identify ways in which pre-service teacher trainees' self-efficacy beliefs can be fostered and strengthened. The findings will inform teacher preparation programs and support mechanisms to enhance self-efficacy among future art educators, thereby fostering creativity, imagination, and artistic expression among students under the broader objectives of NEP 2020.

## Review of Literature

The concept of self-efficacy (Bandura, 1977) was first introduced to describe an individual's belief in their ability to effectively execute particular tasks and accomplish desired results (Bandura, 1977, 1997). In the field of education, self-efficacy - stated as an individual's belief in their ability to perform tasks that achieve desired outcomes - is particularly crucial in the teaching profession (Zivlak & Stojanac, 2019). According to a study conducted by Orakcı et al. (2023), educators who possess a high level of self-efficacy demonstrate increased dedication to their professional responsibilities and positively affect students' academic outcomes. Therefore, recognizing the importance of self-efficacy in the education sector is essential, and exploration of methods that are designed to foster its development among teachers is crucial (Orakcı et al., 2023).

Moreover, in the wider context of education, art education assumes a crucial position, requiring the involvement of extensively prepared educators to enable successful integration of the arts (Garvis, 2009). Within the realm of art education, a considerable body of research has been dedicated to

investigating the impact of teacher self-efficacy on the extent and scope of arts instruction inside educational establishments (Alter, et al., 2009; Garvis & Pendergast, 2010; Kleinsteuber, 2014; Lemon & Garvis, 2013; Oreck, 2004). Multiple studies have consistently found that educators who exhibit high levels of self-efficacy in their teaching abilities in the arts tend to display more favourable attitudes, elevated expectations, heightened enthusiasm, enhanced creativity, increased incorporation of the arts into various subjects, improved collaboration, rigorous assessment methods, and a stronger dedication to professional growth in comparison to their colleagues (Chung, 2021; Davies, 2012; Denee, et al., 2023; Lemon & Garvis, 2013; Lindsay, 2021; Orakcı, et al., 2023; Zakaria, et al., 2019; Zee & Koomen, 2016). On the other hand, it is common for pre-service teachers to encounter considerable challenges regarding their confidence, motivation, and competence in teaching the arts (Denee, et al., 2023; Garvis, 2009; Lindsay, 2021; Lummis, et al., 2014). Consequently, they may exhibit avoidance behaviours that limit the amount of arts instruction provided in classroom environments (Ene, et al., 2020; Garvis, 2009). Therefore, it is crucial to have a thorough understanding of the self-regulation mechanisms employed by pre-service teachers within the realm of arts education, as well the impact of their self-efficacy beliefs (Lummis et al., 2014).

Several studies undertaken in India at the national level have examined the impact of arts education on teachers' self-efficacy from both a general and subject-specific perspective (Kumar & Singh, 2018; Sharma & Sharma, 2017; Srivastava & Singh, 2019). These studies show that through mastery experiences, vicarious learning experiences, persuasive feedback, and emotional arousal, arts education greatly increases teacher self-efficacy. Incorporating arts education into the curriculum gives teachers an opportunity to develop and enhance their skill set, strengthen their self-assurance, welcome

feedback for improvement, communicate their emotions effectively, manage stress, and nurture their creative capacities.

In a recent research endeavour, Agarwal (2023) investigated the development of a teacher preparation program that incorporates performing arts and its impact on the attitudes and self-efficacy of pre-service teachers. It aimed to offer a thorough understanding of the successful incorporation of performing arts within the educational context, aiming to enhance the engagement of students and foster a more interactive and vibrant learning environment. The author asserts that despite governmental efforts to promote arts integration in education, teachers often struggle to apply these techniques in their classrooms due to a lack of training in effectively integrating various art forms.

In a related study, Prince (2020) investigated the practical implications of art integration in a CBSE school in Assam. The study provides a comprehensive analysis of how art integration impacts both teaching and learning.

Hence, it follows that there exists a significant gap in research and in between policy and practice, particularly in the Indian context and more specifically within the state of Assam. The relevance of this gap becomes more pronounced when examined within the framework of NEP 2020. The current research study aims to fill this gap and provide a significant contribution to the realm of art education. The study's findings are anticipated to have broad implications for teacher training programs and curriculum development, since they aim to promote effective art education practices and enhance educational standards.

Based on the above literature, this study focuses on the following research question, objectives, and hypotheses.

### Research Question

How does previous knowledge of art and art exposure influence the self-efficacy in art

education of pre-service teacher trainees?

### Objectives

1. To assess the levels of previous knowledge of art among pre-service teacher trainees.
2. To assess the extent of art exposure among pre-service teacher trainees.
3. To measure the self-efficacy beliefs of pre-service teacher trainees in their ability to effectively teach and integrate art education.

### Hypotheses

Three null hypotheses were established to guide the study as follows:

- 1. Hypothesis 1:** There is no significant impact of the level of previous knowledge on self-efficacy in teaching art when controlling for exposure to art.
- 2. Hypothesis 2:** There is no significant impact of the level of art exposure on self-efficacy in teaching art when controlling for previous knowledge.
- 3. Hypothesis 3:** The combined impact of previous knowledge and exposure to art experiences does not significantly predict self-efficacy in teaching art.

### Research Methodology

**Research Design:** This study adopted a descriptive survey method to examine the impact of pre-service teacher trainees' prior art knowledge and exposure on their self-efficacy in art education.

**Population and Sampling:** The population for this study consisted of pre-service teacher trainees from five District Institutes of Elementary Teachers' Training (DIETs) in Assam, India, selected via a multistage cluster sampling method to represent different geographical regions. A total of 250 trainees were randomly selected based on a 95% confidence interval.

**Data Collection Instruments:** Custom scales were developed to measure Previous Knowledge (PK), Art Exposure (AE), and Self-Efficacy (SE) using 5-point Likert-type

scales. Instruments were designed based on established scales and literature (Bandura & Bandura, 2006; Kay, 2010; Malandrakis, et al., 2019; Sánchez-Rosas, et al., 2022; Tschannen-Moran & Hoy, 2002), focusing on capturing these key variables. Demographic data were collected using nominal scales.

**Standardization and Validation:** The scales underwent content validation by experts in Art Education, Research Methodology, and Teacher Education. Their feedback was used to refine the questionnaire, and the calculations of the Content Validity Index (CVI) and Content Validity Ratio (CVR) determined item retention. Thereafter, a pilot study with 63 trainees was conducted to test the feasibility and refine the instruments. Cronbach's Alpha coefficients, calculated using Jamovi software, ensured internal consistency and reliability for the scales. Results: Previous Knowledge ( $\alpha=0.92$ ), Art Exposure ( $\alpha=0.92$ ), PK and AE combined ( $\alpha=0.96$ ), and Self-Efficacy ( $\alpha=0.98$ ), affirming strong consistency within each scale (Nunnally, 1978).

**Data Collection Procedures:** Data collection was executed online using Google Forms to facilitate efficient and wide-reaching participation.

## Statistical Analysis

The study employed inferential statistics, with data analysis techniques including descriptive statistics and regression analysis using Jamovi Statistical Software.

## Descriptive Statistics:

Mean, median and standard deviation were calculated to assess the previous knowledge (PK), level of art exposure (AE), and the self-efficacy (SE) of pre-service teacher trainees in teaching art education, aligned with objectives 1, 2, and 3. The findings and interpretation are presented below:

**Table 1: Descriptive statistics**

	PK	AE	SE
N	250	250	250

Mean	2.87	2.75	2.59
Median	2.90	2.80	2.50
Standard Deviation	0.840	0.825	0.880
Minimum	1.00	1.00	1.00
Maximum	5.00	5.00	5.00

## Objective 1

From Table 1, it can be observed that the pre-service teacher trainees, on average, have a moderate level of previous knowledge of art with the mean value as indicated by the 'PK' variable being 2.87 (Table 1) on a scale from 1 to 5. The distribution of knowledge levels is relatively consistent with a slight tendency towards higher knowledge levels (Median 2.90 and SD 0.84). This information provides a baseline understanding of the pre-service teacher trainees' previous art knowledge.

## Objective 2

On average, the pre-service teacher trainees are found to possess a moderate level of exposure to art, with the mean value as indicated by the 'AE' variable, being approximately 2.75 (Table 1). The distribution of art exposure levels is fairly consistent among the trainees with some individual variability (Median 2.80 and SD 0.825). This information provides insight into the pre-service teacher trainees' prior experiences with art, which may be relevant to their future roles as teachers.

## Objective 3

The mean self-efficacy belief score of pre-service teacher trainees in their ability to teach and integrate art education, as indicated by the 'SE' variable, is approximately 2.59 (Table 1) on a scale from 1 to 5. This shows that on average, pre-service teacher trainees have a moderate level of self-efficacy in their ability to instruct and incorporate art education. However, the distribution of self-efficacy beliefs is somewhat skewed towards lower levels, with a range of beliefs among individuals (Median 2.50 and SD 0.880). This suggests that there may be some variability



in how confident trainees feel about their ability to teach and integrate art education effectively.

## Inferential Statistics

Regression analyses were carried out to test the hypotheses. The results are presented below.

### Analysis of Null Hypothesis 1

**Table 2: Model Fit Measures**

Model	R	R <sup>2</sup>
1	0.625	0.390

**Table 3: Model Coefficients – SE**

Predictor	Estimate	SE	t	p
Intercept	0.710	0.1554	4.57	<.001
PK	0.655	0.0520	12.60	<.001

The linear regression model indicates that there exists a significant and positive relationship between pre-service teacher trainees' previous knowledge of art (PK) and their self-efficacy beliefs in teaching and integrating art education (SE).

The R value of 0.625 suggests a moderately positive linear relationship between the two variables. The R<sup>2</sup> value of 0.390 indicates that about 39% of the variation in the dependent variable (SE) can be attributed to the independent variable (PK) included in this study.

The analysis provides strong evidence to reject the null hypothesis indicating a significant impact ( $p < 0.001$ ; Table 3) of pre-service teacher trainees' previous knowledge of art (PK) on their self-efficacy beliefs in teaching and integrating art education (SE), even when controlling for exposure to art.

So, it can be concluded that pre-service teacher trainees' prior art knowledge plays a significant role in shaping their self-efficacy beliefs related to teaching art education, regardless of their exposure to art experiences.

### Analysis of Null Hypothesis 2:

**Table 4: Model Fit Measures**

Model	R	R <sup>2</sup>
1	0.592	0.351

**Table 5: Model Coefficients – SE**

Predictor	Estimate	SE	t	p
Intercept	0.852	0.1567	5.44	<.001
PK	0.632	0.0546	11.58	<.001

The R value of 0.592 indicates a moderately positive linear correlation between the two variables

The R<sup>2</sup> value of 0.351 (Table 4) suggests that 35.1% of the variance in the dependent variable is accounted for by the independent variable in this study.

The analysis provides strong evidence to reject the null hypothesis. The statistically significant coefficient for Art Exposure (AE) in the linear regression model ( $p < 0.001$ ) indicates that AE has a significant impact on self-efficacy beliefs (SE) in teaching art when controlling for previous knowledge (PK).

So, it is inferred that art exposure significantly influences self-efficacy beliefs related to teaching and integrating art education, beyond the impact of prior knowledge.

### Analysis of Null Hypothesis 3:

**Table 6: Model Fit Measures**

Model	R	R <sup>2</sup>
1	0.628	0.394

**Table 7: Model Coefficients – SE**

Predictor	Estimate	SE	t	p
Intercept	0.852	0.1567	5.44	<.001
PK	0.632	0.0546	11.58	<.001
AE	0.158	0.124	1.28	0.203

The linear regression analysis reveals that both previous knowledge (PK) and the combination of previous knowledge (PK) and

art exposure (AE) together have a statistically significant influence on self-efficacy beliefs (SE) in teaching art.

The value of  $R=0.628$  suggests a moderate positive relationship between the predictors (PK and AE together) and SE.

The value of  $R^2 = 0.394$  (Table 6) indicates that 39.4% of the variance in the dependent variable (SE) is explained by the combination of independent variables (PK and AE) considered for this study.

The p-value is less than 0.001 for PK (Table 7) which is statistically significant and indicates that higher levels of previous knowledge are associated with higher self-efficacy beliefs in teaching art.

However, the coefficient for AE is not statistically significant ( $p = 0.203$ ; Table 7), suggesting that art exposure does not have a significant additional impact on self-efficacy beliefs when controlling for previous knowledge.

So, it can be concluded that while both previous knowledge and art exposure are factors influencing self-efficacy in teaching and integrating art education, the results suggest that previous knowledge (Coefficient value 0.514) plays a more substantial and significant role in predicting self-efficacy beliefs than art exposure (Coefficient value 0.158).

The analysis provides evidence to reject the null hypothesis (H03). The linear regression model shows that the combination of both previous knowledge (PK) and exposure to art experiences (AE) together has a statistically significant influence on self-efficacy beliefs (SE) in teaching art.

Although the coefficient for AE is not statistically significant ( $p = 0.203$ ), it is still considered in the model.

Overall, the model demonstrates that the combination of PK and AE together significantly predicts self-efficacy in teaching art.

Previous knowledge and exposure to art experiences significantly impact self-efficacy beliefs in teaching and integrating

art education, supporting the alternative hypothesis (HA3).

## Results And Discussion

The primary objective of this study was to investigate how pre-service teacher trainees' prior art knowledge and their involvement in art-related activities influence their self-efficacy in teaching and integrating art education. The findings, interpreted within Albert Bandura's Social Cognitive Theory (Ye & Yee, 2023) framework, emphasizes the importance of self-efficacy, provide valuable insights for enhancing art education programs and teacher training.

### Previous Knowledge of Art

The findings indicate that pre-service teacher trainees generally possess a moderate level of prior art knowledge, with some showing a slight tendency towards higher expertise. This foundational knowledge is crucial as it influences future engagement in art education and potentially impacts their teaching methods. Regression analysis confirmed a statistically significant positive correlation between trainees' prior art knowledge and their self-efficacy beliefs.

### Art Exposure

The findings of the study indicated that trainees generally had a moderate level of exposure to art-related activities, with notable diversity among individuals. This finding highlights the significance of taking into account trainees' knowledge of art in teacher training programs. The differences in art exposure among trainees, likely influenced by their diverse backgrounds, could significantly affect their efficacy in teaching and integrating art education.

### Self-Efficacy Beliefs

The study revealed that teacher trainings, on average, held moderate self-efficacy beliefs, with a tendency towards lower self-efficacy levels. While many trainees demonstrated a fair degree of self-efficacy in their ability to

teach art, a significant portion displayed less certainty. This variation underscores the importance of designing teacher preparation programmes that cater to the diverse needs and confidence levels of trainees, ensuring that they are well-equipped to teach effectively.

### Implications for Teacher Training

This study shows that teacher training programmes must consider trainees' previous knowledge and art experiences. Programmes need to adapt to the diverse backgrounds of learners, emphasizing the enhancement of existing knowledge, providing more opportunities for artistic exposure, and offering specific support to those with lower self-efficacy.

By doing so, teacher training can effectively improve the confidence and abilities of future art educators, which will benefit their professional development and the quality of art education overall. The study highlights the need for tailored interventions to address the varying levels of confidence among trainees, ensuring that all educators are well-prepared to teach art education effectively in diverse settings.

### Suggestions

Drawing from the findings of this study, the following recommendations are proposed to enhance the self-efficacy of pre-service teacher trainees in art education:

#### 1. Comprehensive Art Education

**Curricula:** Teacher training programs should offer comprehensive curricula that include art history, theory, and practical skills within the realm of art education. Grounding art education in rigorous academic principles provides trainees with the essential knowledge that is required to teach and integrate art within their prospective educational settings effectively.

**2. Practical Engagement:** Integrating experiential art activities into teacher preparation programs can enhance trainees' artistic abilities and boost their

confidence. Participating in practical art activities such as drawing, painting, and sculpture enriches their skills and assurance in teaching these methods.

#### 3. Collaborations and Partnerships:

Facilitating collaborations between trainees and local artists or art organizations can broaden exposure to diverse art forms and practices, thereby providing excellent opportunities for engagement and learning. This is proposed in the NEP 2020 (paras 4.26 and 22.8). Participation in community art initiatives can also enhance individuals' appreciation for the arts and improve their teaching skills.

#### 4. Cultural Experiences:

Facilitating field trips to art exhibitions, museums, galleries, and cultural events can deepen trainees' understanding of diverse artistic forms and historical contexts. Encouraging reflection on these experiences can further enhance their teaching approaches.

#### 5. Mentorship Programs:

Implementing mentorship programs that include seasoned art educators can provide trainees with valuable instruction, constructive feedback, and essential support. Such mentorship not only enhances teaching skills but also cultivates confidence within the realm of art education.

#### 6. Professional Development:

Offering continuous professional development opportunities in art education helps keep educators well-informed about contemporary pedagogical approaches and emerging trends, thereby enhancing their self-efficacy.

#### 7. Interdisciplinary Approach:

Implementing an interdisciplinary approach in art education fosters the development of versatile educators who can seamlessly integrate art into various academic subjects, thus enhancing their teaching capabilities.

#### 8. Adapting Art Education to Evolving Trends and Technologies:

As art continuously evolves, integrating technology into contemporary art forms

is crucial. Training teachers in digital tools, multimedia applications, and virtual platforms equips them with skills essential for modern art practices, enhancing student engagement in the digital age.

**9. Assessment and Feedback Training:**

Providing training in assessment and evaluation within art education empowers educators by equipping them with the skills needed to proficiently evaluate student artwork, offer constructive criticism, and accurately assess artistic development.

**10. Community Engagement:** Encourage trainees to actively engage with their local communities through art outreach initiatives. This involvement not only facilitates meaningful pedagogical encounters but also strengthens the presence of the arts within the community.

**11. Research and Reflection:** Promoting reflective practice and research in art instruction can greatly enhance trainees' proficiency and confidence. Engaging in research on effective pedagogical approaches and sharing personal experiences can substantially improve educators' professional development.

**12. Policy Advocacy:** Advocate for policies and guidelines that support the integration of art education within educational systems. This advocacy ensures that art is seamlessly incorporated into the curriculum and that resources are appropriately allocated.

## Conclusion

The study highlights the role of previous knowledge and art exposure in shaping self-efficacy perceptions of pre-service teacher trainees. It highlights the importance of teacher training programs and art education in India, supporting the development of art education and student creativity.

While recognizing the significance of these findings, it is also essential to consider the limitations of the study. These limitations encompass the utilization of a cluster sampling technique, which may restrict the generalizability of the results beyond the specific context of Assam. Also, the variety of statistical techniques used in the process was restricted by the use of Google Forms as the main instrument for data collection. Furthermore, the study was subject to resource constraints, including limitations in time and financial resources. Future research in this field should endeavor to address these limitations by exploring the intricacies of mentorship programs, examining the influence of particular art exposure encounters, and evaluating the long-term implications of art educators' self-efficacy on their instructional methods. These research approaches aim to broaden the field of art education while avoiding the constraints inherent in this study, opening the way for evidence-based teacher training programs, thereby advancing the goals of art education in India.

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# A Comparative Study on Effectiveness of Problem-Solving Method, Vedic Mathematics and CRA Approach on Solving Mathematical Problems at the Primary Level

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## Abstract

*This research aimed to determine the effectiveness of three methods—Problem-Solving, Vedic Mathematics, and the Concrete-Representational-Abstract (CRA) Approach—in improving the mathematical problem-solving abilities of primary-level students in India, aligned with the National Education Policy, 2020. Students in Grade III were assigned to one of three groups (Group A: Problem-Solving, Group B: Vedic Mathematics, Group C: CRA Approach) and received a week-long teaching intervention. The study included 60 students who were similar in their pre-test performance but diverse in terms of gender, social category, and parental background. Results showed that all three teaching approaches had a significant impact on post-test scores, but the CRA Approach demonstrated superior effectiveness (Mean=16.40), compared to Problem-Solving (Mean=12.47) and Vedic Mathematics (Mean = 11.80). Based on stakeholders' feedback, the CRA Approach displayed exceptional strengths in promoting joyful learning (2.95), fostering deep understanding (2.90), and facilitating real-life application (2.25). These findings make a strong case for the integration of the CRA Approach into elementary mathematics education and for further refinement of current teaching methods. Additionally, future research should explore the long-term effects of the CRA Approach, expand sample sizes, investigate teacher training methods, and explore interdisciplinary connections. Notably, this study emphasizes the significant impact of teaching practices on mathematics proficiency and offers valuable insights for educators, policymakers, and curriculum developers. Ultimately, it presents valuable avenues for future research and advancement in the field of mathematics education.*

**Keywords:** Mathematics Education, Problem Solving, Vedic Mathematics, CRA Approach, Teachers Training

**JEL Classification Code:** I2, C4, C9

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## Introduction

The NEP 2020 envisions transforming the Indian education system by emphasizing holistic development, critical thinking, and application-oriented learning (NEP, 2020). In this context, selecting appropriate teaching methods that align with the policy's objectives becomes crucial (Napper, 2012). Mathematics education at the primary level serves as the cornerstone for the cognitive development, problem-solving skills, and analytical

thinking abilities of children (Harel and Sowder, 2005; Son, Darhim, and Fatimah, 2020). The process of learning mathematics involves both traditional (Huda, Florentinus, & Nugroho, 2020) and innovative pedagogy (Freudenthal, 2002; Yilmaz, 2020) aimed at enhancing understanding and mastery of mathematical concepts. In recent times, the Problem-Solving Method (Polya, 1985; Tambychik & Meerah, 2010; Badger et al., 2012) Vedic Mathematics (Day & Tan, 2022), and the Concrete-Representational-Abstract

(CRA) approach (Mercer & Miller, 1992; Misquitta, 2011; Milton et al., 2019; Reyes, 2021) have gained significant attention by the practitioners due to their potential to facilitate effective learning experiences in mathematics education.

The Problem-Solving Method is an instructional strategy that encourages students to engage with mathematical problems actively, fostering critical thinking, logical reasoning and creativity (Lester & Kehle, 2003; Zakaria, Matt & Khalid, 2019; Aljalalma, 2023). It emphasizes understanding the problem, devising strategies, and applying mathematical concepts to derive solutions, and a deeper understanding of mathematical concepts rather than rote memorization (Chin & Chia, 2004; Prathana, Suwimon & Siridej, 2014; Robert, Nganga & James, 2022). Vedic Mathematics, based on ancient Indian mathematical principles, offers alternative techniques and shortcuts for arithmetic and algebraic calculations (Shukla et al, 2017; Sharma, 2014; Mala, 2023). This method is known for its simplicity, speed, and efficiency in solving mathematical problems, employing mental calculations and innovative techniques to expedite computation processes (Muehlman, 1998; Tiwari et al, 2008; Dhivyadeepa & Govindarajan, 2013).

The Concrete-Representational-Abstract (CRA) approach, grounded in the principles of constructivist theory, scaffolds learning by progressing from hands-on experiences with concrete materials to visual representations and then to abstract mathematical concepts (Matthew, 2006; Corey & Kimberly, 2018; Nugroho & Jailani, 2019). It aims to build a solid foundation by allowing students to manipulate physical objects, transition to pictorial representations and finally understand abstract mathematical concepts through structured stages. While existing studies have highlighted the effectiveness of these methods in isolation, there is a lack of research comparing their relative effectiveness. This comparative study seeks to explore and evaluate the effectiveness of these

three methodologies – the Problem-Solving Method, Vedic Mathematics, and the CRA approach – in enhancing the mathematical problem-solving skills of children at the primary level. This study aims to shed light on which approach or combination thereof yields the most significant and sustainable improvements in problem-solving abilities among primary-level students. The study involves implementing these methods within controlled classroom settings, observing students' performances, analysing their problem-solving strategies and evaluating the overall impact on learning outcomes. Further, it also aims to identify the strengths, weaknesses, and potential areas of improvement for each approach and provide valuable insights into designing more effective mathematics teaching strategies for teachers and policymakers. The effectiveness of these methodologies in primary-level mathematics education could shape pedagogical practices and foster a solid mathematical foundation essential for academic success and real-life problem-solving skills of children studying in early-grades.

## Review of Literatures

In the realm of mathematics education, the choice of an appropriate teaching method holds paramount significance in shaping students' understanding, problem-solving skills, and overall performance (Shellard & Moyer, 2002). With the recent implementation of the National Education Policy (NEP) in 2020, there is a growing emphasis on innovative and effective pedagogical approaches that foster conceptual clarity, critical thinking, and application-oriented learning at the elementary level. Furthermore, Pratham's Annual Status of Education Report, 2022 and National Achievement Survey, 2021 of the Government of India consistently highlight the need to improve students' mathematical learning outcomes. By understanding the impact of different teaching approaches, this study aspires to contribute to the ongoing efforts to enhance the quality of mathematics education. As India strives to enhance its



education system, it is essential to explore and evaluate various teaching methodologies to ensure students' holistic development and mastery of mathematical concepts (Feb 9, 2021, India Today). This comparative study aims to investigate the effectiveness of three distinct teaching approaches in mathematics, namely the Problem-Solving Method, Vedic Mathematics, and the Concrete-Representational-Abstract (CRA) Approach, on solving mathematical problems at the elementary level. The study's significance is underscored by the changing educational landscape in India and the increasing focus on developing students' mathematical abilities in alignment with the NEP 2020 objectives.

The Problem-Solving Method equips students with versatile strategies and techniques to approach different types of mathematical problems effectively (Liljedahl, Trigo, Malaspina, & Bruder, 2016). It emphasizes logical reasoning and creative thinking, fostering the development of problem-solving skills that are crucial for success in academic and real-life scenarios (Kirschner et al., 2011; Lochhead & Zietsman, 2001; Hair, Anderson, Tatham & Black, 1998). Similarly, Vedic Mathematics, rooted in ancient Indian mathematical systems, offers sutras and sub-sutras to expedite problem-solving and calculation (Mala, 2023). It is known for its efficiency in quick computation and mental mathematics, making it a popular approach among some educators and parents (Raikhola, Panthi, Acharya & Jha, 2020). On the other hand, the CRA Approach introduces abstract mathematical concepts through concrete manipulatives, gradually transitioning to more abstract representations (Hinton & Flores, 2022). This approach nurtures deep understanding and connections between mathematical ideas, facilitating application and retention of knowledge (Witzel, 2005). Mathematical problem-solving is a fundamental pillar of mathematics instruction, playing a crucial role in preparing students to thrive in modern society. It serves as a platform for students to

apply their understanding of mathematical concepts, bridging the gaps between isolated pieces of knowledge and fostering a deeper conceptual comprehension of mathematics as a discipline (Lester and Cai, 2016). Some researchers propose that mathematics itself is essentially a science of problem-solving, dedicated to the development of theories and methodologies for effectively addressing various problem types (Hamilton, 2007; Davydov, 2008). By nurturing problem-solving skills in students, educators empower them to approach real-life challenges with a structured and analytical mindset, providing them with invaluable tools for success in their personal and professional lives.

### Objectives of the Study

- (a) To assess the effectiveness of three distinct teaching approaches in mathematics: Problem Solving, Vedic Mathematics and the CRA (Concrete-Representational-Abstract) approach.
- (b) To compare the post-test scores of participants after undergoing different teaching methods.
- (c) To determine the impact of participants' pre-test scores on their post-test performance across the various teaching methods.
- (d) To identify the strengths and weaknesses of each teaching approach in terms of deep understanding, real-life application, creativity development, quick problem-solving, and material retention.

### Hypotheses of the Study

- (a) The intervention plan, which includes three different teaching approaches in mathematics (Problem Solving, Vedic Mathematics, and the CRA approach), has a significant impact on participants' post-test scores after intervention.
- (b) There are no significant differences in the post-test scores among the

- three teaching approaches (Problem Solving, Vedic Mathematics, and CRA approach).
- (c) Participants' pre-test scores have no significant influence on their post-test performance across the different teaching methods.
  - (d) The CRA approach is perceived as the most effective approach in enhancing participants' mathematical abilities compared to Vedic Mathematics and Problem Solving.

## Research Methodology

The study adopted a pre and post-test experimental design. The experimental design was planned to assess the study of mathematical abilities of three different approaches in teaching mathematics to Class III students. Participants were divided into

three groups (Group A, Group B, and Group C) based on homogeneity in pre-test results and heterogeneity in gender, social category, and socio-economic parental background. The Levene Statistic (Homogeneity of Variance Test) was used to assess whether the variances of pre-test scores for the three different teaching approaches were approximately equal. Each group underwent a distinct teaching approach (Vedic Mathematics, Problem Solving, and CRA) for a week. Post-test scores were measured to evaluate the impact of the teaching approaches on participants' mathematical abilities using analysis of variance (ANOVA). Further ratings were obtained from parents regarding the effectiveness of each teaching approach in various areas such as time taken to solve problems, real-life application, creativity development, and material retention.

**Table 1. Intervention Plan Participants**

Pre-Test	Group	Intervention	Post Test
A1	Group A	X1= Problem Solving	A2
B1	Group B	X2= Vedic Mathematics	B2
C1	Group C	X3=CRA approach	C2

The study was conducted in three government-run schools located in a semi-urban area of Kalahandi District where the students' performance in arithmetic was found to be relatively low as per National Achievement Survey, 2021. The schools cater to students from diverse socioeconomic backgrounds. The intervention was conducted in six classrooms, with 60 students aged 8-9 years, across different schools adhering to the state curriculum. Teachers in these schools were trained with the support of DIET and the researchers. The researchers played a crucial role in deploying these teaching techniques and building rapport with teachers and parents for track the progress for feedback, ensuring a smooth implementation of the study.

The intervention plan involves three different groups (Group A, Group B and Group C), each

focusing on a distinct teaching approach. The pre-test and post-test were structured to evaluate students' understanding of basic mathematical concepts at varying levels of difficulty. The pre-test, which included 20 questions, focused on fundamental operations and simple word problems. For example, students were asked, "If you had 15 apples and bought 13 more, how many apples did you have in total?" In contrast, the post-test also consisted of 20 questions but with increased complexity to assess a deeper understanding of the concepts. For instance, one post-test question was, "If you had 10 toffees and received 6 each from Rabi, Kishor, and Gobind, how many toffees did you have in total?" These questions required students to apply their knowledge more comprehensively, thus evaluating their ability to handle more complex and integrated mathematical tasks in post-intervention test.

The groups were formed based on the homogeneity in pre-test results but heterogeneity in gender, social category and relatively same socio-economic parental background using matching group method.

**Table 2. Similarity among Groups**

Mean Score before Intervention of various approaches in Teaching Mathematics							
Approaches to Teaching Mathematics	Mean	Std. Deviation	Levene Statistic for Similarity among Groups				
			Pre-Test before Intervention	Levene Statistic	df1	df2	Sig.
Group A	8.40	2.644	Based on Mean	.648	2	57	.527
Group B	8.00	2.938					
Group C	7.35	3.117					

The above table revealed that the mean score of the groups varies from 7.35 to 8.40. Further, the study used Levene Statistic before intervention for three different teaching approaches in mathematics to assess whether the variances of different groups' data were similar or not. Based on the Levene Statistic ( $F=0.648$  with  $df=2$ ,  $df=57$ ) and its associated p-value ( $0.527 > 0.05$ ), it is evident the variances of pre-test scores for the three different teaching approaches (Groups A, B, and C) are not statistically different. It reveals that the groups are relatively similar to their mathematical ability before the intervention.

### About the Intervention

**Intervention 1 (X1):** This approach deployed various teaching strategies and techniques to approach and solve different types of problems effectively. This approach focuses on developing students' ability to solve mathematical problems through the application of concepts to real-life situations. It emphasized understanding the problem, devising a plan, carrying out the plan, and evaluating the solution. For example, students are tasked with calculating the total cost of fruits within a budget of Rs. 20. The fruit prices are: Apple - Rs. 10, Banana - Rs. 2, and Orange - Rs. 5.

### Implementation

- **Understand the Problem:** Students identified the prices of each fruit and recognize the budget constraint.
- **Devise a Plan:** Students explored various combinations of the fruits that would sum up to Rs. 20 or less. They considered which fruits to buy and in what quantities.
- **Carry Out the Plan:** Students calculated the total cost for each fruit combination. For example, if they choose 1 Apple (Rs. 10) and 2 Bananas (Rs. 4), the total cost is Rs. 14. They repeated this for other combinations.
- **Evaluate the Solution:** Students checked if their selected combination(s) fit within the Rs. 20 budget and verify that it satisfied the budget requirement.

This approach allows students to practice mathematical operations such as addition and subtraction while also engaging in practical budgeting and decision-making.

**Intervention 2 (X2):** This approach uses sutras (aphorisms) and sub-sutras for various mathematical operations of ancient Indian system of mathematic to solve the problem that simplifies calculations with specific techniques for faster mental arithmetic. For instance, to multiply 97 by 96:

## Implementation

**Step 1:** Apply the Vedic Mathematics formula for numbers close to 100:  $(100-97) \times (100-96)$ .

**Step 2:** Subtract each number from 100, resulting in 3 and 4.

**Step 3:** Multiply these results:  $3 \times 4 = 12$ .

**Step 4:** Subtract one of the original numbers (97 or 96) from 100, then add the difference to the other number:  $97-4=93$  or  $97 - 4 = 93$ .

**Step 5:** Combine these results to get the final answer:  $(93 \times 100) + 12 = 9300 + 12 = 9312$ . This approach aids students in performing quick mental calculations and developing a strong numerical sense.

**Intervention 3 (X3):** This instructional strategy introduced abstract mathematical concepts through concrete manipulative, gradually transitioning to more abstract representations. The CRA Approach is a three-step instructional strategy designed to deepen students' understanding of mathematical concepts by progressing from concrete manipulatives to representational diagrams and finally to abstract symbols.

**Scenario:** Students are learning about division.

## Implementation

- **Step 1 (Concrete Stage):** Use physical objects, such as counters or base-ten blocks, to demonstrate division. For example, to illustrate 12 divided by 3, distribute 12 counters into 3 equal groups, showing that each group contains 4 counters.
- **Step 2 (Representational Stage):** Draw pictures or diagrams to represent the

division problem. For instance, draw 12 dots and group them into 3 equal sets, illustrating that each group contains 4 dots.

- **Step 3 (Abstract Stage):** Use numerical symbols and equations to represent the division problem. For example, write  $12 \div 3 = 4$  to represent that dividing 12 by 3 yields 4.

**Duration of the Intervention:** Each group received a one-week intervention using one of the three teaching methods. The one-week intervention period was selected to understand the pre-instruction testing effects which generally range from few days to few weeks aiming to provide a preliminary assessment of the impact of different teaching approaches. While a longer intervention might yield more comprehensive results, the one-week period allows for an initial evaluation of the methods' effectiveness. This duration observed noticeable changes in post-test scores in previous studies (Kliegl et al., 2022; Janelli and Lipnevich, 2021; Beckman, 2008).

## Results and Discussion

The Results and Discussion section presents a detailed analysis of the impact of three distinct mathematics teaching approaches—Problem Solving, Vedic Mathematics, and the Concrete-Representational-Abstract (CRA) approach—on students' post-test performance. This section also explores stakeholder feedback on the strengths and weaknesses of each approach, providing insights into their relative effectiveness in promoting joyful learning, deep understanding, and retention of material.

**Table 3. Tests of Between-Subjects Effects**

Dependent Variable: Post-Test after Treatment						
Source	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	281.444a	5	56.289	5.585	.000	.341
Intercept	933.738	1	933.738	92.652	.000	.632
Method	104.006	2	52.003	5.160	.009	.160

Corrected Model refers to the portion of the total variance in post-test scores attributed to the main effects of the methods and pre-test scores, as well as their interaction effect.

Pre-Test	20.984	1	20.984	2.082	.155	.037
Method x Pre-Test	22.772	2	11.386	1.130	.331	.040
Error	544.206	54	10.078			
Total	12005.000	60				
Corrected Total	825.650	59				
a. R Squared = .341 (Adjusted R Squared = .280)						

The Analysis of Variance (ANOVA) results reveal that the intervention plan, which included three distinct teaching approaches in mathematics (Problem Solving, Vedic Mathematics and the CRA approach), has a significant impact on the participants' post-test scores after intervention. The Corrected Model, representing the overall significance of the regression model, demonstrated a substantial effect size (Partial Eta Squared = 0.341), indicating that the model accounted for a considerable amount of variance (About 28% - 34% considering the adjusted R<sup>2</sup>) in the post-test scores. Additionally, the main effects of method are statistically significant (influenced by around 16%) but effect of pre-test score are not statistically significant. Pre-Test effect (influenced by less than 0.37% only). This indicates that the choice

of teaching method significantly influenced the post-test performance. Moreover, the interaction effect between Method and Pre-Test was not significant, suggesting that the impact of pre-test scores on post-test scores not much varied significantly across the different teaching methods. These findings collectively underscore the importance of selecting appropriate teaching approaches tailored to students' abilities, as it can significantly enhance their mathematical abilities.

### Comparison of various Approaches

The study also tried to answer, whether any intervention performs better than others? This is answered by post hoc tests which are found in the Pairwise Comparisons in the following table.

**Table 4. Pair wise Comparisons (Post Test Score)**

Dependent Variable: Post-Test after Intervention						
Use of Various Approach in Teaching Mathematics	Use of Various Approach in Teaching Mathematics	Mean Difference	Std. Error	Sig. <sup>b</sup>	95% Confidence Interval for Difference <sup>b</sup>	
					Lower Bound	Upper Bound
Problem Solving (Mean=12.47)	Vedic	0.67	1.013	.889	-1.840	3.152
	CRA	-3.93*	1.021	.001	-6.441	-1.408
Vedic (Mean=11.80)	Problem Solving	-0.67	1.013	.889	-3.152	1.840
	CRA	-4.60*	1.013	.000	-7.076	-2.085
CRA (Mean=16.40)	Vedic	4.60*	1.013	.000	2.085	7.076
	Problem Solving	3.93*	1.021	.001	1.408	6.441
Based on estimated marginal means						
*. The mean difference is significant at the .05 level.						
b. Adjustment for multiple comparisons: Sidak.						

The pair wise comparisons of the mean scores after intervention for the various teaching approaches in mathematics revealed significant differences among the groups. Comparing Vedic Mathematics to Problem Solving, there was no significant difference in their mean scores (Mean Difference = 0.67,  $p = 0.889$ ). However, when comparing the CRA (Concrete-Representational-Abstract) approach to Vedic Mathematics, the mean score for the CRA approach was significantly higher (Mean Difference = 4.60,  $p < 0.001$ ). Similarly, when comparing the CRA approach to the Problem-Solving approach, the mean score for the CRA approach was significantly higher (Mean Difference = 3.93,  $p < 0.001$ ). These findings suggest that the CRA approach is a much more effective approach compared to Vedic Mathematics or

Problem-Solving in improving participants' mathematical abilities, while both Vedic Mathematics and Problem Solving showed commendable performance in this study.

### **Strengths and Weakness of the various approaches**

The author collected and analysed feedback from students, teachers, and parents based on six major criteria (*joyful, quick solve, deep understanding, application to real-life situations, develop creativity, retention of material*) using a three-point scale to understand the strengths and weaknesses of various approaches in teaching mathematics. To illustrate the feedback, a few quotes and examples from the different stakeholders are included below.

Criteria	Stakeholder	Statement
1-Joyful	Student	I enjoyed the math games and group activities where we solved puzzles together
	Teacher	I noticed that students ask more questions and are eager to come to the board to solve problems
	Parent	My child is much more excited about math and often talks about the fun activities they learnt in class.
2- Quick Solve	Student	I take less time to solve a problem (97 x 96) after the new ways of teaching
	Teacher	Students take less time to solve a problem (97 x 96) after the new ways of teaching. (Teachers were asked to record the time taken by the children to solve the problem and take the average time taken by the students of your class and rate accordingly)
	Parent	Students take less time to solve a problem (97 x 96) after the new ways of teaching.
6-Retention of the material	Student	I can still explain how to distribute chocolates among friends equally.
	Teacher	I have seen students correctly use math strategies learned weeks ago without needing a refresher.
	Parent	My child remembers to still use the mental math tricks they learned to quickly add numbers when we are out shopping.

The combined mean score of the students, parents and teacher is presented below.

**Table 5. Strength and Weakness of Approaches**

Approaches to Teaching Mathematics	Joyful	Quick Solve	Deep Understanding	Application to real-life situation	Develop creativity	Retention of material
Problem-Solving	2.12	1.80	2.15	2.85	2.80	2.25
Vedic Mathematics	1.67	2.90	1.35	1.70	1.45	1.15
CRA Approach	2.95	1.30	2.95	2.25	1.25	2.65

The study's findings indicate that the Concrete-Representational-Abstract (CRA) approach is highly effective in several aspects of mathematical learning. It received the highest ratings for Joyful Learning (2.95) and Deep Understanding (2.90), demonstrating its effectiveness in facilitating both an enjoyable learning experience and a thorough comprehension of mathematical concepts. Additionally, the CRA approach scored well in Application to Real-life Situations (2.25), Development of Creativity (2.90), and Retention of Material (2.85). However, it received a lower rating for Quick Solve (1.75), suggesting that while it excels in conceptual understanding and engagement, it may be less effective for rapid computation tasks.

