Voices of Teachers and Teacher Educators

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| Volume XI | Issue I | July, 2022 |

About the Journal

The journal 'Voices of Teachers and Teacher Educators', an initiative of the Ministry of Human Resource Development (MHRD) (at present Ministry of Education) is being co-ordinated by the NCERT. 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, the National Curriculum Framework for Teacher Education (NCFTE)-2009 and the Right of Children to Free and Compulsory Education Act (RTE)-2009 and also the National Education Policy, 2020 all reflect this commitment and underline the principles that make such an effort necessary and also spell out the strategies for it. The challenge is to augment the role of teachers in shaping the social transformation that India is witnessing, have a long lasting impact on the quality of education, and making education equitable. Teachers and all those 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 teachers, teacher educators, researchers, administrators and policy makers 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., and make their engagement visible in accomplishing extraordinarily complex and diverse tasks that they are expected to perform. Contributions to the Journal are welcome both in English and Hindi. Voices is an e-Journal and we hope to circulate it widely. We also look forward to suggestions and comments on the articles published. The views expressed and the information given are that 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 policy makers. 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, 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 receive your contributions for the forth coming issue. We also look forward to your comments and suggestions. The contributions can be sent to the following:

E-mail: voicesofeducators2016@gmail.com

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Contributors

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Savita Kaushal, Associate Professor, IASE, Department of Teacher Training and Non- Formal Education, Jamia, Millia Islamia , Jamia Nagar ,New Delhi : 110025

Animesh Kumar Mohapatra, Professor and Head of Department, Department of Education in Science and Mathematics, Regional Institute of Education (NCERT), Bhubhaneswar, India, 751022, **Deepshikha,** Masters Student, Department of Zoology, Babasaheb Bhimrao Ambedkar University, Lucknow, India, 226025, **Priyamvada,** PhD Research Scholar, Department of Education, University of Delhi, Delhi, India, 110007

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Poonam Sharma, Assistant Professor, Center for Education Innovation and Action Research, Tata Institute of Social Sciences, Mumbai, India

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Sumbul Khalil, Department. of Education, School of open Learning, University of Delhi, ORCID No.- 0000-0002-2084-3174, **Dr. Urvashi Gupta,** Asst. Professor, D.I.E.T (Dist. East), SCERT, Delhi, ORCID No. - 0000-0002-5520-4831.

Dr. Arup Kundu, Assistant Professor in Mathematics, Govt. Training College, Hooghly, West Bengal-712103, India

Dr. Ajit Kumar Bohet, Assistant Professor, Department of Teacher Training and Non-Formal Education (IASE), Faculty of Education, Jamia Millia Islamia, Delhi, **Rashmi Rekha Dash,** Research Scholar, Department of Teacher Training and Non-Formal Education (IASE), Faculty of Education, Jamia Millia Islamia, Delhi, Dr. Ajit Kumar Bohet.

Dipak Karmakar, Ph.D. Scholar, NIEPA, New Delhi.

Ritesh Khunyakari, TISS-Azim Premji School of Education, Tata Institute of Social Sciences (TISS), Turkayamjal, Ranga Reddy District, Hyderabad 501 510.

Reviewers List

S. No.	Reviewers	Email Id.	Address
1.	Aerum Khan	akhan26@jmi.ac.in	Assistant Professor, Department of TT & NFE (IASE), Faculty of Education, Jamia Millia Islamia
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11.	Rajni Dwivedi	ritudwi@gmail.com	Educator, Tejpur Assam
12.	Ranjana Arora	ranjuarora1967@yahoo.co.in	Professor and Head, Department of Curriculum Studies of Development, NCERT
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20.	Savita Kaushal	skaushal@jmi.ac.in	Associate Professor, Teacher's Training & Non Formal Education (IASE),
21.	Nimrat Kaur	nimrat.kaur@ azimpremjifondation. org	Professor, Azimpremji University
22.	Gurjeet Kaur	gurjeet_edu@yahoo.co.in	Professor,Department of Teachers Training & Non-Formal Education,
23.	Rejaul Karim Barbhuiya	rejaul.jmi@gmail.com	Assistant Professor, Central Institute of Educational Technology (CIET), NCERT
24.	Sharad Sinha	drsharadsinha@gmail.com	Professor and Head, Department of Teacher Education, NCERT
25.	Richa Goswami	goswami84@gmail.com	Educator, Mumbai

26.	Gunjan Sharma	Gunjan@aud.ac.in	Assistant Professor, School of Education Studies, Dr. B.R. Ambedkar Ambedkar University Delhi
27.	Manasi Thapliyal Navani	manasi@aud.ac.in	Assistant Professor, School of Education Studies, Dr. B.R. Ambedkar Ambedkar University Delhi
28.	Ramanujam Meganathan	rama_meganathan@yahoo.com	Professor, NCERT
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33.	Mythili Ramchandran	mythili.ramchand@tiss.edu	Proffesor, TISS
34.	Anchal Chomal	aanchal@ azimpremjifoundation.org	Associate Professor and Leader,

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'Voices of Teachers and Teacher Educators' largely gives space to contributions with different experiences, questions, suggestions, perspectives as well as critical comments on different aspects of Teacher Education and Schooling for publication. 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 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 the 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 exposition of a point of view / uncritical / hypercritical presentation of an experience. Preferably the papers should be approximately 3000 words. The paper must include an abstract 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, so please check before you send it. For those who are citing other author's work or their own work, please ensure that there are not many quotes from any previously published text. You can not take any material from any published work including your own. You must keep the amount of material you cite to the minimum, and give reference to the original. Whatever you wish to write in the paper should be linked to your own work and written 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 this cannot be through the use of the 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.

Contents

Editorial

This issue of Voices of Teachers and Teacher Educators   has 15 papers. The issue has been delayed for some unavoidable reasons. The papers in the issue include topics linked to classrooms of school, teacher education as well as on overall educational perspective. We try to select papers that are readable and meaningful for the readers and have some implications for the readers. Papers that have just data and statistics or which are not linked to school education or teacher education directly are not considered as suitable for publication in the journal. We would request all the prospective authors to keep this in mind when sending articles to the journal for consideration. We receive many papers that are about collection and statistical analysis of data with no background of the reason why the work is needed, the explanation of the tool, why it was chosen, how it was administered or about the implications and usefulness of the research. These technical papers are not considered suitable for the journal. Our request to the potential authors is to keep that in mind when deciding where to send their paper.