The CRA approach emerges as particularly effective in fostering students' understanding of mathematical concepts, real-life applications, and material retention. This approach aligns with Piaget's Theory of Cognitive Development, which emphasizes the importance of concrete experiences in the early stages of learning before progressing to abstract reasoning (Piaget, 1973). For instance, using manipulatives like blocks in the Concrete Stage allows students to build a tangible understanding of mathematical operations, which is then gradually abstracted into symbols and numbers.

In comparison, the Problem-Solving approach garnered moderate to high ratings across

various criteria, particularly in Application to Real-life Situations (2.85) and Development of Creativity (2.80). This approach's strength lies in its practical application and creative problem-solving, but it received more modest ratings for Retention of Material (2.25), Deep Understanding (2.25), and Joyful Learning (2.12). Its Quick Solve rating (1.80) was also relatively low, indicating that while it supports practical and creative aspects of learning, it may not be as effective for quick computational skills. The Problem-Solving approach, which engages students with real-life scenarios, reflects principles from Vygotsky's Sociocultural Theory. This theory highlights the role of social interaction and context in cognitive development (Vygotsky, 1978). Students can relate their learning to practical contexts, thereby enhancing motivation and creativity by connecting mathematical concepts to everyday experiences. For example, budgeting for a birthday party helps students apply mathematical skills in real-world situations, fostering a deeper understanding of their relevance.

On the other hand, Vedic Mathematics, known for its quick-solving techniques, received the highest rating for Quick Solve (2.90), underscoring its effectiveness in rapid computation. Nevertheless, it scored lower in several other areas, including Deep Understanding (1.35), Application to Real-life Situations (1.70), Joyful Learning

(1.67), and Retention of Material (1.15). These lower ratings suggest that while Vedic Mathematics excels in speed, it may not be as effective in promoting a deep understanding of mathematical concepts, practical application, and long-term retention. Vedic Mathematics, which emphasizes rapid calculation techniques, is based on principles of Information Processing Theory. This theory focuses on how information is processed and retained (Atkinson and Shiffrin, 1968). While Vedic techniques improve computational speed, they may not always promote a deep understanding of underlying principles. Therefore, balancing these techniques with traditional methods ensures a more holistic grasp of mathematical concepts.

### Recommendations for Teacher Education

To effectively implement these teaching approaches, teacher training programs should integrate psychological theories into their curriculum. For example, Piaget's Theory can guide educators in structuring lessons that move from concrete to abstract thinking, while Vygotsky's Sociocultural Theory can inform strategies for incorporating real-life problem-solving and social interaction in teaching. Professional development should include practical demonstrations of these approaches, strategies for engaging students, and methods for addressing challenges, all grounded in established psychological frameworks.

### Implications for Classroom Teaching

- **CRA Approach:** Teachers should use manipulatives and visual aids, transitioning from concrete experiences to abstract thinking, in line with **Piaget's Theory**. This method enhances understanding and makes learning enjoyable.
- **Problem-Solving Approach:** Engaging students in real-life scenarios aligns with **Vygotsky's Theory**, fostering motivation and practical understanding by relating mathematical concepts to everyday experiences.

- **Vedic Mathematics:** While quick-solving techniques can enhance computational speed, balancing them with traditional methods ensures a comprehensive understanding of mathematical principles, consistent with **Information Processing Theory**.

### Score for Further Study

The study provides valuable insights into the effectiveness of three distinct teaching approaches in mathematics, but further research is warranted to explore other areas. Further research is essential to fully understand the impact of different teaching approaches on students' mathematical abilities. A longitudinal study that tracks participants' progress over an extended period could provide valuable insights into the sustained benefits of each teaching method and its long-term influence on academic performance. Existing research has demonstrated that longitudinal studies can reveal how early educational interventions affect long-term outcomes (Juel, 1988; National Reading Panel, 2000). Additionally, while the current study offers valuable findings, it is based on a specific group of participants. Expanding the research to include a larger and more diverse sample would enhance the generalizability of the results, making them more applicable to a broader population of students. Research has shown that broader sample sizes can lead to more robust and widely applicable conclusions (Cohen et al., 2003). Investigating the impact of specialized teacher training programs on the effective implementation of the Concrete-Representational-Abstract (CRA) approach and other teaching methods could provide critical insights for educational institutions. Effective teacher training is known to significantly affect the success of educational interventions (Guskey, 2002; Darling-Hammond, 2000). Replicating the study across different subjects could also be informative. Exploring the effectiveness of these teaching approaches in various academic disciplines might reveal whether



the benefits observed in mathematics are consistent across other areas of learning. Research into cross-disciplinary applications of teaching methods has highlighted the importance of context in educational effectiveness (Hattie, 2009). In summary, this study lays a solid foundation for further research in mathematics education. Hence, study of longitudinal effects, diverse samples, specialized training, and cross-disciplinary applications—future studies can provide deeper insights into how to enhance teaching practices and improve students' mathematical abilities.

## Conclusion

This comparative study illuminated the significance of selecting appropriate teaching methodologies in fostering primary-level students' mathematical abilities. Amidst India's educational reforms, our research demonstrates the distinct impacts of the Problem-Solving Method, Vedic Mathematics, and the Concrete-Representational-Abstract (CRA) Approach on students' math skills. Findings of the study indicated that while all three methodologies exhibit strengths, the CRA Approach emerges as the most impactful in enhancing mathematical abilities, deep understanding, and real-life application. Its emphasis on tangible manipulatives, joyful learning, and fostering a deeper conceptual understanding

resonated positively with stakeholders. However, the study also acknowledged the commendable performance of Problem-Solving and recognizes the swiftness of Vedic Mathematics in computational tasks. Both approaches showed strengths in certain aspects but lagged behind in fostering deep conceptual understanding and real-life application, areas where the CRA Approach excelled. The implications of this research extend beyond the classroom, underscoring the need for educational stakeholders to consider the nuanced impacts of teaching methodologies on students' holistic mathematical development. Integrating the CRA Approach into elementary mathematics education emerges as a promising step towards fostering deeper conceptual understanding, joyful learning experiences, and practical application in real-life scenarios. As education in India continues to evolve, leveraging effective teaching methodologies becomes imperative. This study's insights offer practical guidance for educators, curriculum designers, and policymakers to enhance mathematical education, emphasizing the importance of tailored, evidence-based approaches aligned with the evolving educational landscape. Further research and longitudinal studies could delve deeper into refining teaching practices, ensuring sustained impact, and widening the scope of effective pedagogical strategies in mathematics education.

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## Synergistic Relationship Between Computational and Mathematical Thinking: The Role of Spreadsheets

Jonaki B Ghosh

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### Abstract

*There is widespread acknowledgement that computational thinking needs to be integrated in the school curriculum. Mathematical thinking (MT) and computational thinking (CT) are mutually supportive and yet distinct. Mathematics as a fundamental school subject therefore becomes the likely choice for integrating CT practices. However, the nature of tasks that integrate MT and CT remains elusive. This paper presents an exemplar from a larger study, where fractal explorations and simulation of problems in probability enabled by spreadsheets led pre-service teachers to develop mathematical concepts and also engage with CT practices. The tasks enabled the participants to engage in processes of visualization, generalization, recursion, iteration, and analysing algorithms, which are important from computational and mathematical standpoints. The evidence of student learning indicates a compelling argument for incorporating such tasks in foundational mathematics courses in pre-service teacher education programmes.*

**Keywords:** Computational thinking, mathematical thinking, teacher education programmes, spreadsheets

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### Introduction

Computational thinking (CT) is considered to be a skill set that is applicable across contexts and domains. The need to integrate CT in K–12 curricula has been widely acknowledged. Pei et al. (2018) have noted that advancement in computing technology in the past few decades has made it imperative “to make computational thinking a part of every student’s educational experience.” (Pei et al., 2018, p. 75). In light of the increasing role of technology in education, the PISA 2021 Mathematics Framework recognises that mathematical literacy should leverage the “synergistic and reciprocal relationship between mathematical thinking and computational thinking” (OECD, 2021, p. 7). CT and mathematical thinking (MT) are closely related to each other. Some of the skills common to CT and MT include

the ability to engage with challenging problems, reduce problems to simpler and more tractable versions, represent concepts and solutions in computationally meaningful ways, making abstractions and generalisations and engage with multiple paths of inquiry while solving problems. Thus, mathematics as a fundamental school subject is the natural choice for integrating CT-based activities. The National Education Policy 2020 emphasises this in its policy document by stating that “mathematics and computational thinking be given increased emphasis throughout the school years.” It recommends that CT be integrated into the mathematics curriculum through innovative methods such as using puzzles and games “that make mathematical thinking more enjoyable and engaging.” (p. 15)

However, developing tasks that integrate both CT and MT is not straightforward and

remains a major pedagogical challenge. Teacher preparation programs (TEPs), both in-service and pre-service, need to address this challenge. In general, foundational mathematics courses in pre-service TEPs emphasise school mathematical content and pedagogy but often fail to offer adequate opportunities for engaging with CT. In this article, we shall make a case for incorporating CT-based activities in the mathematics content courses in TEPs. We argue that pre-service teachers can develop CT skills if they engage in appropriately designed tasks that illustrate the practical significance of mathematics as a discipline and also enable them to apply mathematical concepts to real-world phenomena via computer-based explorations. We propose that spreadsheets can provide the appropriate learning environments for fostering MT and developing CT practices. Spreadsheets are easily accessible, do not require extensive knowledge of coding, and have low technical overheads as compared to programming languages. This article describes a study where CT- MT tasks enabled by spreadsheets, designed to elicit MT and computational skills, were integrated into a foundational mathematics course taught in the first year of an undergraduate four-year pre-service TEP. The aim of the course is to revisit school mathematics from a higher standpoint through in-depth exploration of the concepts and content. The author, who taught the course, selected 34 pre-service teachers from among the 67 who were enrolled in the TEP. These pre-service teachers had volunteered to participate in the study and had studied mathematics up to grade 12. Their prior knowledge included secondary-level mathematical topics, such as algebra, probability, trigonometry, and coordinate geometry. They were also familiar with the basic features of Excel, such as inserting formulas in cells and using simple commands. The CT- MT tasks were designed by the author and covered a wide variety of topics, from fractal explorations to simulation of problems based on probability.

## Theoretical Framework

Researchers have interpreted CT and its connection with mathematics in different ways. The pioneering work by Papert (1980) and his colleagues led to concretizing the term CT. Papert believed that the primary goal of CT was to build new ideas. His theory of constructionism, considered to have arisen out of Piaget's theory of constructivism, posits that learning can be enhanced if the learner engages in "creating a meaningful product." In his book *Mindstorms*, he envisioned the computer as a "mathematics-speaking being" and delved into how constructionist math environments could integrate MT and CT.

While the term CT was concretised by Papert, the credit for popularising it may be alluded to Jeanette Wing. She described CT as a "fundamental skill for everyone" and advocated that CT be given as much importance as reading, writing, and arithmetic in a child's education. (Wing, 2006, p. 33). According to her, CT comprises four primary components: decomposition, pattern recognition, abstraction, and algorithmic design. Decomposition is the process of reducing a mathematical problem into more tractable sub-problems. Pattern recognition involves identifying commonalities, structures, and regularities within mathematical data. Abstraction deals with generalizing patterns into mathematical results or formulae. Algorithm design refers to creating a sequence of steps that, when exercised by a machine (computer) or a human, can lead to the solution of the problem. While these fundamental components provide a clear understanding of CT with mathematics learning, incorporating these in mathematics lessons is not straightforward. To address the challenge of meaningfully integrating CT in mathematics, it would be helpful to have a framework for guiding teachers and practitioners to enable their students to engage in CT in the mathematics classroom. Ho et al. (2019) propose a framework comprising four design principles, based on the fundamental

components of CT, to enable teachers to interpret them for the instructional design of CT-MT tasks. These are framed in the form of questions.

**Complexity Principle:** Does the mathematical concept on which the task is based lead to an adequately complex problem? Is the problem worth solving, and can it be decomposed into simpler sub-problems?

This refers to the idea that the mathematical task should be challenging enough so that finding its solution is a worthwhile pursuit. In other words, the task should be sufficiently complex so that it necessitates decomposition. If it is too simple and has an easy solution, then it would not need to be decomposed or reduced to a simpler form.

**Data Principle:** Can the concepts be observable through data? Can the data be collected or created and then analysed?

This entails collecting or generating data from which patterns or structures may be identified.

**Mathematics Principle:** Can the problem be expressed in mathematical terms, and is a mathematical solution possible?

This refers to the mathematical formulation of the problem. A real-life problem or phenomenon needs to be represented mathematically so that it can be solved by mathematical means.

**Computability Principle:** Does the problem lend itself to exploration? Is it programmable? Is it amenable to solutions via algorithms and computer programming?

This principle focuses on arriving at a solution either by a machine (computer) or a human being.

Other researchers, such as Weintrop et al. (2016), have also attempted to explicate computational thinking, especially in the context of STEM disciplines. They advocate a classification that includes four kinds of practices: those associated with handling data, modelling and simulation, computational problem solving, and systems thinking. Their article presents a sequence of lesson plans that integrate CT

in high school science classrooms. Despite attempts by researchers, a lack of agreement concerning how CT can be integrated into the mathematics classroom remains a challenge. However, it is imperative to orient future mathematics teachers to the various aspects of CT in their mathematics content courses so that they are equipped to meaningfully incorporate CT in their teaching. This article is therefore a beginning step in exploring the integration of CT-MT tasks in foundational mathematics courses in TEPs and to enable pre-service teachers to accrue the benefits of engaging with such tasks.

## CT – MT Tasks

In this section, we will briefly describe two CT- MT tasks, one based on fractal explorations and the other on simulating the Birthday Paradox, which was assigned to the 34 participants in the study. These tasks were administered as a part of a larger module comprising five CT-MT tasks whose design was informed by the framework proposed by Ho et al. (2019). The tasks were implemented by the author in the classroom through reading materials, worksheets, and whole-class discussions. The worksheets comprised step-by-step investigations, which enabled the participants to explore the concepts. For computational work, most of the participants used MS Excel on their mobile phones, while a few brought their laptops to class. The fractal explorations took ten hours of classroom time, while the Birthday Paradox exploration took three hours. Post the completion of the tasks, the participants submitted their worksheets for evaluation and also documented their explorations in a file for their own records.

### Fractal explorations

The topic of fractals can be an excellent resource for engaging with ideas of recursion, iteration, self-similarity, and fractal dimension, all of which are important for developing MT and CT. The investigatory tasks in the worksheet required the pre-service teachers to explore various

attributes, such as length, perimeter, and area of the Sierpinski Triangle, Koch Curve, and Koch Snowflake and also create their own fractal patterns. The spreadsheet MS Excel was used as a vehicle for exploration. While investigating the Sierpinski Triangle (see Figure 1), participants predicted the geometric sequences, which emerged from computing the number of black triangles and the combined black area at each stage. Across stages, the number of black triangles led to the sequence 1,3,3<sup>2</sup>,3<sup>3</sup>,... whereas the shaded area followed the sequence 1, 3/4, (3/4)<sup>2</sup>... Recursive and explicit formulae for these attributes were derived for the *n*th stage as  $S_n = 3S_{n-1}$ ,  $S_n = 3^n$  and  $A_n = (3/4)^n$ ,  $A_n = (3/4)^n$  respectively. At this point, the teacher asked the participants to reflect and comment on the two types of formulae. One participant responded, “The explicit formula is more useful as we can get the exact number of black triangles at any stage by inserting the value of *n*. This does not happen with the recursive formula. So,  $S_5 = 3S_4$  but I can’t calculate  $S_5$  unless I know  $S_4$ . But if I use the explicit formula,  $S_5 = 3^5$ , I get the exact number.”

Another student felt that the recursive formulae were also useful as they “highlighted an important aspect of the structure of the Sierpinski triangle.” Post this discussion, the participants generated numerical and graphical representations of the two sequences on a spreadsheet. This led to an interesting classroom discussion as one participant explained, “At least numerically and graphically, the spreadsheet helps us to visualize the Sierpinski triangle in higher

stages. It is impossible to understand the growth of the fractal using only pictorial representations.” Another participant concurred, “As the number of stages increases beyond 3, the Sierpinski triangle becomes too complicated as many small equilateral triangles get added at every stage.” When asked by the teacher to comment on the graphical representations of the number of shaded triangles and the shaded area (Figure 1), one participant observed “the graphs show opposite processes—growth as well as decline.” The teacher used this opportunity to enable participants to conclude that with an increase in the number of stages, the number of black triangles grows exponentially, whereas their combined area approaches 0. It was heartening to see the participants engage with different modes of representation of the Sierpinski triangle while at the same time acknowledging the benefits and disadvantages of each mode. Figure 1 illustrates how the fractal was explored using multiple representations—numerically, graphically, and pictorially.

The notion of self-similarity was also explored within the different stages of Sierpinski triangle construction. This entailed identifying copies of earlier stages in later stages of the fractal. For example, in stage 1 of the Sierpinski triangle, three copies of stage 0 can be seen, in stage 2, three copies of stage 1, and so on. One participant commented, “The idea of self-similarity can be used to build higher stages from lower ones. So I can use three copies of stage 3 to build stage 4 and so on.” This observation was an important milestone in the Sierpinski triangle exploration.

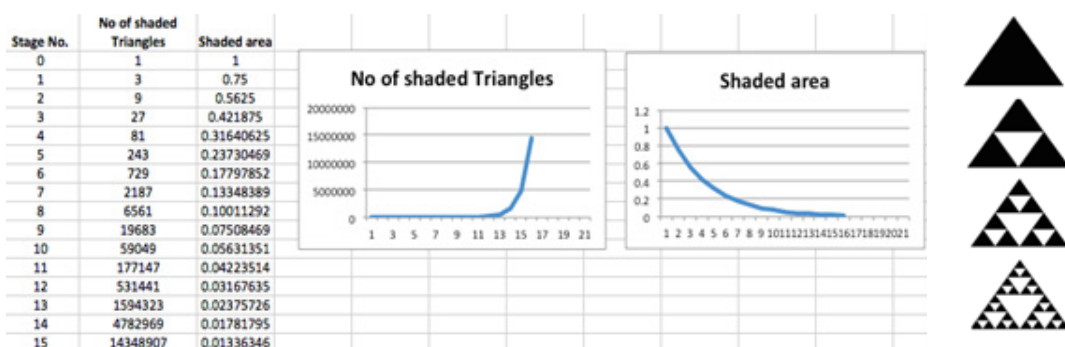


Figure 1: Exploring the Sierpinski triangle fractal using multiple representations



While exploring the Koch snowflake in Excel, the participants were required to find the total area enclosed by the snowflake. It came as a revelation that as n increases, the number of stages increases, the additional area at each stage keeps decreasing, and the total area approaches a fixed value of  $2\sqrt{3} \approx 0.69$  (as shown in figures 2 and 3). The area inside the snowflake was also computed using the theory of geometric sequences as follows:

$$\frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} \times \frac{1}{3} \left\{ 1 + \frac{4}{3^2} + \frac{4^2}{3^4} + \dots \right\} = \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} \times \frac{1}{3} \times \frac{9}{5} = \frac{\sqrt{3}}{4} \left( 1 + \frac{3}{5} \right) = \frac{\sqrt{3}}{4} \times \frac{8}{5} = \frac{2\sqrt{3}}{5}$$



Figure 2: Stages 0,1,2 and 3 of the Koch Snowflake

Some participants expressed that although they had studied the topic of geometric sequences in school, it seemed “very abstract.” However, the fractal explorations helped them to see the relevance of the topic.

One commented, “We had learned so many formulae on the topic of geometric sequence. Now I know why they can be used.

Figure 3 illustrates the numerical and graphical exploration of the Kock snowflake in Excel”

stage	line segments	length of line segment	perimeter	Additional area	Total area
0	3	1	3	0	0.433012702
1	12	0.333333333	4	0.144337567	0.577350269
2	48	0.111111111	5.333333333	0.06415003	0.641500299
3	192	0.037037037	7.111111111	0.028511124	0.670011424
4	768	0.012345679	9.481481481	0.012671611	0.682683034
5	3072	0.004115226	12.64197531	0.005631827	0.688314861
6	12288	0.001371742	16.85596708	0.002503034	0.690817896
7	49152	0.000457247	22.47462277	0.00111246	0.691930355
8	196608	0.000152416	29.96616369	0.000494427	0.692424782
9	786432	5.08053E-05	39.95488493	0.000219745	0.692644527
10	3145728	1.69351E-05	53.2731799	9.76645E-05	0.692742191
11	12582912	5.64503E-06	71.03090654	4.34064E-05	0.692785598
12	50331648	1.88168E-06	94.70787538	1.92918E-05	0.69280489
13	201326592	6.27225E-07	126.2771672	8.57411E-06	0.692813464
14	805306368	2.09075E-07	168.3695562	3.81072E-06	0.692817274
15	3221225472	6.96917E-08	224.4927416	1.69365E-06	0.692818968
16	12884901888	2.32306E-08	299.3236555	7.52734E-07	0.692819721
17	51539607552	7.74352E-09	399.0982074	3.34549E-07	0.692820055
18	2.06158E+11	2.58117E-09	532.1309432	1.48688E-07	0.692820204
19	8.24634E+11	8.60392E-10	709.5079242	6.60837E-08	0.69282027
20	3.29853E+12	2.86797E-10	946.0105656	2.93705E-08	0.6928203

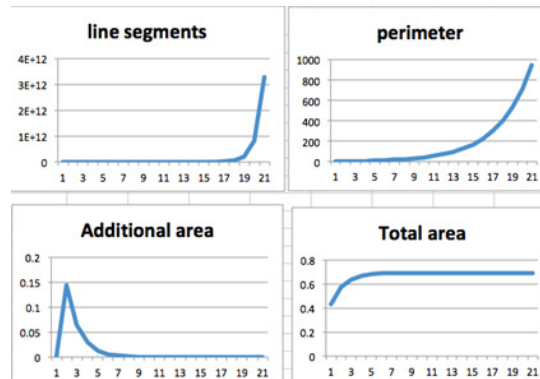


Figure 3: Numerical and graphical exploration of the Koch Snowflake construction in Excel

Exploration of the Koch curve (Figure 4) led to a discussion on matrix transformations. Students were scaffolded to obtain a sequence of four transformations,  $f_1$ ,  $f_2$ ,  $f_3$ , and  $f_4$ , which transition the Koch curve from stage  $n$  to stage  $n+1$ . The first step was to visualize the transition from stage 0, comprising

$$f_1X = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{3} \end{bmatrix} X,$$

$$f_2X = \begin{bmatrix} 1 & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}}{6} & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, f_3X = \begin{bmatrix} 1 & \frac{\sqrt{3}}{6} & -\frac{\sqrt{3}}{6} & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, f_4X$$

$$= \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1}{3} & 0 & 0 \\ 0 & 0 & \frac{1}{3} & 0 \\ 0 & 0 & 0 & \frac{1}{3} \end{bmatrix} X + \begin{bmatrix} 2 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$



Figure 4: Stages 0, 1, 2 and 3 of the Koch Curve

### Simulating the Birthday Paradox

The concept of probability is introduced and developed at the secondary school stage and forms an integral part of the curriculum. The experiments used for illustrating the fundamental concepts in textbooks tend to be restricted to coin tossing, die rolling, or selecting cards from a deck of cards. While these may be useful as examples, they do not relate the concept of probability to real-life phenomena, thus rendering the topic dull. Interesting problems, such as the Birthday Paradox, leading to meaningful explorations can truly enliven the teaching of probability. Such problems provide a context to introduce the concept of simulation, a method for mimicking random behaviour or phenomena through the use of computers. In this section, we shall illustrate how the pre-service teachers explored the birthday paradox by first mathematizing the problem and then simulating it on MS Excel.

They were presented with the following problem in the worksheet:

How many people do you need to bring together to ensure that there are at least

a line segment of unit length, to stage 1, where the segment is trisected, the middle third removed, and an equilateral triangle is raised on the middle third. To achieve this, students used matrices to perform the transformations of shrinking, shifting, and rotating the line segment.

two people with the same birthday? Here birthday refers to birth date and month.

Most students were unsure of the answer. However, the immediate response from a few participants was 367. One explained, "There are 366 possible distinct birthdays, including 29th February (in a leap year). If one more date is added to this list, it would coincide with one of the 366 dates." However, when they were told that the chance of a birthday match in a group of 60 people was almost certain, their reaction was one of disbelief. This claim, popularly known as the birthday paradox, takes everyone by surprise. To verify this, an experiment was conducted, wherein 60 birthdays (of friends and relatives) were noted by the participants on slips of paper. These were folded and placed in a box. The box was circulated among the participants, wherein each participant selected a slip and recorded the date on it. The box was circulated till a match was found. The same experiment was repeated with another set of 60 birthdays, which again led to a match. Thinking this to be a coincidence, many students remained sceptical. However, everyone agreed that it

was impractical to keep listing birthdays to check for a match. For the teacher, this was an opportune moment to introduce the concept of simulation on a spreadsheet. The idea was to randomly generate 60 birthdays on Excel and check if the list had a repeated date. Several simulations could be generated very quickly in a matter of seconds. In each simulation, the first step was to generate a column of 60 integers between 1 to 12 (both inclusive, as shown in column B of Figure 5) representing the months (1, 2, 3, etc. representing January, February, March, etc.). To achieve this, students were familiarized with the command `RANDBETWEEN(1, n)`, which randomly generates an integer between 1 and  $n$ . Hence `RANDBETWEEN(1,12)` was used to create a column of months. The next step was to use `RANDBETWEEN(1,31)` to generate a column of 60 integers between 1 and 31 (both inclusive) to indicate the day of the month (column C of Figure 5). The data in columns B and C represent a set of 60 (randomly generated) birthdays.

For example, a 10 in column B and 31 in column C represent the date 31st October. Scrolling through this list of dates to search for a match was time-consuming. To simplify the process, the operation  $=100*B1+C1$  was used to convert the dates to three- or four-digit numbers and store them in column D. Once this was done, the first one or two digits of the numbers (in the column called Bday) represented the month, and the last two digits represented the day of the month. Thus, 806 in the list represents 6th of August, while 1113 represents the 13th of November. This list of dates could now be copied to a different column and sorted so that the repeated date (birthday match) appeared in two consecutive rows, making it easily identifiable. In Figure 5, after sorting, the repeated birthday is 428, that is, 28th April (column F), and 318, that is, 18th March (column H). The simulation was repeated several times to confirm that there is indeed a match every time a set of 60 birthdays is randomly generated. This aroused the curiosity of the participants of the study.

A	B	C	D	E	F	G	H
S. No	Month	Day	Bday		Bday list1		Bday list2
1	6	13	613		115		103
2	3	6	306		119		114
3	1	12	112		204		120
4	3	6	306		208		124
5	10	31	1031		215		202
6	4	13	413		215		213
7	5	15	515		221		215
8	3	23	323		228		219
9	8	6	806		229		221
10	1	18	118		302		222
11	12	9	1209		311		228
12	8	24	824		314		315
13	7	5	705		318		318
14	3	26	326		320		318
15	11	13	1113		321		320
16	3	8	308		324		329
17	7	16	716		410		329
18	5	24	524		417		404
19	4	15	415		424		405
20	3	16	316		428		502
21	5	18	518		428		510
22	6	15	615		501		511

Figure 5: Birthday Problem simulation in MS Excel

The simulation was used to verify the claim that if we randomly gather 60 people, the probability of a birthday match is a certain event. One participant observed, "Each time we simulate a list of 60 birthdays, we see a match... Sometimes there is more than one match." But another commented, "Simulation does not help prove the claim. It needs to be justified mathematically." This was indeed a high point for the teacher, who realized that the pre-service teachers were not satisfied merely with a numerical verification but were looking for proof. The latter requires the problem to be analyzed using probability theory. This led to another interesting class discussion where students first computed the probability of a birthday match among three, four, and five people, respectively. They observed the patterns within these expressions and tried to arrive at a generalization for  $n$  people. The probability that all three people will have distinct birthdays in a group of three people is given by the expression

$$\frac{365}{365} \times \frac{364}{365} \times \frac{363}{365}$$

Hence, the probability, that in a group of three people, *at least* two have the same birthday is given by

$$1 - \frac{365}{365} \times \frac{364}{365} \times \frac{363}{365} = 1 - \frac{365 \times 364 \times 363}{365^3}$$

Extending this argument to four people, the probability of finding a birthday match is

$$1 - \frac{365 \times 364 \times 363 \times 362}{365^4}$$

and similarly for five people, it is.

$$1 - \frac{365 \times 364 \times 363 \times 362 \times 361}{365^5}$$

Students observed the pattern within these expressions and generalized the result to obtain the expression

$$1 - \frac{365 \times 364 \times 363 \times \dots \times (365 - (n - 1))}{365^n}$$

which represents the probability of a birthday match among  $n$  people. Using

factorial notation this was further simplified to: As  $n$  (the group size)

$$1 - \frac{365!}{(365 - n)! \times 365^n}$$

approaches 60, the value of this expression approaches 1. The high point of this exploration was the fact that students were now convinced that the paradox was indeed true.

## Discussion And Conclusion

Based on the "synergistic relationship between CT and MT" as espoused by the PISA mathematics framework, the study described in this article attempted to explore the potential of incorporating spreadsheet-enabled CT-MT tasks in a foundational mathematics course in a pre-service TEP. In the study, 34 pre-service teachers engaged in modules comprising CT-MT tasks. The tasks were facilitated through reading materials, worksheets, and classroom discussions. The choice of the tasks was based on students' knowledge of mathematical content and the four design principles proposed by Ho et al. (2019). Here we shall explain how these design principles informed the CT-MT tasks on fractal explorations and the Birthday Paradox, which were open-ended and investigatory.

**Complexity Principle:** Fractals are complex objects that represent infinite recursive processes. However, observing their constructions in the initial stages can lead to an understanding of the nature of their growth. In the study, investigating attributes such as the length, perimeter, and area of the fractals in the initial stages led to geometric sequences, identifiable patterns, and their generalization. The Birthday Paradox, a real phenomenon, makes a claim that defies intuition. Yet exploring the probability of a birthday match in small group sizes (of three, four, and five people) helped us understand the problem, making it more tractable.

**Data Principle:** The data involved in the fractal explorations were numerical values

of the attributes in the different stages of the fractals. Similarly, the data required in the Birthday paradox was the random generation of birthdays, which could be obtained by collecting the birthdays of actual people or by simulation on a spreadsheet. In both explorations, the spreadsheet played a crucial role by quickly generating the data, thus enabling the participants to focus on observing patterns.

**The mathematical principle:** The mathematical principle allows for the generalization of the patterns and regularities found in the generated data. This led to representing the attributes of the fractals mathematically through recursive and explicit formulae. In the Birthday paradox exploration, the patterns within the expressions of the probabilities of a birthday match for smaller group sizes led to a more general formula for a group of any size. The general formula then led to proof of the paradox.

**Computability Principle:** The recursive and explicit formulae of the fractal attributes could be easily incorporated into a spreadsheet to generate numerical values of the attributes at higher stages. Further graphical representations led to a deeper insight with regard to the nature of fractal growth. In the Birthday Paradox exploration, the simulation generated birthdays randomly to check for a match. Thus, the four design principles helped determine the suitability of these problems as CT-MT tasks.

An in-depth analysis of the participants' responses revealed that the described tasks enabled them to engage in MT and CT practices. We summarize them here briefly.

**Problem decomposition:** To begin with, the participants explored the attributes of the fractals in the initial stages (0 to 4) through pictorial representations. This led them to observe important patterns in fractal growth. For example, in the Sierpinski triangle, a geometric sequence comprising powers of 3 emerged while counting the number of black triangles across stages, whereas in the Koch curve, the number of line segments led to

powers of 4. Similarly, while exploring the birthday paradox, the pre-service teachers began by collecting sets of 60 birthdays to search for a match. However, to analyze the problem, they used the definition of probability to work out the probabilities of a birthday match in groups of 3 and 4 people. In both tasks, simplifying the problem led to a starting point for exploration.

Identifying geometric sequences within fractal attributes entails MT, whereas observing their recursive self-similar structures requires CT. In the Birthday Paradox task, visualizing the simulation steps on the spreadsheet requires CT, while deriving the expressions of the probability of a birthday match requires MT.

**Pattern recognition and generalization:** The participants worked with the geometric sequences arising out of the attributes of the fractals and generalized these patterns symbolically by deriving mathematical formulae, both recursive and explicit. Also, identifying attributes of the  $n$ th stage in terms of the  $(n-1)$ th stage or using copies of the  $(n-1)$ th stage to build the  $n$ th stage led to understanding self-similarity and fractal dimension. This enabled them to visualize recursion while also expressing it symbolically. In the birthday problem, observing patterns in the expressions of probabilities of birthday matches in small group sizes provided insight into the general formula. Therefore, we generalized the identified patterns in both tasks.

**Data generation:** The pre-service teachers incorporated the recursive and explicit formulae (for attributes such as area and perimeter of the fractals) into the spreadsheet. Using this approach, they created meaningful numerical data, which further helped them to observe the properties of the fractals at the higher stages even without pictorial representations. In the case of the Birthday Paradox, simulation helped to quickly generate sets of 60 randomly generated birthdays. They were able to verify the paradox by scrolling through these data sets.

**Abstraction:** As participants worked with pictorial and symbolic representations, they made connections between geometric representations of fractals and algebraic expressions, while the spreadsheet enabled them to visualize the fractals numerically and graphically at higher stages. Here participants could see the benefits of multiple representations in action. Feedback taken from participants at the end of the fractal tasks revealed that their understanding of geometric sequences was strengthened and that they found the topic more relevant. Arriving at the formula for the probability of a birthday match for any number of people led to a symbolic representation of the birthday paradox. Further, participants were able to mathematically justify the reason for finding a birthday match among 60 people, while logical reasoning tells us that the number should be 367. Working through this task strengthened my understanding of several foundational concepts in probability theory. Hence, these open-ended tasks enabled by spreadsheets highlight the potential for integrating CT practices in the mathematics classroom. They provided a natural context for engaging in the processes of visualization, recursion, iteration, generalization, and analyzing algorithms, which are essential from computational as well as mathematical standpoints. Further, as argued by Pea (1987), technology in the form of spreadsheets acted as an amplifier as it increased the scope of the tasks by providing access to numerical data that could not have been obtained manually. This was evident from the participants' responses during classroom discussions and feedback taken at the end of the tasks. With regard to the fractal explorations, many participants expressed that "the numerical and graphical outputs provided by the spreadsheet led to a deeper understanding of the fractal, which

could not have been obtained manually or through pictorial representations." In the birthday paradox investigation, they shared, "We can't keep gathering groups of 60 people to check for a repeated date. That would be impossible. However, the spreadsheet instantly generates the dates, which aids in verifying the paradox. Technology also played the role of a reorganizer, in the sense that each task had a different trajectory of exploration. It also gave access to higher-level concepts by affording the possibility to explore the problem through multiple representations—numerical, symbolic, and graphic. In general, by working through the tasks, the pre-service teachers developed the capability of using the spreadsheet meaningfully for exploration. They also appreciated the power afforded by the spreadsheet in the investigations. While attempting the tasks, they engaged in processes such as looking for patterns and invariances within data, making conjectures, selecting between multiple representations, simplifying or generalizing aspects of the problem being explored, and identifying new opportunities for exploration. All these are important skills for developing CT and MT. About 28 participants rated the CT-MT tasks as meaningful and relevant. One participant mentioned, "These tasks are fascinating, and they make the topics so interesting. This is different from the math I learned at school." This study therefore emphasizes that appropriately designed CT-MT tasks, founded on the symbiotic relationship between MT and CT, can lead to deeper mathematical learning while fostering meaningful use of technology at the same time. Further, the positive feedback from the pre-service teachers who participated in the study and the evidence of their engagement in the tasks provide a compelling argument for incorporating such CT-MT tasks in foundational mathematics courses in TEPs.

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## Collaborative Learning: Perceptions of Teacher Educators

Diksha Verma\* and Kuldeep Singh Katoch

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### Abstract

*This study focused on collaborative learning (CL) techniques and whether and how teacher educators implement them in their teaching practices. Their general perception of the effectiveness of CL techniques, how they choose a particular technique over another, and the challenges in implementing these techniques are discussed. A questionnaire with mixed items was developed and utilized for data collection and responses from 28 teacher educators were computed using a simple percentage method for closed items and content analysis in the case of open-ended items. The study identified significant challenges in implementing collaborative learning (CL) in teacher training. This study shed light on the present practices of CL in teacher education programs and how teacher educators' pedagogical orientation towards CL techniques is important so that our pre-service teachers can learn these from their teachers and can implement these techniques effectively in their future classes.*

**Keywords:** Collaborative Learning (CL), Collaborative Learning Techniques, Teacher Educators, Pre-service Teacher Education, CL and NEP (2020), CL and NCFTE (2009)

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### Concept of collaborative learning

In the evolving landscape of education, the call for collaborative learning has grown increasingly resonant. This pedagogical approach, emphasizing shared learning experiences, teamwork, and collective problem-solving, is not a recent phenomenon. Its roots run deep, echoing in ancient practices like the Indian Gurukul system (around 1500-500 BCE), where disciples lived and learned together, embodying collaboration and cooperation. Similarly, in Western educational thought, the seeds of CL were sown in the mid-20th century, influenced by burgeoning theories of personality development, group dynamics, and social cognitive mechanisms. Luminaries like Dewey, with his advocacy for social learning, Lewin's social interdependence theory (Lewin, 1945, p. 18), Piaget's emphasis on social interaction for intellectual development

(Piaget, 2001, p. 98-99), and Vygotsky's view of learning as a socially mediated process (Vygotsky, 1978, p. 101-102) laid the groundwork for CL's emergence. By the late 1980s, CL had evolved further, embracing technology with the advent of Computer-Supported Collaborative Learning, thereby expanding its reach and applications.

Despite its long history, CL is characterized by diverse interpretations and implementations. While some scholars define it narrowly as learning in pairs or small groups, others adopt a broader perspective, encompassing larger communities (Dillenbourg, 1999; Johnson & Johnson, 2002). This definitional variance poses a challenge, particularly in fostering positive group dynamics, a crucial element for effective CL regardless of group size (Davidson, 2012, p. 16). Effective CL hinges on well-managed group interactions where each member actively contributes to



and benefits from the collective learning process.

Further complicating the conceptual landscape is the relationship between collaborative and cooperative learning. These terms are often used interchangeably, sometimes positioned as two ends of a spectrum, with cooperative learning representing a more structured approach and collaborative learning a less structured one. However, some scholars argue for a clear distinction between the two, with cooperative learning grounded in the authority of individualism and competitiveness, while collaborative learning draws upon the authority of shared wisdom (Bruffee, 1995, p. 92). Despite these nuances, it's important to recognize that cooperative and collaborative learning share more commonalities than differences. Both emphasize peer interaction and active engagement with intellectual challenges, contrasting sharply with traditional teacher-centered lectures. Furthermore, both are inherently student-centered and rooted in shared theoretical assumptions: learning as an active, social, and constructive process; the importance of learner diversity; the significance of rich learning contexts; and the recognition of the emotional and personal dimensions of learning (Cole & Vygotsky, 1978, p. 20–22; Dillenbourg, 1999; Faroun, 2020).

Interestingly, in the realm of computer-supported learning environments, the distinction between collaborative and cooperative learning appears to blur. This convergence highlights the adaptable nature of collaborative learning, making it suitable for diverse educational settings and learner needs. Smith and MacGregor (1992, p. 14–25) capture this essence, emphasizing the infinite possibilities of CL and urging educators to embrace continuous innovation in its implementation. They offer a range of techniques, including problem-based learning, cooperative activities, and learning communities (Smith and MacGregor, 1992, p. 16), showcasing the versatility of this pedagogical approach.

## Policy context

The National Education Policy (NEP) 2020 advocates for interactive classroom sessions with collaborative and exploratory activities to enhance critical skills among learners (NEP, 2020, p. 13). It encourages collaboration among parents, teachers, and stakeholders to improve the school environment, giving teachers more autonomy to select instructional methods that cater to diverse student needs (NEP, 2020, p. 21). Furthermore, the NEP 2020 envisions the use of collaborative learning techniques in B.Ed. programs to better prepare future teachers (NEP, 2020, p. 23).

Similarly, the National Curriculum Framework for Teacher Education (NCFTE) 2009 highlights the necessity for teachers to work collaboratively, promoting self-criticism and reflective practices among prospective teachers (NCFTE, 2009, p. 24). It recommends providing ample opportunities for teacher trainees to engage with learners and work in groups, fostering the development of collaborative skills (NCFTE, 2009, p. 54).

Despite these policy recommendations, there is a gap between the intended collaborative learning practices and their implementation in teacher education programs, particularly in regions like Himachal Pradesh. This study aims to explore the perspectives of teacher educators at distance education institutes regarding collaborative learning. It seeks to identify the barriers to effective implementation and propose strategies to enhance the practice of CL in teacher education.

## Review of existing literature

The review of existing literature validates the importance of studying teacher educators' attitudes toward collaborative learning techniques. Research by Umbach and Wawrzynski (2005) supports the idea that active and cooperative teaching techniques lead to heightened student engagement and improved learning outcomes. Educators increasingly favour

collaborative learning methods due to their efficacy in fostering active participation and enhancing student retention (Lau, 2003). However, studies also highlight challenges in implementing these techniques. Ruys et al. (2010) found that teacher educators rarely use collaborative learning techniques, and Thanh (2011) identified barriers such as large class sizes and workload division.

Despite these challenges, Pazzi et al. (2023) noted that teachers are generally willing to implement collaborative learning, though certain techniques like Pyramid and Jigsaw are less frequently used. The study underscores the need for evidence-based teacher training and support to design and implement quality collaborative learning environments.

In conclusion, the pedagogical orientation of teacher educators towards collaborative learning techniques is crucial for pre-service teachers to learn and implement these techniques effectively in their future classes. The challenges faced by teacher educators in implementing collaborative learning techniques must be addressed through evidence-based teacher training and support to design and implement quality learning environments (Ruys et al., 2010; Thanh, 2011; Pazzi et al., 2023).

## Rationale of the study

This study aims to explore the attitudes and practices of teacher educators in Himachal Pradesh towards collaborative learning techniques. Given the theoretical support for collaborative learning and its endorsement in national policies, it is crucial to understand the practical challenges and opportunities in implementing these techniques. This study specifically targets teacher educators in Himachal Pradesh due to their pivotal role in shaping the pedagogical practices of future teachers. As these future teachers will directly impact the learning experiences of children in the region, it is crucial to equip them with a diverse repertoire of teaching

methods, including collaborative learning techniques.

By focusing on teacher educators, this study aims to understand their current practices and perceptions regarding collaborative learning. This understanding can inform the development of targeted professional development programs and interventions that enhance teacher educators' capacity to effectively model, teach, and promote collaborative learning approaches among pre-service teachers. Ultimately, this ripple effect can contribute to a more engaging, interactive, and effective learning environment for students in Himachal Pradesh.

## Research Objectives

The current study was conducted with the following aims in mind:

1. To find out the perception of teacher educators towards the use of collaborative learning in classrooms.
2. To find out perceived barriers to the implementation of collaborative learning in classrooms.

## Methodology

**Method:** A descriptive survey design was used to achieve the above-said objectives of the study. This design is particularly responsive to the needs of the study as it helps to systematically describe the state of collaborative learning (CL) among teacher educators in Himachal Pradesh. By using a descriptive approach, the study aims to capture the current practices, perspectives, and barriers associated with use of collaborative learning in classrooms in a comprehensive manner.

**Population and Sample:** The target population for this study comprised teacher educators in Himachal Pradesh, India. Due to the difficulty of accessing a comprehensive list of all teacher educators in the state, a convenience sampling method was employed. The researcher initially distributed the survey questionnaire to known teacher

educators within their personal WhatsApp network, located in Himachal Pradesh. These individuals were then encouraged to share the questionnaire with other teacher educators within their professional contacts, expanding the reach of the survey. The use of WhatsApp for distribution allowed for efficient and rapid collection of data, reflecting a diverse yet specific segment of the target population. Within five days, 40 completed responses were received. Among these, 9 respondents were not familiar with the concept of collaborative learning, 3 responses were not filled and were not providing any insight, so their responses were not considered for the analysis. Hence, the final sample for this study comprised of 28 teacher educators in Himachal Pradesh. The majority of these respondents were female, making up 86 per cent of the total, while 14 per cent were male. In terms of teaching experience, 58 per cent had more than 5 years of experience, 18 per cent had between 3 and 5 years, and the remaining 25 per cent had less than 3 years of experience. It is important to acknowledge that this convenience sampling method may introduce bias, as the sample is likely to reflect the characteristics and perspectives of the researcher's network and those within close social proximity. Also, the findings of this study may not be applicable to the entire population of teacher educators in Himachal Pradesh. However, they offer valuable initial insights that can inform further research.

**Tools and data collection:** A survey questionnaire having mixed items was prepared and converted into Google Forms by one of the researchers while the other checked for its content validity in the context of the study.

## Questionnaire Content

It was divided into the following two sections

- **Section 1: Respondent Demographics**

This section gathered demographic information, including age, gender, teaching experience (categorized as 3 years to 5+ years), and courses taught.

- **Section 2: Collaborative Learning Practices and Perceptions**

This section focused on participants' experiences and perspectives on collaborative learning, having the following items

- Are you familiar with the concept of collaborative learning? (close-ended)
- Do you feel CL is beneficial for improving classroom learning? (open-ended)
- Have you ever used CL in the classroom? (close-ended)
- What is your experience of using CL in the classroom? Share one instance of using CL. (open-ended)
- What are some barriers to using CL in the classroom? (open-ended)

## Analysis of Data

Close-ended items were analyzed using a simple percentage method and for open-ended questions, thematic analysis was used. After the final analysis the results were discussed with another researcher from the same field of research who was not a part of the study, to ensure the consistency in generated themes. The final result is depicted below.

## Result

### Objective 1: Perception of teacher educators towards the use of collaborative learning in classrooms

#### w.r.t perception towards the benefit of CL in improving classroom learning

All the teacher educators (100 %) agreed that collaborative learning improves students' learning. Teaching experience-wise variations were not found among teacher educators towards the perceived effectiveness of CL in improving students' learning.

#### w.r.t Practice of CL in classrooms

82 per cent (23 teacher educators) confirmed using CL in the classroom, while

18 per cent (5 teacher educators) were on “maybe” status and no one reported not using it.

Teaching experience-wise distribution of practicing CL in the classroom is given in Figure- 1

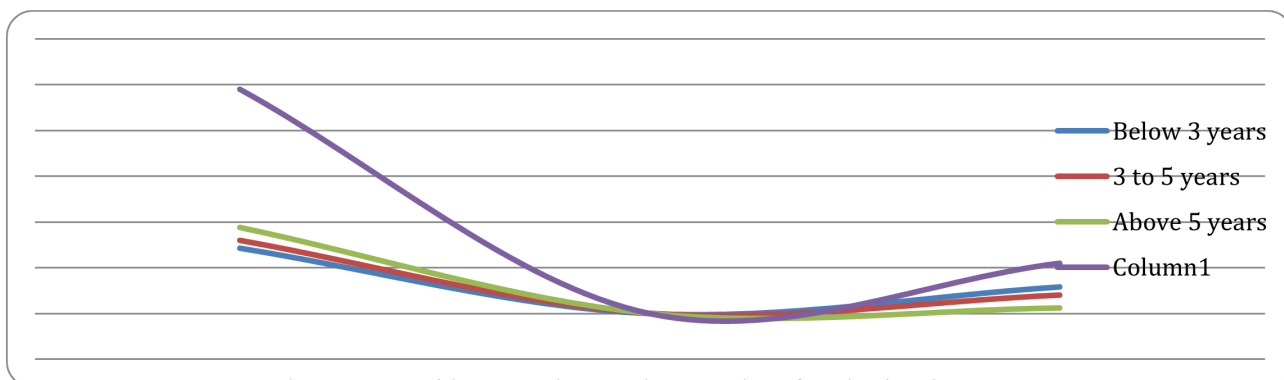


Figure 1: Teaching experience-wise practice of CL in the classroom

**w.r.t Experience of using CL in the classroom**

The result provides the analysis of content in the following two main themes:

**Theme 1:** preferred CL technique and

**Theme 2:** the reason for choosing CL technique

**Theme 1: Preferred CL techniques**

The analysis revealed six subthemes representing the collaborative learning techniques preferred by the teacher educators. These are T11- Discussion,

T12-Brainstorming, T13- Think-Pair-Share, T14- Team-Pair-Solo, T15-Simulation, T16- Jigsaw emerged from content analysis. Further Maximum teacher educators used discussion (82%) and brainstorming (75%) techniques for classroom teaching. Some teacher educators also used the Think-pair-share (29%) technique of collaborative learning. Techniques like Team-Pair-Solo, Simulation, Jigsaw were also preferred by less but equal number (4%) of educators in their classroom teaching (Figure-4)

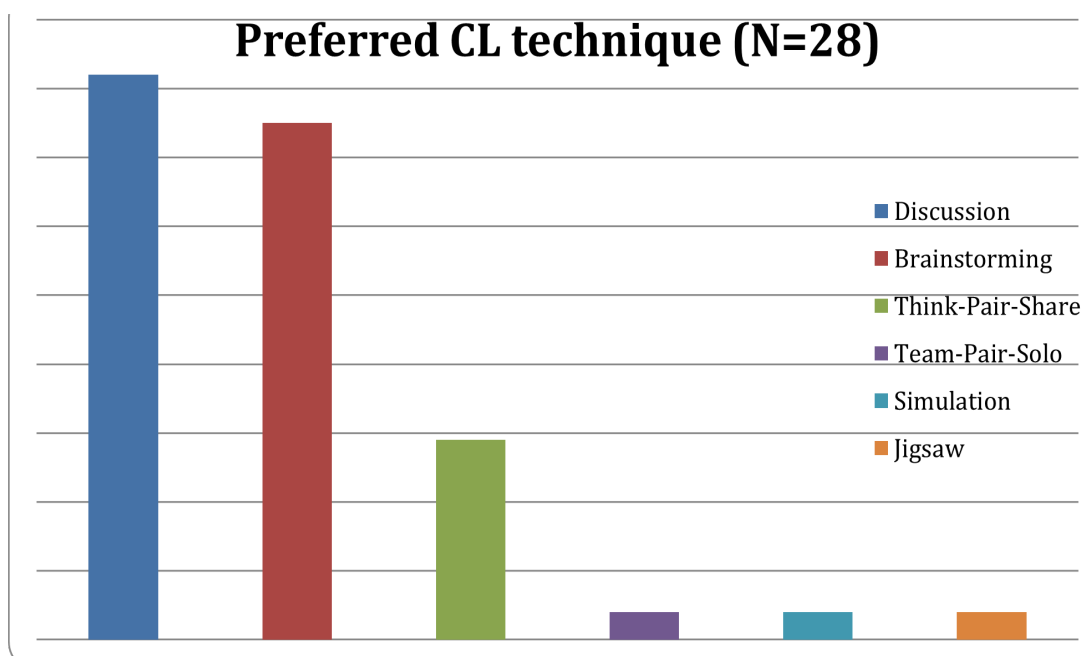


Figure 4: Preferred CL technique

The distribution of preferred techniques according to the teaching experience of the teacher educators is illustrated in Figure 4A:

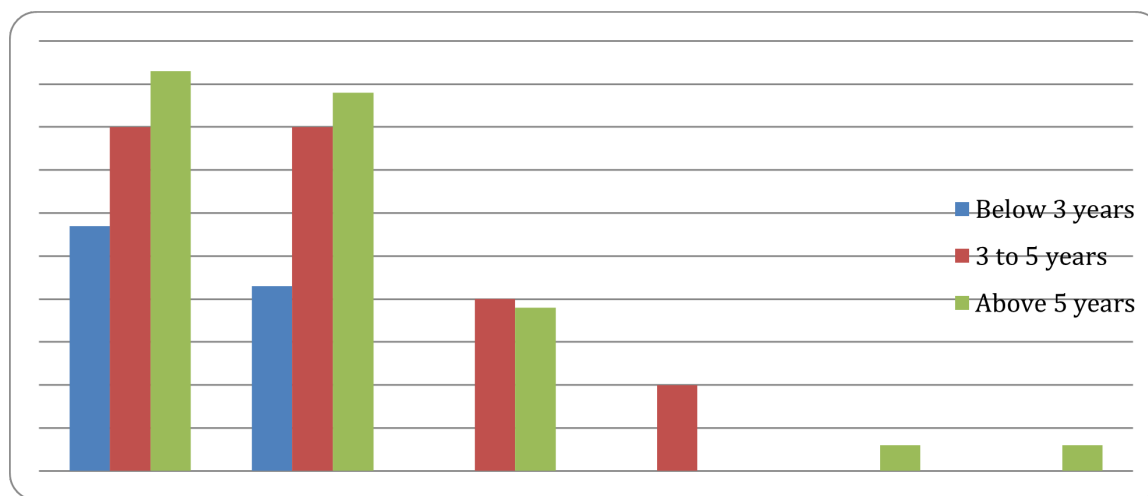


Figure 4A: Teaching experience-wise preferred CL technique

## Theme 2: Reason for preferring one technique over another

From the experience they shared, five subthemes i.e., T21- Enhance Student

Engagement, T22- Holistic Skill Development, T23- Strengthen deeper learning, T24- Ease of Use and T25: Social Development and Confidence emerged. These are shown in the following Table 2 with codes and examples

Table 2: Reason for preferring technique

Sub Theme	Codes	Example Responses
<b>T21: Enhance Student Engagement</b>	Promotes engagement and better learning outcomes	"Students become more involved in the teaching-learning process."
	Enhances teamwork, fosters group learning, encourages healthy competition	"This type of learning is suitable...as it enhances active participation."
<b>T22: Holistic Skill Development</b>	Encourages creativity, develops critical thinking, improves analytical thinking	"Brainstorming helps them to think creatively. I have used this technique many times in my class to improve the analytical thinking and critical thinking of my students."
	Enhances communication, Prepares for real-life scenarios	"Discussion helps students to develop their communication skills and also prepare them for real life."
	Strengthens leadership skills, promotes self-management, enhances thinking	"Help in strengthening a good level of thinking and ensure the development of communication skills, leadership skills, and self-management skills."

<b>T23: Strengthen Deeper Learning</b>	Enhances problem-solving abilities, develops intellectual capacity	"This helps the students in enhancing their intellectual ability as well as problem-solving ability."
	encourages deeper reflection, promotes critical analysis	"These techniques help students to think deeply about the subject matter and reflect on their learning process."
	Supports understanding of complex concepts, facilitates knowledge integration	"Techniques like discussion and brainstorming help students integrate various concepts and develop a deeper understanding of the subject matter."
<b>T24: Ease Of Use</b>	Easy implementation, classroom-friendly	"These techniques are convenient to do in the classroom."
	Facilitates online interaction, adapts to online platforms	"We can try to share their experiences as well as their thoughts and knowledge on online platforms like Zoom, Meet, and Google Classroom."
	Ensures individual participation, classroom interaction	"If I talk about offline mode, we can ensure their individual participation."
<b>T25: Social Dependence And Confidence</b>	Enhances social interaction, boosts self-esteem and confidence	"Teamwork by the group members makes them confident and socially dependent."
	Encourages collaboration, develops interpersonal skills	"Collaborative techniques help students improve their social skills and ability to work effectively with others."

### Objective 2: Perceived barriers to the implementation of collaborative learning in classrooms

The following six themes emerged after the analysis of content. These are Theme 1: Constraints Posed by Time Duration of

Class, Theme 2: Readiness and Motivation of Students, Theme 3: Inadequacy of Training and Competency, Theme 4: Managing Group Dynamics, Theme 5: Workload, Theme 6: Infrastructure and Resources. Themes/codes/examples are given in the following table.

**Table 3: Barriers to using CL in the classroom**

Theme	Code	Example Responses
<b>Th1: Constraints Posed By Time Duration Of Class</b>	Time consumption	"It is time-consuming and sometimes acts as a barrier in completing the syllabus in time."
	Lengthy syllabus	"Lengthy syllabus can be a barrier, as it limits the time available for collaborative activities."

Th2: Readiness And Motivation Of Students	Lack of readiness	"Lack of readiness, lack of confidence, and lack of good communication skills."
	Lack of motivation	"I found students and teachers have a lack of interest and lack of open-mindedness."
Th3: Inadequacy Of Training And Competency	Insufficient training	"...for me, lack of proper training is a challenge in using it."
	Competency issues, poor planning	"Inadequacy of training and competency", " Sometimes not able to achieve desired objectives if not planned properly or in advance"
Th4: Managing Group Dynamics	Dominance by some students	"Some students or a group may dominate the discussion."
	Group conflicts	"Because of many students with different thinking abilities, there are always conflicts and disagreements."
Th5: Workload	Workload	"The workload is a significant barrier, making it challenging to implement collaborative learning effectively."
Th6: Infrastructure And Resources	Lack of infrastructure	"Physical infrastructure is not proper for conducting group activities. ."
	Technology barriers	"Technology barriers, communication barriers are there specially in online mode..."

## Discussion of result

The current study provides an insightful analysis of teacher educators' perceptions and practices regarding collaborative learning (CL) techniques in classrooms. The findings align with previous research, highlighting both the benefits and challenges associated with the implementation of CL methods.

### Perception Towards the Benefit of CL in Improving Classroom Learning

All participating teacher educators unanimously agreed that collaborative learning improves student learning. This consensus reinforces the findings from Lau (2003) and Umbach and Wawrzynski

(2005), who emphasized the effectiveness of active and cooperative teaching methods in enhancing student engagement and learning outcomes. The unanimity among educators in recognizing the value of CL suggests a strong acknowledgement of its role in fostering a more interactive and engaging learning environment, which is crucial for student retention and deeper understanding. Importantly, no significant teaching experience-wise variations were found in perceived effectiveness, indicating that both novice and experienced educators equally appreciate the benefits of CL

### The practice of CL in Classrooms

The study revealed that a significant majority (82%) of teacher educators actively use CL

in their classrooms, with none reporting complete non-use. This high adoption rate contrasts with the findings by Ruys et al. (2010), who noted the infrequent use of CL techniques by teacher educators. This discrepancy may indicate a growing trend towards the acceptance and integration of collaborative methods in educational practices. However, the 18 per cent of educators who were uncertain about their use of CL (“maybe” status) suggests that while many educators recognize the benefits, some still face uncertainties or barriers in their consistent application. Addressing these barriers could further increase the effective use of CL techniques.

Experience-wise comparisons indicated that more experienced educators (with over five years of teaching experience) were more likely to implement CL techniques consistently compared to their less experienced counterparts. This trend suggests that experience and familiarity with classroom dynamics may play a role in the confident application of collaborative methods.

### **Experience of Using CL in Classrooms**

The analysis highlighted two primary themes: preferred CL techniques and reasons for choosing specific techniques. The study identified six preferred CL techniques among teacher educators — discussion, brainstorming, think-pair-share, team-pair-solo, simulation, and jigsaw. Discussion and brainstorming were the most commonly used techniques, supporting Pazzi et al. (2023)’s findings that these methods are favored due to their simplicity and effectiveness in promoting student engagement. Techniques like team-pair-solo, simulation, and jigsaw, although less frequently used, still play a crucial role in diversifying instructional methods and catering to different learning styles.

The reasons for preferring certain CL techniques over others were categorized into five subthemes — enhancing student

engagement, holistic skill development, strengthening deeper learning, ease of use, and social dependence and confidence. Techniques that promote active participation and teamwork were highly valued, consistent with Umbach and Wawrzynski’s (2005) emphasis on active learning environments. CL techniques were also praised for fostering creativity, critical thinking, and communication skills, aligning with findings by Thanh (2011) on the comprehensive benefits of collaborative methods. The ability of CL techniques to enhance problem-solving abilities and intellectual capacity underscores their role in promoting deeper understanding and critical analysis of subject matter. The adaptability of CL techniques for both online and offline settings highlight their practical utility, supporting Pazzi et al. (2023) call for evidence-based teacher training to facilitate effective implementation. Additionally, the development of social skills and confidence through collaborative activities further validates the pedagogical value of these methods in preparing students for real-life interactions and teamwork.

Experience-wise analysis revealed that educators with more teaching experience tended to prefer techniques such as discussion and brainstorming, possibly due to their straightforward implementation and familiarity. In contrast, less experienced educators showed a more varied preference for techniques like think-pair-share and simulation, which might be attributed to recent training and exposure to diverse methods during their professional development.

### **Perceived Barriers to the Implementation of Collaborative Learning in Classrooms**

The study also identified six major themes regarding perceived barriers to the implementation of CL techniques: constraints posed by the time duration of the class, readiness and motivation of students, the inadequacy of training and competency,



managing group dynamics, workload, and infrastructure and resources

**1. Constraints posed by Time Duration of Class:**

Many educators highlighted time consumption and the challenge of completing a lengthy syllabus as significant barriers. This issue is echoed in the literature, where the intensive time requirement of CL activities is seen as a hindrance to their broader adoption (Thanh, 2011).

**2. Readiness and Motivation of Students:**

A lack of student readiness and motivation was noted as a barrier, with educators citing students' lack of confidence, communication skills, and open-mindedness. This aligns with previous studies indicating that student preparedness and interest are critical factors in the successful implementation of collaborative learning (Ruys et al., 2010).

**3. Inadequacy of Training and Competency:**

Insufficient training and competency issues were major barriers, as highlighted by educators who felt they lacked the proper training to implement CL techniques effectively. This is consistent with findings by Ruys et al. (2010) and Pazzi et al. (2023), emphasizing the need for comprehensive training programs to equip educators with the necessary skills and knowledge.

**4. Managing Group Dynamics:**

Managing group dynamics, including dominance by some students and group conflicts, was another significant barrier. Educators noted that varying abilities and personalities within groups often led to conflicts and unequal participation, reflecting the complexities of facilitating effective group work (Thanh, 2011).

**5. Workload:**

The workload associated with preparing and managing CL activities was cited as a barrier, with educators indicating that the additional effort required made it challenging to implement these techniques regularly. This aligns with the general sentiment in the literature that workload considerations can deter educators from

adopting innovative teaching methods (Pazzi et al., 2023).

**6. Infrastructure and Resources:**

Finally, inadequate infrastructure and resources, including physical space and technology barriers, were significant obstacles. Educators highlighted the need for proper facilities and technological support to conduct group activities effectively, especially in online settings. This finding is consistent with studies that identify the need for supportive infrastructure to facilitate collaborative learning (Ruys et al., 2010).

The findings underscore the importance of supporting teacher educators in overcoming barriers to implementing CL techniques, such as large class sizes and workload division, as noted by Thanh (2011). Providing targeted training and resources can help educators design and manage collaborative activities more effectively, ensuring that pre-service teachers are well-equipped to use these methods in their future classrooms. Teachers face challenges in classrooms. Some challenges like lack of time can be easily tackled with the choice of proper CL technique. In-class or out-of-class activities can be helpful if explored. Moreover, the study highlights the need for continuous professional development and the sharing of best practices among educators to enhance the implementation of diverse CL techniques. By addressing the challenges identified in this and previous studies (Ruys et al., 2010; Pazzi et al., 2023), educational institutions can foster a more collaborative and engaging learning environment, ultimately benefiting both educators and students.

## Conclusion

Collaborative learning is an activity done in groups of various sizes (depending on the nature of content to be learned) intended to learn or understand a concept. Maintaining group dynamics is important while conducting any CL session. While collaborative learning is not prevalent in many institutions, it helps to satisfy many

goals when planned carefully. It helps learners to become constructively and actively involved in coursework topics, to feel responsible for studying, and to improve the spirit of teamwork among the participants. As these techniques can provide a good base for an inclusive learning situation, teachers must be explorative and experimental to use these teaching techniques. Its evaluation must be explored by teachers for knowledge creation. To overcome barriers to collaborative learning, teacher educators can ensure thorough preparation and planning, developing a deep understanding of various techniques, and identifying suitable content. Effective classroom management involves ensuring equal student participation and addressing the needs of shy or reluctant students. Allocating specific sessions outside the regular timetable can alleviate timing constraints. Understanding student interests and individual differences boosts motivation and engagement while emphasizing communication skills builds confidence. Providing high-quality materials and creating a language-rich environment is crucial. The continual motivation of students

and teachers through positive reinforcement and proactive adoption of techniques fosters a supportive atmosphere. Institutional support through regular workshops, training, and curriculum revisions integrates collaborative learning as a core component. Promoting collaborative learning creatively ensures holistic development, and teacher educators should commit to consistent implementation and continuous improvement. Dedicated weekly sessions for collaborative learning provide ample focus and time for these activities, leading to enhanced educational outcomes and overall student development.

In conclusion, the study contributes to the growing body of literature on collaborative learning by providing empirical evidence of its perceived benefits, preferred techniques, and practical challenges. By addressing these insights through targeted interventions, educators can enhance the quality and effectiveness of collaborative learning in classrooms. The use of such techniques in classrooms will give prospective teachers exposure to various teaching techniques that will help them in future.

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# Investigating the Role of Home Learning Environment in Shaping Children's Literacy Development: A Comparative Analysis of Two Families in Rural India

Sanjib Malo

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## Abstract

*'Home learning environment' refers to the learning activities occurring within the four walls of one's house, encompassing both formal and informal values, beliefs, and attitudes shared between parents and children. Napoli and Purpura (2018) delineate this environment as comprising the home literacy environment (HLE) and the home numeracy environment (HNE), both of which significantly impact children's literacy development. Through a qualitative research approach, this paper investigates the dynamics of the home learning environment and its influence on literacy development in children in the context of India. The findings underscore the pivotal roles of parenting practices and home learning environment in fostering essential competencies among young children. Furthermore, the study highlights a noticeable discrepancy between middle-class and lower middle-class families, making it imperative for community members, educators and NGOs to provide support tailored to the latter group's needs*

**Keywords:** literacy, home learning environment, parenting practices, children's literacy development, socio-economic disparity

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## Introduction

Growth and development take place in the lives of children in multiple contexts, such as parenting and home environment. They play a significant role in children's well-being and affect their families over time (Bronfenbrenner, 1986). In this instance, parents are primarily responsible for structuring their children's home environment (Morin, et al., 2016). It creates circumstances for improving children's learning (Heckman, 2006). The home environment of a child can be described by the concept of 'capital', which is often studied in the fields of economics and sociology. To define the home environment, in view of the context of the study, the concepts of three different types of capitals that constrain parenting, such as economic capital (the kind of monetary resources available at

home), human capital (the educational qualifications of parents) and social capital (the number of relationships and linkages with other individuals) are used. Their role in the development of their children's literacy and numeracy is significant (Becker & Tomes, 1994).

In this study, the definition of the term 'literacy' is limited to a person's ability or skill to read and write simple sentences with comprehension in a language one is familiar with and do basic arithmetic operations. This is considered to be the conventional definition of literacy, accepted and practised across all developing and underdeveloped countries. However, it may not be applicable in developed countries. For example, in the study, titled 'International Adult Literacy Survey' (IALS), conducted by the Organisation for Economic Cooperation and Development (OECD) in 1997, the concept of literacy was

not conceived conventionally as involving the ability to read and write but as involving a range of activities of the highest level, involving problem-solving, reasoning and other higher-level cognitive skills drawn from information in printed texts. This definition is highly related to the complex information processing skills of an individual, which may not be appropriate in the context of marginal communities residing in developing and underdeveloped countries. Hence, it can be said that there is no universal argument on how to define literacy, and not all countries use the same definition to classify a person as literate. Literacy skills, such as reading, writing and doing basic arithmetic operations, can be acquired both at home and in educational settings like schools (Morin, et al., 2016). Children, who develop these skills early in life, are better able to take advantage of learning opportunities at a later stage (Brooks-Gunn, et al., 2014).

### **Home Learning Environment and Its relation with Children's Literacy Development**

'Home learning environment' refers to the learning activities that parents and children do together at home. It comprises a plethora of formal and informal values, beliefs, and attitudes depicted in the provisions, resources and socialisation experiences provided by parents to their children (Dearing & Tang, 2009). According to Napoli and Purpura (2018), the home learning environment is frequently conceptualised as consisting of two domains—home literacy environment (HLE) and home numeracy environment (HNE). It plays a significant role in the literacy development of children (Silver, et al., 2020; Mol & Bus, 2011; and Scarborough & Dobrich, 1981). Studies reveal that HLE is related to children's literacy development (Mol & Bus, 2011; Evans & Shaw, 2008; and Scarborough & Dobrich, 1981) and HNE with numeracy development (Daucourt, et al., 2021; Susperreyguy, et al., 2020; and Klemans, et al., 2012). The home learning

environment is greatly affected by the parental education (Silinskas, et al., 2020; Esmaeeli, et al., 2018; Thompson, et al., 2017; and Purpura & Reid, 2016).

In research studies on HLE and HNE, activities at home have been classified separately (Silver, et al., 2020; Mol & Bus, 2011; Sénéchal & LeFevre, 2002; and Scarborough & Dobrich, 1994). As part of their home literacy model, Sénéchal and LeFevre (2002) established two categories of HLE activities—formal and informal. Formal activities are code-related activities that aim to instruct children. Informal activities are various playful activities, involving print or numbers, for example, shared reading or measuring ingredients while cooking. There is growing evidence that both formal and informal activities contribute to the development of literacy and numeracy skills (Soto-Calvo, et al., 2020; and Sénéchal & LeFevre, 2014) and that different practises in the home environment may correlate with children's skills at different ages (Thompson, et al., 2017).

There are various factors associated with the home learning environment that affect children's literacy development. According to the study, the major factors that affect children's literacy development are family's learning background, reading and numerical activities, and home resources. The other factors include the reading and numeracy interests of children and the parent-child relationship (Kumar & Behera, 2022; Tiwari, 2022).

### **Familial Risk for Literacy Difficulties and Its Relation with the Development of Literacy Skills**

The term 'familial risk group' is employed to characterise a cohort of children whose parents grapple with literacy difficulties (Salminen, et al., 2021). This delineation suggests that there exists a correlation between parental literacy challenges and the likelihood of their children encountering similar difficulties. A critical aspect of

this issue is the observation that literacy difficulties are prevalent within families belonging to marginalised groups (Snowling & Melby-Lervåg, 2016). Consequently, children born into families where parents face literacy challenges have an elevated probability of developing comparable difficulties, highlighting the intergenerational nature of this issue (Salminen, et al., 2021).

The magnitude of the challenge faced by children in this group is underscored by empirical evidence. Research studies conducted by Puolakanaho, et al. (2007); Van Bergen, et al. (2014); Hulme, et al. (2015); Torppa, et al. (2015) and Esmaeli, et al. (2019) demonstrate that children within the group are four to 10 times more likely to experience literacy difficulties compared to their counterparts who do not belong to this risk group. This statistical insight reinforces the substantial impact of familial risk on children's literacy outcomes.

Despite the significance of these findings, it is noteworthy that literature on this subject remains relatively limited. Shalev and Gross-Tsur (2001) and Soares, et al. (2018) point out the scarcity of pertinent research, indicating a gap in the understanding of nuanced dynamics between parental literacy difficulties and children's development within the group. Nevertheless, the available literature suggest a discernible influence of parental literacy challenges on children's development.

The interplay of hereditary factors within the group is a subject of contemplation (Esmaeli, et al., 2019). The proposition that hereditary familial risk may exert a direct impact on children's abilities is posited, adding a genetic dimension to the complex relationship between parental literacy difficulties and children's outcomes (Hamilton, et al., 2016; Dilnot, et al., 2017; Esmaeli, et al., 2018 and Salminen, et al., 2021). Moreover, the role of parental literacy skills extends beyond genetic influence, as evidenced by studies conducted by Hamilton, et al. (2016); Dilnot, et al. (2017) and Esmaeli, et al. (2018). These studies emphasise the

interactive role of parental literacy skills with the home learning environment, suggesting a multifaceted mechanism through which familial risk influences children's literacy development.

A crucial implication of these dynamics is the potential detriment to the home learning environment for families within the group lacking adequate parental literacy skills. The absence of proficient literacy skills among parents may hinder their ability to provide an encouraging and conducive learning environment to children. This insight underscores the importance of addressing not only the direct impact of familial risk but also the broader context of parental literacy skills and their interaction with the home learning environment.

## Context and Research Questions

The demographic landscape of India reveals a stark reality where 68.8 per cent of the total population, translating to 833 million people, resides in rural areas (Census of India, 2011). Within these village settings, a substantial number of families, particularly from marginalised communities, grapple with sub-optimal socio-economic conditions, encountering persistent financial challenges. This economic strain often becomes a formidable barrier, discouraging parents from prioritising their children's education. Consequently, children from such families find themselves engaged in household chores or employed in local shops, forsaking educational opportunities. The detrimental impact of these circumstances is evident from the high dropout rates among these children, as they are compelled to abandon studies due to the absence of essential opportunities and support at home. The struggle faced by families in marginalised communities creates a cycle of educational disadvantage, perpetuating limited access to learning resources and hindering the development of literacy skills. In contrast, children belonging to highly educated families experience a markedly different reality. The

conducive learning environment provided by such families becomes a catalyst for their academic success. These children benefit from supportive parental involvement, educational resources, and a mindset that values and encourages learning. Recognising this stark dichotomy, efforts were made to unravel the intricate dynamics at play in the context of home learning environment and their impact on children's literacy development in India. Here, the objective raised three questions, in particular, that need to be addressed—how do the socio-economic conditions of the families look? Do parents have literacy difficulties? What role does the home learning environment play in children's literacy development? Methodology

## Methodology

### Research Design

The study was crafted with a qualitative research approach tailored to its research questions. To delve into the intricacies of the home learning environment's impact on children's literacy development, case study method was employed. The in-depth examination focused on comparing the findings derived from the data collected from different families.

### Participants

Two children (A and B) and their parents were selected for the study, using purposive sampling technique. The children were selected based on their previous year's academic performance at school. A came from a lower middle-class family, whose performance was low compared to his peers at school; while B belonged to a middle-class family, who performed better than his peers. A studied at a government school and B went to a private school. In this study, the term 'parents' is restricted to the children's mothers. Both the families lived in the same village located in the Goalpara district of Assam.

## Tools

Questionnaire, observation techniques and semi-structured interviews were used for data collection. These tools helped to delve into the socio-economic backgrounds of the families (semi-structured interview schedule), and how parents' behaviour and home environment affected children's literacy development (questionnaire, printed texts, observation techniques and semi-structured interview schedules).

## Data Analysis Technique

To analyse and interpret the data, thematic analysis technique was used as it best suited the study, considering its nature. Thematic analysis, a qualitative research method, entails identifying, analysing and reporting patterns or themes within data (Javadi & Zarea, 2016). It enables researchers to unveil meaningful insights and comprehend underlying themes or patterns in participants' responses (Braun & Clarke, 2012).

## Results

The data were analysed and interpreted in two phases, aligning with the in-depth study of the two families treated as individual cases.

### Case Study 1

In this section, the data of the lower middle-class family were analysed and interpreted. According to a study conducted by Home Credit India (2024), the annual income of a lower middle-class Indian family is something between ₹2 lakh and ₹5 lakh.

## Socio-Economic Conditions of the Family

### Family income

A's family has a monthly income of approximately ₹10,000 (equivalent to about ₹120,000 annually), primarily earned by his father, who works as a vegetable vendor.

This income is spent in meeting all family expenses, including household costs, medical bills and A's education. Because of this, the family struggles to save money for unknown future emergencies. A's mother is a homemaker, contributing to the family in non-monetary ways.

### **Parental education**

A's father is 42 years old. He has studied up to Class 8 in a government Assamese-medium school, possessing proficiency in Assamese, Bangla and English. He can speak Assamese and Bangla, read and write Assamese with comprehension, and English without comprehension. Aged 35 years, A's mother has studied up to Class 6 in a government Assamese-medium school. She understands Assamese, Bangla and Hindi. She can speak Assamese and Bangla, read and write Assamese with comprehension, and read and write some English without comprehension.

### **Family structure**

A's family comprises five members—father, mother, two children and grandmother. A has a younger sibling. The family communicates in Bangla.

### ***Literacy Difficulties among Parents***

To assess the literacy skills of A's parent (mother), a comprehensive evaluation was conducted. Literacy difficulties, in this context, refer to challenges in reading and writing simple sentences with comprehension in a familiar language, along with doing basic arithmetic operations. The assessment utilised simple printed texts and a questionnaire, encompassing tasks ranging from easy to difficult, covering various domains of literacy skills. The participant, i.e., A's mother, was approached politely and encouraged to complete the tasks.

### **Reading skills**

The participant, i.e., A's mother, was provided with a paper containing stories printed in two languages—Assamese and

English. The participant was fluent in reading the text in Assamese. However, she showed difficulty in reading the text given in English. Despite having some knowledge of the English alphabet, she struggled to read out the words fluently and faced challenges in comprehension.

### **Writing skills**

A questionnaire, encompassing exercises on vocabulary, print and letter knowledge, was employed to evaluate the writing skills of A's mother. The questionnaire was divided into two sections—one in Assamese and another in English. The participant was instructed to do the exercises in both the sections. The data collected indicate that the participant attained a 'norm score' (a score indicating that she is proficient in writing) in the Assamese section. But she fell short of achieving the same in the English section, reflecting challenges in English writing skills.

### **Numeracy skills**

To evaluate the participant's numeracy skills, a questionnaire, consisting of questions on traditional number operations—addition, subtraction, multiplication and division—was used. The questionnaire was presented in two sections—one in Assamese and the other in English. The participant was asked to solve the questions in both the sections. The data collected indicate that the participant successfully solved the questions related to addition and subtraction in both the sections. However, she faced problems in solving multiplication and division questions, indicating the areas where her numeracy skills needed to be polished.

### ***The Role of Home Learning Environment in Children's Literacy Development***

The significance of the home learning environment in children's literacy development is well established (Silver, et al., 2020; Mol & Bus, 2011; and Scarborough & Dobrich, 1981). In exploring this aspect within the family, observations were made regarding how parents support their child's



literacy development. The data reveal that A has school textbooks in the Assamese language. Also, there is a notable absence of textbooks and other supplementary materials like storybooks, newspapers or magazines printed in the mother tongue, i.e., Bangla. When asked about the lack of storybooks with pictures, the parent (i.e., the mother) expressed uncertainty, citing lack of guidance on appropriate book choices. This absence suggests a limited printed environment at home that could enhance the child's literacy skills. However, it is noteworthy that the parent possesses a smartphone, which the child used occasionally for watching cartoons and listening to music.

In this family, Bangla is the language of communication, while at school, the medium of instruction is Assamese as A studies in an Assamese-medium government school. The children acquire Assamese through interactions with peer groups at school. The mother actively engages in her child's academic activities, often sitting with him to ensure focused reading. She reads out words in Assamese, and the child, in turn, reads from the book. The mother assigns writing tasks to A to develop his writing skills, providing assistance as and when needed. She also teaches A to do basic arithmetic operations. However, English learning is not actively facilitated due to the mother's difficulties in the language.

Despite the father's literacy in Assamese and English, most of his time is spent in selling vegetables in the market, which earns the family a livelihood. The mother takes the lead in overseeing the child's studies, emphasising that A should spend most of his time in studies rather than playing. Given the mother's limitations in English, A receives additional support through private tuitions at home. The tuition teacher assists in literacy development and helps with school assignments, compensating for the limited resources within the family for English language learning.

## Case Study 2

In this section, the data acquired from the middle-class household were analysed and interpreted. It is important to mention that as there is no universally accepted definition of middle-class, the think tank defines a middle-class Indian as someone earning between ₹109,000 and ₹647,000 annually (based on 2020–21 prices), or between ₹500,000 and ₹30,00,000 annually in household terms (Rajora, 2023).

### **Socio-Economic Conditions of the Family**

#### **Family income**

B's family has a monthly income of approximately ₹100,000 (approximately ₹12,00,000 annually in household terms). Both his parents are employed as teachers. His father works at a government secondary school, while his mother works at a government primary school. This suggests the family's financial stability and that it does not face any major economic constraint that might hinder the overall progress and well-being of the household.

#### **Parental education**

B's father is 46 years old. He is a postgraduate in English and proficient in three languages (Assamese, English and Hindi). He also has a degree in Bachelor of Education (B.Ed). He is adept at understanding, speaking, reading and writing in all three languages. His mother is 41 years old. She is a graduate in political science, and proficient in Assamese, English and Hindi in all linguistic skills. Thus, both his parents bring a solid educational background and linguistic versatility to the family.

#### **Family structure**

B's family comprises four members—father, mother and two children, with B being the youngest. The family's native language is Assamese, the regional language of Assam.

### ***Literacy Difficulties among Parents***

To assess the literacy skills of B's parent (mother) and determine if she faced any kind of difficulties, basic printed texts and a questionnaire were employed. Difficulties, in this context, refer to challenges in reading and writing simple sentences with comprehension in a familiar language, along with doing fundamental arithmetic operations. The questionnaire included activities in the order of easy to difficult across various domains of literacy abilities. The participant, i.e., the child's mother, was approached politely and encouraged to complete the assessments.

#### **Reading skills**

B's mother was provided with a paper containing basic written words that conveyed stories, with one half written in Assamese and the other in English. She read out the literature in both languages effortlessly and accurately. Besides, she exhibited a comprehensive understanding of the meanings of each English word presented in the material.