On the other hand we also get papers which are more like opinion pieces and sometimes even lists of to do's and don'ts, sometimes even what look like manuals and guides. These pieces with very little justification from well collected data are written as they would be for newspapers and magazines. Clearly, however valuable the opinions are or however useful the instructions about how to do things in classrooms may not be considered as original reflections that are research-like and based on empirical data instead of anecdotes and chance encounters. We urge the authors to send these to other suitable periodicals as taking them through the plagiarism check and review takes time and these are prima facie not suitable for the journal. The authors can save time by sending them to appropriate publications.

The other important thing we want to restate is about plagiarism. We have a policy of no repeat of earlier published portions of a paper unless absolutely essential. The portion reproduced must obviously be in quotes and should constitute a very small portion of the entire paper. There are well established norms of deciding what would be acceptable in a paper. We would like to point out that due to the large numbers of papers that have substantial portions from already available materials, we have to run a plagiarism check on each paper which delays the processing time. For *Voices of Teachers and Educators* we have a limit of similarity index of 5% for papers to be considered for further review, acceptable keeping in mind other necessary criteria.

As you are aware some of the issues of Voices of Teachers and Teacher Educators are based on certain themes. In these we focus on and give priority to papers around a specific theme. The 'Volume XII, Issue II, July 2023' of Voices of Teachers and Teacher Educators would be thematic and we look forward to contributions around the theme of *curricular and pedagogical reforms in Secondary and senior secondary education in the context of the NEP 2020.* These could be around the recommendations in the new policy, their implications, experiences of efforts to move in that direction, analysis of the background to the policy. The papers could be apart from these other work on the area of this period in school based on the materials and methods suggested in the NEP 2020. We look forward to contributions in these areas particularly for the July 2023 Issue.

The first paper by Jyoti Kohli has the title '*Life Skills Approach to Education: Role of the English Classroom'* focuses on the need for life skills education in the light of changed social realities and presents some illustrative examples.

The second paper by Savita Kaushal titled '*School Leadership- from Vision to Practice: Untying the knots for Integration of EWS Children'* has described the practices adopted by the school head that aimed at improving learning and equity amongst the most disadvantaged children. The paper points out that a principal's leadership style can impact the integration of the EWS learners.

The third paper '**Pre-service Teachers' Perceptions on Internship in Relation to Integrated and Specific Professional Teaching Courses: A Study**' has been contributed by Animesh Kumar Mohapatra, Deepshikha and Priyamvada, is an exploration of the perceptions of trainee teachers towards internship, a central part of the teacher preparation efforts The study finds significant differences in the perceptions of student teachers of integrated and specific courses with respect to appropriateness of duration of internship, number of lesson plans assigned, practice of teaching skills and use of ICT in classroom during internship.

The fourth paper by Seema Shukla with the title '**Understanding Public Discourse on History Textbooks in India'** analyzes the discussion on the history textbooks in India from the premise that textbooks occupy a large space in school education. The author points out that textbooks are not just pedagogic tools but disseminators of what is to pass on to the next generation. All over the world they are contentious most so in history. This paper through letters of various stakeholders brings out the discourse around textbooks of NCERT and implications for future history textbook writing.

The fifth papers in this issue include the paper by Poonam Sharma entitled '**Best Practices of a school-based pre-service teacher education programme'**. This paper is a study of one part of the work of Muktangan Education Trust, a Mumbai-based NGO and brings out the challenges teacher education programmes face.

Madhumati Manjunath and Shilpi Banerjee in their paper '**Unpacking the Meaning of a Standards-based Education System'** talk about increasing adoption of standards-based education systems and the need to have clarity about the underlying concepts. Presenting and clarifying some of the features the paper points out the caveats associated with standards-based education systems and concludes with suggestions for improvement and implementation.

The seventh paper '**Vision of Science Education in National Education Policy 2020**' by Mamta Singhal and Manisha Wadhwa presents an analysis of how science education has been viewed in the NEP 2020. It brings out that science has an impact on our lives and we need to be aware of the degrading effects of science and technology on human lives even as we think about its benefits. It emphasizes the need for scientific temperament, possessing basic process skills and knowledge of scientific concepts in order to make informed and meaningful choices.The paper discusses the vision of NEP-2020 and possible contribution of education towards scientifically literate citizens and the SDGs of 2030 .

Ashu Kapur's paper '**Private School Culture and Pedagogical Practices: Glance into EWS Children's Experiences'** is focussed on the experiences of children from disadvantaged backgrounds in the private schools that are bound to admit some of them in the light of the RTE 2009. It tries to interpret the socio-cultural confluence of private school culture, teaching learning processes and class-cultural specificities embedded in disadvantaged children's experiences of school.

The ninth paper '**Strengthening Teachers' Knowledge of Students' Conceptions in Physics'** by Shruti Chopra is about how teachers should be more informed about the

conceptual understanding of their students. In their study they look at the teachers' knowledge of learners' conceptions regarding thermodynamics and kinetic theory of gasses. by engaging them in collective reflection on their classroom processes and students' thinking. They find even very experienced teachers lack a comprehensive understanding of learners' alternative conceptions. They have little idea of the learning difficulties and hence have not thought about pedagogical strategies needed to address this. The study attempts to develop a model for teacher learning that promotes more responsive teaching practices.

In the tenth paper '**Voices of Student Teachers on Teacher Education During Covid-19 Pandemic: A Case Study of D.El.Ed Students'** Sumbul Khalil and Urvashi Gupta present the results of their study of student teachers of D.El.Ed who shared their experiences and reflections on all aspects up to assessment in their teacher education course during COVID-19 pandemic.

Arup Kundu in eleventh paper '**Influence of Gender and Parents Education Level on Mathematics Achievement of Madhyamik Passed Students in South 24 Parganas, West Bengal'** presents the results of an investigation of the Parents' level of education and gender on Mathematics achievement in class X exams of students from South 24 Parganas district in West Bengal. The result showed that Mathematics achievement was not independent of gender and the education levels of the mother and the father have significant influence on the mathematics achievement.

The twelfth paper '**Making History Relevant In 21St Century: An Indian Perspective'** by Ajit Kumar Bohet and Rashmi Rekha Dash questions the general perception that History is a non-utility subject, and irrelevant for career opportunities. It suggests ways of making the teaching of history more relevant by developing a spirit of enquiry in history with an activity based learning within a framework linked to competency based learning emphasized in the NEP 2020.

In the thirteenth paper **'Teacher's Recruitment, Salaries, and Development: Equity and Quality issues in Eklavya Model Residential Schools'** Dipak Karmakar points out the necessity of qualified regular teacher recruitment across all structures to ensure equitable quality education for tribal children. Their study of the current status of teacher recruitment concerning qualification, salary structure, and responsibilities in these schools for tribal children shows that the massive contractual teacher deployment affects the quality of schooling compared with other Govt. Schools. The study also validates that contractual recruitment of teachers limits their responsibility..