#### **Writing skills**

In assessing the participant's writing abilities, a questionnaire encompassing vocabulary, print and letter-related questions, was administered with two sections—one each in Assamese and English. The participant successfully achieved above-average scores in both the sections, indicating proficiency in both the languages.

#### **Numeracy skills**

In assessing the participant's numeracy skills, a questionnaire covering traditional number operations—addition, subtraction, multiplication and division—was administered in both Assamese and English sections. She successfully answered all questions in both the sections, demonstrating her abilities and skills. When asked about facing any kind of difficulties, the participant reported having none, indicating a confident and proficient understanding of the numerical concepts presented in the questionnaire.

### ***The Role of Home Learning Environment in Children's Literacy Development***

The significance of parental involvement in children's education was explored through an observation of the academic environment within the household. The data reveal a conducive print atmosphere, where the child (i.e., B) has access to a diverse range of books in languages like Assamese and English. This exposure is expected to significantly contribute to the enhancement of the child's literacy skills. The available print resources at home include textbooks, fictional literature, periodicals, newspapers, self-improvement literature, dictionaries and other supplementary materials catering to the child's educational needs. This rich array of resources reflects a supportive environment for the child's academic development.

The language of communication both at home and school is Assamese. The child attends a private Assamese-medium school, where he faces no linguistic challenges as he has already acquired proficiency in the language at home through interactions with family members. Both his mother and father assist him in school-related activities. So, the child does not seek private tuitions to enhance his literacy skills.

The data highlight a favourable digital learning environment at home, incorporating electronic devices, such as smartphones, tablets, television and laptop. The child uses his mother's smartphone to watch animated audiovisual content in Hindi, contributing to his language acquisition. Additionally, he engages with diverse rhymes on the smartphone. The home environment supports bilingual literacy practices, with the parents reading out materials in different languages. Adequate parental support is provided to enhance the child's literacy and numeracy skills, fostering academic achievement and exam success. The child also reads storybooks written in the Assamese language.

## Discussion

The research investigated the impact of parents and the home learning environment on the literacy development of children, focusing on two families from different socio-economic backgrounds—lower middle-class and middle class, using case study method. The findings reveal that the lower middle-class family faced financial constraints and parental literacy difficulties that negatively affected the child's (A) education. Here, parental involvement in literacy development is observed to be insufficient compared to the middle-class family. The home learning environment for A, who comes from a lower middle-class family, is deemed inadequate, lacking essential reading materials and literacy resources crucial for his academic progress. It is recommended that parents like A's should aim to create a conducive learning environment for children. Community members, teachers and local NGOs can significantly contribute to this by providing the necessary literacy resources and support to children facing such challenging situations.

In contrast, B's parents exhibit a favourable socio-economic background. They do not face literacy difficulties as they could complete the tasks in the questionnaire. His parents actively contribute to the child's literacy development by providing constructive literacy resources, contributing to his academic strength. Their role in fostering a conducive home learning environment is deemed satisfactory. So, it can be concluded

that the child in this family benefits from a well-equipped environment with ample literacy advancement facilities and support.

## Conclusion

This study underscores the pivotal roles of parenting and the home learning environment as critical contexts for developing essential competencies in young children, as supported by existing research (Niklas & Schneider, 2013 ; and Lehl, et al., 2020b ). These factors play a significant role in shaping children's literacy development. The research reveals a disparity in the literacy learning environment between middle-class and lower middle-class families, with the former exhibiting a more favourable setting. In light of this finding, there arises a responsibility for schools, teachers, community members and NGOs to extend their support to children of lower middle-class families in improving their academic performance. This assistance can take various forms, such as providing literacy resources, educational support and guidance on creating a conducive home learning environment. Collaborative efforts from these external stakeholders can contribute substantially to improving the literacy development outcomes for children belonging to lower middle-class families. This highlights the potential for community engagement and collaborative initiatives to bridge the gap in literacy learning environments, and enhance opportunities for children in less privileged socio-economic contexts.

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# The Effect of School Climate on Teaching Satisfaction: The Role of Teacher Engagement

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## Abstract

When teachers like working in the environment of a school, they are more likely to be satisfied with their professional lives. The relevance of school climate in sustaining productive learning settings for students and secure, healthy working conditions for faculty has been repeatedly seen in researches. This research looks at how teachers' levels of engagement may serve as a mediator between their perceptions of the school climate and their levels of job satisfaction. A total of 476 secondary school educators from 49 public institutions took part in this survey. The study has found positive and statistically significant impact of school climate on the view of teachers about their work and job satisfaction with a strong positive relationship also seen between teacher engagement and teacher satisfaction. In addition, the relationship between teachers' perceptions of the school climate and their job satisfaction is considerably mediated by their level of engagement with the classroom.

**Keywords:** school climate, teacher engagement, teaching satisfaction, secondary school, mediation.

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## Introduction

Teachers have a pivotal role in shaping the educational experiences of their students and thereby determining their success in today's fast-changing environment (Zhang et al., 2021). According to studies (e.g., Au et al., 2016), teaching is one of the most stressful jobs. Professionals and researchers must immediately address the particular difficulties and stress experienced by instructors. The school's environment has a significant impact on teaching, staff productivity, and student achievement (Sancar, 2009), and previous studies have linked teacher stress to a negative school climate (Skogstad, et al., 2014).

Teacher satisfaction has been shown to increase when educators like their work setting (Cohen et al., 2009) and their impressions of the school climate may affect their sense of professional identity and ability

to build professional capital in the classroom. This suggests a need to study these inter-relations between teachers' perceived school climate and their satisfaction in the local context and see how teacher engagement plays the role of a moderator in that relationship.

## School climate

School climate refers to the overall atmosphere and environment within a school and encompasses the social, emotional, and physical aspects that shape the experiences of students, teachers, and staff. A positive school climate fosters a sense of safety, belonging, and support, promoting academic achievement, emotional well-being, and positive behavior. Factors such as school leadership, teacher-student relationships, peer interactions, and physical surroundings all contribute to shaping of the school climate, which in turn influences student

engagement, motivation, and overall school success.

The concept of 'school climate' is quite challenging to comprehend and often gets mixed up with the term 'school culture'. The two terms have been used interchangeably in recent years (Aldridge & Fraser, 2016, Van Houtte, 2005). School climate and school culture are related but are distinct. School culture refers to the underlying beliefs, values, traditions, and norms that shape the behavior and interactions within the school community. School climate refers to the overall atmosphere and environment within the school. It encompasses factors like safety, relationships between students and teachers, peer interactions, disciplinary policies, and physical surroundings. It is more about the current conditions and experiences within the school environments. It is generally agreed that the term "school climate" encompasses the following: (a) the state of the physical environment of schools (such as their buildings, facilities, and equipment); (b) the nature of individuals who are in the schools (such as qualifications and backgrounds of students and teachers); and (c) the interpersonal dynamics within schools (such as those between teachers-teachers, students-students and teachers-students) (Van Houtte, 2005). Teachers are more likely to stay in a school with a positive atmosphere (Cohen et al., 2009) and their perceptions of professional identities and accumulation of professional capital in teaching might be impacted by their impressions of the school climate.

### **Teacher engagement**

According to Schaufeli, Salanova, González-Romá, and Bakker (2002), "engagement" describes an individual's mental state when they have a favorable and fulfilling outlook on their work. There are three parts to this structure: enthusiasm, commitment, and concentration. So, when we talk about "teacher engagement", we are talking about how invested educators are in the classroom. Another way to think about

teacher involvement is through the actual time spent in the classroom by the teacher (Shuck et al., 2011).

### **Teaching satisfaction**

Satisfaction in classroom teaching results from a good match between what instructors want to gain and what they experience in their work (Ho & Au, 2006). Positive and negative feelings about the job make up the overall job satisfaction of the employee (Dunn & Harris, 1998). According to Bhatti and Qureshi (2007), job happiness has a direct impact on productivity in all fields. As a result, happy educators foster better student growth (Luthans, 2002).

In this investigation, job satisfaction was considered to be a component of teacher well-being and was measured by teachers' perceptions of their satisfaction in teaching. Satisfaction in classroom teaching is a measure of both the emotional and intellectual aspects of teaching since it reflects the teacher's assessment of the fit between his or her preferences and the demands of the work

### **Relationship among the study variables**

Teacher engagement and school climate are deeply intertwined. A positive school climate can enhance teacher engagement by providing a supportive and collaborative environment that encourages teachers to fully invest in their work. When teachers feel valued, respected, and supported by their colleagues and administrators, they are more likely to be engaged in their teaching and committed to the success of their students. Conversely, a negative or toxic school climate can erode teacher engagement, leading to feelings of burnout, frustration, and disengagement.

Teaching satisfaction refers to the degree of fulfillment and contentment that teachers experience in their profession. It encompasses various factors, including job autonomy, recognition, opportunities for professional growth, and the ability to make a positive impact on the lives of the students. Engaged



teachers in a positive school climate are more likely to experience high levels of teaching satisfaction, feel supported in their roles with opportunities for professional development and growth, and derive fulfillment from the success of their students.

In summary, teacher engagement, school climate, and teaching satisfaction are interconnected components of a thriving educational ecosystem. A positive school climate can nurture teacher engagement, leading to increased teaching satisfaction and ultimately benefiting academic achievement and well-being of students. Addressing issues related to teacher engagement and satisfaction can contribute to the cultivation of a more positive school climate, creating a cycle of improvement and success.

### The present study

The study focused on examining the relationship among the three criterion variables: teachers' perceived school climate, teacher engagement, and their satisfaction with teaching. The present study attempted to answer the following questions: i) whether the perceptions of teachers about school climate influence teacher engagement and their satisfaction in teaching, ii) whether teacher engagement leads to teaching satisfaction, and whether it mediates the

link between school climate and teaching satisfaction.

### Objectives of the study

This study in government secondary schools of West Bengal focused on the examination of inter-relation among the three variables, namely, school climate, teacher engagement, and teacher satisfaction in teaching. The research objectives were to study: 1. How does school climate contribute to predicting teacher engagement? 2. How does school climate contribute to teacher satisfaction? 3. How does teacher engagement contribute to predicting satisfaction in teaching? and 4. The mediation effect of teacher engagement on the link between school climate and teaching satisfaction. Based on these objectives the following hypotheses were formulated:

H<sub>0</sub>1: There is no significant contribution of school climate in predicting teacher engagement.

H<sub>0</sub>2: There is no significant contribution of school climate in predicting teacher satisfaction.

H<sub>0</sub>3: There is no significant contribution of teacher engagement in predicting the satisfaction in teaching.

H<sub>0</sub>4: There is no significant mediation effect of teacher engagement on the relationship between school climate and teaching satisfaction.

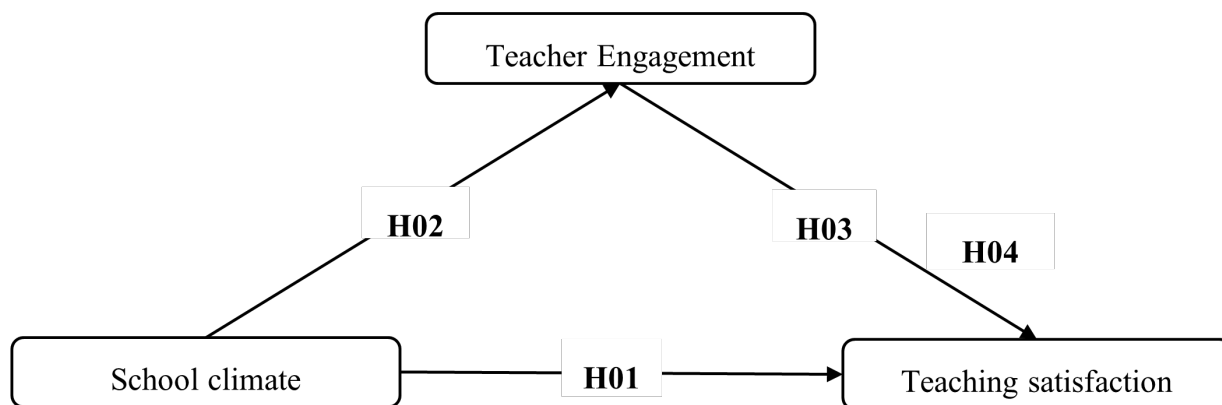


Figure 1: A hypothetical model for the inter-relations among the study variables

## Methodology

### Methods

A cross-sectional survey method was used for the study and the inter-relations among study variables tested using primary (quantitative) data.

### Participants of the study

The secondary school instructors of Bengali-medium secondary schools under the jurisdiction of the West Bengal Board of Secondary Education (WBBSE) were the focus of this study. Multistage sampling procedures were used to select the sample. In the first stage, seven out of twenty-three

districts of West Bengal were chosen randomly using the fish-bowl method. At the second stage seven schools were randomly selected from each of the seven districts (Malda, Purba Burdwan, Nadia, Birbhum, Hooghly, Murshidabad, and Cooch Behar). The roster of institutions was taken from the government's website at <https://wbbse.wb.gov.in>. All the 476 teachers of these 49 secondary-schools participated in the study. Among them, 221 (46.43 %) teachers were female and 255 (53.57 %) were male teachers (Table 1). Among the sample 162 (34.03 %) teachers had the experience of teaching below 5 years, 175 (36.76 %) teachers had between 5-10 years, and 139 (29.20 %) teachers had experience of more than 10 years.

**Table 1**

Respondents' details	Sample with specifications (476 participants)	
	N	%
<b>Gender</b>		
Male	255	53.6
Female	221	46.4
<b>District-wise distribution of the respondents</b>		
Purba Burdwan	67	14.1
Nadia	71	14.9
Birbhum	65	13.7
Hooghly	72	15.1
Murshidabad	68	14.3
Cooch Behar	66	13.9
Malda	67	14.1
<b>Teaching experience</b>		
Below 5 years	162	34
Between 5 to 10 years	175	36.8
More than 10 years	139	29.2

### Instruments

#### The Multidimensional School Climate Questionnaire (MSCQ)

The MSCQ (Teacher version) (Molinari & Grazia, 2022) was used for this research to assess school climate. The instrument

consists of 44 statements. The teacher version of the MSCQ consists of two broad sections ("Classroom Practices" and "School Atmosphere") having 22 items in each section. Five different sub-dimensions make up the 'Classroom Practices' section: Rules (7 items), Student support (3 items), Student

involvement (4 items), Positive teaching (5 items), and Encouragement (3 items). On the other hand, student relations (5 items), student-teacher relations (4 items), educational climate (5 items), sense of belonging (5 items), and interpersonal justice (3 items) are the five sub-dimensions that make up the 'School Atmosphere' section. On a 5-point Likert scale, responses ranging from 1 ("Strongly disagree") to 5 ("Strongly agree") were elicited. Perceptions were the aggregated MSCQ score. The items included in this instrument are as follows:

### **Section 1. Classroom practices**

#### **Rules**

1. Students know the consequences of breaking the rules.
2. Most people know the school rules.
3. At school, some time is spent explaining the rules clearly to students.
4. It is easy to obtain information about the school rules.
5. The rules are clear and easy to understand.
6. Teachers enforce the rules.
7. Teachers intervene when a student doesn't keep to the rules.

#### **Student support**

8. When they have problems, students seek the help of adults in the school.
9. If students have personal problems, they can easily get help from adults in the school.
10. If students have academic problems, they can easily get help from teachers

#### **Student involvement**

11. Students are asked their opinion on the school's functioning.
12. When it is important, teachers ask students' opinions before making decisions for them.
13. There are moments or situations when students can express their opinions on the school.
14. Students participate in defining rules.

#### **Positive teaching**

15. Most teachers appear to draw pleasure from teaching.
16. Most teachers appear to love their job.
17. Teachers explain what students are about to learn.
18. Teachers explain the importance of what students study.
19. Teachers use methods that make their subject interesting

#### **Encouragement**

20. Teachers tell students that they can do it.
21. Teachers encourage students to do their best.
22. Teachers compliment students when they work hard to learn

### **Section 2. School atmosphere**

#### **Student relations**

1. Students help each other.
2. In general, students get along with one another.
3. Students treat one another respectfully.
4. Students can count on each other.
5. In general, relations among students are friendly.

#### **Student-teacher relations**

6. Students and teachers feel good together.
7. In general, students and teachers get along with each other.
8. Students feel close to most of their teachers, and they trust them.
9. In general, relations between students and teachers are friendly.

#### **Educational Climate**

10. At my school, students can learn and get a good education.
11. At my school, students can feel that students' success is the priority for teachers.
12. At my school, students can feel that studying is important.

13. At my school, we are expected to do our best.
14. In general, what students learn is interesting.

### **Sense of belonging**

15. I would rather be in a different school.
16. At my school, I feel at ease.
17. I am proud to be a teacher of this school.
18. This school is important for me.
19. I love my school.

### **Interpersonal justice**

20. Punishment is fair.
21. Students are treated with justice.
22. The rules are fair.

### *Work Engagement Scale (WES)*

The WES developed by Schaufeli and Bakkar (2004) was utilized to assessing the criterion variable (teacher engagement) to evaluate teachers' dedication to their jobs. There were 17 statements included in the scale. The instrument was a 5-point Likert scale on which 1 indicated strong disagreement and 5 indicated strong agreement. The measure considered the following three dimensions: vigor, absorption, and dedication of teachers. Cronbach's alpha, a measure of internal consistency reliability, was 0.82 for this scale in the investigation. The items of this instrument were:

#### **Vigor**

1. At my work, I feel a burst with energy.
2. At my job, I feel strong and vigorous.
3. When I wake up in the morning, I feel like going to work.
4. I can continue working for very long periods.
5. At my job, I am very resilient, mentally.
6. At my work I always persevere, even when things do not go well

#### **Dedication**

7. I find the work that I do full of meaning and purpose.
8. I am enthusiastic about my job.

9. My job inspires me.
10. I am proud of the work that I do.
11. To me, my job is challenging

### **Absorption**

12. Time flies when I'm working.
13. When I am working, I forget everything else around me.
14. I feel happy when I am working intensely.
15. I am immersed in my work.
16. I get carried away when I'm working.
17. It is difficult to detach myself from my job.

### *3.3.3 Teaching Satisfaction Scale (TSS)*

The satisfaction of the teachers in their profession was assessed using TSS, a uni-dimensional scale consisting of 5 items to be rated on a scale from strongly disagree (1) to strongly agree (5). developed by Ho (2006). Ho (2006) reported the global reliability of the original scale as 0.77 (Cronbach's alpha) and the two-week test-retest reliability as 0.76. However, reliability analysis demonstrated Cronbach's internal consistency reliability coefficient of 0.81 for the teaching satisfaction scale. The scale items are as follows:

1. In most ways, being a teacher is close to my ideal.
2. My conditions of being a teacher are excellent.
3. I am satisfied with being a teacher.
4. I have gotten the important things I want to be a teacher.
5. If I could choose my career over, I would change almost nothing.

### **Data collection procedures**

The data collection was conducted following certain formal and ethical protocols. Firstly, the heads of the institutions were approached to inform about the present study and were also requested to cooperate during data collection. The teachers were also informed about the purpose of the present study. Teachers, who agreed to respond voluntarily, were provided with three questionnaires,

namely, MSCQ, Work engagement scale, and Teaching satisfaction scale. Before filling out the questionnaires, the teachers were requested to read all the instructions carefully provided in each research tool. Besides, they were also requested to provide honest responses.

## Data analysis

The entire data analysis was performed using IBM SPSS version 26.0. In this study, data analysis was conducted with the help of linear regression analysis and mediation analysis. To test the first three null hypotheses (H01-H03) i.e. 'There is no significant contribution of school climate in predicting satisfaction in teaching of teachers', 'There is no significant contribution of school climate in predicting teacher engagement', and 'There is no significant contribution of teacher engagement in predicting teaching satisfaction, a series of linear regression analysis was performed. To test the hypothesis (H04), mediation analysis, which is a statistical technique to explore the underlying mechanisms or pathways through which one variable (i.e., school climate) influences another (i.e., teaching

satisfaction), was performed. The test checks if the effect of the independent variable (i.e., school climate) on the dependent variable (i.e., teaching satisfaction) is significantly reduced, eliminated, or enhanced when the mediator (i.e., teacher engagement) is included in the analysis. This helps researchers understand the underlying processes or mechanisms by which the independent variable affects the dependent variable. Thus, mediation analysis allows researchers to better understand the complex interplay between variables and to identify potential intervention targets or points of leverage for influencing the outcome variable (i.e., teaching satisfaction).

## Results and discussions

### Preliminary analysis

In the preliminary analysis, the descriptive statistics (mean scores of the variables, standard deviation, skewness, kurtosis, and 95 % confidence intervals) for school climate, teacher engagement, and satisfaction in teaching were calculated. The results are presented in Table 2.

**Table 2: Summary Statistics of Scores of the study variables (N= 426)**

Variables	Mean Score	Std. Deviation	Skewness	Kurtosis	95% CIs of Mean	
					LL	UL
School climate	172.34	6.34	0.45	-0.79	163.99	180.69
Teacher engagement	52.39	4.57	-0.63	0.73	45.62	59.16
Teaching satisfaction	17.48	3.81	0.89	0.85	14.81	20.15

### Main analysis

#### *The individual contribution of school climate in predicting satisfaction in the teaching of teachers*

For testing the first null hypothesis (H01), a linear regression analysis was carried out (Table 3). The regression coefficient for school climate is 4.10 which is positive

and statistically significant at 0.05 level. It indicates that school climate by itself contributes significantly to the prediction of satisfaction of teachers

**Table 3: Percentage of the contribution of school climate in predicting teaching satisfaction of teachers**

	<b>B</b>	<b>SE</b>	<b>t-value</b>	<b>%contribution</b>
Constant	17.66	1.57	11.23***	
School climate	4.10	1.24	3.31*	47.11

B= unstandardized regression coefficient, \*\*\*significant at 0.001 level, \*significant at 0.05 level

Shows that the school climate is a potential predictor of satisfaction in the teaching of teachers. Based on the results, the following regression equation for predicting satisfaction in teaching based on their perceived school climate may be developed:

$$Y = 4.10X + 17.66$$

[where, Y= teaching satisfaction, X= school climate]

### 6.2.2 The contribution of school climate in predicting teacher engagement

For testing the second null hypothesis ( $H_02$ ) i.e. 'There is no significant contribution of school climate in predicting teacher engagement', a linear regression analysis was conducted (Table 4)

**Table 4****Per cent contribution of school climate in predicting teacher engagement**

	<b>B</b>	<b>SE</b>	<b>t-value</b>	<b>%contribution</b>
Constant	14.19	1.92	7.38**	
School climate	2.58	0.79	3.28**	44.32

The standardized regression coefficient for school climate at + 2.58 is statistically significant at 0.01 level indicating that school climate contributes positively and significantly to the prediction of teacher engagement. The positive regression coefficient reflects that a higher perceived school climate increases level of engagement in teaching. The contribution of school climate in predicting teacher engagement being 44.32 per cent, it is claimed that school climate is a potential predictor of teacher engagement. From the results, the following regression equation for predicting teacher

engagement based on teachers' perceived school climate may be developed:

$$Y = 2.58X + 14.19$$

[where, Y= teacher engagement, X= school climate]

### 6.2.3 The individual contribution of teacher engagement in predicting satisfaction in teaching of teachers

For testing the third null hypothesis ( $H_03$ ) i.e. 'There is no significant contribution of teacher engagement in predicting satisfaction in the teaching of teachers', a linear regression analysis was performed (Table 5).

**Table 5: Per cent individual contribution of teacher engagement in predicting satisfaction in teaching of teachers'**

	<b>B</b>	<b>SE</b>	<b>t-value</b>	<b>%contribution</b>
Constant	11.67	3.55	3.29**	
Teacher Engagement	2.08	0.59	3.55**	39.57

6.2.4 The mediation effect of teacher engagement on the association between school climate and satisfaction in teaching of teachers

For the fourth null hypothesis (H04), a mediation analysis was performed. The path model (Figure 1) was tested in the mediation analysis. The results are in Figure 2:

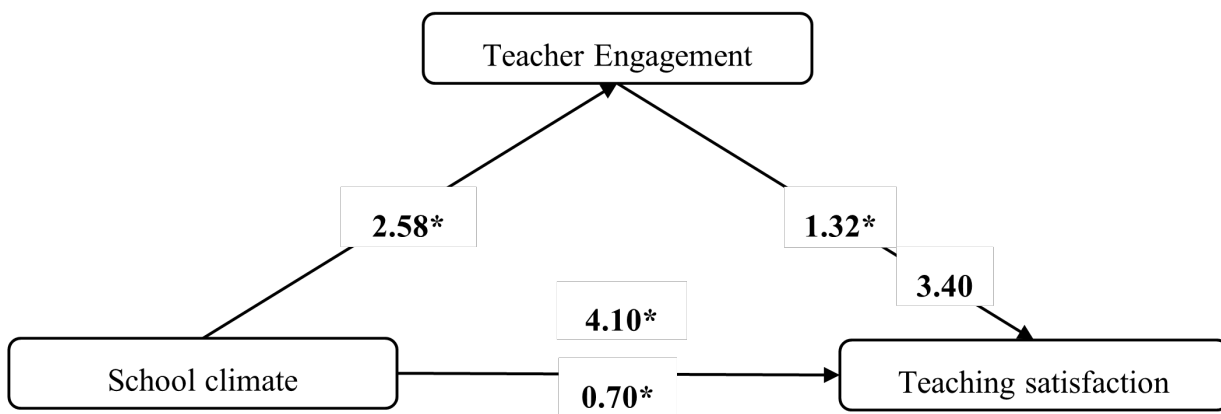


Figure 2: The mediation model of school climate and teaching satisfaction of teachers taking teacher engagement as a mediator

The effect of school climate on teacher satisfaction was assessed in the absence of the moderator (Table 6). Table 6 indicates that school climate had a significant positive effect on the teaching of teachers. The analysis yielded B = 4.10, SE = 1.24, t = 3.31, p<0.05 with the R-square value of 0.47.

Secondly, the direct effects of school climate on teacher engagement and of teacher engagement on their teaching satisfaction were assessed (Table 6). It is clear that school climate has a significant positive influence on teacher engagement. The analysis B = 2.58, SE = 0.79, t = 3.28, p<0.05 with the R-square value of 0.44 shows teacher engagement has a significant positive influence on teaching satisfaction. The analysis also yielded B = 1.32, SE = 0.61, t = 2.17, p<0.05. Therefore, school climate had a significantly positive direct effect on teacher engagement, while teacher engagement had a significantly

positive direct effect on their teaching satisfaction.

Finally, the indirect regression path (SC→TE→TS) i.e., the indirect effect of school climate on teaching satisfaction in the presence of the mediator (teacher engagement) was tested (Table 6). From Table 6, B= 3.40, SE= 1.50, p<0.05 it is evident that school climate had a significant and positive influence on teaching satisfaction in the presence of teacher engagement analysis rejecting H04. Further, the percentage of mediation effect (indirect effect) over the total effect was found to be 82.93%. However, the effect of school climate in the presence of the mediator (i.e., teacher engagement) was reduced but remained significant (B= 0.70, SE= 0.35, t= 2.01, p<0.05). Hence, teacher engagement partially mediates the association between school climate and teaching satisfaction.

Table 6: Results of Mediation Analysis

Regression Path	B	SE	T	95% CIs	
				LL	UL
Path estimates					
Total effect: SC→TS (in the absence of TE)	4.10	1.24	3.31*	3.22	4.98

Moderator effect model: SC→TE	2.58	0.79	3.28*	1.82	3.34
Dependent variable model: TE→TS	1.32	0.61	2.17*	0.61	2.03
<b>Mediation estimates</b>					
Direct effect: SC→TS (in the presence of TE)	0.70	0.35	2.01*	0.32	1.08
Indirect effect: SC→TE→TS	3.40	1.50	2.27*	2.09	4.71

18. Note. SC= school climate, TE= teacher engagement, TS= teaching satisfaction

## Discussions

The present research studies the relationship between school climate, teacher engagement, and teaching satisfaction. By examining the mediating role of teacher engagement, the present study offers insights into the underlying mechanisms through which school climate influences teaching satisfaction, thus providing practical implications for improving educational quality (Wang & Holcombe, 2010). The findings of this research can contribute to the development of effective strategies and interventions aimed at improving school climate and teacher satisfaction, ultimately fostering a more conducive teaching and learning environment.

### Significance of the study

Previous research has often focused on the direct impact of school climate on teaching satisfaction, overlooking the underlying processes and mechanisms involved especially, the intermediary role of teacher engagement. The present study fills this gap offering a more nuanced understanding of the relationship. There is ample previous research on the importance of school climate and teacher engagement but there is a dearth of studies that explicitly examine their interconnectedness in the context of teaching satisfaction (Wang & Holcombe, 2010). This research addresses this gap.

### Integration of the findings into Educational Policy, Practice, and Teacher Education

Policymakers can utilise the findings of this research to develop policies aimed

at cultivating positive school climates conducive to teacher engagement and satisfaction (Skaalvik & Skaalvik, 2014). This may involve initiatives to enhance school leadership and teacher autonomy, foster collaborative culture and provide support for teacher professional development. For example, introduce policies that involve creating structured opportunities for teachers to collaborate on lesson planning, sharing best practices, and engaging in professional learning communities. Schools could establish regular team meetings where teachers can brainstorm ideas, discuss challenges, and collaborate on projects, ultimately fostering a sense of camaraderie and collective responsibility. Policy may suggest flexible curriculum frameworks that allow teachers to tailor their instructional approaches to meet the diverse needs of their students. System can allocate resources toward providing comprehensive professional development opportunities for teachers, including for workshops, conferences, and courses that focus on pedagogical techniques, subject matter knowledge, and social-emotional learning.

Administrators could reduce administrative burdens, giving teachers more time and freedom to innovate and experiment with new teaching strategies.

School administrators can implement practical strategies informed by this research to create nurturing environments where teachers feel valued and supported (Skaalvik & Skaalvik, 2014). For instance, school administrators could implement regular surveys or feedback sessions to gather input from teachers about their experiences, challenges, and suggestions for improvement.



For instance, they might conduct an annual anonymous survey that covers various aspects of the school environment, teaching resources, professional development opportunities, and administrative support. This feedback can then inform decision-making processes and help administrators address concerns proactively. Administrators can establish recognition programs to acknowledge and celebrate exemplary teaching practices. For example, they might introduce a “Teacher of the Month” award where outstanding educators are publicly recognized for their contributions to the school community. Additionally, administrators could provide tangible rewards such as monetary bonuses, extra professional development opportunities, or special privileges within the school. Further, they can foster a culture of shared decision-making by involving teachers in important school-related decisions. For instance, they might create committees or task forces comprised of teachers, administrators, parents, and community members to discuss and make recommendations on issues such as curriculum development, school policies, or budget allocation. By actively involving teachers in decision-making processes, administrators will demonstrate respect for the expertise of teachers and commitment to collaboration.

Teacher education programs can integrate the findings of this research into their curriculum to prepare future educators to recognize the significance of school climate and teacher engagement. For example, teacher education programs can include modules on understanding and assessing school climate. Policymakers might offer practical training on assessing and analyzing various aspects of the school environment, such as teacher-student relationships, school culture, and safety. Students of educational colleges

could learn to identify strengths and areas for improvement within different educational settings. Additionally, teacher education programs might offer field experiences during internships for pupil-teachers to observe and participate in classrooms with highly engaged teachers, gaining first hand insight into effective teaching practices. Recognizing the importance of teacher well-being, teacher education programs can incorporate modules on self-care practices and strategies for maintaining a healthy work-life balance. For example, they might offer coursework on stress management, mindfulness techniques, and strategies for setting boundaries and managing workload. Additionally, teacher education programs might encourage trainee teachers to reflect on their values, priorities, and self-care routines, empowering them to prioritize their well-being throughout their careers.

## **Conclusions and recommendations**

The study concludes that the direct effects of school climate on teacher engagement and teaching satisfaction are positive and statistically significant. Teacher engagement also has a significant positive effect on teaching satisfaction. Further, teacher engagement significantly mediates the association between perceived school climate and teaching satisfaction. Hence, teachers who perceive that school climate is healthy and encouraging become involved and interested in teaching and this leaves them feeling satisfied in their job. Thus, teacher engagement becomes the most important factor for enhancing teaching satisfaction. This study recommends future researchers study on different contextual factors and predictors of teacher engagement need to be taken up.

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## Key Focus Areas for Enhancing Interpersonal Leadership Practices among Teachers: Insights from Teachers and Experts

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### Abstract

Several academic fields including philosophy, psychology, and education discuss interpersonal leadership. It is also a popular concept in the scenario of self-transformation of ideas for getting desired outputs in the life of Modern Man. As times change, approaches to understanding this term are updated, and suitable relearning becomes necessary. As the world is functioning as an era of specialisations, concepts like interpersonal leadership must be transacted appropriately, fitting individuals in their respective areas of expertise. According to Covey (2013), the principles of interpersonal leadership are one of three key dimensions that an individual must be aware of in order to evolve from a state of independence to interdependence and attain public victory. Some theories consider interpersonal leadership as a single explorative idea, and some accommodate it as a part of more prominent themes or as a structure of different perceptions. Awareness about six paradigms of human interaction and five dimensions of Win/Win, namely Character, Relationships, Agreements, Supportive Systems and Processes, are connected with Interpersonal Leadership. Primary school teachers can mould the next generation by preparing with a scientifically guided attitude on interpersonal leadership practices, if they come to grasp its the importance. The present study aims to find the specific areas for enhancing interpersonal leadership practices relevant to teachers and student teachers. This investigation includes experiences, insights, suggestions from present primary school teachers and experts, and themes identified from related research documents.

**Keywords:** Interpersonal Leadership

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### Introduction

Efforts to search for the possibilities within individuals to create productive spaces for themselves and others were always part of educational research. Unlike the old days when lesser possibilities for individuals for creative participation existed, education systems in the world have now started considering each individual as a potential source for effective contributions. Interpersonal relationships, awareness about various human interactions and interpersonal leadership strategies have started contributing to several team tasks,

creative collaborations leading to paradigm shifts in several life areas, including science, technology, business, politics and arts. In the last few decades, it has started spreading among more people to create an effect not only at a global level but also at a local level. Interpersonal leadership typically involves communication and tasking others with work, empowering and participating in decision-making, follow-up and giving feedback, providing support, development and taking an interest in others' careers, as well as encouraging collaboration with colleagues and teamwork (Zander, 1997). It also involves delegating, empowering

and promoting collective decision-making; recognizing, supporting and developing others; understanding, caring and consideration of others; facilitating and encouraging teamwork; and communication and information dissemination. All these are behaviors classified under interpersonal leadership (Zander, 2020). Interpersonal leadership is about leading other people, and the challenge is how to enable and empower them to do their absolute best to realize a shared purpose and reach common goals (Bradt, 2020).

In the context of political science, transformational leadership is represented as the phenomenon of encouraging people to achieve goals with values, fulfilling the needs of followers and leaders (Kessler, 2013). Transformational leaders motivate their followers to pursue their higher needs (Jung, 2001). Interactional justice is defined as the degree to which the people affected by decision are treated by dignity and respect (Schermerhorn, 2003). Interpersonal leadership is a relatively new term in the leadership literature, which has emerged as a higher order concept of transformational leadership combining characteristics of transformational leadership and interactional justice (Hansen et al., 2014).

According to Covey (2013), Principles of Interpersonal leadership are one of the three key dimensions of awareness of an individual to evolve from a state of independence to interdependence. Principles of empathic communication and principles of creative cooperation are the other two dimensions. Some theories consider interpersonal leadership as a single explorative idea, and some accommodate it as part of more prominent themes or a structure of various perceptions. Life practices based on the Habit 'Think Win-Win', and awareness about six paradigms of human interaction and five dimensions of Win/Win, namely Character, Relationships, Agreements, Supportive Systems and processes, are connected with the term Interpersonal Leadership. Integrity, maturity and abundance mentality are three traits that are a part of the dimension of

Character. The relationship dimension on the trait emotional account and can lead transactional leadership to transformational leadership. Desired results, Guidelines, Resources, Accountability and Consequences are the elements of the dimension of agreements to be formulated. In this a . Win-win Management training and performance agreements can be also included. Supportive Systems and processes have to be organized by recognizing and taking account of situation of the both sides, their needs and expectations and taking necessary steps in each phase with a sense of mutual growth. Individuals habits like being proactive, beginning with the end in mind and putting first things first can use of practices from the paradigm of principles of interpersonal leadership mean more systematic.

### **Need and Significance**

Leadership educators are encouraged to adopt, or adapt, the proposed model when educating about interpersonal leadership. For example, a comprehensive model may serve as an appropriate guide for developing a semester long undergraduate curriculum. Alternatively, a purposive selection of a particular content area, such as motivating others, may be helpful when conducting non-formal education with professional audiences (Lamm et al., 2016). The culturally endorsed ideal leadership prototypes have over the years moved into numerous other areas of research, such as communication, corporate social responsibility, education, ethics, entrepreneurship, and sustainability, demonstrating the value and viability of interpersonal leadership. Scholars thus continue to build and broaden our knowledge base of cross-cultural leadership and provide more detail on the concepts and contingencies that surround various types of interpersonal leaderships (Zander, 2020).

Democratic values, sustainable development and an inclusive world, will be evolved through participatory approaches of individuals. This will be manifested when each individual or each citizen takes responsible initiatives for

interpersonal leadership. Habits like Win-Win have to be integrated as part of life to see an increase of participatory efforts by people in the coming decades. This can happen through primary school teachers who work with the next generation in their classroom at a very young age. Since practices like this requires genuine understanding and patience to be part of the lifestyle, preparing modules for future primary school teachers can be productive when the future is considered. Opinions, experiences and observations of experts and primary school teachers can be included along with theoretical resources to prepare a more open and pragmatic module. The process of this investigation can help for developing and execute the module more effectively. This study is an attempt to bring some insights to add to the Teacher education curriculum of future primary school teachers which may later reflect in the school curriculum.

## Methodology

### Objective

To identify dimensions of the interpersonal leadership practices suitable for prospective primary school teachers

### Sample

- Seventeen experts, including four clinical psychologists, four senior researchers in education, three senior researchers in management and six teacher educators.
- Twenty-seven teachers from primary schools follow that the Kerala State syllabus.

### Tools used

1. Semi-structured Interview schedule for experts on interpersonal leadership perceptions
2. Semi-structured Interview schedule for primary school teachers on interpersonal leadership status

## Techniques used for Data Analysis

- Content Analysis
- Thematic Analysis

## Procedure

23 documents, including five books, and investigated 26 research documents were referred to plot the codes and themes needed for module preparation based on the content analysis. The interview schedule on the interpersonal leadership status of primary school teachers was prepared based on research articles relevant to the field of study, policy documents published at State, national and international levels, and on discussion with various experts in the sector of general education and teacher education and researchers. 14 questions with the options of adding individual opinion and extra remarks were included in the schedule. An interview schedule on the interpersonal leadership perceptions of experts was prepared based on the discussions with the experts in educational research and research articles related to the field of study.

Seventeen experts, including four clinical psychologists, four researchers of education, three researchers from field of management and six teacher educators, were interviewed. The researches of this study explained the concept of interpersonal leadership based on Stephen R Covey to the respondents and sought their views on the most important areas to be addressed in connection with interpersonal leadership skills and habits to be developed in primary school teachers and in prospective primary school teachers for effective functioning of the schools. Experts were asked to respond with their knowledge and experiences. Interviews were interactive and the researcher sought clarity for deriving connections to the view of research objectives. Questions concerning the daily life of a primary school teacher, activities in a primary school classroom, challenges in dealing with young children, school

administration, theoretical aspects of school and teacher, the balance between personal and professional life and achievement of curricular objectives were discussed from the perspective of interpersonal leadership. In primary schools, Classroom, staffroom, staff meetings, parent -teacher association meetings, interactions with local self-governing bodies and many other connected scenarios require competencies and skills which are in alignment with the ideas of interpersonal leadership. Wherever a collective effort of more than one individual becomes important for achieving the mission of an educational institute, a set of logically derived principles related to interpersonal leadership can be supportive of effective results and smooth conduct. Primary school teachers who face situations require teamwork daily and the insights and awareness of challenges gained out of individual experiences in real school scenarios can be very useful from the point of view of molding next-generation teachers. Twenty-seven primary school teachers were interviewed, and audio recordings of the interviews were transcribed to identify the codes. Questions related to practical challenges faced in the daily life activities of a teacher were asked. Situations, where significant interpersonal leadership capacity was required in life and school environments, were part of the interview schedule. Information about the areas in life that required teamwork and mutual understanding with other individuals was noted. Specific skills, competencies and abilities required to overcome the challenges faced were asked through this semi-structured interview schedule. Family, classroom, staffroom, interactions with the parents of students and other officials representing various government bodies including local self-government were the situations reported by teachers and further detailed enquiries on their responses are asked based on the area specified by individual teachers. Specific recommendations and suggestions helpful

for future primary school teachers and other teachers were included.