Ritesh Khunyakari in his paper '**Emergent Investigations in Design Practice: Lessons from Engaging the Social Sciences Undergraduates in Design-based Concept Learning'** presents the findings from an engagement of social sciences students in design thinking. The paper presents the experience of this study and summarizes the learnings from it.

Life Skills Approach to Education: Role of the English Classroom

Dr. Jyoti Kohli*

Abstract

As is widely recognised, there is a need for life skills education in the light of the demands being made on individuals owing to changed social realities. It is imperative that schools act as sites for engagement with skills that help the contemporary youth to cope with these challenging demands successfully. This paper delineates the concept of and the need for life skills. While outlining the need for developing life skills in the contemporary school going population, this paper suggests a way forward through adopting the life skills approach to education with the help of an illustrative example.

Key Words: *Life skills education, English classroom, activity-based learning.*

1. Need for Life Skills

Life is becoming increasingly complex, with the number of personal, social and emotional demands increasing each day. On one hand there is the concept of 'global village' in which, each aspect of life—every thought, act and institution is being reconsidered in the light of what is happening in other parts of the world, and on the other, most people evade decision–making even though it concerns their very own life. The demands of contemporary urban societies call upon individuals to cope with long distances, pollution, traffic congestions, noise, fears and anxieties of being exposed to violence and crimes being committed and health and life style related issues. The limited abilities to cope with emotions and stress have been compounded by a lack of empathy and warped communication, leading to dysfunctional personal relations and insecurities. More often than not, individuals are being subsumed by the larger social phenomena as a result of which structures and support systems available to the individual have dwindled. This necessitates developing abilities in each individual that would enable him/her to lead an optimally productive and satisfying life. This would go a long way in achieving the goal of a harmonised, happy and productive society. These were some reasons for WHO's recommendations of a Life Skills Approach to Education.

2. What are Life Skills?

WHO defines life skills as abilities for adaptive and positive behaviour that enable individuals' everyday living (WHO, 1997). They are considered significant for the promotion of healthy child and adolescent development. They prepare adolescents and children for socialisation and prepare them for changing social circumstances (WHO, 2004). The following life skills are identified as being crucial for charting the life course more meaningfully.

3. What is Life Skills Approach to Education?

Life Skills Approach to Education enables learners to develop skills that help them

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* Associate Professor, M.V. College of Education, University of Delhi, E-mail - jyotikohli.elt@gmail.com

Life Skills Identified By WHO (2004)

Decision-making helps one in weighing one's options and deal positively with their lives. It engages with identification of possible options before arriving at the most relevant one and deciding in its favour.

Problem Solving skills are needed to solve the day-to-day problems encountered by one. Some problems are more complex than others, but careful analysis, planning and execution can solve even the most complicated of these.

Creative Thinking is a novel way of perceiving or attempting things. It calls for flexibility, adaptability, freshness of approach and innovation.

Critical Thinking is the ability to analyse or evaluate things. It calls for logical thinking.

Communication includes the ability to listen and respond meaningfully, while signalling to the other that one is interested in what is being talked about. This would include the use of appropriate gestures and body language.

Interpersonal Skills help us relate positively to people. This would engage one in making and maintaining meaningful interpersonal relationships.

Self-awareness calls for an engagement with knowing one's own strengths and weaknesses; likes and dislikes. Self-awareness helps one in growing positively.

Empathy is the ability to stand in someone else's shoes and perceive things from their perspective. It helps one bond meaningfully with others at home and in society.

Coping with emotions calls for putting a check on your negative emotions, while optimising the positive ones. It is important for maintaining a peaceful and harmonised self.

Coping with stress means dealing with the innumerable demands placed on each individual. Presence of problems in one's life can be a precursor of anxiety, stress and other negative emotions. One must try and engage in activities that help one reduce their effects.

live competently in their later lives. Life skills education is designed to facilitate the practice and reinforcement of psychosocial skills in a culturally and developmentally appropriate way; it contributes to the promotion of personal and social development, the prevention of health and social problems, and the protection of human rights. These skills would help learners to acquire additional competence in the cognitive, social and emotional spheres. Some of the objectives of the Life Skills Approach include:

• Developing a knowledge base among learners.

• Fostering healthy attitudes of living among learners

• Enabling learners to effectively cope with peer pressure.

• Providing learners with the necessary skills to resist peer pressure.

• Developing greater self-esteem, self-mastery and self-confidence.

• Enhancing cognitive, behavioural, social competence to reduce and prevent a variety of health risk behaviours.

(CBSE : Life Skills Education and CCE)

It is significant to note that these skills can be developed in isolation, however, as the term 'approach to education' suggests, life skills need to be integral to the school curriculum. It is believed that inclusion of life skills in the curriculum would help the youth in facing an uncertain future, learning to assume responsibilities of adulthood and to enter the world of work. Not only can these be interwoven with the school ethos, with a visibility in assembly, inter-house activities, clubs and other aspects of the school; they can very well be integrated with the syllabi of various school subjects and be enhanced through pedagogic interventions. It is extremely important to ensure that learners

across the nation are engaged with these in order to improve the quality of their life.

The next part of this paper exemplifies how well can life skills be integrated and transacted in an 'English as a Second Language' context. It focuses on how pedagogy can be used as a vehicle for Life Skills Education. Similar pedagogic interventions situated meaningfully in the context of other subjects, too, can lead to the development of life skills among school-going learners.

4. The English Class as a Site for developing Life Skills

The English class lends itself quite naturally to the development of life skills. It is important to note that the thesis of this presentation is to use the already existing ELT pedagogy to develop life skills in school-going learners drawing on the content from their English syllabus. *Life Skills Approach* can be achieved with great ease functioning within the framework of LSRW — the four language abilities, grammar and vocabulary development as well as teaching language through literature —widely accepted approaches in ELT in the Indian context. Contemporary approaches and methods being used in the language classrooms can provide us with a number of opportunities to foster and nurture various life skills.

- **Communicative approaches** focus on the functional use of language. For this, they rely on role-plays, simulations, dialogues, language games and activities. Each of these can help in the development of life skills in learners. All that is called for, on the part of the teacher is to identify issues from the learners' context that can be used for the development and enhancement of life skills.

- **Role-plays and simulations** can help learners *manage feelings and emotions, develop communication skills and interpersonal relationships and help them deal with conflicts and the resultant stress.* These pedagogic options can help

them analyse their problems, identify their feelings and come to terms with situations that they face in their real lives e.g. adolescents who are not able to perceive their parents', siblings' or teachers' perspectives invariably end up taking very similar decisions when called upon to do so in similar circumstances. They even defend these by giving a number of logical reasons. Role-plays provide the learners with a perfect opportunity to understand aspects of a situation from different perspectives. It has the potential to bring objectivity to their perspective. Role-plays can help them access the subjective worlds of others to gain an understanding, thereby developing a *feeling of empathy* that brings in them the sensitivity as well as the sensibility to be there for others in times of need.

Example:

a) Role-play / simulation for developing communication skills and interpersonal relationship

Language Area: Grammar: Modals

Situations are written on chits, which are placed in a box. Each pair of learners picks a chit and enacts the situation using appropriate modals. The range of situations can vary from formal to informal requiring learners to use not just appropriate modals but also vocabulary and structures suited to the given situation.

b) Role-play / simulation for interpersonal relationship/ communication skills / decision-making / empathy

Language Area: Listening + speaking /writing abilities

Learners listen to an incomplete dialogue between a parent and a son who wants to

buy yet another latest electronic gadget. Learners take down notes and

- Complete the dialogue
- Role-play the situation in pairs clearly stating the end of this dialogue

Such a role-play will not only engage them with the functional use of language, but it would also provide them with an opportunity to 'communicate correctly' , 'build on interpersonal relationship' and 'empathise' with the father, who would otherwise come across as unreasonable and authoritarian.

- **Discussions and Debates** in ESL classrooms provide learners with an opportunity to hone their listening and speaking skills. A good discussion provides the learners with an opportunity to improve their communication skills as well as manage their feelings and emotions. The topic of discussion, stances taken by peers and learners' own subjective experiences can give rise to a lot of emotions which need to be taken care of / resolved. Setting out clear norms, ensuring that the learners adhere to these norms and guiding the discussion in a manner that most of them are able to express their opinions and come to terms with any differences of opinions that may arise can help them grow into adults who would be able to communicate successfully in order to resolve issues in future.

To be good at debate requires learners to be thorough in their understanding of concepts, to listen to others' perspectives closely and patiently, to be analytical and reflective and then come up with logical arguments to put forth a diametrically opposite view point or put forth a point of view in a manner that it seems extremely different from the majority opinion. This often requires outstanding communication ability as well as creative thinking. Often the winners come up with an out of the box detail / idea that draws the judges' attention to them. Debates have found a place in the ELT classrooms and can be used to promote *critical and creative thinking, communication ability and develop*

better interpersonal relationships.

- **Language through Literature** is a widely practiced approach in the Indian context. Most textbooks comprise literary pieces, which are used to create a variety of functional situations in the classroom. It places the language in a context, thereby providing learners with an opportunity to engage in critical analysis and appreciation of literature. The processes that this can lend itself to can be excellent resources for honing the cognitive life skills of learners. We can help develop the critical thinking ability of learners by asking them to:Express if a character's action was justified or not on the basis of logical reasoning. They need to justify their own choices too.
  - Identify character traits of individuals on the basis of their behaviour.
  - Be the character and answer questions on the basis of their understanding of the context .
  - Alter one situation in the story in order to change the end (critical and creative thinking).
  - Think of an alternate ending / conclusion.
  - Given this situation, what decisions would you have taken if you were the protagonist.
  - Change the story / poem into a play.

Some of the tasks mentioned above , with appropriate instructions and class management, can lend themselves to the enhancement of creative thinking as well (changing the end/ story; change of form).

- **Character Journal / Diary Entries/ Letter Writing**

Extrapolatory questions help in building bridges between the content and the situation in real life of the learners. After reading a short story or a play, learners can be asked to assume the identity of one of the characters/protagonists and write a diary entry about what they felt or

write a letter to another character to change something in the story. In both the cases, learners are likely to come closer to developing empathy — as they need to understand the nuances of the situation the character finds itself in. This can even be replicated when reading a novel. The learners will definitely be able to understand most of the nuances of at least one character's travails / situations with the help of a character journal.

Focusing on writing skills is integral to language classrooms. **Guided writing tasks** for helping learners write short stories, advertisements, posters, poems, brochures etc. facilitate divergent thinking and instil creative thinking. A few examples could be:

- Given here is a set of dialogues that occur at different points of a story. Think of character, setting and plot which fit the dialogues. Write your story.
- You are provided with a catch phrase for a product. Frame a suitable advertisement.
- Look at the pictures below. They are about a happy and healthy family. Study their lifestyle. Using the pictures as a guide; write a short talk on how a healthy family can have a happy and successful new generation.
- Given below is a set of postcards, including holiday destinations and activities. Who, do you think, would be interested in these? What positive words or phrases would you use to describe them? Work with a partner and write down your ideas for each one and a caption for each picture.

Besides such tasks, **the process approach to writing** lends itself to the process of self-awareness. It reinforces reflection as the very process of drafting and redrafting, along with editing, rephrasing, choosing apt expressions and words cannot be undertaken without some amount of reflection at the very least. Drafting and re-drafting are inherent in the process approach. Each draft provides the learners with an opportunity to reflect on their writing and improve upon it. In case of prolonged engagement with the process approach to writing, learners would become

both reflective and self aware and developing *self-awareness* in the learners. It makes them recognise that writing is a process with immense scope for improvement. The threshold for perfection gets pushed further with rising levels of self-awareness.

Last, but not the least, awareness of the self is intrinsic to the process of language learning. One who is aware of the mistakes tends to learn from them. *Making learners sensitized to their expression and gradually improving upon it can develop self-awareness as a life skill.* Awareness of concepts and gaps that exist in their understanding (with the help of concept maps) are likely to enhance *self-awareness* in the learners. Not only does this develop the language abilities but such processes tend to make learners truly reflective.

5. Perceived Challenges and the Way Forward

Over the last few years, I have had the opportunity of working with both the pre-service as well as the in-service teachers to facilitate the development of life skills in school learners. The challenges I have faced with each set have been quite different.

Pre-service teachers have more time on their hands and are trying to build their understanding of educational concepts. As a result, most of them are able to gain an understanding of the concept of life skills. But their experience of the class is extremely limited and they are in the process of developing an insight into the day-to-day demands teaching makes on them. As a result, their engagement with life skills as a part and parcel of the everyday transactions is rather limited. Only about 30 per cent of them are able to draw connections between life skills and pedagogy.

Another limitation faced by them is the constraint of time faced by them. Since their engagement is restricted to a particular number of days, it is difficult for them to engage in life skills development even with one group of learners.

However, it is hoped that the beginning of this orientation would eventually reap rich results in the longer run.