Codes were identified based on content analysis and interview responses. Based on these codes, dimensions are identified and labeled as themes. Various Interview responses from experts and teachers were noted and responses connected with similar events, experiences, ideas, concepts and suggestions are grouped as a single code. Few codes connecting to a common concept were identified and that concept was termed as a theme and in the context of this study it was considered as a dimension. The inductive thematic analysis process was used for the identification of dimensions and reflective thematic analysis was executed. The six phases of reflective thematic analysis (Braun & Clarke, 2022) are as follows: (1) Familiarisation with the data set (2) coding (3) generating initial themes (4) developing and reviewing themes (5) refining, defining and naming themes (6) writing. In this research investigation, thematic analysis steps were organised based on the above six phases and changes were made based on the nature of this study.

## Results and Analysis

Codes and themes identified based on each tool is listed below.

### Content Analysis

Five themes were identified where each theme was selected based on several codes.

**Table 1: Codes of the theme: Paradigms of human Interaction**

Codes	Theme
Win-Win	Paradigms of Human Interaction
Win-Lose	
Lose-Win	
Lose-Lose	
Win	
Win-Win or No Deal	

The theme Paradigms of Human Interaction were based on six codes in Table 1. Codes

under this theme were identified from the chapter related to principles of interpersonal leadership from the book of Stephen R. Covey (2013). These codes were related to the mindset of individuals while interacting with others. When a person alone or in a team deals with one or more individuals or in a group, the selection of human interaction can be vital and based on the requirements, one may choose the appropriate type of interaction. Win-win deals are the type of interaction where both sides of the interaction are aiming for the victory of both sides. Win-win type interactions are the most useful interactions in the context of interpersonal leadership. A mathematics teacher and a physical education teacher in a class must work together to achieve the goals by understanding each teacher's specific curricular objectives while working together for common curricular objectives. Attitude of thinking of win-win interactions will help to create such interactions in school scenarios. In a competitive sports item like a final game in football, win-lose can be a suitable interaction where one has to score a goal and stop the other team from scoring a goal in their post. In a father-child relationship, a lose-win interaction can be helpful in scenarios where parents have to sacrifice time or other priorities to provide extra attention to the child. Lose-lose interactions are normally a negative type of interaction where both sides of the interaction will face troubles in the mission. But in the case of removing unhealthy objectives or self-destructive tasks, it happened to be positive in a larger perspective. Win-type attitudes in interactions are good for achieving tasks where an individual alone is responsible for the outputs. Improving the health conditions of a person by committing to regular physical exercise does not have a role in the hands of other individuals. However, that person will have to give priority to that task by communicating the importance of it to others and may have to create schedules where other individuals are involved in such a way that daily physical exercises are not disturbed which leads to personal win in

the aspect of health. Win-win or No deal-type interactions are useful while making decisions like choosing a life partner for marriage where the couple find both cannot win together then drop the idea of being together. It will be very helpful if teachers are aware of various types of human interactions and how they help while working together or alone.

Investigating about direct and indirect styles of human interactions and interpersonal relationships along with connected theories were part of educational research activities for decades. (Berne, 1964; Hayes, 2002). When analysing from the perspective of teamwork, the outcome of any interaction is bound to win or lose based on the objectives selected by the team. The success of the interaction of a team member will be interpreted based on how that interaction supports the objective of the team. In the larger context, there are situations where it is not possible to label the impact of an interaction as success or failure, it can be relative or unknown. The possibility of breaking a larger context into small segments till deriving a context of interpretation in terms of win-lose or success-failure is the reason behind choosing these six codes.

**Table 2: Codes of the theme: Dimensions of Think Win-Win**

Codes	Theme
Character	Dimensions of Think Win-Win
Relationships	
Agreements	
Supportive Systems	
processes	

The theme Dimensions of Think Win-Win is based on five codes in Table 2. These codes are related to the various dimensions to be considered while interacting through the habit of Think Win-Win. Out of the various other codes mentioned in Table 1, Win-Win can be an appropriate mindset from

the view of interpersonal leadership. When deciding to have a Win-Win approach with another individual or group, it can ensure that the approach is maintained in the five dimensions mentioned in the codes in Table 2. Clear communication of expectations in character, Relationships and Agreements from both ends can strengthen the win-win platform. Supportive systems like training and facilities have to be arranged to benefit all stakeholders. Administration, steps, development and evaluation of the process have to be interacted well with a proactive attitude by seeing the outputs in mind based on priorities. The above codes are illustrated by Covey (2013) in his famous book *Seven Habits of Highly Effective People*.

DuBrin (2017) shared views on dealing effectively with people, by including the areas related to communication in the workplace, effective leadership and teamwork. Concepts mentioned as part of this theme can be connected directly with several ideas mentioned in his books about human relations for career and personal success.

**Table 3: Codes of the theme: Learner and Learning**

Codes	Theme
Learner as Individual	Learner and Learning
Learner in group	
Classroom strategies	
Learning activities	
Content Transaction	
Assessment	

The theme, Learner and Learning, is based on five codes in Table 3. Knowing the factors related to the psychology of learners and learning is essential while dealing with young kids at schools. A conscious choice of acts with affection is necessary while designing tasks inside and outside the classroom. Inclusion of insights like content to be transacted among primary school students, consideration of development and growth and awareness about classroom

dynamics have to be part of the interpersonal leadership paradigm of a primary school teacher aspirant. Unlike normal human interactions, interactions that happen in a learning environment require consideration and awareness of several psychosocial factors. Codes of this theme are derived from various teacher education curricula and syllabi of educational psychology and related subjects. (State Council of Educational Research and Training Kerala [SCERT Kerala], 2018; University of Calicut., 2017; University of Calicut., 2021; National Council of Educational Research and Training [NCERT]., 2016.)

**Table 4: Codes of the theme: School Management**

Codes	Theme
Relationship with other Teachers and staff	School Management
Relationship with Parents	
Relationship with Higher authorities	
Relationship with School Authorities	
Relationship with society	
Utilisation of facilities	

The theme, school management, is based on six codes in Table 4. School is an educational environment with an institutional structure which requires management skills and competencies. A teacher has to engage with various stakeholders and administrative structures proactively. Effective organising for the benefit of learners and learning, requires abstract and concrete interpersonal leadership practicing attitude. These codes are derived from the subjects related to educational management and the curriculum of various teacher education programmes. (NCERT., 2005; NCERT., 2023; SCERT Kerala., 2018; University of Calicut., 2017; University of Calicut., 2021.)



### Semi-structured interview schedule for experts on interpersonal leadership perceptions

**Table 5: Codes of the theme: School Management**

Codes	Theme
Interpersonal relationship	School Management
Effective Communication	
Personal vision	
Team spirit	
Administrative Awareness	
Democratic discussions	

The theme of School Management is constituted based on six codes given in Table 5. According to experts, school management plays a vital part and requires awareness. Life skills like Interpersonal relationships and effective communication, which require patient listening, empathy and respect, are unavoidable in making things happen in schools. Awareness about laws, legalities and functioning of educational institutions is helpful to understand the scope and limitations of a school system. Space has to be created for expressing, criticism, creative thinking and brainstorming in a team environment theme.

Experts emphasised the importance of maintaining healthy relationships with persons connected with the school, conscious choices of healthy styles of relationship with them and adopting a clear and constructive communication strategy for that purpose. The teacher must become aware of their vision of education, learning, teaching, and the school. They also have to learn how their vision conflicts with and integrates with the vision of the curriculum and practice intervening in school activities. It also highlights the need to apply interpersonal leadership principles in different ways in the school context. It is necessary to organise training for teachers by

understanding that interpersonal leadership practices are naturally needed in institutions which follow the principles of democracy completely or partly.

**Table 6: Codes of the theme: Dimensions of Think Win-Win**

Codes	Theme
Personal leadership	Dimensions of Think Win-Win
Understanding roles	
Execution of team work	
Auditing of the objectives	
Auditing of the process	
Identification of the possibilities in each member	
Identifications of demerits of the team	
Acknowledging the efforts	

The theme Dimensions of Think Win-Win is constituted based on eight codes given in Table 6. Areas in a team activity in which each team member has to ensure they will be achieving their aim parallel to the aim of team members and team is suggested by experts are mentioned as codes. Suppose two teachers are doing a group activity together, each teacher has to ensure the space for committing individual responsibility for both to achieve the team goals as well as individual goals from that team effort. Similarly, each teacher has to take the initiative to ensure that both understand the roles clearly, can execute work, achieve individual objectives, audit their progress, understand each other's possibilities in achieving outcomes, understand the strengths and weaknesses of the team and can acknowledge each other's efforts. This practice is supposed to happen first internally in the mind of an individual teacher while doing a team activity. If all the members in the group activity have this attitude internally and practically, better

results will be reflected. Keeping an attitude of winning along with the individual victory of each team member while achieving a common goal together is the essence of the Think Win-Win habit and the core of the idea of interpersonal leadership.

**Table 7: Codes of the theme: Quality personal life**

Codes	Theme
Health factors	Quality personal life
Emotional Well Being	
Family goals	
Parenting responsibilities	
Time management	
Identificatiocn of personal goals	

The theme Quality of Personal Life is based on six codes in Table 7. Giving attention to physical health, mental health, smooth conduct of family responsibilities, role as a parent and harmony between personal and professional life can be complimentary for the performance in school or institute. Time management and personal management activities of teachers will have to be more flexible, creative and innovative for developing a quality personal life.

**Table 8: Codes of the theme: Teacher-Student Relationship**

Codes	Theme
Classroom management	Teacher-Student Relationship
Understanding Student's objectives	
Understanding Curriculum objectives	
Selection of suitable strategies	

The theme Teacher-Student Relationship is constituted based on four codes in Table 8. Experts suggest being aware of the objectives

of various aspects of learning and selecting pragmatic strategies accordingly is vital to the success of interpersonal leadership practices in the classroom. Interpersonal leadership practices must be sharpened well enough to implement the curricular principles effectively with students. Nature, age, developmental stages, emotional patterns, momentary requirements in the learning environment and personal goals of students have to be considered.

**Semi-structured interview schedule for primary school teachers on interpersonal leadership status.**

**Table 9: Codes of the theme: Relationship with Colleagues**

Codes	Theme
Consideration	Relationship with Colleagues
Respect	
Mutual Understanding	
Recognition	
Team spirit	
Online communication	

The theme, Relationship with Colleagues, is based on six codes in Table 9. Teachers reported considering the importance of self-respect and emotional consideration among teachers for the smooth functioning of the school. Online communication and interactions must be made with the intention of true team building. Small efforts and contributions of all members have to be recognised for executing in win-win practice in its true sense. Teachers shared the incidents which created misunderstanding between teachers in the staff room, staff meetings and team tasks due to a lack of mutual understanding. Teachers shared various incidents about how healthy bonds between teachers can create worthy outputs and how unhealthy patterns can influence the school environment. Students of the school winning various prizes in school youth festivals, science exhibitions and sports as a result of extraordinary unity and team spirit

among the staff is one example of a positive story. Open interactions without valuing the efforts of other teachers in staff meetings caused the creation of unhealthy groups among teachers, and created confusion in class timetables, an incident shared by a teacher, is an example of a negative story.

**Table 10: Codes of the theme: Individual Transformation**

Codes	Theme
Information sharing	Individual Transformation
Priority selection	
Skill development	
Training Programs	
Postive working environment	
Upadating	
Suitable opportunities	

The theme Individual Transformation, is constituted based on seven codes given in Table 10. Teachers require suitable information and training to get updated the way they want. Non-judgmental positive space is necessary for individual transformation. Training programs are useful, but sometimes not connecting at the individual level, and appear as if just part of the official schedule as per the opinion of some teachers. Directions for choosing priorities of objectives and actions to be implemented as an individual, as well as a teacher, can be made part of various training programs, especially in the in-service ones. A teacher reflected on her experience of how the techniques of self-development shared by a senior teacher in the school helped her to manage things well in school as well as at home effectively. She expressed the practical wisdom that such teachers and experienced persons have to be part of training programs to change the attitude of teachers.

Some teachers suggested that opportunities for advanced training programs conducted

at International, National and State levels must be arranged for more teachers and for the teachers of different regions. An official system has to be created to share information about programmes with all teachers which supports the teachers to update themselves in specific skills and competencies and that platform can be used for planning and conducting innovative programmes for continuous professional development based on the direct needs and demands of teachers. Such teacher community platforms can conduct professional trips, specific talent nurturing of teachers and collaborative efforts of teachers of various schools or even various states as per the reflection of a teacher. Information technology support and updating related skills can be made more individualised so that a teacher can learn themselves and several times common information technology-related jobs in school become the duty of only a few teachers.

**Table 11: Codes of the theme: Teacher-Student Relationship**

Codes	Theme
Understanding Generation gap	Teacher-Student Relationship
Friendliness	
Child centeredness	
Child rights	
Curricular objectives	
Expectation of parents	

The theme Teacher-Student Relationship is constituted based on six codes given in Table 11. Generational changes in the attitude of students are visible often such that teachers are forced to change their communication strategies. A friendly approach is necessary to build proper communication with young minds in the age of social media. Clarity in actions is necessary to take corrective measures, pointing out the mistakes and criticising. Teachers require patience and

have to use effective communication skills. Primary school kids get influenced by media, cartoons and mobile phones and value changes happening in society. Teachers have to be watchful of these happenings and respond appropriately while transacting the curricular objectives. Child-centered attitude and selections of transacting methods in alignment with that are required in executing learning activities. Teachers of democratic countries have to deal with young minds with an insight to be made aware of child rights and citizen rights including the details of cyberspace. Awareness of conscious parenting, expectations of parents on their children, individuality of learners, uniqueness in abilities of individual primary school children and dealing with learning disabilities of kids are a few factors which display why a teacher has to master the art of relationship with students.

**Table 12: Codes of the theme: Social Relationship**

Codes	Theme
Interactions with parents	Social Relationship
Dealing with Management	
Social auditing	
In-service supporting programs	
Managing public programs	
Association with people of various category	

The theme Social Relationship, is constituted based on six codes given in Table 12. Inside and outside the school scenario, primary school teachers often deal with members of society including parents of students, members of local self-governing bodies, Old

Student Association Members, Old Teacher Association members, Representatives of Management or Government authorities, citizens residing near the locality of the school and representatives of in-service training programs, courses, workshops and seminars. Social auditing responses of teachers and schools can be received in several interactions of these types. Sometimes public speaking skills are necessary to communicate the required message to the school and learners. Teachers reported incidents of how managing these situations went wrong and influenced the smooth conducting of the school system negatively for a few days.

Some teachers described similar types of events and few individuals in the community pointed out the social interaction incompetence of teachers and attempted to defame the image in unhealthy ways. The teachers shared examples of misunderstandings caused by social interactions that led to situations where the personal lives of students, teachers, and parents were criticised unacceptably. There have been situations where the objectives of education and teaching are misinterpreted and unscientifically criticized by the parents causing unwanted tension in the smooth conduct of the school. The teachers also shared situations in which teachers who are proficient in social interaction can intervene positively. The teachers described various situations in which they teachers were able to make positive interactions with the public eventually resulted in increasing the infrastructural facilities of the school, upgrading the school library, providing school uniforms, providing better food with the help of society, facilitating students' travel, removal of nuisance from anti-socials, and distribution of aid to students of poor families.

## Conclusion

**Table 13: Themes based on three different analyses**

<b>Content Analysis</b>	<b>Semi-structured Interview schedule for experts on interpersonal leadership perceptions</b>	<b>Semi-structured Interview schedule for primary school teachers on interpersonal leadership status</b>
Paradigms of Human Interaction	School Management	Relationship with Colleagues
Dimensions of Think Win-Win	Dimensions of Think Win-Win	Individual Transformation
Learner and Learning	Quality Personal life	Teacher-Student Relationship
School Management	Teacher-Student Relationship	Social Relationship

Table 13 displays 12 themes that were identified using three different analyses. Dimensions of Think win-win, Teacher-student relationship and School Management are the codes present twice. Some codes have similarities in nature, even though they are viewed as different domains. Teacher-student relationship and learner and learning are two codes similar in the interaction between teacher and learner. Learner and learning are independent of identifying normal relationships as per the responses recorded from the interviews. Quality personal life and individual transformation are other sets which have similarities. Quality personal life emphasises the quality of personal being where, as individual transformation is looking forward to evolving as an individual. Even though health and emotional factors are associated closely with both, interpersonal leadership patterns act differently in both scenarios. Some connections can be found among the codes of School Management and Social Relationship as association with stakeholders is present in both.

While preparing a module for enhancing interpersonal leadership practices among D. El. Ed. students' insights and ideas, these twelve themes and seventy-one codes can be considered while doing the module, fixing the objectives and selecting the activities. Elements like Paradigms of Human Interaction, Dimensions of Think Win-Win and Learner and Learning must be introduced with a theoretical outlook. Quality

personal life and individual transformation must be transacted as a practice of self-understanding. Other themes are connected with practical insights chained with real school experiences. All the themes suggest methods and approaches that scaffold creating self-awareness, perception changes, and integrating various sides of life and socio-emotional balance. Inputs can be identified from these findings and the process of investigation for implementation in Teacher Education curricula including D.El.Ed. and in-service programs for integrating the lessons of interpersonal leadership and similar topics.

Themes and Codes identified through this investigation reflect several scenarios where an individual teacher can apply principles of interpersonal leadership. The school environment is demanding competencies to deal with these key focus areas effectively. The synergy of wisdom based on theories, experts and experiences of teachers can give a better picture of how Continuous Professional Development activities of teachers have to be modified by integrating the awareness of human interaction styles. Unlike other professions, teachers have to be alert always about several psychological, curricular and pedagogical factors while applying any new ideas into their practices. Preservice programmes can be modified based on the insights presented in this study by promoting the practice of Think Win-Win habit in the interactions of student teachers.

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## Innovation in Action: Exploring the Effectiveness of a MOOC in Teacher Education

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### Abstract

MOOCs are Massive Open Online Courses that are open and accessible to those with a stable internet connection. There is no kind of biasness concerning caste, creed, gender, etc. for its enrolment and registration which makes learning through MOOC inclusive. Learners can select any course of their choice irrespective of their previous background. The courses are also free in most cases and there are provisions for financial assistance in the case of paid courses. MOOCs have discussion spaces where students can talk with other learners from different regions and of differing backgrounds. The course provides students with self-paced learning and learning at their own convenient time. People who are doing a job and lack time to study in physical mode can enroll in such courses and get the benefits of online learning. Though MOOC has gained momentum worldwide, MOOCs in India are in a nascent stage. The Teacher Education programs should prepare students to use new technology in the classroom to meet the demands and aspirations of students in the twenty-first century. To fulfil these educational demands of students, we require teachers who know how to deliver knowledge and who truly care about students and their future success. The researchers in the present study developed a MOOC for pre-service teacher educators and studied its effectiveness with the help of an achievement test prepared and validated by the researchers. The developed MOOC enabled students to get acquainted with a new method of learning, compelling them to use various authentic open educational resources available on the online platform, enabling self-paced and flexible learning. The analysis indicates that MOOC was found to be effective in enhancing pre-service teacher educators' achievement. The findings support the idea that pre-service teacher educators need to be trained for developing Massive Open Online Courses in their respective subjects by utilizing the various free open-source software available online.

**Keywords:** MOOC, Pre-service teacher educators, research methodology, quadrants, achievement

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### Introduction

Massive Open Online Course (MOOC) has evolved as a critical type of Open Distance Learning. These courses are Massive because there is no limit on the enrolment of students in these courses. It is considered Open because anyone from anywhere with the internet can access it and it is Online because all course components like instruction, testing, and discussions are done online. MOOC can be defined as a

course that has no limits on its enrolment; it may have a set start and end duration, is open for all irrespective of the background, all components are shared online, and has features of video lectures, discussion forums, online assignments and assessments leading to certifications. MOOCs are open and accessible to all with a stable internet connection. There is no kind of biasness concerning caste, creed, gender, etc. Hence, learning through MOOC is considered to be inclusive. Learners can select any course

of their choice irrespective of their previous background. The courses are also free in most cases and there are provisions for financial assistance in the case of paid courses. MOOCs have discussion forums where students can talk with other learners from different regions and backgrounds. The course provides students with self-paced learning and learning at their own convenient time. People who are doing a job and lack time to study in face-to-face mode can enroll in such courses and get the benefits of online learning. According to Goel & Goel (2013), "Open Distance Learning through MOOCs has great potential to be infused in teacher education in both pre-service and in-service modes which seems to be a neglected area. Teacher education in India has a slow pace in getting access to modernization and has not yet integrated the technological innovations for transacting education." The researchers in the present study developed a MOOC for Pre-service teacher educators and studied its effectiveness with the help of an achievement test developed and validated by the researcher. The developed MOOC enabled students to get acquainted with a new method of learning, compelling them to use various authentic open educational resources available on the online platform, enabling self-paced and flexible learning among them.

### **Present Status of MOOC In Teacher Education**

Teacher Education is an important discipline to improve the quality of school education. According to Goel and Goel (2013), "Teacher Education is a discipline which educates the progressive generations on what has gone by, where we are, where we want to go, and what we like to create, observing healthy, meaningful and long life. Innovations in Teacher Education are very rare. It may be attributed to various factors. Novel ideas do not incubate because of adverse external conditions. There are wide gaps between the visionaries and actors. So, very often the

innovations have a short life and die down in the institutions, where these originate. Sometimes, the most innovative programs fail in the formal system, because, these are beyond the view & purview of the apex bodies." Teacher Education Programs largely follow traditional methods of teaching and infusion of modernization is very slow. The programs are always novices to new modes of teaching in India, teacher educators are reluctant in adopting or experimenting with innovative teaching approaches. It is crucial to remember that teaching isn't essentially a field that's known for creativity, so change can be tough. As science and technology are advancing in India, the methods of teaching are also not confined to the 'chalk-and-talk' method but moving more towards methods which focus on the need of students. However, the outlook of teachers towards adopting such innovative approaches to teaching is a big challenge (Parvin, 2021). Teacher Education Programs should prepare students to use new technology in the classroom in order to meet the needs and aspirations of students in the twenty-first century. To fulfil these educational demands of students, we require teachers who know how to enhance the learning experiences of students and who truly care about students and their future success.

### **Review of Related Literature**

The researcher reviewed few studies on the development and implementation of MOOC. Uppal (2019) and Inchiparamban and Pingle (2017) developed and implemented a MOOC and found that MOOCs can significantly enhance knowledge and awareness among teacher educators and B.Ed. students. Similarly, Najafi et al. (2014) demonstrated that integrating MOOCs into school-based courses as self-study tools can improve test scores, although they underlined a potential issue with platform sustainability. Griffiths et al. (2015) observed no significant difference between students' learning through blended MOOCs and traditional



methods in university settings, suggesting that MOOCs offer a unique learning style. Andone and Mihaescu (2018) commended MOOCs for promoting self-paced learning, while Israel (2015) highlight the challenges of incorporating MOOCs into conventional classrooms despite their potential as excellent resources. Cohen and Soffer (2015) as well as Goncalves et al. (2016) highlighted MOOCs' flexibility and their role in developing 21st-century skills, especially in teacher education. Janssen et al. (2016) emphasized the importance of teacher involvement in MOOC design, and studies like Oakley et al. (2016) identified key factors for MOOC popularity, including material accessibility and practicality. Research across various studies highlights the potential of MOOCs in enhancing knowledge among educators and students, offering a flexible and self-paced learning environment.

### Need for the Study

The Indian government recognizes the value of MOOCs in promoting Entrepreneurship, Education, and Training, and has set aside funds in its budget to support the creation of more MOOCs. The government's recent initiatives to provide quality education for people at all levels will be dependent on the expansion of online learning. To increase the enrolment in higher education in India and to provide quality world-class education to all, MOOC can be a viable option. Given the increasing need of youth to pursue excellent higher education at affordable prices, as well as the importance placed on e-learning and digital literacy by educational institutions and governments worldwide, Massive Open Online Courses are becoming an integral part of the global education system (Subrahmanyam & Swathi, 2017). MOOCs are the new revolution sweeping the Higher Education sector. India's defining task and opportunity for the twenty-first century is to provide good higher education and to prepare young people for their livelihoods and careers. MOOC is the answer to all these problems and can provide access to

education to any massive population. MOOCs can offer students more engaging and effective instruction than individual professors might be able to create on their own (Daniel, 2012).

Although MOOC has gained momentum worldwide, MOOCs in India are in a nascent stage. Efforts need to be taken to maximize the engagement among learners, monitor their learning, and make learning interesting so that the dropout rate can be minimized. This study aims to provide pre service teacher educators with not only a new platform for teaching and learning but also prompt them to adopt such practices in the future. It also seeks to provide a path for pre-service teacher educators to get acquainted with an innovative teaching-learning platform, promote professional development, create awareness for MOOCs and equip them with 21st-century technical skills. The investigator did not find any studies, research, or investigations especially focused on developing a MOOC for pre-service teacher educators during the review of the literature. Consequently, the researcher was eager to undertake the present study in this field and to develop a MOOC on the selected topic of Research Methodology and test its effectiveness.

### Objectives of The Study

- To develop a MOOC in 'Research Methodology' for pre-service teacher educators.
- To implement the developed MOOC in 'Research Methodology' on pre-service teacher educators.
- To study the effectiveness of the developed MOOC in terms of the achievement of pre-service teacher educators

### Hypothesis

The following null hypothesis was formulated and tested at the 0.01 level of significance.

**H<sub>0</sub>:** There is no significant difference in the post-test mean achievement score of the control and experimental group in Research Methodology.

## Terminology

MOOC: MOOC stands for Massive Open Online Course. It can be defined as an online course hosted on a platform that can enroll many students simultaneously, may have a set start and end date, is open for all irrespective of the background, all components are shared online, and has major components like video lectures, discussion forum, online assignments and assessments leading to certifications and badges.

Pre-service Teacher Educators: Students enrolled in the two-year M.Ed. program across India.

Achievement in Research Methodology: Score secured by the pre service teacher educators in an Achievement Test in 'Research Methodology' prepared by the researcher.

## Research Design

The present study is quantitative and an experimental study was adopted. The research design used was quasi-experimental. In this design, an experimental procedure is applied but all extraneous variables are not controlled (Christensen et al., 2014). Here, manipulation of the independent variable is carried out but there is no random assignment of individuals to the control and experimental group. The design adopted was a pretest-posttest non-equivalent control group design was adopted. The independent variable used was MOOC and the dependent variable was the achievement in 'Research Methodology' of pre-service teacher educators.

## Population and Sample of the Study

The population consist of all those items, objects or things which are having certain characteristics common in all and are of interest to the researcher. The present study population comprises all the pre service teacher educators studying in the two-year M.Ed. programme in India in the academic year 2021-2023. Since 2015, the duration of the M.Ed. programme has been increased

from one year to two years. Due to this, several M.Ed. colleges started facing difficulties in getting sufficient enrolment (Rohilla, 2020). Hence two institutions from Gujarat state with sufficient enrolment were chosen to conduct the research i.e. Department of Education, Faculty of Education and Psychology, The Maharaja Sayajirao University of Baroda, Vadodara and Kameshwar College of Education, affiliated to Gujarat University situated in Ahmedabad. The only factor for choosing the institution was the convenience of the researcher to be able to get access to the pre service teacher educators and get permission and full support of the authority to collect data.

## Research Tool

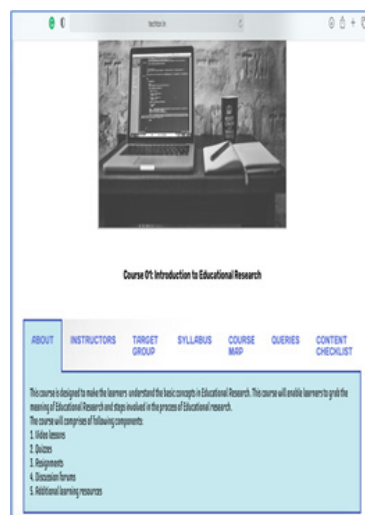
An achievement test in 'Research Methodology' was constructed by the researcher. The same achievement test was used both in pre-testing and post-testing (i.e. before and after the implementation of the developed MOOC) of the control and experimental group. It was prepared in both English and Gujarati language. The achievement test was constructed keeping the topics to be taught through MOOC in mind. So, the achievement test comprised questions relating to three broad topics of 'Research Methodology' constituting of introduction to research methodology, types of research methods and sampling in educational research. Before constructing the achievement test in Research Methodology a blueprint was prepared by the researcher. The achievement test consisted of 50 multiple-choice questions and was of 50 minutes duration. The achievement test was prepared using multiple choice question options in Google form. The questions prepared by the researcher took into consideration all three levels of the cognitive domain i.e. knowledge, understanding and application. The items in the test were divided uniformly among all three broad topics. The developed achievement test was validated by the subjects and language experts. All suggestions and comments were incorporated into the final achievement test.

## Development of the MOOC

MOOCs are Online Courses with the capacity to enroll unlimited students, open to all and consist of components like video lessons, assessments, discussion forums and additional resources. It also consists of a platform to host the Course. The researcher developed the MOOC, along with its different quadrants and platform, to host the MOOC. The following steps were involved in this process:

- Self-enrolment in MOOC to understand its basics and technology
- Selection and analysis of content for MOOC
- The content selected for MOOC was then divided into three Specializations

- WordPress was selected as a Content Management System to design the website
- Designing various web pages on the platform WordPress
- Selection of an LMS –plugin called LIFTERLMS to develop the course
- Development of Quadrants for MOOC including video lessons, discussion forums, assessments and additional resources.
- Making the quadrants interactive and engaging.
- Assembling the Quadrants in the Course Builder feature of the LIFTERLMS. i.e. planning the lesson and modules.
- Developing Additional elements of MOOC



<b>Module 1: Introduction</b>	
Pre Course Survey	1 of 3
Course Introductory video	2 of 3
Let's know each other	3 of 3
<b>Module 2: Concept of Educational Research</b>	
What is Research?	1 of 6
What is Educational Research?	2 of 6
Characteristic of Educational Research	3 of 6
Purpose of Educational Research	4 of 6
Activity 1	5 of 6
Additional Resources	6 of 6
<b>Module 3: Steps of conducting Educational Research</b>	
Identifying an educational research problem	1 of 8
Reviewing Related Research Literature	2 of 8
Specifying purpose of Research	3 of 8
Collecting Data	4 of 8
Analyzing and Interpreting data	5 of 8
Reporting and Evaluating Research	6 of 8
Activity 2	7 of 8
Additional Resources	8 of 8
<b>Module 4: Benefits of Research in Education</b>	
Benefits	1 of 3
Activity 3	2 of 3
Additional Resources	3 of 3
<b>Module 5: Classification of Educational Research</b>	
Classification	1 of 8
Basic Research	2 of 8
Applied Research	3 of 8
Evaluative Research	4 of 8
Action Research	5 of 8
Types of research-By Approach	6 of 8
Discussion Forum	7 of 8

Figure 1: Home Page of Course 1

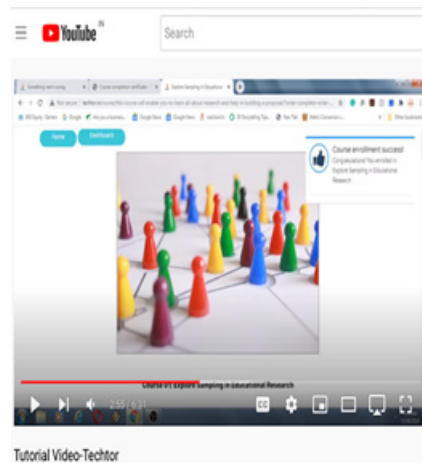
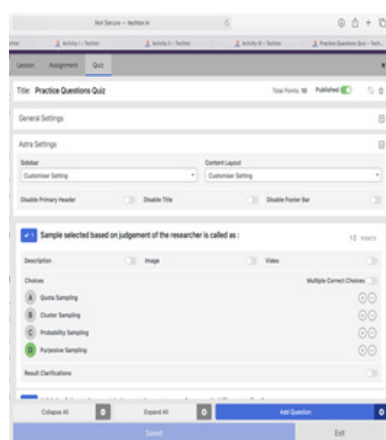
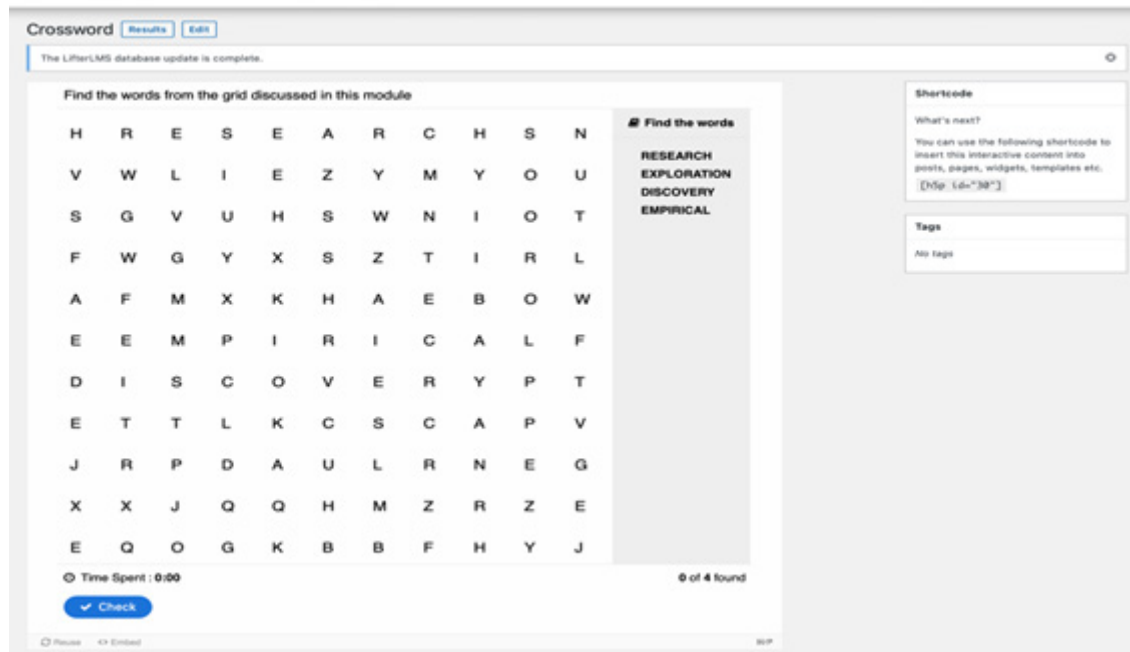


Figure 1: Some quadrants of MOOC (i.e., Video lessons and assessments)

- Development of an e-Manual to assist users in understanding how to effectively and efficiently use the course.
- Development of a Tutorial Video



*Games/Activities in the MOOC*

- Development of an Orientation Presentation on MOOC for the experimental group
- Validation of the MOOC by experts-The storyboards along with the manual, instructional video and link of the course was initially shown to five research scholars in field of education. These were mailed to the scholars and their valuable feedback on the Course was sought. They were also asked to fill a google form to provide their feedback. All their comments and views were noted and changes were done in the Course wherever required. Subsequently, it was shown to experts in the field of Education and Education Technology. The feedback was noted and changes in the Course were made accordingly. After the validation of the Course, it was finally ready for pilot testing.
- Piloting the MOOC- A pilot testing is done majorly to find the feasibility of a tool or programme. As per Christensen et al. (2014) when conducting an interned based study, the researcher should self-pilot as well select some participants to complete the Course. This will enable the researcher to know whether the Course works properly in the browser. Hence the first piloting was done by the researcher to see whether all Course components were working properly. Further researcher decided to implement it on student teacher educators of M.Ed. first year. An online google form was circulate in groups for consent to participate in pilot study. Student teacher educators other than the sample were finalized on whom the MOOC was implemented. They were also provided with the manual. Once the pilot testing once over, researcher made the minor modification in the Course, as

suggested by them. The entire Course was finally available on TECHTOR.in .

### Implementation of the MOOC

The study was carried out in September 2021, when institutions were getting back to normal after the second wave of the COVID-19 pandemic, and the majority of the students and teachers were working from home. The researcher sent an email to different instituting running two years M.Ed. Course in Gujarat, to get permission to conduct the study. Data were collected from the experimental and control group during the implementation phase. Pre-test and post-test were administered in both the control and experimental group. The Massive Open Online Course was implemented in the experimental group and the control group was taught through the Conventional method. Here, 'conventional method' means the method adopted by the teachers in the control group to teach their students and as it was the time of Covid-19 so conventional method mainly comprised of online teaching on Zoom and Google Meet platforms. MOOC was developed to evaluate its effectiveness in terms of student achievement. After the researcher got permission from the head of the department to implement the MOOC in the experimental group, the steps to implement the Course began. The first step was to make a WhatsApp

group wherein all the students enrolled in the batch of M.Ed. first year of 2021-23 were asked to join. In the last week of September 2021, a virtual meeting was conducted using the platform google meet, and a link for the same was shared on the WhatsApp group. Pre service teacher educators of the experimental group were introduced to the topic of the Massive Open Online Course. The researcher also explained to students about the new platform TECHTOR and ways to get access to it. The experimental group was also instructed on how to register on the platform and enroll in the Course.

### Data Analysis and Interpretation

To achieve objective 3 of the present study, i.e., to study the effectiveness of the MOOC in terms of the achievement of student-teacher educators in 'Research Methodology' and to test the null hypothesis a comparison of the post-test score of the experimental and control group in achievement test was done. In the present study, the pretest was conducted for the purpose of matching.

Table 1.2 shows the summary of the results after applying descriptive statistics on the post-test scores of the achievement test on the experimental group and control group in the Research Methodology.

**Table 1.2: Distribution of Mean, Standard Deviation (SD) and Standard Error of Mean (SE) of post-test scores of Experimental Group and Control group in Research Methodology.**

Groups	N	Mean	SD	SE
Control	40	26.00	5.18	0.82
Experimental	40	29.88	3.12	0.49

The comparative scores of the post-test in 'Research Methodology' of the experimental group and control group are given in Table 1.2. It is evident from Table 1.2 that the mean achievement score of the experimental group and control group in 'Research Methodology' were 29.88 and 26.0 respectively. The mean achievement score of the experimental group was found more than that of the control group in 'Research

Methodology'. The standard deviation of the experimental group and control group mean were found to be 3.12 and 5.18 respectively. Comparing the standard deviation of the experimental group and control group, it was found that the experimental group was more homogenous in comparison to the control group. Standard error was also found to be less in the experimental group as compared to the control group. The

mean score of the experiment group in the post-test and the less standard deviation could be due to the implementation of MOOC. To find whether the difference in the mean scores was significant or by chance and to test the null hypothesis, i.e., "There will be no significant difference

in the post-test mean achievement score of the control and experimental group in 'Research Methodology' non-parametric statistic Mann-Whitney U-test was used. The detailed summary of the Mann-Whitney U-test is given in Table 1.3 which is followed by the analysis.

**Table 1.3: Summary of Mann-Whitney U- Test for Achievement in Research Methodology of Experimental and Control group with Sample Size (N), Sum Ranks ( $\sum R$ ), U- Value, z- Value and significance level**

Groups	N	$\sum R$	U- Value	z- Value	Significance Level
Experimental	40	2036.00	1216.0	4.018	0.000
Control	40	1204.00			

As seen in Table 1.3 the sum of the ranks of the group taught through MOOC and the control group taught through the conventional method were 2036.00 and 1204.00 respectively with 40 student-teacher educators in each group. The Z-value was 4.018 and the u value was 1216.00. Referring to the table for normal probability (Table A of Sigel, 1956) under null Hypothesis ( $H_0$ ) of z, for  $z \leq 4.018$ , the two-tailed probability was found to be 0.000 which was lesser than our decided significance level ( $\alpha$ ) i.e., 0.01. Therefore, the null hypothesis, i.e., "There will be no significant difference in the post-test mean achievement score of the control and experimental group in 'Research Methodology' was rejected and it could be believed that the group who studied through the Massive Open Online Course and the group who were taught through a conventional method different significantly in terms of their mean scores in achievement test of 'Research Methodology'. Moreover, from Table 1.2, it can be seen that the mean achievement score of the experimental group is higher than the mean achievement score of the control group which can be due to teaching the experimental group through MOOC. Thus, it can be concluded that the MOOC in 'Research Methodology' was found to be effective in enhancing the achievement of student-teacher educators in 'Research Methodology'.

## Findings of the Study

From the analysis and interpretation of the data the following findings have been derived: The Massive Open Online Course was found effective in terms of significantly enhancing students, teacher educators' achievement in 'Research Methodology'.