In-service teachers are adept at identifying and using pedagogy but their understanding of life skills seems rather limited. Life skills come across as a relatively new concept, and a significant number of in-service teachers are unable to relate to newer concepts. Their engagement with these remains partial, at best (with very few exceptions). Workshops are time bound and clarifying the nuances of each life skill can be quite time consuming. Therefore, helping them understand aspects of life skills can be quite a challenge.

Most in-service teachers are in a hurry to complete the syllabus; and despite developing an understanding of the life skills and integration with pedagogy, they are unable to include these regularly.

Finally, each teacher's real test is in the classroom. The final challenge, as I perceive it, is how to ensure that each learner is not just involved in the class, but involved enough to enhance both language ability as well as life skills. This will lead to the development of integral understanding.

Persistent efforts in this regard are likely to result in responsible and responsive adults, whose contribution to society will make a big difference.

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Jyoti Kohli teaches at M. V. College of Education, University of Delhi. She has been a teacher educator for over 20 years. Her areas of interest include material development and adaptation, learning styles and pedagogy of English language and literature in the Indian context.

School Leadership- from Vision to Practice: Untying the Knots for Integration of EWS Children

"The only Difference between Successful and Unsuccessful People is Extraordinary Determination"

Savita Kaushal*

Abstract

School leaders, specifically the school head, have a crucial role to play in establishing goals, fostering a healthy school climate that includes the proactive school mindset, and fostering essential staff enthusiasm and dedication that are necessary for success even in difficult situations. This paper is based on the case study of a school where the principal took the bold step of integrating students from Economically Weaker Section (EWS) families into the school. EWS children suffer significant hurdles to integration, education, and learning because of poverty and social marginalisation. Inequality in learning achievement is a problem that is particularly evident in children from economically disadvantaged families, and they are exacerbated by their social and familial disadvantages. They are known as the "children at the bottom of the pyramid" because they are frequently forgotten and are often left behind. Within this context, the author in this paper has described the practices adopted by the school head that aimed at improving learning and equity amongst the most disadvantaged children. The paper points out that a principal's leadership style can impact the integration of the EWS learners.learning outcomes, and instructional objectives—with examples specifically related to the Indian context. The paper discusses some caveats associated with standards-based education systems and concludes with suggestions for improvement and implementation.

Keywords: *Standards-based system, Competency-based education, Standards, Learning outcomes, NEP 2020*

Introduction

It is believed that behind any great organisation there is a great leader, and schools are no exception. A school head's duty should be to provide leadership, direction, and coordination within the school and among all the stakeholders. Principals are expected to be always visible, meet students, parents, and teachers, address problems and deal with a variety of situations directly, and represent the school. A successful school leader balances all these responsibilities while maintaining his or her primary obligation as the school's instructional leader. School principals are expected to fulfil many tasks. They are expected to be academic, administrative/ personnel and financial managers. All these aspects are not mutually exclusive of each other and thus there exists a lot of overlapping in their roles and responsibilities. The CABE Committee

* Associate Professor, IASE, Department of Teacher Training and Non Formal Education, Jamia Millia Islamia , Jamia Nagar, New Delhi : 110025, E-mail - savitakaushal@gmail.com

on Universalisation of Secondary Education (2005) also highlights that heads of schools hold the key to quality management and self-renewal of schools. It points out that managing and leading schools is a specialised job and not merely an automatic extension of activities of a teacher. The role of principal becomes crucial, as they give the school the direction and standards to be ensured. They maintain close liaison with all stakeholders of the school, including parents and students. Hence, collection of real time information and processing the same for timely decision making becomes smooth and effective.

A school that has "strong instructional leadership", "clear and focused mission", "safe and orderly", "regular monitoring of student development ","good home-school relationship", and "opportunity to learn" is an effective school (Nyagosia and others, 2013). Without effective leadership or guidance, the entire plan or organisation will fail. Under the leadership, three things are critical: making decisions, declaring those decisions, and implementing those decisions.. Educational leadership in a school can thus be defined as the process of coordinating the activities of school personnel, such as teachers, students, and their parents, while utilising relevant materials, such as the school, property, and so on. It is carried out in such a way as to successfully foster the development of human traits as anticipated by philosophy based on socialism, secularism, and democracy. It is concerned with the development of students and school workers (Bossert, Dwyer, Rowan, and Lee 1982; Hallinger and Heck 1996; Robinson, Lloyd, and Rowe 2008). As a result, leadership is a goal-setting job that establishes the policies and areas of the institution to achieve the desired results.

A vision for their school, university, institution, or organisation is essential for educational leaders. Educational leaders are held to a variety of standards (Bush and Glover, 2014). He or she may be expected to be a strong hands-on leader who points others in the right direction in some situations,

but in others, they may be expected to be more collaborative. They may necessitate collaborative planning and visioning with all stakeholders"(Schleicher, 2012). The school head must be able to communicate effectively and have the patience to listen to everyone who approaches them. The postcapitalist society is fundamentally an information capitalism-based civilisation. Instead of manufacturing and distributing products, the industries at the heart of the economy are those that produce and distribute knowledge. Figure 1 depicts the complexities connected with Educational Leadership.
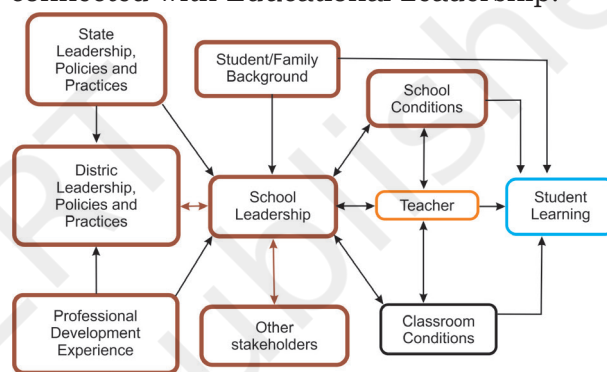
Figure – 1.1

Source: Louis, Karen Seashore (2015) Nordic Journal of Studies in Educational Policy, linking leadership to learning: State, District and Local Effects

Curriculum and other school matters must be understood by school leaders. They must relate staff development to educational advancement. As school leaders, they must act as "teachers of teachers", diagnosing educational issues, coaching teachers, and reviewing and correcting the pedagogical work of their colleagues. In this view, leadership is multifaceted, combining management, human, and educational abilities (Wiles and Bondi, 1996). The numerous difficulties and concerns in school education can be addressed by principals in their capacity as school leaders.

Like the stratifications in Indian society, the stratifications in the educational system can be clearly seen. Class plays a significant role in who has access to high-quality education; typically, upper, and

middle-class families send their children to private, unaided schools that charge substantial tuition fees. Amidst this scenario, quality education remains elusive for the children from EWS families. This has significantly impeded the process of equitable development of all sections of the society. Against this backdrop, the Right of Children to Free and Compulsory Education (RTE) Act, 2009 mandated that all private schools in India must set aside 25 per cent of their seats for students from Economically Weaker Sections (EWS). The government would be covering these students' tuition costs up to the amount spent per child in the government schools. This was done to lessen the stratification in educational opportunities. Due to the EWS Quota, it became feasible for poor households to enroll their children in private schools, which would not be possible otherwise.

The idea of EWS Quota is to give poor and disadvantaged children access to high-quality education and give them the chance to integrate with more privileged children in society. But there are several challenges on this path as provision of mere quota is not enough. There are also concerns raised at times by other stakeholders that this provision of their integration will lead to the dilution of education quality for private schools. Though the RTE Act, 2009 does not require segregation of children in school, but the EWS children are at times compelled to get segregated in private schools under the EWS Quota due to financial , social, and other constraints. These students face social integration issues after they begin classes. Either the parents of EWS students are not educated or are not able to contribute more in terms of learning and knowledge whereas there are more children in the class whose parents are educated and can help them . The social, economic, and psychological barriers of these learners also must be taken into consideration and remedial measures need to be planned accordingly. In many ways the school principals can play an important role in meeting these challenges. There are

several research evidence that support this. A Wallace Foundation research (2013) supports that the principal as a school leader can play an effective role in integrating the learners of diverse background in the school. As per the research good principals excel at five crucial tasks: creating a vision for all students' academic success, establishing conditions favourable to education, fostering others' leadership qualities, enhancing education, managing personnel, information, and procedures to promote academic advancement. As per Leithwood and Riehl (2003), "Principals must adapt to increased variety in student characteristics, including cultural background and immigration status, income inequities, physical and mental disabilities, and variation in cognitive capacities". In order to increase the acceptability and adaptability of the EWS Quota learners and their integration in the school, it is strategically necessary to address the various concerns among stakeholders as well as the financial constraints of the learner. The school principal can play a significant role in creating an environment in which the EWS students can be integrated.

Rationale of the Study

In numerous policy documents, the promotion of equal access to high-quality education free from prejudice and inequities has been repeatedly reaffirmed. The availability of EWS Quota has allowed the economically underprivileged children to get admission to private schools, which they would not have been able to do otherwise. The idea of EWS Quota is to give poor and disadvantaged children access to high-quality education and give them the chance to integrate with more privileged children in society. However, there have been several issues in integration of EWS learners. For instance, Sarin and Gupta (2013) and Mehendale, Mukhopadhyay and Namala (2015) have claimed that the school administrators' perception that students from the weaker sections came from disadvantaged backgrounds significantly

impacts efforts to include them and violates their dignity and rights. The doubts of the planners and implementers regarding the feasibility of achieving social inclusion through the provision of free seats is reiterated by Srivastava and Noronha (2014) as well.

Two recent large-scale studies from the United States (Karen Seashore Louis et al, 2010) and England (Christopher Day et al, 2009) demonstrate the importance of school principals in influencing the efficacy of schools through a wealth of empirical evidence. Principals have the freedom to choose how learning frameworks (class structure, ability within the school, etc.) will be implemented, as described in "Principals," published by Resh & Dar (2011). In this book the authors shared the Israel's integration experience and described that their (principals') views and assumptions about the success of integration have an impact on inclusive practices adopted in school.

When children from different socio-economic situations are accepted into the same school and receive an education together, the role of the school head becomes crucial. The current research work is grounded in a case study that attempts to reflect on the efforts made by school head to integrate the EWS students. It is important to comprehend how did the school head mediate to accommodate their needs, as well as negotiated with EWS students and parents to meet the school's educational requirements.

The current case study is an attempt to elucidate the transformation process that was brought about by a school leader in terms of integrating economically disadvantaged children and improving their academic achievements, as well as building healthy relationships between students, teachers, and school administration through the initiatives.

The case study will enable us to understand the strategies which the school head adopted in addressing student diversity in terms of their economic background thereby enabling

their integration. Considering this, firstly it would be interesting to study the many ways in which the private school's head responded to this condition and progressed towards the integration of the EWS learners. Secondly, there is also a need to understand the challenges faced by the teachers and parents over this initiative. The case study can lead us to know the extent to which the schools can play a facilitating role in responding to the diversity of students and easing the process of integration of EWS learners.

Objectives of the Study

The objectives of the present study were to examine:

- policies and real time practices adopted by school head in integrating the EWS learners
- initiatives taken in terms of community involvement and engagement
- kinds of issues and challenges that are faced by the school due to the integration of the EWS children

Methodology

The primary focus of this study was on the EWS children and the role of the principal in changing their schooling experiences so as to integrate them with the other children. Individuals' attitudes, beliefs, feelings, and behavior, particularly those of the school principal, teachers, parents and children were explored and understood through open ended interviews. In-depth interviews with school principal helped in learning more about her perspectives and measures used by her to promote integration. To better understand how they deal with diversity in the classroom all the teachers who were teaching these EWS learners were also spoken with. During the data collection phase, a few Focused Group Discussions with teachers and parents were also conducted to learn their perspectives on integration of these children The school began implementing this provision during the academic year 2004–05 (much before the RTE Act). A majority of these respondents were from the nursery,

kindergarten, and Grade 1 stages of the academic session 2006-07. All the teachers (N=13) and administrative staff (N=5) dealing with the children in these classes (nursery, kindergarten, and grade 1) were interviewed. In addition to these, 15 parents of non EWS children and 15 parents of EWS children were interviewed . 20 children of EWS category were interviewed. In all, 69 respondents were interviewed, including the principal, teachers, administrative staff, and children of these classes. As the children were extremely young, attempts were made to build a rapport with them and interview them several times depending on their capacity for articulating their response. In addition to this, the secondary source of data such as annual reports, school admission records and notifications/orders issued by the school authorities for integration of EWS learners were also analyzed to gain more insight. Extensive observations of the school were made during the period of 12 days of the academic session. Every class in which EWS children were enrolled was carefully observed. These observations were conducted at least three to four times. The school's records, reports and documents were thoroughly analysed to learn more about the policies and practices implemented by the principal.