## Discussion and Conclusion

Teacher education programs largely follow traditional methods of teaching and infusion of modernization is quiet slow. The programs are mostly aversive to new modes of teaching. In the present study, a Massive Open Online Course was developed for student's teacher educators in the subject of Research Methodology. This Massive Open Online Course was hosted on a platform named TECHTOR, and had four major quadrants in the form of interactive videos, discussion forums, assessments and additional materials. The MOOC was found to be effective in terms of significantly enhancing students' achievement in Research Methodology. This finding was supported by the studies of Inchiparamban (2017), Alturkistani et al. (2018), Ismail et al. (2018), Andone and Mihaescu (2018), and Uppal (2019) and Tzovla et al (2021), who implemented Massive Open Online Course in Educational Technology, Data

Science, Food and Beverage presentation, Web Technologies, ICT Integration in Higher Education and a Professional Development MOOC respectively and found it to be effective in enhancing the achievement. The most probable reason for the success of the present study could be the exposure of the group to a Massive Open Online Course divided into chunks of three specialized courses; the content in the course was taught through interactive videos, support of additional materials after every video, assessments, discussion forums, activities and through variety of online software, with online support available for all enquiries through WhatsApp. In addition to these student teacher educators also received badges after each module and certificates at the end of the course. Student teacher educators also had the advantage to check their own learning through the embedded quiz in the videos and watch the videos again and again to revise the concepts. The 'Research Methodology' course which is an important component of curriculum for student teacher educators and not only for conducting research and writing the thesis but also for developing rational thinking. Majority of times lecture method is being used for its transaction, although learning by doing, cooperative learning, computer-assisted simulation, video based learning, electronic mind map (Lehti and Lehtinen 2005, Rohilla 2020, Tungprapa 2015, and Mekonnen 2020) have also been tried, tested and proved to be effective.

In the present study an attempt was made to develop MOOC in area of Research Methodology and provide students teacher educator with a unique mode to learn using interactive videos, discussion forums, additional resources and automated quizzes. Student teacher educators had positive reaction towards the course and also preferred to learn other topics though this

method. A possible explanation for this might be that students learn better when they have control over their learning (Hardway & Stroud, 2014).

The COVID-19 pandemic and the subsequent lockdown affected all the sectors in the country. As colleges and universities got closed teachers resorted to online learning. Experimentation with different platforms began and MOOCs emerged as one of the major sources of remote learning. Although MOOC was not a new concept before the pandemic and has been in existence since 2009, its acceptance among learners increased during this period. MOOCs are not only accessible from anywhere but also accommodate massive students at the same time at no extra cost. They provide a platform where students from arts can learn a subject of science, with only one requirement and that is interest in learning. Higher education institutes from around the globe, from various fields are trying their best to make MOOCs and reach millions of students but its infusion in the area of teacher education in general and M.Ed. programme in particular is still limited. The present study attempted to develop a massive open online course for pre service teacher educators in the subject of research methodology. The distinguishing features of the course development were that it had interactive videos, modules with numerous lessons, a variety of additional resources, a personalized open-source platform to host the MOOC, ample opportunities for students to get support from the instructor, automated assessment and set start and end date which were flexible. This MOOC was effective in terms of the achievement of student-teacher educators. The student-teacher educator found the course interesting, self-paced, fun, and engaging and they also preferred to learn other topics of 'Research Methodology' through MOOC in the future.

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## Cultivating Equity: Analysing Access to Quality Education for Tribal Students in Eklavya Model Residential School

Dipak Karmakar

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### Abstract

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*In 1997–98, the Government of India (GOI) established the Eklavya Model Residential School (EMRS), a residential education scheme to provide quality education to tribal children in remote areas of the country. This study focuses on the structure, governance, and resourcing patterns of EMRSs, especially the deployment of teachers, raising some equity concerns for the education of tribal communities. It also highlights flaws in the governance and resourcing patterns using cases of teacher recruitment, deployment, salaries and development in EMRSs. It further examines interstate and inter-district disparities, as well as differences in functioning between privately managed and government-managed schools, leading to inequalities. The study reveals how large-scale contractual teacher appointments lead to unequal teacher effectiveness, which significantly impacts student learning and affects the overall quality of education provided to tribal children compared to those studying in other government schools. The study highlights how the nature of appointment limits contractual and guest teachers to just being subject knowledge deliverers rather than contributing to the children's holistic development. The inequalities in teacher resourcing and student learning are further affected by the lack of coordination between tribal societies at the state and district levels. Besides, the directorates of education at the state level, through State Councils of Educational Research and Training (SCERTs), District Institutes of Education and Training (DIETs) and other central government initiatives, deprive teachers of professional development opportunities, which subsequently deprive schools of the benefits that would otherwise reach children. Thus, it impacts the curriculum quality, and subsequently, the overall quality of education, resulting in schools that merely follow circulars and norms. But they miss the spirit of learning, deepening the inequalities faced by tribal and marginalised children.*

**Keywords:** *Eklavya Model Residential Schools (EMRSs), equity, teacher resourcing, rationing of opportunities, tribal schools, governance*

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### Introduction

Scheduled Tribe (ST) communities are geographically and socially isolated from society, facing different types of challenges (Geddam, 2015). Across the country, it has been observed that children from marginalised communities receive unequal educational opportunities (OECD, 2010). This primarily relates to the limited availability of resources and amenities in rural areas that are predominately

tribal in makeup. Besides, these regions face inadequate teacher–student ratio, difficulties in using teaching staff, time constraints and issues with the quality of teaching-learning experiences. To ensure a level playing field for equal learning for all students, factors involving exposure to and accessibility of co-curricular resources and opportunities for holistic child development are crucial (Patra, 2018). To address inequities regarding access to education experienced by tribal children in rural areas,

residential schooling facilities, such as the Eklavya Model Residential Schools (EMRSs), are a significant step taken by the Ministry of Tribal Affairs, GOI. According to Kumar and Naseema (2018), residential schooling can boost performance, motivation, and learning by fostering an inclusive and a fair school culture. The EMRSs try to develop themselves into a system that addresses the achievement, motivation, and learning needs of millions of tribal children in the country.

This paper highlights some structural and governance concerns of schools managed by Tribal Development Departments in different states, especially EMRSs. It also points out a flawed understanding of equality, as demonstrated through the limited provisioning of school buildings and infrastructure, as well as the failure to ensure sufficient qualified regular staff and continuous training opportunities for staff development. Thus, it narrows the meaning of 'equality of opportunities' to availability of schools, and 'equality of treatment' to availability of learning resources and residential facilities.

Amidst the focus on learning outcomes that place the onus on individual teachers while downplaying the need for recruiting qualified and trained staff and for necessary inputs, such as a friendly learning atmosphere and quality education (Rampal, 2018), the paper questions the rationing of opportunities for tribal children and how schemes intended to reduce inequalities are, in fact, exacerbating them.

### **Understanding Equitable Quality of Learning Opportunities**

Equity provides resources that enable everyone to accomplish shared objectives. In simple words, while all students have the same expectations and goals, each of them require different levels of support to meet those goals. Ensuring that every student gets the opportunity for quality education recognises the intrinsic value of diversity and dignity of all individuals (UNESCO, 2016). According

to Schleicher (2014), students must be able to learn to their fullest without barriers in an equitable educational system. To ensure quality education for underprivileged pupils, it is imperative to have fair and inclusive resources at the school level. To provide equity in educational opportunities for all students to develop their potential—irrespective of socio-economic status, racial heritage, gender or any other factor—all of them must have access to quality education. Discrimination needs to be eliminated, and students must succeed at school based on their efforts and abilities. It helps improve opportunities for disadvantaged students and schools, benefiting both the education system and society.

This study examines policy and practice measures that promote equity and quality at the system and school level. Equity and quality education must be combined for a high-performing education system. It is important to adopt policies that promote equality and quality at the system and school level to ensure that every child has access to quality education. Improving educational opportunities benefits both students and communities. It is crucial to design equitable systems and paths across the education system, implement inclusive practices inside and outside the classroom, and allocate sufficient resources (equity priorities, resources, and goals) to achieve equity. Facilitating fair education for marginalised students would help make the society fairer, and reduce the gap between privileged and underprivileged students. An effective education system combines quality and equity so that most students can achieve high knowledge and skills (OECD, 2012). Schools with a higher percentage of underprivileged pupils face more challenges, leading to poor performance and ripple effects throughout the educational system.

The quality of leadership and teachers are the key players in transforming the performance of these schools. Qualified, trained, and skilled teachers need to be recruited. But their numbers are inadequate. Besides,

teachers hardly get any support from the authorities concerned to perform their role of change agents in tribal schools. Training programmes should offer foundational competence and expertise on handling issues encountered in schools, having pupils from disadvantaged sections of society, to increase teachers' capacity as those of change agents. Even though teachers significantly impact students' performance, schools for disadvantaged groups often do not have enough qualified teachers (OECD, 2012). Experienced and competent teachers are valuable resources for schools. So, the policies should encourage recruitment of qualified teachers in disadvantaged schools and conducting regular teacher training programmes.

### **The Context of EMRS**

This research explores the meaning of 'equality of opportunities' as observed in the structure, governance, provisioning, and functioning of the EMRS through the case studies of seven EMRSs in West Bengal. Realising the significant role that quality education plays in improving the living conditions of people, the GOI decided to dedicate the EMRS scheme for tribal students as a model school after the success of Jawahar Navodaya Vidyalayas (JNVs). The scheme aims to provide equitable, quality education to ST students in the upper primary and higher secondary stages of schooling. Tribal students, under the EMRS scheme, can benefit from reservations provided by the government and secure employment in public and private sectors and become change agents (EMRS Guidelines, 2020, Ministry of Tribal Affairs, GOI).

### **Objective of the Study**

The study is aimed at exploring the nuances of how equality of opportunity is reflected in the governance, provisioning, structure, and functioning of EMRSs, as well as the function of school leaders in enhancing the overall quality of these school systems. The

study aims to analyse teachers' recruitment, qualifications and development in EMRSs, and how these factors influence equality in learning opportunities and overall learning.

### **Methodology of the Study**

This study adopts a descriptive survey research design to comprehensively gather and analyse field-related data, and blending qualitative and quantitative approaches for a nuanced understanding (Creswell, 2011). To explore the multifaceted dynamics of EMRSs in West Bengal, the research employs data triangulation strategy and enhances convergence validity by triangulating multiple sources and methods, including interviews, observations, school documents, and contextual analyses. Drawing from primary and secondary sources and engaging various stakeholders, this approach ensures a comprehensive examination of the subject through complementary perspectives (Greene, Caracelli, and Graham, 1989).

The primary data collection approach involved conducting in-depth interviews with a representative sample of EMRS administrators and key personnel across West Bengal. Purposive sampling guided the selection of participants based on their roles and responsibilities in the schools, ensuring a diverse representation. The interviews were semi-structured. Open-ended questions were asked to explore themes, such as school governance, educational practices, and challenges specific to EMRSs. A standardised school information schedule was also developed and used to gather quantitative data. This schedule included sections on student demographics, academic performance metrics, infrastructure details, staff profiles and community engagement initiatives, providing a comprehensive snapshot of each EMRS.

Districts with a substantial tribal population—Jalpaiguri, Bankura, Purulia, Paschim Bardhaman, Jhargram, Birbhum, and Dakshin Dinajpur—have EMRSs. The EMRSs cater to students from Class VI to XII.

Each EMRS has approximately 480 students. The analysis employed a mixed-method approach. Qualitative data underwent systematic classification, thematic coding and trend identification. Quantitative data were analysed using percentage analysis and tabulation to derive comprehensive insights into the functioning and impact of EMRSs. This robust methodological framework ensures a rigorous examination of the research questions, offering valuable insights into the educational landscape of tribal residential schools in West Bengal.

### About Teachers across EMRSs in West Bengal

Teaching and learning form the core of the education system, with teachers being the central figures in the educational process. A school's most valuable asset is its teachers. The need to have qualified teachers becomes even more critical in schools serving marginalised communities. In such cases, teaching transcends mere instructions and becomes a noble mission, aiming to integrate marginalised students as equal participants in learning. It, thus, requires teachers to possess empathy, understanding, sound content knowledge, professional skills, and dedication. The EMRSs aim to provide quality education to tribal students and address the educational disparities the children belonging to these communities face. So, the role of teachers in these schools is not just to provide academic knowledge, but to uplift and empower children. This is demonstrated through significant improvements in educational outcomes for tribal students, such as increased graduation rates and improved enrolment in higher educational institutions.

However, the ability of EMRSs to fulfil this noble mission is hampered due to the lack of regular recruitment of qualified teachers. For instance, in West Bengal, only EMRS-Satyabanpalli recruited a relatively higher number of teachers (44), with 12 (27.27%)

being contractual and 32 (72.72%) guest teachers. Across all EMRSs in West Bengal, approximately 60% teachers are contractual, 25% are guest faculty, and only 15% are regular. This heavy reliance on contractual and guest teachers, who often receive meagre salaries and per lecture compensation, undermines the stability and quality of education. The inadequate number of regular teachers compromises everyday school activities, leading to unfulfilled learning needs.

Additionally, 21% of the teachers, including regular employees, teaching in these EMRSs are not qualified or experienced enough. Some regular employees do not even have a degree in teacher education (B.Ed). Thus, the quality of education is significantly compromised. A research by Bennell and Akyeampong (2007) underscores the necessity of having a sufficient pool of qualified, motivated, and dedicated teachers for quality education. The Rashtriya Madhyamik Shiksha Abhiyan (RMSA) prescribes that a secondary school, with more than two sections per class, should have at least five teachers for each subject to maintain a 40:1 Student Classroom Ratio (SCR). Despite this, there has not been more than four regular appointments in any EMRS across West Bengal, and EMRS-Satyabanpalli has no regular teacher. Without qualified regular teachers, even state-of-the-art buildings and facilities cannot ensure a high-performing education system.

To truly embody the noble mission of teaching in EMRSs, it is crucial to establish educational institutions and housing facilities supported by a stable, regularly appointed faculty. Such efforts must be carefully and methodically executed to ensure that these teachers are not just filling positions, but are dedicated to the holistic development and empowerment of tribal students. Only then can EMRSs fulfil their mission of providing equitable and high-quality education to the children of marginalised communities.

**Table 1: About the Teachers of EMRSs in West Bengal**

School name	Total No. of Teaching Staff	Gender		Appointment			No. of Untrained Teachers
		Male	Female	Regular	Contractual	Guest	
EMRS-Nagrakata	18	14	04	02	14	02	04
EMRS-Mukutmanipur	19	14	05	04	12	03	02
EMRS-Shushunia	21	21	00	03	14	04	00
EMRS-Raghunathpur	26	18	08	03	13	10	06
EMRS-Satyabanpalli	44	23	21	00	12	32	02
EMRS-Kankutia	21	16	05	03	12	06	13
EMRS-Kumarsai	17	14	03	01	12	04	00

Source: Field Notes, 2021

The gender distribution of teachers at EMRS-Shushunia and EMRS-Satyabanpalli highlights the feminisation of the teaching profession and how service conditions dissuade many from joining this noble profession. At EMRS-Shushunia, all 21 teaching positions are held by males, whereas EMRS-Satyabanpalli has a balanced distribution with 23 male and 21 female teachers. This disparity indicates how service conditions, such as lower salaries and job insecurity for contractual and guest teachers, deter women from entering and continuing the profession at EMRS-Shushunia. In contrast, a balanced gender representation at EMRS-Satyabanpalli, despite having similar conditions, suggests that local recruitment policies and gender norms significantly influence gender distribution. Besides, the feminisation of teaching is linked to the societal perception that teaching is suitable for women due to its alignment with traditional gender roles. However, there is a notable underrepresentation of women in leadership roles, such as principal and vice-principal. The gender-disaggregated data

reveal that men dominate regular teaching positions, which offer better job security and benefits, while women are predominantly found in less secure, lower-paid contractual roles. This trend reflects broader societal patterns where women are overrepresented in precarious positions, limiting their career progression and leadership representation. Furthermore, the status of teachers' residences on school campuses exacerbates these issues. Only 19% of the teachers live on campus, and merely three out of seven principals reside in their school. This situation compromises students' safety and security, and reduces teacher-student interaction time. Female teachers represent only 15% of resident teachers. For instance, in EMRS-Kankutia (five female teachers) and EMRS-Raghunathpur (eight female teachers), only female teachers reside on campus. This limited presence of teachers on campus restricts after-class student support, affecting relationship building and the overall learning environment. Consequently, the apparent equality of access and treatment among teachers and students is not genuinely equitable.

## Nature of Employment and Its Impacts on Teaching

The West Bengal TDD administers the management of EMRSs through the Paschim Banga Adibashi Kalyan O Siksha Parisad (PBAKOSP). There are three types of teacher appointments in EMRSs—contractual, guest and regular. The West Bengal Public Service Commission (WBPS) uses a merit-based recruitment process to select regular teachers, which includes a written examination and an interview. Contractual teachers are hired by the District Level Committee (DLC) via a formal hiring process that involves the DLC identifying vacancies, posting job openings, screening applications, interviewing shortlisted candidates, and providing appointment letters that outline the terms of employment, including the length of the contract and salary. Guest teachers are hired to cover short-term and urgent needs.

The nature of employment in EMRSs across West Bengal shows significant diversity in appointment types and their impact on employees. The regular employees receive salaries according to the state government's current pay scale and enjoy related facilities. On the contrary, contractual and guest teachers receive a fixed

monthly remuneration with no associated facilities. This disparity in recruitment and remuneration affects teacher job satisfaction and motivation levels. Contractual teachers, in particular, struggle with lower pay, lack of related facilities and job security, which affects their commitment and undermines the overall quality of education. Furthermore, less housing facilities for teachers on school campuses exacerbates these issues as most teachers have to commute daily, limiting their availability to provide support to students beyond the school hours. The role of DLCs is crucial as they manage the recruitment process for contractual and guest teachers, and must ensure that the immediate needs of each school are met through local hiring and selection procedures (Karmakar, 2022).

## About the Heads of EMRSs

West Bengal has seven EMRSs. Two of them have regular principals, three have contractual principals and two are managed by teacher-in-charge or in-charge principal. The WBPS makes regular appointments to EMRSs across the state. A district-level committee is responsible for managing each school as per the provisions of the EMRS. This committee is responsible for handing out contracts and making appointments.

**Table 2: A Snapshot of Heads of EMRSs in West Bengal**

School Name	Nature of Appointment	Academic Qualification	Previous Experience	Leadership Training	Continuous Professional Development
EMRS-Nagrakata	Contractual	B.Sc., M.Sc., B.Ed.	No	No	No
EMRS-Mukutmanipur	Teacher-in-charge	B.Sc., M.Sc.	Yes	No	No
EMRS-Shushunia	Teacher-in-charge	B.Sc. M.Sc. Ph.D.	Yes	No	No
EMRS-Raghunathpur	Regular	B.Sc. M.Sc. B.Ed.	Yes	No	No
EMRS-Satybanpalli	Contractual	B.Sc., M.Sc., B.Ed.	No	No	No

EMRS-Kankutia	Regular	B.A., M.A., B.Ed., M.Ed., Ph.D.	No	No	No
EMRS-Kumarsai	Contractual	B.Sc., M.Sc., B.Ed.	No	No	No

Source: Field Notes, 2021

A vice-principal is needed in these schools to ensure better management. But none of them have a vice-principal. Two principals serving in West Bengal EMRS do not have the necessary teacher training degree or qualifications. It must be noted that these tribal schools are managed by principals without residential school experience. The heads of EMRSs need professional development and training in leadership roles and other important areas to manage the schools effectively.

### Professional Development and Training

Professional development and training for teachers at EMRSs in West Bengal are notably deficient, with the School Education Department and the PBAKOSP of the TDD failing to provide in-service training or induction programmes. This shortfall is exacerbated by the lack of coordination between various educational departments and ministries, denying EMRS teachers access to training opportunities that are readily available to their peers in government schools affiliated with DIETs or SCERTs. Consequently, EMRS teachers and leaders often lack specialised training in curricula and pedagogy, which are crucial for creating a suitable learning environment for tribal students. In contrast, JNVs have more qualified and better-paid staff, clear career progression paths, and a National Leadership Institute that conducts regular in-service training for teachers and principals. The Ministry of Tribal Affairs has established the National Educational Society for Tribal Students (NESTS) to address the recruitment, training, development, monitoring, and career progression needs

of EMRS teachers. But professional training and development programmes for EMRS teachers are irregular due to inconsistent recruitment criteria and processes that vary by state and management body. This inconsistency leads to continuous influx of untrained contractual and guest teachers, making sustained and progressive training for teachers and school heads nearly impossible. Effective school leadership is critical for ensuring quality education for all students. Head teachers and principals need training in leadership to be equipped to oversee curriculum planning, administer competency-based assessments, monitor and analyse student performance, and maintain student enrolment. School leaders must also understand their institution's strengths and limitations; motivate the staff regarding punctuality and attendance; and ensure availability, distribution and optimal utilisation of resources. Despite the non-tribal background of most EMRS teachers and their limited knowledge about tribal cultures and practices, no tribal sensitisation programme is carried out for them, hindering their ability to meet the basic learning needs of tribal students and creating a communication gap that further impedes effective teaching and learning (Karmakar, 2022).

### Cultural Disconnect between Non-Tribal Teachers and Tribal Students

The study highlights a significant cultural disconnect between non-tribal teachers and tribal students in EMRSs across West Bengal. It was found that most teachers, coming from different social backgrounds, lacked the experience of teaching in



residential schools for tribal communities, leading to insensitivity towards the unique challenges tribal adolescents face, such as language, culture and food. This disconnect extended to administrators, with a district official dismissively stating, “They receive food, a place to reside, books...what else do they need?”

Understanding tribal sociocultural backgrounds is crucial for effective management at EMRSs. Yet, many officers and teachers, predominantly from non-tribal backgrounds, lacked this awareness, limiting their ability to address tribal students’ issues.

Consequently, students felt detached from teachers, a problem exacerbated by the non-residential status of many teachers that left students’ belonging needs unmet and made learning difficult. Teachers are responsible for providing academic support to tribal students from impoverished socio-economic backgrounds. Although most tribal children learn Bangla or Santali in primary school, English is the language of instruction at EMRSs, creating a significant language barrier that 40-minute classes cannot overcome. Non-tribal teachers, unfamiliar with tribal cultures and languages, struggled to communicate effectively. The prevalence of non-residential, contractual and guest teachers with little acculturation further widened the gap. Prioritising hiring teachers with tribal backgrounds for matron and mentor positions could foster cultural sensitivity and a better understanding of the local community. Alternatively, teachers should undergo immersion programmes to understand the students’ cultural backgrounds better. Supervising teachers with limited experience in handling inequality and efficiency issues is challenging, given their roles in overseeing daily administration and participating in various school committees. Teachers must prioritise mentoring and coaching underachieving students and spend more instructional time with them. However, inadequate staff quarters make staying on campus less appealing than

living with families, making most teachers to commute daily. These structural deficiencies and infrastructure problems require urgent attention from EMRS management agencies to create a more supportive and culturally attuned educational environment for tribal students (CBPS, 2017; Karmakar, 2022).

### **Governance and Resources Allocation: Managing or Exacerbating Inequalities**

The importance of governance systems at various levels must be addressed for adequately managing education and guaranteeing equity and quality. To manage and govern EMRS, the GOI’s Ministry of Tribal Affairs (MoTA) operates through the National Education Society for Tribal Students (NESTs), which is responsible for creating, endowing, administering, and regulating EMRSs across the country and addressing school system challenges and needs occasionally. The management of EMRSs is directly overseen by a DLC chaired by the District Magistrate (DM) and the state’s TDD. There is no provision in the EMRS guidelines for the constitution of school management committees (SMCs) or PTA/MTA, as recommended by the Right to Education (RTE) Act (2009). Hence, there is no decision-making body at the school level, except for some EMRSs that non-governmental organisations manage.

The DLCs play a pivotal role in the governance and management of EMRSs in West Bengal. Their responsibilities span various domains, including financial management, infrastructure development and academic support. Financial management involves allocating and monitoring funds, managing day-to-day expenditures and ensuring financial support for various school activities. The DLCs are also responsible for hiring contractual and guest teaching and non-teaching staff, and addressing staffing needs promptly. Besides, they develop and implement annual action plans, supervise and monitor school activities, and ensure

the safety and security of students and staff. Academic support includes offering assistance to meet the needs of students and supporting quality residential services.

Additionally, the DLCs facilitate community engagement by ensuring local aid and cooperation and addressing local needs to improve school resources. The DLCs consist of DM as the chairman, project officer-cum-district welfare officer (PO-cum-DWO, BCW TDD) as the member secretary, and members including Additional District Magistrate (ADM), Sub-Division Officer (SDO), Block Development Officer (BDO), a member from the local tribal community and the school principal of the concerned EMRS. This structure ensures a balanced approach to managing EMRSs effectively, focusing on meeting the needs of a tribal community and maintaining cultural sensitivity.

Furthermore, the governance structure must provide a platform for inter-ministerial collaboration or convergence, especially in school education. Unfortunately, the efforts made by the Department of School Education and Literacy, Ministry of Education (MoE), and the GoI do not benefit students or teachers of EMRS. The MoE neither has a direct role, linkage or convergence with MoTA, nor has it made any effort for the indirect participation or extension of benefits of central government schemes and support system to EMRS, thus, leaving both students and teachers under MoTA to fend for themselves. While the EMRSs were set up looking at the success of JNVs, they could not develop the required governance structure, making it uniformly operational to remove the interstate disparities in the functioning of EMRSs across the country. The EMRS has a non-uniform governance structure across states that paralyse its smooth functioning in recruiting qualified teachers and the professionalisation of the entire school system. This contrasts with JNVs, which are centrally governed and examine teacher recruitment, management issues, and conduct regular induction and training programmes for teachers and principals. The

JNVs have regional offices with capacity-building and monitoring mandates and a National Leadership Institute (NLI) in New Delhi to strengthen the academic skills of their staff and monitor schools. In addition to collaborating with other academic bodies for capacity-building, it conducts regular training programmes for school leaders and teachers. It is going to be three decades since the EMRS establishment, it still needs such structures and human and infrastructural resources to sustain and lead these structures. However, collaboration with the National Institute of Educational Planning and Administration (NIEPA), the National Council of Educational Research and Training (NCERT) and other such premier educational organisations has made leadership and pedagogical training for school heads and teachers possible. In addition, some online training and resources are available to teachers through the National Initiative for School Heads and Teachers' Holistic Advancement (NISHTHA), as well as the development of online learning support, such as Digital Infrastructure for Knowledge Sharing (DIKSHA). However, if there is no face-to-face orientation or training for teachers regarding EMRS, how aware they are remains to be seen. In addition to the National Assessment of Educational Progress (NAEP) 1994), teachers who receive more staff development opportunities are more likely to engage students in learning using a wide range of books and materials from other subjects. This was associated with higher student achievement. The NAEP-1994 reported that such curricular differences are widespread across the USA, and the achievement gap between white and minority pupils and between higher and lower socio-economic backgrounds is heavily influenced by these factors (Lee and Bryk, 1988; Oakes, 1985). Thus, the lack of a structure that supports provisions for professional development or little or no time scheduled for staff development are also an equity issue impacting learners' achievement and furthering their scope for economic success.

In addition, the EMRS has been governed by a top-down approach by the state bureaucracy under the direction of the TDD. As a result, individual schools still need to be connected to the decision-making structure of state-level school governance. Except for some schools managed by non-governmental organisations with their own SMCs and social and political networks that navigate bureaucracy, there must be a direct link or opportunity to break the bureaucratic channel or power at the school level to make decisions (Karmakar, 2021). Thus, a stark difference is seen in the functioning of NGO-managed schools and those that are without a management. While teacher appointment and development is an issue across all management types, NGO-managed schools can still make contractual or guest appointments, balance the PTR, and take school-level decisions through SMCs.

In schools directly governed by the TDD, in the absence of any kind of school-level committees, the principal is like an army captain who neither has the decision-making power to navigate through a situation, nor the training or expertise to win over it. Here, the principal is the helpless, lone leader who knows that one can neither leave the ground nor transform it. Due to dependence on DLCs for regular decision-making, the EMRS needs more effective planning and decision-making. For the TDD and DLCs, which are responsible for managing the EMRSs, education is just one of its numerous jobs in addition to projects for tribal community development and other duties of public administration. Therefore, there needs to be more emphasis on education. However, TDDs are governed by state governments and operate at their will. As a result, there is lack of leadership and decision-making, numerous vacant positions, appointment of contractual and unqualified staff, poor salaries, lackadaisical attitude towards tribal education, and lack of training programmes for teachers. This was evident through interactions with some of the functionaries. One of them said, "...this much is sufficient for them. These are first-generation learners,

getting two meals, a residential facility and an opportunity to educate...What else you expect?"

This attitude is reflected in how schools are governed and managed. It has been observed that marginalised and low-income students often need more access to quality education than those coming from privileged backgrounds who get it easily. These children need the necessary infrastructure and resources, and qualified teachers, support staff and principals. Ensuring equitable education quality to have the right leadership and management approach is crucial for an organisation's success (Murphy, et al., 2007). Access to schools is more than having a building or a few resources. It is also about having the same opportunity and receiving equivalent treatment regarding school access and the required facilities to ensure equal success for all students. Unfortunately, the structure and governance of EMRS lack both equality of opportunity in terms of qualified teachers, quality learning opportunities and equivalent treatment regarding access to educational facilities that their counterparts receive in different parts of the country (Karmakar, 2021).

## Discussion

Since Independence, the GOI has focused on guaranteeing quality education and equal access to educational opportunities to all students. It even framed the RTE Act in 2009. But due to inadequate educational opportunities and poor academic achievement, many continue to long for receiving quality education. Schools and schooling facilities must be accessible to ensure equity and quality of education. This would be possible only by ensuring teachers for every subject in primary and secondary schools. Besides, inadequately qualified teaching staff affect the treatment of students from tribal communities. Evidence from several countries reveals that contractual appointments hurt

motivation and social status (Stromquist, 2018). Students' learning is influenced by their competence and commitment (Bennell and Akyeampong, 2007). According to Barber and Mourshed (2007) and Leithwood and McAdie (2007), teachers play a pivotal role in students' learning. Teachers' ability, motivation, morale and preparation determine how well they teach. According to research, teacher motivation significantly affects teacher efficacy (VSO, 2002), and teacher efficacy influences the teaching-learning process more than teacher competence (Upmanyu, 2016). The study argued that teachers' levels of ownership of their recruitment policies and facilities are highly related to their job satisfaction. Therefore, appointing teachers with an improved salary structure and other facilities, such as incentives, is of utmost necessity. The study found that teaching in schools, such as EMRSs, is challenging, especially if a contractual or guest teacher is expected to improve the educational outcomes in a mere 40 minutes without addressing the students' basic physiological and belongingness needs. Following the redesign and reform of the system of education, policymakers believe that fundamental changes will lead to the practice of teaching (Ball, et al., 2011). Without structural support that acknowledges and promotes teachers' significant role as human resources, the school system cannot address its quality challenges. Effective teacher education and training (both pre-service and in-service teachers) is crucial for producing competent teachers as it affects the overall quality of instruction. It also helps in the development of individuals, communities and countries.

## Conclusion

The secret to development is education. This also applies to tribal communities. Tribal communities are experiencing slow development owing to their poor educational status. Their condition can only be improved by bringing out fundamental changes. It is also crucial to focus on enhancing student learning outcomes, which can only be achieved by hiring teachers having adequate training and expertise. According to the RTE Act 2009, untrained and underqualified teachers are not permitted to be employed. But such contractual appointments are made even in government schools. Moreover, step-motherly treatment is meted out to students and teachers, who have to work in poor and professionally draining work environments. Policies that ignore teacher sentiments create a highly demotivated workforce that negatively affects learning outcomes (Kembhavi, 2011). To create opportunities for fair, inclusive and lifelong learning for all, it is crucial to have trained staff and invest in them, if the UN's Sustainable Development Goals (SDG-4) are to be met. A sustainable, culturally enriched future must be ensured for all children by ensuring that they obtain the necessary information and skills. In other words, teachers contribute directly to achieving five of the seven Sustainable Development Goal (SDG-4) targets through their conviction, vision, knowledge and actions as frontline leaders (Sarangapani, et al., 2021). It is also essential to have a common centralised administrative structure for EMRS, like the JNVs, that looks into recruitment, induction and professional development of teachers, as well as school admissions and assessments, not leaving it to the whims and fancies of the states and their respective tribal departments and district magistrates, for whom education may be just one of the many tasks at hand and maybe the least important.

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## What Works and Why: Insights from Science Teachers' In-Service Capacity Development Programme

Tamralipta Patra

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### Abstract

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*Science, as a discipline, holds immense significance to understand this world. This subject encompasses and enhances one's ability to think critically, observe, infer, solve problems, experiment, and analyse complex phenomena. Given the importance of this subject, effective science teaching is imperative. However, science teachers in the public school system face numerous challenges like high class strength, shortages of teachers, non-academic engagements, inadequate infrastructure, and limited resources. This paper outlines the status of science teaching in public schools, shedding light on some of the issues that impede the teaching-learning process. It also discusses the significance of in-service capacity enhancement programmes for science teachers. Additionally, the paper recognises and describes effective strategies employed in in-service capacity enhancement workshops.*

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### Introduction

India is home to a vast population and is known for its rich diversity. A country's progress is gauged by the quality of education provided to its populace. For decades, the major concern amongst our educators, policymakers, administrators, and various other stakeholders has been to achieve the goal of universalisation of education and overall literacy. Considering India's vastness and diversity of population, public schools were institutionalised with the hope to provide affordable education to all. From the aspect of accessibility, these schools can be found in urban as well as rural settings. They are primarily subsidised by various levels of government—central, state, and local. Regardless of the support, public schools and their teachers face an array of challenges, such as high class strength, inadequate number of teachers, infrastructure, lesser number of laboratories, and limited teaching-learning resources. These issues can subsequently degrade the

teaching-learning process, hindering the overall quality of education.

When it comes to subjects taught in schools, science primarily focuses on developing scientific rigor among learners. This subject entails ways to deal with a complex phenomenon systematically through observation, hypothesis formulation, and experimentation. It is in the middle stage of schooling that science is introduced as a subject that includes physics, chemistry and biology. Therefore, careful attention is needed at this stage to ensure a solid understanding of science fundamentals among learners. Understanding the basics at this stage allows the learners to explore the concepts more clearly and deeply as they progress to higher classes. In a society where teachers are considered to carry the potential to shape and create new narratives in education, they bear a significant responsibility towards developing a scientific temperament among the learners.

This highlights the importance and need for quality science teaching and learning in public

schools. However, there has been a concern around public-school systems regarding the dearth of quality science teachers and the availability of resources, leading to dropout rates in the science stream and heightened dislike for the subject.

This paper brings together the present situation of science teaching in the context of Indian public-school systems, highlighting the issues and challenges that teachers often experience. Additionally, it outlines what works and why in science teachers' in-service capacity enhancement programmes.

### **Difficulties Faced by Teachers— The Need for In-Service Capacity Development**

A series of conversations with middle school science teachers, observations of their classroom teaching and school visits unveiled a plethora of complex challenges, majorly systemic issues that impede the quality of education. A teacher's journey is not simple and linear. One of the major challenges reported as an underlying cause of teacher-centric science classrooms across the public schools in this country is the large-class strength. This unmatched student-teacher ratio leads to a myriad of problems, such as failing to attend to the needs of every learner, providing a more personalised experience while conducting experiments or activities, identifying the challenges faced by the learners, and many more. This, by large, disrupts the flow of the teaching-learning process. The issue further cascades because there is a shortage of science teachers in public schools. To address this problem, a few public schools have assigned language teachers to teach middle stage science.

The scarcity of qualified science teachers can lead to the degradation of effective teaching and learning of science, along with an increase in the dropout rate in higher education. Moreover, there are many schools that not only have a paucity of science teachers but also lack basic infrastructure like laboratories, teaching

aids, teaching-learning resources, libraries, and technological access, such as Internet connectivity, computers, and e-learning resources. These problems have been persistent and make it difficult for teachers to adopt and adapt innovative teaching practices in science classes. Besides, many public-school teachers expressed concern about the amount of time they had to spend on non-academic engagements, which impacted their classroom preparation and teaching.

The conversation with the teachers further established that public schools heavily emphasised conducting examinations and had ambitious expectations in terms of performance from both teachers and students. This compelled the teachers to provide high-end results to maintain the schools' reputation, giving the entire classroom process a teacher-centric approach where they had to complete the syllabus in time and also devote enough time for revision. All these indirectly encourage rote learning and memorisation among the learners at the expense of understanding the processes involved in a scientific phenomenon.

These challenges depict the conditions under which public-school science teachers work and teach. Thus, to improve the teaching of science in public schools, a need for a capacity development workshop for Class 8 science teachers was acknowledged. The primary objective of the workshop was to enhance the teachers' conceptual engagement with Class 8 science topics and foster a shared understanding of the pedagogical practices used in science teaching in low-resource settings.

This paper explores the structure and design of physics workshop, in particular. It outlines the key attributes of the physics workshop as teachers found it relevant to their context. This approach can be further adapted by fellow master trainers or teacher educators to help the teachers maximise their capacity enhancement by keeping it more relatable and contextual.



## Physics Capacity Enhancement Workshop

### Rationale

Keeping with the criteria of the National Curriculum Framework for School Education (NCFSE) 2023, the workshop provided the teachers with a platform to comprehend their role in fostering essential process skills for developing scientific inquiry among the learners. These include the skill of framing questions, observing, understanding patterns, formulating testable statements, experimenting, anticipating possible outcomes, and analysing scientific data, as all of them are important in physics. So, the physics workshop focussed on teaching approaches that are easily employable in classrooms, are low cost and require readily available materials, and use technologies to help the learners develop skills to understand how the physical world functions.

From the pedagogical aspect of teaching middle stage science, the NCFSE 2023 (p. 310) emphasises incorporating hands-on activities, holistic understanding of content through an interdisciplinary approach, inquiry-based learning, project-based learning, discovery-oriented approaches, didactic approaches, and integration of arts and sports. These approaches will not only enhance the efficiency and proficiency of the learners, but will make learning more captivating and enjoyable, such that students will find the process more engrossing and satisfying. Apart from pedagogy, the other important aspect underlined in the NCFSE 2023 is to help the teachers recognise the prior concepts that the learners bring to the classrooms based on their experiences and how to apply them in active learning. This will allow the learners to understand that science is not about collecting facts, but analysing how these facts are associated and seek clarification.

Therefore, this workshop was designed to improve the teachers' understanding of physics concepts, explore teaching-learning

methods, create activities with limited resources, and address the learners' alternative ideas. It also considered the resources available to the teachers and the overall contexts they operated in, including the school culture, class strength, and socio-economic backgrounds of the learners.

### Structure of the Physics Workshops

As outlined in the previous sections, a lot of planning went into designing each workshop. All physics workshops were directed towards meeting the teachers' practical needs in the classroom, allowing them to flexibly adapt the pedagogical approaches, and materials used for demonstrations, and discussions, as per their school context. The structure of the workshops aimed to help the teachers recall concepts (remember and understand), and identify and address misconceptions (understand and apply). Subsequently, the sessions involved demonstrating activities and curating additional activities (apply, evaluate and create) to enhance the understanding of various topics. The workshops were intensive, as they provided a platform to the teachers to immerse in an enriching and engaging experience. The physics workshops covered topics, such as 'force and pressure', 'friction', 'sound' and 'light'. The aspects of the physics workshops are as follows.

### Concept Building Using the Concept Map Tool

Due to the dearth of time and immense pressure on teachers for syllabus completion, they often have to summarise the concepts and sub-concepts of a unit in classroom. This can lead to overlooking the linkages between various sub-topics and addressing the gaps, causing non-redressal of preconceptions among the learners. Revisiting a lesson helps in recalling the concepts dealt with therein, informally gauging one's comprehension of the topic, thus, identifying and clarifying the gaps, if any.

The need to start sessions with an overview of the topic using a concept map tool was

realised in the physics workshops. The tool was used for showcasing the connections (using necessary arrows and links) between different scientific concepts and sub-concepts, thus allowing the teachers to refine and refresh their understanding of physics concepts. In addition, the tool brought out the nuances of interdisciplinary aspects of the subject, such as the history of Braille, the functioning of ears and eyes, and so on. The teachers realised the tool to be a handy resource and that concept mapping can be easily executed as a small exercise at the end of every lesson. Therefore, while planning science workshops, tools like concept maps, flow charts, mind maps, etc., must be introduced, keeping the concepts in mind, as they have the potential to broaden the learners' scientific comprehension with better visualisation.