Brief Profile of the School and its Students XYZ (name kept anonymous), one of the most prestigious schools in a North Indian state, is a 50-year-old institution. The school took satisfaction in upholding its founder's vision, which centered around the idea of bringing about awakening amongst marginalised youth. The school had taken numerous measures to empower economically disadvantaged students, and every attempt had been made to integrate them seamlessly into the school's mainstream. This school had already taken the lead and began on the mission to welcome these children before the State Administration made it essential to reserve a specific percentage of seats for the EWS children. The school took on the task of providing quality education and facilities to students from low-income families and slums along with other students. A total of 39 children from the slums surrounding the school were chosen and admitted. When the terms of the RTE (Right to Education) were enacted later, it did not come as a surprise to them as the school had already integrated the EWS learners.

The Initial Experiences with Children after Admission

The School Authorities chose Surya Kiran as the name for this new addition (name changed). The Surya Kiran programme was named after the EWS children who participated in it.As per the teachers they found these children as a challenging and diverse group to manage. Most of them had no prior knowledge of personal hygiene or schooling. They couldn't even hold a pencil properly. Several of them were having difficulties at home, with no one to assist them with their homework as the parents were not educated and did not have time to attend to the children and they could not afford to have a tuition also. Many of their parents worked as manual labourers. They couldn't afford to feed their children properly. There were times when they arrived at school without having taken a bath due to a scarcity of water in their homes. Parents had to pay Rs. 5/- for a pail of water, which they could not afford. These were extremely distressing events.

The annual reports and notifications issued by the school indicate that the school equipped these children with uniforms, books, and stationery, and this started at the prep level and prepared them for a curriculum identical to that of pupils in ordinary KG classes. The teachers reported that it was initially a frustrating experience for them because the children's response was poor, and even the parents refused to cooperate. The children's behavior in school was influenced by their difficult home circumstances. The teachers stated that students mis behaved, used abusive

language and thefts and other incidents were prevalent, and investigation found that the causes were the lack of money at home, fathers' drinking habits, parental arguments, etc. The school principal informed that this was a sensitive issue. The situation was handled with great care. Parents were contacted and given advice during meetings with teachers. The teachers were specifically asked to deal with them with patience and love and this took a lot of time and eventually children began to adjust and learn. Another initiative that principals reported was that the children were promoted from class to class and given surrogate parenting by the parents /community members/teachers who volunteered for it and children were given extra evening catch-up lessons.

The principal informed that the experience and blunders taught her a lot. It was decided that for this programme to succeed, community awareness must be raised in the 'catchment region,' or the areas from which prospective students would join the school . It was also thought that assessing the attitudes of the children and their parents before admitting them was crucial.

Another key milestone was the decision, taken by the school principal at the time of initiation, to provide these children an additional year of training in personal hygiene, basic manners, and motor skills before admitting them to the KG programme. As a result, Class Prep — the tiniest of the little —was born. Prep was launched here, and it is currently the entry point for students accepted into this programme. The introduction of class Prep (Nursery) has aided these students in making a smooth transition to kindergarten.

Challenges and the Way Out

The school principal stated that she had her own share of challenges from time to time. This programme, too, was met with skepticism and criticism by the different stakeholders, such as parents, community, and the teachers. Many doubts and questions were expressed about its chances of success. How could these children emotionally and cognitively adjust to the other children from the upper classes?

Wouldn't they develop a sense of inferiority?

Wouldn't communication be a difficulty because they didn't grow up speaking English?

Apart from this, other additional issues occurred, the most common of which was theft. These students come from a family where their parents couldn't afford to buy them the nice stationery that the other students carried to school. These children were enticed by such things, resulting in the stealing problem.

Some of them were also prone to using derogatory language, as they had seen their parents do at home. These students never had a structured schedule at home and were accustomed to doing whatever they pleased. It became difficult to get them to follow the rules and regulations, particularly the importance of punctuality.

As stated by teachers, some of them engaged in verbal and physical altercations. It needed a lot of patience and counselling to make them see the difference between right and wrong. Lack of nutrition was yet another aspect.

Another issue that occurred was that the Surya Kiran children lacked a support system at home to help them with their homework. They began to struggle with their academics, particularly with complex ideas in languages, math, and science.

One of the teachers stated that it was felt that the situation was quite difficult also because "these children did not even have a computer at home." The school was sending all circulars and notes to parents via email as it was ecofriendly. How will these children's parents read their emails?

Some of the community members associated with the management of the school raised concerns about the integration's impact on the class, asking, "What if other

children or their parents don't want it?"

Apart from these concerns, the principal reported that in the very beginning of the session the parents of mainstream children expressed reservations, if not outright hostility, to the idea of integrating the Surya Kiran children into the regular sections. They were concerned that these children might have a negative impact on their children. Parents requested that their children may not be seated with the Surya Kiran children because their children would learn all the wrong things. There was initial discontent among some parents as they saw integration measure as a means of protecting the interests of the EWS children who were being integrated.

Another worrisome element was the attitude of the teachers, who were hesitant to accept the responsibility of teaching the Surya Kiran children. Only a few teachers were chosen to educate these youngsters year after year in the beginning. The school principal stated that , the teachers reported that EWS children were quiet in class and not very receptive as they were not fluent in English medium. In the Prep class level the bilingual teaching strategy was adopted, and the students were taught in English and Hindi. The children who hesitated in responding in English and instead they were asked to respond in Hindi when asked about their name, class, etc. The teachers reported that as a result, their interactions intensified and the environment became more positive, children eventually lost their inhibitions. Some EWS children also performed exceptionally better than other students, in fact while responding to the teacher's questions.

The school principal specified that a series of orientations were organised for the teachers. The teachers were asked to communicate with the parents in Hindi, reach out to them to help them understand circulars, and provide other necessary home support. The teachers were asked to make sure that no groups were formed in the class and that there was an optimistic learning environment. The school adopted the practice of seat rotation for this reason through sporadic weekly rotation of seats. The EWS children were given the chance to sit next to the non-EWS children. Their potential was not only tapped via academic excellence but also through extracurricular and athletic activities. Principal informed that some of the EWS students had a variety of interests, notably in athletics because they were more resilient. This gradually brought a transformation in the attitude of teachers towards them also. As a result, everyone got accustomed to the concept, the pattern changed, and integration of these children became seamless.

Celebration of Birthday: Students had a stage fear and to eradicate that fear birthday celebration in prayer assembly were started. Those who had birthdays were especially congratulated, and their birthdays were commemorated by announcing their names, giving them pens and notebooks, and urging them to pray in morning assembly. The school encouraged these students to read the news and lead the prayer in morning assembly. The principal stated that it was noticed that this gradually brought a very positive impact on children, helped them to remove stage fear and build their confidence in public speaking.