### ***Simulation and Software: Useful Tools at No Cost***

There are certain scientific concepts such as atmospheric pressure, propagation of sound, static and kinetic friction, and so on, that teachers find a bit tricky and abstract to explain. To address this issue, simulations and software were introduced in the workshop. Simulation tools, like PhET, were used to understand and visualise the concepts of balance and imbalance force, static and kinetic friction, and the laws of reflection. A conversation with the teachers revealed that they often had to struggle to explain the difference between amplitude and frequency. To clear such conundrums, in subsequent workshops, they were introduced to two free software: Audacity, which could capture the variation in loudness in the form of waves, and Frequency Generator, which was used to demonstrate a range of frequencies from 20 Hz to 22,000 Hz. Both software helped clarify their confusion, convincing them that even schools with low technological accessibility can use these. Tools like these must be a part of everyday science teaching, making the classroom experience more enriching and engaging. Hence, teacher educators or

master trainers must aim at finding more easily accessible free software, like Phyphox, and venture it through workshops to make the teachers aware of their applications and usage in science teaching.

### ***Recognising Alternative Conceptions of the Students***

Prior conceptions, largely known as alternative conceptions, refer to the students' understanding of a concept that digress from the accepted or intended explanations. Students often develop these naïve conceptions from existing experiences or beliefs. The NCFSE 2023 underscores that lack of supervision in the teaching-learning process can lead to alternative conceptions. Therefore, a teacher plays a crucial role in identifying and addressing the students' pre-conceived notions. In the workshop, a session was organised to understand the value of identifying and addressing these prior conceptions, particularly for the concepts of 'force and pressure', 'friction', 'sound' and 'light'.

To recognise and address the alternative conceptions that students bring to the classrooms, the teachers were provided with various simple approaches, hoping that they could adapt and adopt them in their classroom discussions. In the workshop, the teachers were presented with a list of misconceptions, after which they were encouraged to identify the problem in a statement and curate a group activity to address the issue. In another session, 'true or false worksheets' were employed, and the gaps were identified and attended through discussions. The teachers found these sessions helpful and assured to integrate techniques in order to recognise and respond to these prior conceptions. Therefore, teacher educators must extensively include such sessions and give priority to addressing alternative conceptions in their workshops.

### ***Hands-on Activities***

Traditional approach to teaching science may often be monotonous and not spark

learners' interest in the subject. Simple and doable hands-on activities can generate enthusiasm, curiosity, and inquisitiveness among the learners. These activities can guide them to find the reason behind some scientific artefacts, deepening their knowledge. In the workshop, the teachers were asked to use various materials to engage the learners in hands-on activities. For example, in one of the workshops, the teachers used a metal spoon and thread to observe the phenomena of the propagation of sound, in another they used two mirrors and a coin to comprehend multiple reflections. In yet another workshop, they were given all-purpose flour to showcase the effect of force, and so on. The teachers found these activities doable as the materials chosen were economical and could be easily found at home. These activities are engaging and essential as they attach a practical and experiential meaning to the concepts.

To encourage in-service teachers to incorporate hands-on activities in their lessons, teacher educators must include a diverse range of hands-on activities in workshops.

### ***Demonstrations***

Science is better explored and understood when students get the opportunity to apply the theories to practice. Teachers often find demonstrations to be time-consuming and tedious, and thus, refrain from using these in classrooms. Thus, in the workshop, an attempt was made to involve teachers in developing demonstrations on the discussed concepts of physics. In this session, the teachers were divided into groups. They were provided with a procedure sheet and cost-effective materials. The teachers were then instructed to curate a demonstration mapped to Class 8 physics concepts. Each group was encouraged to create two thought-provoking questions to ascertain students' comprehension. The whole session was designed to help the teachers go through various aspects of scientific demonstrations and explanations, such as material required,

noting down the observations, analysing the data, etc. Additionally, the session aimed to make them believe that science concepts can be easily taught through demonstrations and that they should not view these activities separately. Thus, for any in-service professional development course, it is advisable to have sessions on demonstrations as this will help teachers plan activities. It will also assist them in organising demonstrations in classrooms. Thus, they will have clarity on the kind of materials, guided questions, prompts, and procedures to use. This will allow them to enhance the students' science process skills.

### ***Thinking Out of the Box***

Questions are often considered to be a useful tool for assessing students' understanding of a concept. Sometimes, these assessments are formative in nature, where a teacher asks questions in the classroom to check students' comprehension of a concept. These queues help the teacher identify the learning gaps and guide the learners to change their course of action. However, these workshops emphasised not just regular questions to check students' comprehension, but also to incorporate thought-provoking, out-of-the-book questions that can inherently ignite curiosity and evolve science learning. Like, in one of the workshops, the teachers were engrossed in a discussion to find out the reason behind the survival of fishes in the immense water pressure of an ocean, the need for airplane wings, the science behind the working principles of parachutes, and so on. The teachers felt the need to include intriguing questions in classrooms as they strengthen critical thinking and reasoning among learners.

For such prospective workshops, it is essential to provide a scope for discussions on out-of-the-box questions to teachers. This approach will guide the teachers towards employing classroom practices that nurture students' curiosity and help them see the relevance or applicability of the concepts learnt.

### **Promoting Inclusive Practices**

Public schools often have a high class strength, making it arduous for teachers to manage the individual demands of the learners. These classrooms encompass learners of different needs. Thus, in the workshop, there was an emphasis on employing inclusive practices in classrooms. The intention was to ensure that every learner is acknowledged, and can participate and engage in various activities, irrespective of their abilities, backgrounds, or characteristics. For example, two physics chapters—'light' and 'sound' from the Class 8 science textbook—gave the scope to prompt discussions around visual and hearing impairment. This led to discuss ways to accommodate students with such impairments using adaptive technologies, appropriate seating arrangement, adapting assessments to oral cues, and multi-sensory modes of teaching.

As we are moving towards creating a just and equitable society, there is a need to organise such workshops to motivate teachers and explore ways to adapt their teaching methods, content, and assessments. This will help them accommodate the individual needs of all learners, especially children with special needs and students with different strengths, skills, and interests.

### **Conclusion: Insights and the Way forward**

Teaching is one of the most important and daunting professions. A teacher's responsibilities in the public-school system extend beyond teaching, consisting of engagement in various government duties, school administration, meetings, and many more. Additionally, teaching in these schools has its own set of challenges like high class strength, scarcity of teaching aids, and infrastructural issues. So, the workshops were designed and contextualised with a comprehensive understanding of the challenges teachers face in the public-school system. The workshop aimed to ensure that

the teachers could derive the maximum benefit from it.

To instil scientific disposition among students, it is important for teachers to engage in practices that stimulate the students' interest in science. However, it was found that most teachers attending the workshop are entrusted with teaching physics in schools, even though they do not have a degree in physics. These teachers find it taxing to teach and engage in physics-related activities and explanations. So, most of them find the lecture method an easier escape from engaging in hands-on activities and demonstrations. Consequently, it may lead to students resenting science and failing to see its depth and beauty.

All physics workshops consisted of sessions designed to help teachers revise, refresh, and update their content knowledge through the use of a concept map. This approach allowed them to understand the nuances and interconnections in every lesson.

Additionally, there was another group of teachers, with over a decade of experience, who were comfortable with traditional methods of teaching science and were initially reluctant to adopt new pedagogical approaches. Thus, along with revisiting the concepts, efforts were made to shift their mindset towards a student-centric classroom. This was done by introducing them to a range of pedagogical practices tailored to middle-stage science, such as inquiry-based learning, hands-on activities, constructivist approach, etc. Each of these was demonstrated with suitable practical examples. After the session, these teachers expressed appreciation for these approaches, noting their relevance to their school context in terms of resources, labs, and class strength. They assured to incorporate these in classroom teaching. However, such changes or shifts in teaching methodology cannot happen overnight. There is a need for teacher educators to work diligently and closely with teachers to gradually improve middle-stage science teaching. Workshops must, therefore, include updated and new

approaches that can bring meaningful reforms in the way science is currently taught.

Apart from revisiting concepts, discussions around students' preconceptions helped clarify some of the gaps teachers had in certain physics topics. The session on recognising alternative conceptions of the students allowed teachers to revisit and revive their comprehension. They were taken through a set of approaches to identify and address the preconceptions of the learners like worksheets, formative assessments, questioning, and quizzes. It is necessary to note here that the sessions on alternative conceptions must be prioritised as students build further knowledge on a clear conceptual foundation. Thus, to improve science learning, workshops must stress that it is the teachers' responsibility to recognise and grasp flawed conceptions. Further, science teacher educators must guide teachers through strategies to uncover and address those naïve conceptions that the learners bring to the classroom.

Sessions on demonstrations brought out the teachers' active engagement, and their ability to design fascinating activities and seek clarifications. These sessions provided them with the scope of carrying out and curating activities using low-cost resources. Workshops, thus, need to include sessions that offer teachers first-hand experience with interactive learning methods. This practical approach would

empower teachers to carry out activities or demonstrations with confidence. This would also allow them to determine what approaches are effective and what are not, leading to improvements and refinements while executing demonstrations with understanding. It is when these refined techniques are implemented in classrooms that students are expected to grasp concepts effectively.

Besides, it was found that simulations and software stole the limelight. The teachers, initially, believed that they needed expertise in using them. However, demonstrating the easiness of handling these tools convinced them that these can magnify the joy of learning science. The workshop provided them the opportunity to explore ways to integrate tools and resources in their science lessons, enhancing their ability to utilise technology effectively.

Therefore, teacher educators should actively boost in-service programmes, allowing teachers to polish their skills and practices. It is their responsibility to train teachers in integrating various pedagogical approaches, free e-resources, assessment strategies, and many more skills in classroom teaching. There should be opportunities for teachers to gain practical exposure and experience with appropriate guidance. Ongoing follow-ups, feedback, and communication with these teachers can certainly enhance the quality of science teaching across the country.

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## Innovative Teaching Approaches in Social Science Education—A Case Study of Government Model Middle School, Pashkum, Kargil, Ladakh

Mohd Mustafa Kamal

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### Abstract

*Traditional teaching methods have long been favoured by educators. But feedback from students and stakeholders reveals both positive and negative aspects of their effectiveness. In Ladakh, government schools have shown improvement since 2016–17, gaining recognition as potential models for other institutions. The Progressive Growth Index (PGI) report for the year 2021–22 of the Government of India highlights significant advancements in Ladakh’s education sector, attributing some of this success to innovative teaching and learning approaches (PGI Report, 2021-22).. This case study, conducted at Government Model Middle School, Pashkum, Ladakh, focuses on academic years 2021–22 to 2023–24, during which two nearby defunct primary schools were amalgamated to create a healthier learning environment. The school, which started with just 12 students in 2021, boasted an enrollment of around 50 students in less than two years. The adoption of intensive on-site classes (field study) in the social science discipline sets this school apart, as teaching methodologies have shifted towards inquiry, research, projects, exploration and critical thinking. This transformation has significantly enhanced student engagement, fostering a heightened motivation to attend classes regularly.*

**Keywords:** *Ground Classes, ICT, Parliamentary Classroom Approach, Museum Classroom, Cave Classes*

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### Introduction

Social science has been a topic of discussion among students and teachers over many years with regard to its contents, teaching methodology, teaching aids, syllabus, textbooks, etc. The National Council of Educational Research and Training (NCERT) and state boards in India have time to time come up with new sets of syllabus, contents, textbooks, etc., as per the changing times, needs and demands of stakeholders. Further, the history discipline of social science often remains a boring subject among students for its bulky syllabus and text-heavy textbooks (Christou, 2016) . It was observed that a majority of students intentionally missed history classes due to lack of interest in the discipline.

To unravel the reasons behind learners’ waning interest, absenteeism, boredom and poor academic performance, it became imperative to embark on an action research journey. There were questions such as *Are the contents in the textbooks too bulky to retain interest? Does the subject teacher follow appropriate pedagogical approaches suitable to achieve the desired learning outcomes? Do the textbooks contain attractive visuals? Do the syllabi prescribed by the national and state boards have enough relevance for the target groups and their environments? Have the thematic approaches in writing textbooks been getting the desired results?* So, there were a number of questions to raise and respond. Under such circumstances, it was difficult for a social science teacher to respond to and manage every issue pertaining to the pedagogical approaches at the school level.

## Problem Area

The study focuses on addressing key challenges encountered in the social science classroom at Government Middle School Pashkum (Kargil), Ladakh. Some of the identified issues include the following.

1. Poor reading fluency: Students in Class 6 to 8 struggle to read sentences fluently, hindering their comprehension and engagement with the subject matter.
2. Reluctance towards social science classes: There is notable reluctance among students, particularly towards history classes, which impacts their attendance and participation.
3. Lack of interest and retention: Students find it challenging to maintain interest in the topics being taught, leading to disengagement.
4. Perceived complexity of syllabus and texts: Both students and teachers perceive social science syllabus as lengthy and textbooks as overly dense, resulting in difficulties in understanding and timely completion of curricular goals.

These issues underline the urgency for adopting innovative approaches as a part of action research to enhance social science learning experiences and outcomes at Government Middle School, Pashkum.

## Literature Review

Action research has gained recognition in the social science discipline as a transformative approach to address challenges in teaching and learning (Brydon-Miller, et al., 2011). It emphasises collaboration, participation, and cycles of reflection and action (Stringer, 2013). This study aligns with the literature that underscores the importance of action research in shaping innovative pedagogical practices.

In the context of social science education, traditional teaching methods often fail to captivate students' interest, leading to disengagement and lack of understanding (Reason & Bradbury, 2008). The NCERT and state boards continually adapt the syllabi,

but the effectiveness of teaching methods remains a concern (Kemmis & McTaggart, 1988).

In such circumstances, action research becomes crucial for identifying the root causes of disinterest and implementing interventions. It promotes a participatory approach, involving teachers, students and other stakeholders in the process of educational transformation (Carr & Kemmis, 1986). The identified problematic areas, such as students' reluctance to attend social science classes and struggles to retain interest, align with the literature that highlights the need for context-specific interventions (Coghlan & Brannick, 2014).

The proposed interventions recommended by the National Education Policy (NEP) 2020, ranging from game-based learning to ICT (Information and Communication Technology) integration, draw inspiration from existing literature on innovative teaching methods. Moreover, NCF 2023 strongly recommends providing more opportunities to the students where they can apply their knowledge in creating models and artefacts (NCF, 2023). The use of toy-based pedagogy aligns with the idea of hands-on approaches and experiential learning (McNiff, 2013). The introduction of museum classrooms resonates with the literature emphasising the importance of visual aids and interactive learning environments (Reason and Bradbury, 2008).

The implementation of on-site/practical classes like parliamentary classroom sessions and cave classes reflects a commitment to bridging the gap between theory and practice, fostering a deeper understanding of social science concepts (Brydon-Miller, et al., 2011). The use of ICT aligns with the broader literature on leveraging technology for effective teaching (McNiff, 2013).

## Objective

This study aims to put forward some of the interventions, creative pedagogical approaches adopted to address the aforementioned issues and findings, which

directly or indirectly guided students to develop curiosity, critical thinking ability and interest in the subject under discussion.

## Methodology and Data Collection

The research methodology encompassed a diverse approach, incorporating field observations, samples of students' works, stakeholder interviews, and a combination of qualitative and quantitative research methods. The selected methods aimed to provide a thorough exploration of challenges and opportunities in the social science classroom at Government Middle School, Pashkum. The research was conducted on 20 students of Class 6 to 8 for academic years 2021–22 to 2023–24

## Interventions and Implementation

To address the problems, the following pedagogical interventions and innovations were implemented. These activities were inspired by innovative strategies implemented by various award-winning schools across India from time to time.

1. **Games of Great Bath, Race Court and Spin the Past:** The games of 'Great Bath', 'Race Court' and 'Spin the Past' are recent innovations developed by the researcher and Arushi Kapoor (M.Phil) for social science students across India. These games were created during a workshop organised from 12 to 16 December 2022 at NCERT, New Delhi. The games have been implemented and tested on students in the school where the action research was conducted while delivering various concepts.

The three innovative games—Game of Great Bath, Race Court and Spin the Past—were designed to make social science learning engaging and effective for students.

- a. **The game of Great Bath:** Unlocking the Harappan Civilisation (Class 6) Explanation: Inspired by Ludo, this game serves as a fun assessment tool for the 'Harappan Civilisation' or 'The Earliest Cities' chapter in NCERT Class 6 curriculum. Learning outcomes: To

recall the key features of the Harappan civilisation (e.g., town planning, drainage system and Great Bath to name a few) and reinforce the knowledge through interactive play



Figure 1: The students playing the game of Great Bath

**How to play:** Similar to Ludo, the players move tokens around the board based on how the dice rolls. Landing on specific squares triggers questions about the Harappan civilisation. A correct answer allows the players to move forward, while an incorrect answer might lead to a missed turn or moving backwards. The first player to reach the finish line wins.

- b. **The game of Race Court:** A journey through the Indian history (multiple classes) Explanation: This game helps to work with diverse topics like the Indian National Movement, social reformers and religious movements. Designed for two to three players, it transforms learning into a race to the finish line.

**Learning outcomes:** To revise events and processes related to the chosen historical topics; and develop critical thinking skills by answering the questions

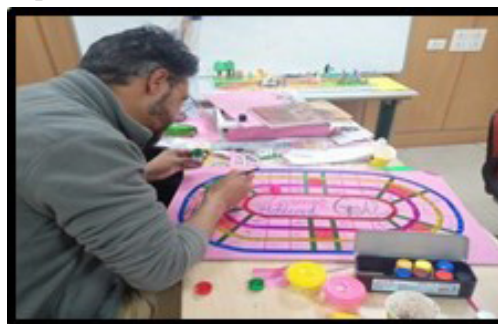


Figure 2: The making of the game 'Race Court'.



**How to play:** The players move tokens along a track, encountering red and green zones. The red zones pose challenging questions that require a deeper understanding. Answering correctly allows progress, while a wrong answer might incur penalties. The green zones offer opportunities to gain advantages through easier questions. The first player to reach the finish line wins.

**c. The game of Spin the Past:** A whirlwind of events (for all classes)

**Explanation:** This simple, self-playable game caters to individual or group learning. A cardboard spinner with historical events and details makes revision enjoyable.

**Learning outcomes:** To enhance memorisation and communication skills through individual or group play

**How to play:** Spin the cardboard to land on a historical event or detail. Individually or in groups, discuss the details or answer the questions related to the spot where the cardboard has landed. The players can create questions or use pre-defined ones to enhance their learning.



Figure 3 and 4: Students playing the game of Spin the Past

**2. Toy-based Pedagogy:** The study developed interest among students by departing from the conventional method of teaching history, geography and political science, and adopting innovative approaches. Initially, the target group of students from Class 6 to 8 were encouraged to complete tasks, such as making replicas of historical monuments, drawing various styles of coins, creating terracotta toys, writing the inscriptions as on various things of historical significance, and developing still and working models of geography-based concepts and processes. Readily available materials, such as clay, sticks, pebbles, etc., were used to create replicas of the Priest-King, Great Bath, Unicorn Seal, etc., aiming to make the students realise the appropriate use of these low or zero-cost resources. Through this process, they also gained insights into the material remains of the past and the geographical significance of events and processes.



Figure 5

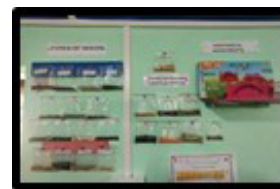


Figure 6

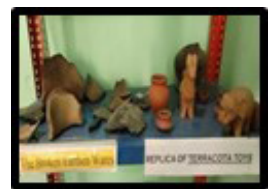


Figure 7



Figure 8

Figure 5, 6, 7 and 8: Glimpses of learning resources, games and toys

**3. Museum Classroom:** As a part of innovation, the traditional classrooms under study were upgraded with a learning room consisting of models (both still and working), replicas of monuments and objects of historical importance, and 3D and puzzle maps. Additionally, to foster research interest and aptitude, different types of soils and stone samples were displayed as teaching aids. The learning room featured an intensive use of teaching aids related to history, such as replicas of terracotta, the Great Bath, coins, seals, potteries (even broken ones), inscription and script samples, agricultural tools like plough, etc. Furthermore, puzzle images of historical monuments transformed this traditional classroom into a museum.



Figure 9



Figure 11



Figure 10



Figure 12

Figure 9, 10, 11 and 12: Replica of artifact, terracotta toys, earthen pots, stone pots, and stone tools

**4. Ground classes—a near to real approach:** To change the stereotypical mindset of educators and students regarding the subject, the study placed emphasis on conducting ground classes and investigations, and encouraging inquiry-based learning. Ground classes involved helping the students learn about different social science concepts, events and processes by creating

near-to-real situations. The students also participated in public gatherings like Gram Sabha and Panchayati Raj Institution (PRI) meetings; and visited public places like health centres, banks, tehsil offices, historical ruin sites, burial grounds, etc.

Once, the students were taken to the India–Pakistan Line of Control (LoC), where an abandoned heritage museum village was located. They visited these sites and saw the border village, army bunkers, and the national flags of India and Pakistan at their respective posts. In the heritage museum, they saw the remains of daily use like kitchen utensils, face cream container, shoe polish container, letters, books, water container, hearth, building structure, and many more.

The idea was to make the students experience life along the LOC, and develop in them a sense of belongingness, pride and respect for the soldiers who perform their duties and protect their countries in challenging situations. The students were also encouraged to write reports based on their observations from their visit to the LOC. They were also encouraged to hold talks with village elders to learn interesting facts about the previous local developments. Subsequently, the reports were collected as a part of their assignments. After every such ground classes, the students were asked to share their experiences in writing, which indicated that they found this way of learning interesting, joyful, engaging and stress free.

**5. Parliamentary classroom approach:** To familiarise the students with the ideas of democracy, republicanism and parliamentary form of government, the classroom seating was arranged to resemble the Indian Parliament. The teacher acted as the speaker of the Lok Sabha or State Assembly, or the chairperson of the Rajya Sabha, while the students assumed the roles of members of the House. In classrooms with sufficient number of students, the students were

divided into ruling and opposition groups. The ruling group prepared to speak on a specific topic. Sometimes, the topics included local issues, while at other times, and curricular topics were chosen. Both the groups were asked to prepare on the assigned topics. They were also guided to prepare their queries and responses. The Parliament or Assembly met on a scheduled day. The opposition group raised different questions, which were responded by the ruling group, leading to debates and discussions.

The learning outcome of the approach was to make the students aware of the parliamentary proceedings, and the roles and responsibilities of the ruling and opposition groups (parties), and duties of the speaker and chairperson of the House.

- 6. Cave classes:** A learning room set-up specifically designed for Class 6, cave classes aimed to introduce the students to the lifestyle of prehistoric people. Upon

discovering many caves in and around the school campus on the first day, it was learned that local residents had dug these caves during the Kargil War that took place between India and Pakistan from 1998 to 2002. The students were taken inside the caves. They were advised to experience and observe the base area; height, depth and thickness of the entry area; markings on the walls and roof; and the material remains. This approach aimed to develop preliminary research interest and curiosity among the students.

After this session, the students could easily learn about the lifestyle of prehistoric people and understand the environmental challenges they might have faced. They could also differentiate between engraved wall paintings and other material remains, and also identify their usage. Further, they were informed how these remains were used as archaeological sources for reconstructing histories.



*Figure 13 and 14: Cave class—students outside and inside of a cave*

- 7. The use of ICT in social science:** ICT has proved to be an excellent medium of instruction in social science classes. It was used to make the students understand different concepts and ideas. It was also used to demonstrate events and processes through animations, short video clips, history-based movie clips, short documentaries, digital dynamic maps, etc. Concept maps supported

by lectures also became a favoured pedagogical approach. Assessment results showed substantial improvement in the students' understanding of concepts, processes and events. Some of the subject specific Free and Open Source Software (FOSS) applications popular among the sampled students were School Bhuvan, Stellarium, SkyView, Google Earth, Phases of Moon,

MindMaps, Kahoot, YouTube, Google Lens, etc. Sometimes, the students were

also encouraged to watch relevant live sessions from PM e-Vidya channels.

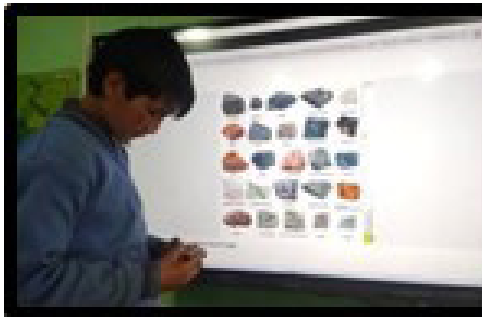


Figure 15



Figure 16

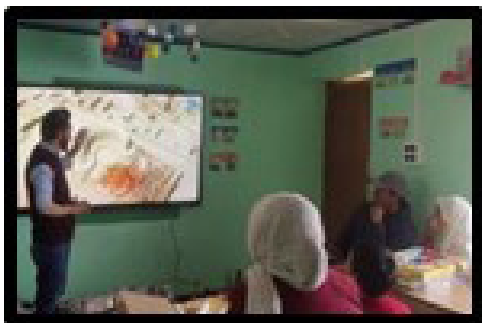


Figure 17



Figure 18

Figure 15, 16, 17 and 18: Different digital platforms were used for teaching various complex concepts

**8. Map puzzle:** To ensure a clear understanding of map usage, self-made and standard readymade map puzzles were introduced in the selected classes. During the allocated time periods, the students of Class 6 to 8 were given to solve map puzzle problems. This approach

aimed to enable the students identify and memorise various geographical landforms; states/union territories and their capitals; state borders; river systems; etc. About 90 per cent of the sampled students found it easy to memorise and solve map puzzles.



Figure 19 and 20: Students solving map puzzles

**9. You-first approach:** In this teaching-learning technique, the students were instructed to read and translate the planned topics in the first attempt. They were also asked to interpret illustrations, maps, pictures and exercises given in the books independently. The subject teacher acted as the facilitator, guiding the students in understanding the given situations or solving problems. The objective was to instill self-confidence and self-reliance, and foster creativity and critical thinking abilities in students. It was observed that out of 20 students, the comprehension and reading ability of eight students was above satisfactory, four were found satisfactory, another four were average and the remaining four were marked below average.

## The Outcomes

The results of the nine distinct interventions have been effectively executed with students in Class 6 to 8 in the academic years 2021–22 to 2023–24. Before the experiment, the students displayed lack of enthusiasm, particularly towards social science subjects. Upon investigating the challenges they faced, it became apparent that difficulties existed in comprehending abstract concepts, such as nationalism, national movement, globalisation, urbanisation, revolution, civilisation, fundamental rights, BCE, CE, decades, centuries, etc. The innovative interventions tailored to address these learning gaps have substantially mitigated these problems. During this research and amidst the experiment phase, the students exhibited consistent motivation to attend social science classes. This is substantiated by the fact that students from different classes actively participated in discussions and debates outside their own class.

For instance, during a lecture or discussion on a Class 7 topic, students from Class 6 and 8 joined the session. In another instance, some students from Class 6 and 7 approached the researchers with a bag filled with stones of various designs, colours and

textures. Their curiosity led them to seek details about the factual aspects of different stone textures and colours, as well as the reasons behind their physical differences. There was a persistent demand from the students to engage in field observations and explore the wonders of nature and material remnants of the past.

Moreover, an interest in research was noticed in students at this stage of schooling, bringing a sense of pride to teachers. Sparked by a discussion on the topic 'Books and Burials', a chapter in Class 6 history textbook published by National Council of Educational Research and Training (NCERT), New Delhi in March 2021, students of Class 6 and 7 discovered the ruins of an old burial site in a locality and shared their observations. This shows the profound impact that these teaching interventions or approaches have on students at the school level.

Active engagement in the learning process has led to meaningful moments and shared enjoyment with peers, facilitating effective learning. So, the integration of art and toy-based pedagogy has gained much popularity among students.

During 2021–22 to 2023–24, 20 students with varied abilities were selected as the sample. Three were highly satisfied and explained the given topics to their peers with examples in writing, as well as through lectures. Nine students were highly satisfied but could explain the topics with examples to their peers through lecture only, while three were satisfied and could explain the topics slightly. Four students wanted the teacher to continue with the same teaching approaches and could not explain anything. Only one student, a differently abled child, could not understand the topics at all.

Meanwhile, the Chief Education officer of Kargil in 2021–22, District Education Planning Officer of Kargil in 2022, Zonal Education Officer of Shargole (from time to time) and inspection team from the District Institute of Education and Training (DIET), Kargil, in 2024, expressed satisfaction with the approaches that were undertaken.

## Conclusion

Hence, it may be concluded that innovations tend to emerge in response to the existing challenges. Pedagogical gaps in instruction across all three disciplines viz., history, geography, and social and political life were identified. Collaboratively with the students, effort was made to create alternative teaching materials to address these challenges, resulting in a noticeable improvement in student engagement and participation. As a result, these students exhibit heightened interest in activities related to specific topics of social science. Besides, attendance rate

for target classes (6 to 8) have consistently surpassed 90 per cent during the academic years of 2021–22 to 2023–24. Moreover, 95 per cent of the sampled students were highly satisfied with the teaching approaches over the period of three academic years. Significant changes in the students' body language and understanding of a democratic learning approach were observed. Moreover, teachers engaged in delivering these topics expressed a heightened comfort level with these innovative approaches. We remain committed to achieving excellence in the field through continuous innovation and creativity.

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## Study of Metacognition among Senior Secondary Students in relation to their Problem-Solving ability and Self-Esteem

Navdeep Kaur and Monkia Rai\*

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### Abstract

*The study's major goal is to examine how students in secondary schools use metacognition in relation to their capacity for problem-solving and their sense of self. Metacognition is a specialized concept in psychology that refers to the understanding of one's own cognitive processes. Metacognition helps to develop the Problem-Solving ability of a learner, which can be applied in solving the obstacles of life in an effective manner. Metacognition also bears a relationship with the self-esteem of a person. The present study was undertaken in the context of metacognition, problem-solving and self-esteem. Following a descriptive research design 200 secondary school students of Amritsar were chosen as sample through simple random sampling. The data was collected with the help of standardized tools prepared by Punita Govil (Meta Cognition Inventory), L.N. Dubey (Problem-Solving ability test) and G.P Thakur (Self-Esteem Inventory). The results of the study showed that while male and female students' abilities to solve problems were comparable, female students' metacognition skills were much higher. However, male students' self-esteem was much higher than that of female students. It was also found out that metacognition does not have any impact on the Problem-Solving ability, however there is positive and negative impact of Metacognition on Self-Esteem*

**Keywords:** Metacognition, Problem-Solving Ability, Self-Esteem, Descriptive Research Design

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### Introduction

Education is a tool for helping people reach their intrinsic potential. It helps people to not only recognize their own potential but also to put it to use for the betterment of society and themselves. In terms of research on student performance and achievement in classroom settings, self-regulated learning is a relatively new concept (Xiao, Yao & Wang, 2019) Self-regulated learners have the ability to organise and structure favourable learning settings, plan and manage the time and effort to be spent on tasks, and focus their mental energy on achieving personal objectives. One

essential attribute of self-regulated learners is metacognition and use of metacognitive strategies. The following section dwells upon the construct of metacognition positioning it in the broader concept of cognition.

Cognition involves the capacity to make sense of the self and the world, through action and language. Meaningful learning is a generative process of representing and manipulating concrete things and mental representations, rather than mere storage and retrieval of information. It also deals with metacognitive activities and problem-solving abilities. This is a process that begins in infancy, and develops through independent

as well as mediated activities. For the enhancement of problem-solving ability in learners, various activities should be included in the curriculum. National Education Policy (2020) lays particular emphasis on cognitive capacities such as critical thinking and problem-solving ability through exposure and experiential learning. It states that these result in positive learning outcomes such as increased creativity and innovation, problem-solving abilities, teamwork, communication skills, critical thinking and higher-order thinking skills, more in-depth learning and mastery of curricula across fields, and improvements in social and moral awareness. Hence, cognitive

abilities are essential for the effective development of learners.

An important aspect of cognition is metacognitive skills and abilities of learners which is the foremost demand of twenty-first century. The word 'Metacognition' was first used in psychology by cognitive researcher and psychology professor Flavell (1970). Flavell was the first to identify that learners can intentionally guide themselves in terms of procedures needed for information recall, classification, and retention. Metacognition, according to Flavell, is the ability to recognize one's own cognitive knowledge and regulate the cognitive knowledge in daily learning tasks.



Image: 1 Concept of Metacognition

(Source: <https://moonpreneur.com/blog/wp-content/uploads/2023/03/metacognition.png>)



Metacognitive abilities can forecast achievement in learning and other spheres of life. Numerous facets of cognition, such

as memory, attention, communication, problem-solving, and intelligence, are also known to be significantly influenced by metacognition.

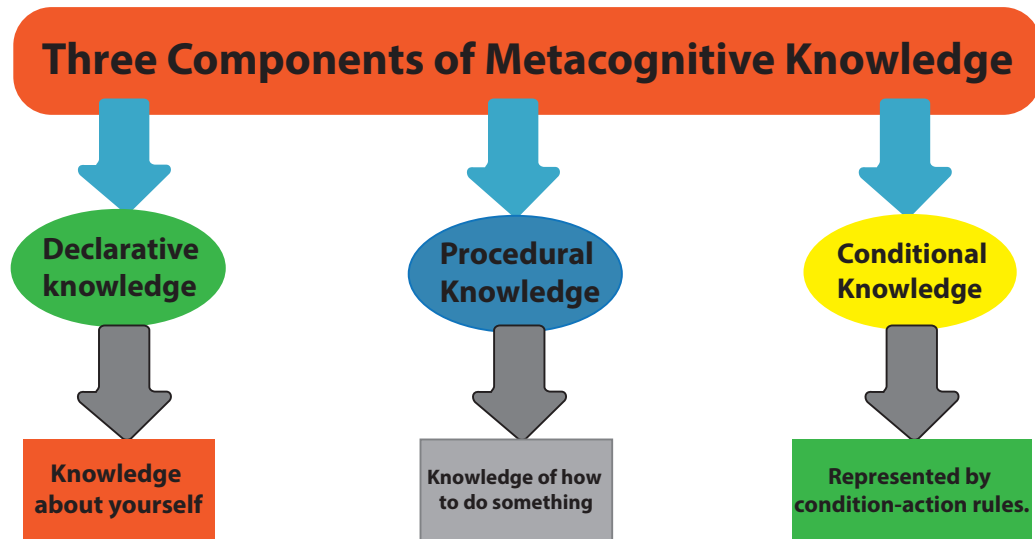


Image: 2 Components of Metacognitive Knowledge

(Source: Metacognition - Practical Psychology ([practicalpie.com](http://practicalpie.com)))

Metacognitive knowledge or ‘meta-knowledge’ is defined as the “knowledge individuals have of their own cognitive processes and their ability to monitor and reflect on them” (Fluer, Bredeweg & Bops, 2021). Metacognition helps to develop the problem-solving ability of a learner, which can be beneficial to solve the obstacles of the life in an efficient manner. Herein, a problem exists when the individual is in a state that differs from the desired end state and there is a perceived need to achieve the specified objectives or reach a particular goal. Problem-solving in continuance then is the identification and application of knowledge and skills that result in goal attainment. Problem-solving abilities involve identification of the problem and understanding its nature followed by formulation and carrying out of the chosen solution. An efficient blend of analytical and creative thinking is necessary for effective problem-solving. Problem-solving abilities are related with cognition and metacognition in complex manner.

Another crucial factor to consider is self-Esteem. One reason for wide spread interest in self-esteem is the notion that poor self-esteem might account for school failure for some children (Paul and Conger, 1984).

Self-esteem refers to one’s evaluation of one’s own qualities. It is an individual’s perception of how they value and perceive themselves. For example, an eight-year-old boy might have a concept of himself as someone who fights a lot. If he values his ability to fight and stand up for him, that quality might add to his self-esteem in a positive manner. If he is unhappy about himself and his tendency to get into conflicts, then his aggressive nature might impact his self-esteem adversely. The main components of high self-esteem are: (Khalek, 2016)

- Compassion, Acceptance, and Respect
- Integrity, honesty (with subtlety and empathy)
- Genuine emotional expression
- Positive reinforcement, assistance, and gratitude

- Forgiveness; allowing and learning from mistakes

Hence, Metacognition, Problem-Solving Ability and Self Esteem are crucial factors that have a complex relationship with each other and can impact learning and cognition in significant ways.

## Review of Related Literature

There have been several researches on the study of metacognition, problem-solving skills, and self-esteem in the fields of psychology and education.

Research by Nbina and Viko (2010) demonstrates that teaching secondary school students how to use a metacognitive self-assessment technique improved their achievement in Chemistry and also markedly increased their sense of self-efficacy. The study's findings also showed that there was no statistically significant difference between male and female students exposed to the self-assessment skills training in terms of their mean achievement scores or mean self-efficacy scores in Chemistry. The recommendation that follows from the study is that teachers should provide senior secondary school pupils with pertinent metacognitive self-assessment tools that are useful for learning. These abilities, which have been shown to increase task execution confidence, also raise the self-efficacy of the students and help them stay focused on the activity.

The metacognitive and affective model of self-regulated learning put forth by Efklides (2011) describes it as a dynamic process that examines the impact of emotions, motivation, metacognition, and cognition on self-regulated learning. Students' abilities, motivation, emotions, and metacognitive skills, as well as their metacognitive, affective, and emotional experiences with academic tasks influence their decisions on the techniques they will employ. Therefore, research into how these connections affect students' performance is crucial. Anderson (2011) conducted a study on, "Relationship

of Self-efficacy, metacognition and performance" to examine the relationships among self-efficacy, metacognition and performance. Regression analysis showed that the relationship between self-efficacy and performance was not mediated by metacognition. However, another analysis showed that the relationship between metacognition and performance was fully mediated by self-efficacy. This suggests that students with effective metacognitive strategies also have strong belief in their capabilities to successfully perform a task. These findings lend support to training programs for students that enhance self-efficacy and strengthen their metacognitive strategies and skills.

The above specified studies mostly deal with the relationship of self-efficacy and metacognition and not with problem solving ability of students. However, problem solving ability tends to be a major variable in understanding the metacognition processes in an effective manner. This can be identified as a major research gap. A few pertinent studies in this area are as follows.

Sharei, Kazemi, and Jafari (2012) undertook a research to understand how students' abilities to solve mathematical problems relate to their emotional intelligence and metacognitive skills. A random selection of sixty male and forty female students was the statistical sample for the study. The results show a substantial correlation between the general scores of metacognitive abilities, emotional intelligence skills, and some of its components and mathematical problem-solving ability. Regarding the students' gender specificity, the findings indicate notable distinctions between male and female students in three domains. Male students outperformed female students in the domains of problem-solving and metacognitive skills, while female students achieved higher emotional intelligence scores. Metacognition then was a better predictor than emotional intelligence in this study.

In order to ascertain epistemological beliefs, metacognitive strategy use, and link between

epistemological beliefs and metacognitive strategies of primary education teacher trainees, Jena and Ahmed (2013) designed their study as a descriptive survey study. A total of 820 teacher candidates were chosen from the primary education departments of seven education faculties. The data were gathered using the Metacognition Inventory and the Epistemological Beliefs Scale. The results demonstrated that the beliefs of primary school teacher candidates regarding “learning depends on effort” had grown and changed more than their views regarding “learning depends on skills” and “there is only one truth.” Although there were notable differences between their beliefs about gender, grade, and university attendance, no significant relationship was found between the students’ beliefs and academic achievement. On the basis of these researches it can be recommended that metacognition and mature epistemological beliefs should be conveyed to teachers and teacher educators, along with strategies for helping students acquire these skills over the course of their formal education. To increase the students’ capacity for learning, teachers should raise their students’ metacognitive awareness. Students are more likely to perform well in class if they are aware of effective learning techniques. Teachers are in charge of establishing a metacognitive learning environment in the classroom. With the teacher acting as a facilitator, (s) he should let the students come to their own understanding through independent exploration and investigation. Additionally, she can employ techniques to promote metacognition in the classroom.

Another study “Metacognition and Academic Performance of Rural Adolescents” was undertaken by Narang and Saini (2013) to study the impact of metacognition on academic performance of rural adolescents (13-16 years). The sample comprised of 240 rural adolescents from rural schools of Ludhiana. To assess the academic performance of the subjects, the aggregate percentage of marks obtained by the

students in the last school examination was procured from the concerned teachers. Results revealed that the major proportion of students with high level of metacognition also performed above average in academics. Further analysis depicted that both the components of metacognition - ‘Knowledge of Cognition’ and ‘Regulation of Cognition’ significantly contributed towards the Self-Esteem and Problem-Solving ability of secondary school students.

Talekar (2016) conducted a study to determine Mumbai secondary school pupils’ levels of metacognitive awareness by studying 120 pupils enrolled in Mumbai’s SSC Board secondary schools. The results indicated that the metacognitive awareness of the majority of pupils was average. Hence, schools must support in-class activities that enable students to evaluate the material they are studying and consider how they are learning it. These kinds of exercises will move the educational system towards a child-centered approach. Additionally, it will support the pupils’ development of skills for lifetime learning since students will be able to recognize their areas of strength and weakness and take appropriate action.

The purpose of Fooladvand, Yarmohammadian, and Zirakbash’s (2017) systematic review method study was to determine how cognitive and metacognitive methods affected academic accomplishment. The existing research on the impact of cognitive and metacognitive methods on academic accomplishment, both nationally and internationally, comprised their review. According to the findings of several studies (Ozcakma, Koroglu, Korkmaz & Bolat, 2021; Stanton, Sebesta & Dunlosky 2021) learning methods like cognitive and metacognitive strategies have had the most impact on students’ academic performance in various courses at schools and at universities.

Generally speaking, learning strategies of all kinds (cognitive and metacognitive) are highly effective on the degree of learning in various courses (experimental sciences, mathematics, and English language) for

all learners (males and females), in all studies (experimental, quasi-experimental, relational, or correlational). Using a sample of 200 B.Ed. students, Sawhney (2018) investigated the relationship between self-efficacy and metacognition among aspiring teachers enrolled in rural and urban programmes. According to the findings of their study, students in urban areas outperformed students in rural areas in terms of mean scores in KOC (knowledge of cognitive process), ROC (regulation of cognitive process), and overall metacognition. The self-efficacy of B.Ed. students studying in urban and rural areas of institutions did not significantly differ from one another. Thus, it can be proposed that enhancing self-efficacy and metacognitive awareness may be a useful strategy for raising learning and performance across the lifespan. In this context, role of teachers is quite significant. Students' behavior and decisions are influenced by their teachers along with their parents, the home environment, and the community. A learner can succeed if he is well-versed in his own idea of knowledge, which includes both acquired and current knowledge as well as the control of his cognitive processes. The urban students' favourable association between self-efficacy and metacognition further demonstrated how the location of the institution helped the learners not only comprehend the task, activity, or topic, but also cultivate positive beliefs about accomplishing the goal.

Kukreja, Saini, and Vig (2020) conducted research to examine gender disparities in the interaction between intellectual capacities, metacognition, and academic achievement in rural teenagers (aged 13 to 16). The study was carried out government schools in villages of Ludhiana. The results indicate that the 'metacognitive skills' of the rural teenagers had a substantial impact on their 'academic performance' but it was not possible to determine how their 'intellectual abilities' affected their performance. Students will succeed academically if they have well-developed metacognitive knowledge and

metacognitive regulation skills, and if they apply their metacognition. As such, it is critical to evaluate students' metacognition using a variety of methods and, if needed, to devise strategies for helping them become more metacognitive. Consequently, it is also crucial to identify pupils who require direct assistance in metacognition and who lack basic understanding of how to manage their learning. This is particularly important in courses with large class size because there is little chance for teachers to interact personally with each student. As a result, they are able to ascertain the kinds of metacognitive knowledge and regulatory abilities that the students can apply during their learning. Therefore, efforts must be focused on helping students, regardless of their 'intellectual capacity', acquire and improve their metacognitive awareness and skills in order to improve academic achievement.

Another study by Guner and Erbay (2021) delves into the metacognitive techniques middle school pupils employed when working through challenges on their own. Thirty-seven eighth-grade middle school pupils made up the study group. One non-routine word problem was given to the students, and their written responses were compiled. Following their solution to the challenge, the students completed a self-monitoring questionnaire asking them to reflect on the metacognitive techniques they had used. A recommendation arising from the study's findings is that middle school pupils can benefit from a variety of interventions aimed at fostering metacognitive abilities. For example, instructional activities can be designed to necessitate the use of metacognitive strategies from students themselves, and they can be motivated to do so. It is important to look at the possibilities of structuring the curriculum so that middle school pupils are exposed to these seemingly 'non-routine' tasks more frequently.

Study by Oyovwi & Iroriteraye (2022) conducted in Nigeria with the goal of improving scientific students' academic

attainment and retention rate through the application of metacognitive strategies employed a quasi-experimental design used - a non-equivalent control group pre-test post-test design with intact classes. The sample consisted of 221 science students. One of the tools used in the investigation was the Science Achievement Test. Based on the findings, it was concluded that the best method for teaching and learning science is metacognition. The study suggested, among other things, that educators should employ metacognitive strategies when instructing students in the Science curriculum. In light of the study, it is recommended that the government and educational stakeholders arrange for instructors/teachers to receive training on the proper application of metacognitive approach in real classroom instruction. When examining the curriculum - curriculum planners, developers, and educators should consider this approach to ensure that students are adequately taught relevant skills that will enable them to engage effectively in metacognition.

After going through all the above literature, it can be observed that most of the researches have been done on professional identity, academic achievement, positive thinking, intellectual abilities, motivation, epistemological beliefs, scientific attitude, mathematical creativity, enhancing environmental ethics, teaching arithmetic and geometry and science in relation to metacognitive skills and metacognitive strategies, but studies on problem-solving skills and self-esteem in relation to metacognition are extremely rare. Moreover, the majority of research has not been done in India, but conducted abroad. In India, researches on metacognition is still in its early stages of development and not many researchers have explored this field.

Helping students develop metacognition is one of the most critical challenges facing educators as it is becoming increasingly clear that many academic tasks would benefit from metacognitive awareness and skills. Effective learning requires

metacognition. When compared to kids who have low metacognitive abilities, those who have strong metacognitive abilities perform better academically. Metacognitive training may help students who struggle with metacognition to become more proficient in it.

Apart from metacognition the second key variable is the capacity for problem-solving. Problem solving is an intricate behaviour. No matter how much expertise or knowledge a problem-solver possesses, every new problem scenario is different in some aspects and necessitates the innovative application of techniques for formulating, addressing, and resolving the issue at hand. The third significant variable in this research is Self-esteem. Having positive self-esteem empowers an individual to place trust in themselves and have the motivation and courage to try new things. It enables the individual to accept who they are in spite of their shortcomings. Additionally, when an individual respects themselves, other children and adults do the same. In order to understand how adolescent students' metacognition relates to their capacity for problem-solving and sense of self-worth, the researchers undertook this study. In the light of the analysis of the literature cited above it is apparent that there are research gaps despite the buzz across the constructs of 'meta-cognition' and 'problem solving' skills in the field of cognitive psychology yet there the researches on the interconnections between 'metacognition', 'problem-solving' and 'self-esteem' are sparse. The research aims to fill this gap.

## Objectives

1. To study the difference in meta-cognition of secondary school male and female students.
2. To study the difference in the problem-solving ability of secondary school male and female students.
3. To investigate the difference in self-esteem between secondary school male and female students.

4. To investigate the relationship between metacognition and senior secondary students' problem-solving abilities.
5. To investigate the relationship between senior secondary students' metacognition and self-esteem.
6. To investigate the association between senior secondary students' problem-solving skills and self-esteem.
7. To investigate the interactional effect of problem-solving ability and self-esteem on senior secondary students' metacognition.

## Hypotheses

1. There is no significant difference in metacognition between secondary school male and female students..
2. There is no significant difference in problem-solving abilities between secondary school male and female students..
3. There is no significant difference in self-esteem between secondary school male and female students..
4. There is no significant association between metacognition and problem-solving skills of senior secondary students.
5. There is no significant association between senior secondary students' metacognition and self-esteem.
6. There is no significant relationship between problem-solving ability and self-esteem of senior secondary students.
7. There is no significant interactional effect of problem-solving ability and self-esteem on metacognition of senior secondary students.

## Tools and Techniques

Three types of tools have been used in this research as given below.

- Punita Govil's (2003) Meta Cognition Inventory (MCI).

- L. N. Dubey's (2006) Problem Solving Ability Test (PSTET-D).
- G. P. Thakur's (1989) Self-Esteem Inventory (SEI).

## Study design

The study falls under Descriptive Research design.

## Sample

The sample of this study comprised of 200 students (100 Girls + 100 Boys) of class 12. For this study, investigator used Random Sampling technique to select the sample.

## Statistical Analysis

The data was analyzed by using appropriate statistical techniques such as Mean, SD, T-Test, coefficient correlation and Two-way ANOVA.

## Results and Conclusion

Mann-Whitney test was applied for testing the significance of the following three null hypotheses, laid down in the present study:

- $H_01$ : There is no significant difference in metacognition between secondary school male and female students..
- $H_02$ : There is no significant difference in problem-solving abilities between secondary school male and female students..
- $H_03$ : There is no significant difference in self-esteem between secondary school male and female students..
- $H_01$ : (a) There is no significant difference in self-esteem (self) of secondary school male and female students..
- $H_02$ : (b) There is no significant difference in self-esteem (society) of secondary school male and female students.

**Table:1: Mann-Whitney Test for studying significance of difference between Mean Scores of Male and Female students in respect of Different Variables (n=100 each)**

Variables	Mean Scores		Mean Difference (Female-Male)	Test Statics	P-value	Remarks
	Females	Males				
Metacognition (MTCG)	97.36	81.73	15.63	7445.0	< 0.0001	***
Problem-Solving (PRSL)	7.47	7.79	-0.32	4490.5	0.20917	Not Significant
Self-Esteem (Self) (SESL)	139.26	150.47	-11.21	3860.0	0.00533	**
Self-Esteem (Society) (SESC)	137.98	145.93	-7.95	4037.0	0.01863	*

\*Significant at 5% probability level; \*\*Significant at 1% probability level; \*\*\*Significant at 0.1% probability level; NS: Non-Significant.

### Main conclusions from Table 1:

- Among female students, mean score in metacognition was 97.36, whereas among male students, the mean score was only 81.73. Thus, there was a difference of 15.63 in the mean scores of metacognition. Computed value of Mann-Whitney test statics was computed to be 7445.0, which was associated with an exceedingly small (< 0.0001) p-value. Therefore, as per the test procedure, the observed difference (= 15.63) in the mean scores happened to be highly significant (at 0.1% probability level), thereby implying that on an average, metacognition score of female students was highly significantly than that of male students. Accordingly, the first null hypothesis ( $H_01$ ) is rejected.
- In respect of problem-solving ability, mean score of female students was 7.47, whereas that of male students was marginally higher at 7.79. Thus, there was a difference of only 0.32 in the mean scores of problem-solving abilities. Computed value of Mann-Whitney test statics was computed to be 4490.5, which was associated with the p-value of 0.20917. Since the p-value was higher than the threshold value of 0.05; therefore, as the first procedure, the observed difference (-0.32) in the mean scores was statistically non-significant. Thus, on an average, problem solving abilities of female and male students were at par with each other. Accordingly, the second null hypothesis ( $H_02$ ) could not be rejected.
- Next, with respect to Self-Esteem (Self), mean score among females was 139.26, whereas the males were higher (through a difference of 11.21) at 150.47. Value of Mann-Whitney test statics for the difference was computed to be 3860.0, which was associated with a very small (= 0.00533) value of p. Therefore, the observed difference (=11.21) in the mean score happened to be highly significant (at 1% probability level), thereby implying that on an average, self-esteem (self) of male students was highly significantly more than that of female students. Thus, the third null hypothesis [ $H_03$  (a) ] is rejected.
- Similarly, with respect to Self-Esteem (Society), mean scores among females was 137.98, whereas that among male was higher (through a difference of 7.95) at 145.93. The computed value of Mann-Whitney test statistic for this difference was 40.37.0, which was associated with a fairly low (=0.01863) value of p. Since the

p-value was less than the threshold value of 0.05 (but more than 0.01); therefore, the observed difference (=7.95) in the mean scores happened to be statistically significant (but only at 5% probability level). This implied that on an average, self-esteem (society) of male students was also significantly higher than that of female students. Accordingly, the fourth null hypothesis [ $H_04$  (b)] is also rejected.

### **Testing Significance of Relationship between Mean Scores of different Parameters: Evidence from Correlation Analysis:**

Help of Correlation analysis was sought to examine validity, or otherwise, of the next three hypotheses of the study, viz:

- $H_04$ : There is no significant association between metacognition and problem-solving skills of senior secondary students.

- $H_05$ : There is no significant association between senior secondary students' metacognition and self-esteem.
- $H_05$ : (a) There is no significant association between metacognition and self-esteem (self) of senior secondary students.
- $H_05$  (b) There is no significant association between metacognition and self-esteem (society) of senior secondary students.
- $H_06$ : (a) There is no significant association between senior secondary pupils' problem-solving skills and self-esteem (self).
- $H_06$  (b) There is no significant association between senior secondary pupils' problem-solving ability and self-esteem (Society).

To fulfill this purpose, an inter-correlation matrix among the parameters (pooled over male and female students) was generated, as presented in Table 2.

**Table 2: Matrix of Inter-Correlation Coefficients between different Parameters (n=200)**

Parametres	Metacognition	Problem-Solving	Self-Esteem (Self)	Self-Esteem (Society)
MTCG	1.000	0.072	-0.163	-0.086
PRSL	0.072	1.000	-0.054	-0.033
SESL	-0.163	-0.054	1.000	0.313
SESC	-0.086	-0.033	0.313	1.000

Critical values of  $r$ : 0.139 at 5% probability level; 0.182 at 1% probability level; and 0.231 at 0.1% probability level.

### **Main Conclusions from Table 2:**

- Coefficient of correlation between metacognition (MTCG) and problem-solving ability (PRSL) of the senior secondary students was computed to be a mere 0.072, which failed to cross the threshold value of 0.139 (at 5% probability level). As a result, it may be concluded that there was no significant association between metacognition and problem-solving skill in senior secondary pupils. And, therefore, the fourth null hypothesis ( $H_04$ ) could not be rejected.
- Coefficient of Correlation between metacognition (MTCG) and self-esteem (Self: SESL) was computed to be -0.163,

which in magnitude was more than the threshold value of 0.139 (at 5% probability level), but could not exceed the threshold value of 0.182 (at 0.1% probability level). It could thus be said that there exists a significant inverse relationship (at 5% probability level) between metacognition and self-esteem (Self) of senior secondary students. However, the coefficient of correlation between metacognition (MTCG) and self-esteem (Society: SESC) turned out to be -0.086 only, which (in magnitude) could not cross the threshold value of 0.139 (at 5% probability level). This implies that there does not exist any significant relationship between metacognition and



self-esteem (Society) of senior secondary students. Accordingly, the null hypothesis [H05 (a)] could be rejected in respect to the relationship between metacognition and self-esteem (Self), but the hypothesis [H05 (b)] could not be rejected in respect of the relationship between metacognition and self-esteem (Society).

- Coefficient of correlation between problem-solving ability (PRSL) and self-esteem (Self: SESL) was computed to be -0.054. Similarly, the coefficient between problem-solving ability and self-esteem was computed to be -0.033. Values of both the correlation coefficient were tested to be non-significant (because these could not exceed the threshold value of 0.139. Thus, there does not exist significant relationship between problem-solving ability and self-esteem (whether Self or Society). Hence, the sixth null hypothesis [viz. H06 (b)] could not be rejected.
- Finally, as per the analysis, coefficient of correlation between the two types of self-

esteem (SESL & SESC) was computed to be 0.313, which happened to cross even the 0.1% critical value of 0.231. This implies that there exists very strong direct relationship between the two types of self-esteem.

### **Testing significance of interaction effect of Problem-Solving ability and Self-Esteem on Metacognition: Evidence from Two-Way ANOVA technique**

Finally, an attempt was made to examine validity of the last hypothesis, viz.

- H<sub>0</sub>7: There is no significant interaction effect of problem-solving ability and self-esteem on metacognition of senior secondary students.

For this purpose, two-way ANOVA technique was used, wherein the response variable was metacognition score, while the two factors were the levels of problem-solving ability of self-esteem, respectively. Main findings from the analysis are presented as follows:

**Table 3: Table of Mean values of Metacognition Score at different levels of Problem-Solving ability and Self-Esteem**

Levels of Problem-Solving	Levels of Self-Esteem		Mean Score
	Negative	Positive	
Very Low	89.42	87.37	88.36
Low	102.42	92.29	96.96
Average	NA#	95.00	95.00
Mean Score	91.06	88.17	89.54

*None of the observations belonged to this category*

**Table 4: Two-Way Analysis of Variance of Metacognition Scores in relation to different levels of Problem-Solving ability and Self-Esteem**

Source of Variation	df	Sum of Squares	Mean Square	F-Value	P-value of F	Remarks
Problem-Solving	2	1730.98	865.49	2.696	0.06998	NS
Self-Esteem	1	477.15	477.15	1.486	0.22425	NS
Problem-Solving X Self-Esteem Interaction	1	366.69	366.69	1.142	0.28649	NS
Residuals	195	62596.78	321.01	-	-	-
Total	199	65171.6	-	-	-	-

### Main Conclusion from the above Two Tables:

- As per Table: 3, there were three levels of problem-solving ability, viz. 'Very Low', 'Low' and 'Average'. Similarly, there were two levels of Self-Esteem, viz. 'Negative' and 'Positive'.
- Mean values of metacognition score at 'Very Low', 'Low' and 'Average' levels of problem-solving ability were observed to be 88.36, 96.96 and 95.00, respectively (Table: 3).
- F-Value for the levels of problem-solving ability (at 2 and 195 degree of freedom) was computed to be 2.696. This value was associated with a p-value of 0.06998 (Table: 4). Since the p-value was more than the critical value of 0.05; therefore, mean values of metacognition score did not differ at the different levels of problem-solving ability.
- Similarly, mean values of metacognition score at 'Negative' and 'Positive' levels of self-esteem were calculated 91.06 and 88.17, respectively (Table: 3).
- F-Value for the levels of Self-Esteem (at 1 and 195 degree of freedom) was computed to be only 1.486. This value of F was associated with p-value of 0.22425 (Table: 4). Since the p-value was substantially more than the critical value of 0.05; therefore, mean values of metacognition score did not differ at the different levels of self-esteem as well.
- As regards interaction effect of problem-solving ability and self-esteem on metacognition score, the value of F (at 1 and 195 degree of freedom) was obtained to be a mere 1.142 (Table: 4). Since its p-value (= 0.28649) was far higher than the critical value of 0.05, it can be concluded that the interaction effect was statistically non-significant. Hence, the seventh hypothesis (H07) could not be rejected.

### Conclusion

The results of the study show that while male and female students' abilities to solve

problems were comparable, female students' metacognition skills were much higher. Additionally, male students' self-esteem was much higher than that of female students. At the interaction level, metacognition has no impact on the problem-solving ability, but there is a 'Positive' and 'Negative' impact of metacognition on self-esteem. In sync with the previous researches it can be recommended that metacognition and mature epistemological beliefs should be conveyed to teachers and teacher educators, along with strategies for helping students acquire these skills (like problem solving ability and self-esteem) over the course of their formal education. To increase their students' capacity for learning, teachers should raise their students' metacognitive awareness. Students are more likely to perform well in class if they are aware of effective learning techniques. Teachers are in charge of establishing a metacognitive learning environment in the classroom and with the teacher acting as a facilitator, she should let the students acquire their own understanding through independent exploration and investigation.

### Educational Implications of the Study

1. Metacognitive thinking strategies did not demonstrate substantial predictability. The study's findings successfully proved that skilled problem solvers think in a structured fashion, and to some extent, this structure could be quantified. According to the findings of the present study, there is a significant correlation between metacognition and self-esteem, as well as metacognition and problem-solving capacity of students based on their gender. At the start of each lesson, teachers should create a checklist for their students.
2. The intervention period of the current study was too short to allow for independent mastery of the metacognitive strategies taught. Future studies investigating the impact of self-esteem and problem-

- solving ability on metacognition would benefit from a longer implementation period. This would increase opportunities to personalize scaffolding and to increase the likelihood of students developing automaticity of skills and strategies.
3. The researcher's observations of at-risk students and improvements in their pre and post scores suggest potential for further investigations. Researchers must improve the study design and data collection procedures in order to closely monitor and account for the learner's trips.
  4. The present study indicated that students with high self-esteem and problem-solving abilities performed better in metacognition. Teachers should take note of this discovery. Students should be psychologically trained, especially at a young age, to boost their self-esteem and problem-solving abilities, hence improving their metacognition.
  5. Overall, this study will help the teachers to design the teaching methodology on the basis of problem-solving ability and self-esteem for the students. Higher-Order thinking skills (HOTS) are what teachers are striving for in the classroom, so this study will help in the development of HOTS among students.

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## **BOOK REVIEW: Guthli Can Fly**

*Devika Sharma*

Every teacher, parent and those interested in working with or on young children must read *Guthli Can Fly*, at least once. The book is written and illustrated by Kanak Shashi. It is a famous book and has won several awards, including White Ravens, International Youth Library and Germany Award in 2020, to name a few. The book, first written in Hindi, was titled *Guthli Toh Pari Hai*. It was published by Eklavya Publication. Later, it was translated into English by Rinchin and published as a story for the anthology *Being Boys* by Tulika Books in 2010. Tulika Books also published it as a picture book. The book was also printed by Muskaan Books as part of its English reader set.

*Guthli Can Fly* is the story of a young boy (age is not mentioned) who desires to be a fairy. He does not feel like a boy. Instead, he and wants to dress up like a girl and play with dolls. One day, Guthli asks his mother, “Why do you keep saying I’m a boy when I’m a girl?” His mother admonishes her (him) for being ‘unreasonable’ and asks to behave like a boy. She tells Guthli to wear clothes meant for boys and play with toys like his brother— “Don’t be stubborn. You are a boy. Now, go and change your frock.” Guthli pulls herself (himself) away from her (his) mother’s arms. Over the days, Guthli, who feels like a girl, is seen losing interest in the activities that she (he) used to enjoy previously. She (he) goes into a shell. Guthli’s mother notices that her child is feeling depressed. Finally, one day, she comes to Guthli and gives her (not, him) a dress and says, “Live the way you want!”

The readers empathise with Guthli’s struggles despite the revelation that Guthli is not born a girl but a boy. The author has used several linguistic and literary devices to depict Guthli’s emotions, and successfully strikes a chord with the readers. The book begins by introducing Guthli as a girl through illustrations. Although Guthli is depicted wearing pants, her unkempt long hair confuses her identity. Secondly, pronouns like she and her have been used for Guthli. Activities, including cycling, that Guthli is shown doing can be identified as masculine, but the fact that she is shown carrying chicks on the handlebar and the seat of her cycle; and the colour of cycle tyres, peddle and seat in purple associate her closely with the female gender. Lastly, she is described as a ‘chatterbox’, which is a common trait to describe girls in literature. In the first couple of pages, the character of Guthli is established in the minds of the readers as a happy, talkative and carefree young girl. So, when she is scolded by her family members, including her mother, the readers take Guthli’s side.

The name Guthli aptly locates the heart of the gender’s fluid identity. Like the seed of a mango, which has an outer body and an inner core, Guthli has the body of a boy but feels and desires like a girl. The relationship between the body and affinity, in terms of feelings, towards a particular identity is brought out beautifully through the metaphor of guthli in the book. One is not born into a certain gender identity but becomes and

inhabits a gender. It is achieved through gender performances by repetitive acts over a period of time. It is done through the means of linguistics (such as the use of pronouns and in some languages like Hindi through the use of gender appropriate verbs as well); dressing (such as frocks for girls and pants for boys or jewellery suits girls but not boys); activities (such as dance styles, particularly those that require delicate movements and facial expressions, e.g., Kathak or ballet, that are appropriate for girls; and sports like football and cricket where it requires the player to stand the weather suits boys better). The gender roles and identities circumscribe a person's everyday activities, as well as ambitions, dreams and desires.

When gender norms are not followed, there are severe consequences, including physical and emotional violence. Guthli breaks down when her sister rebukes her, her brother jeers at her and her father gives angry looks for breaking the gender appropriate dress code when she comes wearing her sister's frock. As she cannot express herself fully through her body and the choices that govern the everydayness of her existence, she loses interest in everything she enjoyed. It is only when she is given the freedom to exercise her choice that she comes back to life.

Through the metaphor of flying, —doing, wearing, thinking and more so feeling the way one desires, Guthli can realise her personality. She can be whatever she wants, instead of being controlled, muted and silenced for not fitting in well within the social and patriarchal norms of heteronormative bodies.

A couple of years ago, I attended a conference on the thematics of children and childhoods, organised by the department of education in one of the colleges. After the session on representation in children's literature, one of the early grade teachers working in a reputed private school in Delhi raised concern about the book *Guthli Can Fly*. She acknowledged that the book is interesting

and transforming. But her question was, "What is the pedagogy to engage with such a book in the early grades?" She added that the parents of children of her class had also raised concern over the book. The question of appropriateness of the book for young children takes one step closer to the dual role of children's literature which is literary and pedagogic. I acknowledge that picture books of this kind bring out the challenge one (an adult) faces while negotiating the literary and pedagogic aspects of children's literature. On the other hand, the question itself suggests that the teacher was herself uncomfortable to engage with. The discomfort may be due to several reasons. It may be due to little or no knowledge of the subject concerned, lack of exploration of her own sexuality, lack of pedagogic training to explore such subjects, but more importantly, her notions of childhood which is based on children as innocent, pure and asexual beings. It is necessary that teachers, librarians and parents question their own notions and understandings about their own sexuality and childhood.

*Guthli Can Fly* is an essential addition to the collection for children whether in the class, school or public library. Teachers, librarians and parents must be ready to receive questions from children, and more importantly to acknowledge that they do not have all the answers but are ready to explore some of the questions along with them. *Guthli* can start a conversation about gender norms, gender pronouns and gender identity with a little higher grades. With the lower grades, the focus can probably be on feelings, and through the conversation on feelings, social and gender norms may be explored.

There is another book titled *Soda and Bonda*, published by Tulika Books, which explores a similar theme but in a slightly humorous way—a dog who feels like a dog, and a cat who feels like a dog. Such books teach the readers to become kind and compassionate.

## BOOK REVIEW:

### Review and Introduction to 'Teaching the Young: The Early Childhood Development Profession in India'

*H. K. Dewan*

Children are the future citizens of the world, and they would in time have the responsibility to make decisions and judgements. The consensus on early years is that these are the fastest and most critical years of learning. This is why the current policy documents have made ECCE a central focus of education. To fulfill the aspiration of providing quality education, it is essential to understand its importance and the effective methods of achieving it. This responsibility lies with those entrusted with educating young children. The developing field lacks easily accessible materials from the Indian context that address local contexts and are readily understandable by those seeking to learn from tried-and-tested methods. Towards this, the recent book edited by Kinnari Pandya, Jigisha Shastri, and Vrinda Data, 'Teaching the Young: The Early Childhood Development Profession in India' published by Orient BlackSwan, makes a useful contribution.

The book has 22 chapters written by people who have worked in early childhood development for decades. The diversity in the nature and length of experience of the authors promises a substantial read. The book does not disappoint in the way that it provides many experiences of what has worked on the ground in different contexts and also presents the challenges that lie in the wake of reaching the first leg of sustainable development, Goal 4 (SDG 2023). ECE is a small step, but as is now beginning to be

realized, a crucial step to begin and ensure lifelong learning, and this book explores its principles and practices. Given the emphasis on the period of education in the National Education Policy 2020, this is a topical volume. The wisdom from experience offers profound insights that can resonate deeply. For example, people generally tend to believe that they know and are competent, but they actually are not so knowledgeable, and hence, they need to be more circumspect about reaching conclusions and imposing their ideas. And the process of developing their abilities has to start by helping them realize that they do not know so that their minds are open to observing, thinking, and learning. The other important thing pointed out is that professional development of teachers is essential; it requires resources and patience, apart from respect for autonomy and agency for the roles people are engaged in. There is no one way, and each situation is to develop its own strategy and technique. While we may say there is nothing new about this and it has been said before, the book brings these out in a starkly obvious manner due to the struggles that authors have been through in their works. It is, in that sense, a book worth reading.

The introduction to the book brings out the importance of ECCE and the fact that it requires specific exclusive knowledge and the people in it have a special social role. It is not generalized knowledge or generalized abilities we are looking at. The knowledge

required would not come from training but from being educated. The book differentiates between education and training and suggests that people who work in it must act professionally and be able to make contextually valid decisions automatically. It suggests that while the discipline has its roots in development psychology, it has social dimensions, and the educators must be prepared appropriately. The book emphasizes that educators in this domain have multiple roles, deal with multiple stakeholders, and hence need to reflect on their work and look for more effective functioning.

The introduction also points out that despite many policy referrals to ECCE and its importance in the documents (an increasing trend), the wider social milieu does not know about ECD. The status of practitioners and workers in this field is relatively low. The book raises the issue of establishing ECCE as a recognized profession, given its importance from research and policy perspectives.

The book is organized into four sections. The first section, with four chapters, contains an analysis of the history and policy of teacher preparation for early years. The second section on curriculum and pedagogy of teacher preparation has 8 chapters, while the third on in-service professional development of early childhood teachers has 7 chapters where examples of the work of institutions engaged in this effort are presented and discussed. The final section on resources for early childhood educators includes three chapters with detailed examples of potential activities at ECD centres. This includes details of materials needed as well as how educators and caregivers can be prepared to fill this role meaningfully. The resources cover a wide range of topics, supporting diverse educational contexts. The last chapter on the way forward presents the viewpoints of the editors regarding how ECCE should proceed and what important elements to keep in mind.

The first chapter, by Venita Kaul, one of the doyens of ECCE, analyzes the current state of ECCE institutions in India. Being a part of

the policy development process at the centre and with many states allows her to lay bare the national issues, how the present policy addresses them, and how it can be revised.

The second chapter, 'Higher Education in the Development of Childhood Professionals,' is a practitioner's essay on the need for high-quality higher education for ECCE. The author points out that development in this field has been haphazard, and the available programs address only a few pockets. She also points out that the present preparation of ECCE educators by higher education institutes is not satisfactory, as it may not create an attitude and desire for the ECCE role. She also points out that the research on the effect on the work of ECCE workers due to higher education shows mixed results and suggests holistic practical measures to make improvements in ECCE.

The third chapter is on the important role of NGOs in developing ECCE professionals in India. It points out that these organizations have helped slowly develop in India a greater level of comprehensive commitment and suggests that NGOs have not only played a role with the state and helped it develop people to work in this area and help it set up creches and centres but also have supported evolution, setting up and running of many types of centres that children and parents have accessed. Based on the experience of one of the organization's work, they suggest the steps needed to move forward.

The fourth chapter by Vardarajan and Rajeshri examines Nai Talim's pre-basic teacher education curriculum and comments on its relevance in the current context. The Nai Talim approach from pre-birth to 7 years is in practice very different from the Kindergarten approach. It encompasses the entire framework of ECD, including ECCN and ECE. In contrast to the more cognitive focus in kindergarten, the focus in Nai Talim is on developing self-confidence, self-responsibility, and engaging with work that is part of the work of the community. The authors point out that this approach builds significant relationships between the



teachers and the community and underlines the development of the child as their joint endeavour.

The next section focuses on chapters around the curriculum and pedagogy for pre-service teacher preparation. The first chapter by Kinnari Panday lays the foundation of this section. It presents the framework that must inform the development of the ECCE educator, considering that she must keep track of the curriculum daily up to the entire year. Discussing the elements of this preparation, she emphasizes that its pedagogy must recognize that learners of the course are adults. The chapter by Karma Gayleg is based on the experiences of the effort to develop ECCE educators in Bhutan. As an experience directly from the field, the chapter captures nuances and details. Although set in Bhutan, the chapter applies to other contexts. Asha Singh's chapter, 'Cultural Tools for Children's Literacy and Learning,' suggests that interactions with children, regardless of subject or topic, should have the interests of children in mind, and when given opportunities rooted in their culture, children learn naturally.

She also points out that it's not so much about providing them with opportunities but rather about ensuring they don't lose them and encouraging them to participate in the games they develop on their own terms. As for preparatory schools, the chapter suggests that they should focus on the transmission of facts and activities should focus on the agency of children and involve them in meaning-making. This will only be possible if they are working with instances and examples from their cultural and social experience where they have been able to form an understanding and develop their view. Examples of situations of children engaging in activities that help them develop a sense of the world around them and strengthen their ability to cope through different forms of local arts are both insightful and instructive. They seem to emerge from long experience working with children and those who work with children. The chapter by Neela Dar

is about the TISS program for capacity development. This program, which is a part of the School of Vocational Education, is defined as a work-integrated program. The chapter argues that while the theory is taught in classrooms, skill training is learned in the industry, and the same should be for ECCE 'professionals.' The chapter presents the details of content and how quality checks are maintained across skill training hub sites of the program.

The chapter by Rekha Sen Sharma et al. describes the developmental journey of the IGNOU distance education capacity-building program for ECCE workers. Data about the enrolled students from the start of the program informs the readers not just about the numbers enrolled but also about their age profile, gender, state-wise distribution, and the time taken to complete the program. The chapter underscores the need for quality open and distance learning and blended programs, given the need for a larger capacity required for orienting preschool teachers.

The chapter 5WSIH by Maya Menon suggests that to understand what continuous professional development means, we need to clarify responses to some questions labelled as the 5Ws and the IH. We need to answer the questions [Why, What, Who, When, Where, and How]. The first point argues that CPD is essential because it gives examples of alternative possibilities to replace their own experience as learners as the model for interaction with their students. The second 'w' pertains to learning strategies, and Maya suggests there is no magic formula for it and people had to be taken through a journey from unconscious incompetence to conscious competence. For the third 'w', 'what are the obstacles?' Maya points out that the major one is the lack of any motivation for learning other than for doing well in exams. The other factors, such as the teacher's agency to effect changes, the lack of career growth opportunities, and the inadequate allocation and poor use of funds, are being overlooked. As to 'why is an entire enterprise useful?' The author argues that the results show that

time and funds are well spent on this if there is clarity of purpose and alignment with the implementation.

The next response is to 'who should take up CPD', and here the author says that all should take it as everyone needs this time for reflection and learning. The chapter addresses the next question, 'Who should provide it?', by saying that it should be mostly people who have worked on the ground with children and have sharpened their skills in that process. To 'when', what is the best time for professional development? The author suggests 'any time is a good time'. She points out that we all know that we fail in classrooms, and hence everyone needs to reflect and learn all the time. And to the last 'w' to where to find the time for it, the natural response is that time must be found, and it can be found. Not a large time at one go but small intervals by adjusting. The H is on how we measure impact and how professional development impacts teaching and training. Section 3 has seven chapters (161-252), with a focus on in-service professional development. The section presents diverse approaches that respond to different contexts and situations due to ground conditions as well as the nature of implementing organizations.

The first chapter by Padma Yadav, 'Role of DIETs in Training of Pre-School Teachers' talks briefly about the policy and importance of ECCE in DIETs. It introduces DIETs and their work in the professional development of teachers and details of the diploma course run by NCERT for capacity building of DIETs to enable them to support pre-service program quality improvement. It also talks about NCERT initiatives for realizing the goals of NEP 2020 for ECCE and gives suggestions about what needs to be done based on her long experience.

The chapter by Nilesh Nimaka about the work of the Quest Alliance on ECCE in Maharashtra describes the Palvee model from its genesis through the Ankur program in one block of Palaghat. The chapter provides information on ECCE structure and roles,

including strengths and weaknesses of the Palvee model, which are illustrated through anecdotes from the field. It also talks about the challenges and the need for contextual challenges and specific responses to them. As the road ahead for expansion points out, the Palvee model requires a sustained input of technical and financial resources, which may be seen as a weakness by administrators and funders. The provision of technical and financial resource support to the ground institutions.

The chapter 'Professional Development Strategies' by Vijayanti K. and Gayatri Kiran is based on the work of the Ashra Foundation. They point out that ECCE programs with well-trained, well-equipped, and well-supported personnel work better and that good and well-run diverse ECCE programs matching specific situations can impact better life preparation, including school readiness for children. From the work of the Akshara Foundation presented in a table and some anecdotal narrations, the authors point out the possible effect of this capacity-building strategy.

The next chapter, 'A Multi Model Approach to In-Service Capacity Development of Anganwadi Teachers' by Yogesh GR, Kinnari Pandya, and M. Sreenivasa Rao is based on the extensive work of the Azim Premji Foundation on ECCE in the Sanga Reddy district to discover possible processes and procedures to make the public ECE system better. The chapter presents six key systemic challenges to the functioning of Anganwadi Centres and experience-based possible tried and tested solutions with learnings from implementing the 10-year-long effort. The solutions suggested do not require many additional resources and are within the scope of district authorities. The materials developed for this multi-model work are given in the appendix and offer a framework of what and how for the task.

The chapter by Many Punnose and Shikha Kumari, 'A Community Approach to Early Childhood Care and Education' talks about Prajayatna's effort. Beginning with the

theoretical framework on the need for ECCE and factors that affect the child development domain, it presents the basics of the ICDS Scheme, which has been a major strategy in the Indian context. It describes Prajayatna's genesis, strategy, and belief to address the system rather than the symptoms. The key to the strategy is building and institutionalizing community ownership of the process through parents, local monitoring and support committees, Gram panchayat, and administration. The team has developed their own ECCE centre curriculum and decentralized teacher development through training, meetings, and materials to ensure learning engagements in classrooms.

The chapter by Gauravi Jadhav et al. emphasizes the quality of teaching and an appraisal system that is collegial and trust-inspiring for the teacher. It presents the effort to develop such a program for the 7 schools mentored by Muktanjan. The performance and developmental appraisal are integrated through a feedback mechanism and include a dialogue between the appraiser and the individual. The authors find that this is a crucial input to improve quality and reduce attrition in teachers. The chapter argues that such a system is an important addition to the appraisal mechanism for which NEP 2020 only proposes a state accreditation body.

The last chapter of this section by Jigisha Shastri and Kinnari Pandya, titled 'In-Service Program for Teacher Educators for Early Years Education,' is about an in-service program for teacher educators through the experience of grooming 16 young men and women post-graduates as ECE educators. Starting with working with children at the AWCs, they were immersed in all dimensions of the Anganwadi system involving interaction with diverse stakeholders and gradually inducted into the role of educators. The chapter describes their development in 4 stages parallel to the development process of an Anganwadi teacher, elements of which are shown in a table. All chapters in the section stress that rigorous in-service

programs rooted in on-site experience can prepare high-quality ECE trainers and also build capacities of existing ECE trainers, albeit through different strategies, modes, and structures of intervention.

The last section with three chapters gives resources from different organizations for crucial aspects of setting up and implementing ECCE, including the teacher, her preparation, curriculum, and materials and infrastructure required. Originating from diverse locations, situations, and experiences, the toolkit would be valuable in many different situations.

The first is an ECD toolkit for quality early-year education from Muktanjan based on experience in a metro. This toolkit elaborates the 5 E's Engage, Explore, Explain, Elaborate, and Evaluate of active constructivism and gives reasons for their need.

The second source provided is the 'Anganwadi Teachers Handbook' meant for the public system, which is based on the work of the Azim Premji Foundation in Sanga Reddy district. It gives key elements of a developmentally appropriate thematic curriculum for multiple abilities children with what the child needs to learn woven in. The handbook suggests 14 themes that could be close to the children and gives guidelines to prepare, a possible timetable with activities that can be done with children regularly.

The last resource is the pre-basic syllabus for the training of teachers published before independence by Hindustani Talimi Sangh. The chapter gives details of how the educational movement within the independence struggle visualized pre-basis teacher development and gives principles, staffing and equipment required, quality of potential teachers, and then the program of training. This was an ashram training with full experience of manual work and community living to develop empathy, cooperation, self-regulation, and self-discipline. The document gives the nature of content and activities for hands-on learning by immersion in a nearby community. Given that it gives more

importance to the integrated development of attitudes, habits, and dispositions in comparison to mere cognitive understanding, it poses a fundamental challenge to the current fragmented processes.

The chapter way ahead speaks about the inclusion of many of the recommendations in the NEP 2020 and the kind of steps needed to improve the quality of ECCE. There are many clear and significant suggestions made and what different structures and institutions need to do to get it laid out.

To conclude, as the book itself repeatedly points out, it does not provide answers that can be applied directly, but it provides important insights into the approach that may work and the materials and methods that may be adapted suitably. The book is an enabler also because the diversity of approaches and the multiple ways of looking at the task suggest and provide opportunities to mix and match. From how to initiate work and run a few institutions to how to scale up, the challenges and difficulties in the wake are reflected. It should be a useful read for all wanting to participate in this space.

One of the key takeaways from the book is the need for localized systems to provide quality

ECCE. It shows that it is possible with the on-the-ground engagement of working closely with the community to develop in them the confidence to own the program and become responsible for overseeing the maintenance of quality. The examples of the efforts from small to not small scale put to rest the ghost of community are not interested. Given the fact that the book gives examples of so many different kinds of programs in different situations, there is a broad canvas from which the needs of specific areas may be matched and some lessons learned. It must, however, be pointed out that the diversity at the level of ECCE and in all the dimensions and aspects that it relates to makes it difficult for any one source to be fully adequate, but the book does provide a fair spread of at least the common bulk categories of situations.

The book is useful for those learning about ECCE as an actor in the field or even as a student of ECCE or some other social program. The experiences presented with some analysis can serve as excellent case studies for the development of ECCE educators. The book is also useful for administrators in the sense it gives them some picture of the variety of things that have worked based on the experience of the actors in the field.