Book Bank: One of the teachers was given the charge of book bank, he collected books from outgoing students and kept them safe so that they could be used for next session.

Co-curricular Activities: The principal stated that the energies of these children were channelized effectively by involving them in co-curricular activities. Involving these children in extracurricular activities is an excellent method to steer their enthusiasm. Some of the students were very talented. Their talents in dance, acting, art, music, and other areas earned them praise and appreciation from their peers. As a result, these Surya Kiran youngsters were in high demand whenever a co-curricular activity or competition was declared. Varied group activities sprung up to provide more

opportunity for youngsters from various socio-economic levels to connect in a healthier way. With each passing year, the outreach programme grew stronger, more positive, healthier, and children also became more confident.

The teachers informed that the school head was able to approach problems and come up with creative solutions. Positive initiatives such as the annual fete, class canteens, and many more were unique initiatives. These helped to raise awareness of the needs and aspirations of those who belonged to the less privileged class while also doing something constructive to aid them. These actions helped raise finances and made a significant contribution to the outreach programme. These items helped them meet the stationery, uniform, and nutrition needs of the Surya Kiran youngsters (milk and bananas). The principal stated that these students were encouraged to take part in all the activities. With the capable direction of teachers, students excelled in many competitions, whether it was a quiz, declamation, art competition, or science display. Teachers informed that they used to establish daily plans for school activities. The principal's usual work was to go around the school twice a day, and during spare time, she would take the class and randomly check assignments provided by the teachers. She used to interact with students on a variety of academic and non-academic activities, which enabled her to identify their issues and provide assistance where necessary.

Changing the Mindset of Parents: Changes were implemented gradually but strongly. Parents were made aware of the problem and encouraged to think rationally about it. Every child, regardless of his or her social or economic circumstances, has the right to education. Several programmes have been implemented to raise awareness among children and their parents about the importance of educating these children. At the time of admission, the notices and forms on display made it

obvious that the Surya Kiran children would be integrated into the mainstream and that only those parents who were okay with the idea should apply. Parents began inviting these children to the birthday parties of their children gradually.

With the passage of time, even the teachers developed a positive outlook and changed their attitude. A very motivating factor was the recognition of the efforts of the teachers who had taught the classes having Surya Kiran children. Their efforts were acknowledged and lauded. These teachers spoke about their experiences and the emotional moments they had faced. Their positivity and sensitivity moved many hearts, and the transformation became apparent.

Performance of Students Academic performance of these children was not very good in the first year of their schooling. Above all neither the students nor their parents paid attention to studies. It was difficult for students to catch up in English medium, and the school head felt helpless with perception that no one can change the situation. As regards the lack of a support structure at home was concerned, rays of hope once again showed the path in the darkness. A novel idea was envisaged. The children from the higher classes were approached to volunteer to help these children after school hours. Apart from being provided help in the form of free books, stationery, daily nutritional needs (in the form of milk and bananas) and highly subsidised uniforms, the older students in the senior wing assisted these students by providing academic support. This concept of enlisting the support of older students gave birth to the "Big Buddy" Programme, another innovative idea from the School Head. These older students began creating unique and relevant Big Buddy worksheets to assist students in comprehending, revising, and solving difficult ideas, allowing them to better comprehend.

The school head informed that the 'Big Buddy' Campaign was an exceptional part of their outreach programme. Senior wing students interacted with and offered

assistance to the economically weaker section children. After school, they devoted an hour to leading, assisting, and instructing the Surya Kiran children. The bonding between the mainstream and Surya Kiran children became evident especially with their senior wing big buddies. This programme helped in developing the emotional quotient of the other students at the school, i.e., of the senior wing students who rendered their help to the EWS children. They were the buddies to these young ones. The data (Figure 1 & Figure 2) for the result of the performance of the children in the year of enrollment and the succeeding year for the same cohort of students shows that there was much improvement in the students in terms of their performance in the school.

Figure 1 : Performance of the Student Cohat in the year of Enrollment

Figure 2 : Performance of the Student Cohat After An Year
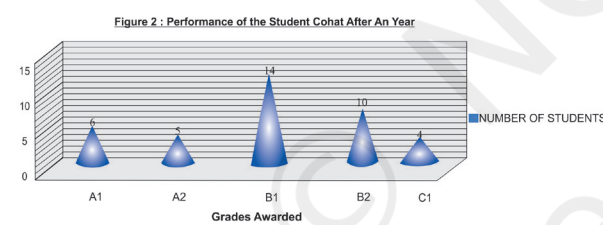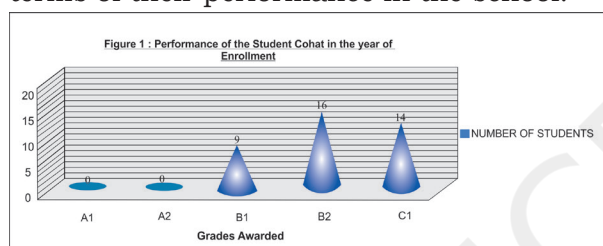
Talking to some of theSurya Kiran children about how they felt being a member of the XYZ school was the greatest method to determine whether their progress was in the correct direction and bearing fruits. Did they feel welcome? One of them said something like this:

Q. Can you tell me about your experience at this school?

A. This institution has shaped who I am. It has provided me with the opportunity to pursue my goal.

Q. How has attending XYZ school benefited you?

A. I can live with pride, hold my head high, and confidently face the world.

Q. Do you have any special memories?

A. I remember all those teachers who prompted, encouraged, pushed, and even scolded me. They never gave up their faith in me and made this journey possible.

Q. Have you ever felt discriminated against by your classmates or teachers?

A. On the contrary, they have always aided and supported me. Our teachers are exceptional. We were always given equal treatment. Teachers went above and above to accommodate us and solve our concerns.

Q. What else about this school appeals to you?

A. Sports equipment, computers, and music. This level of exposure would never be possible anywhere else.

Q. What are your hopes and dreams?

A. I'd like to take the I.A.S. examination.

The success of this programme in the Junior Wing led to its introduction in the Senior Wing too. However, in the Senior Wing, it was decided that there will be no big buddy programme and only teachers conducted the extra classes after the school hours, the afternoon classes. To ensure the smooth operation of this programme, the weekly duties of the teachers were rotated. Principal expressed that the teachers' engagement in extra classes for these students in the senior wing made this programme more effective and meaningful since they were able to provide appropriate direction and support as needed. Furthermore, the children did better under their supervision. Even the wealthiest parents began sending their children to these classes.

The school head managed to take challenges in its stride and came up with innovative ways to meet them confidently. Community contributed to every function organized by school and in developing infrastructure.

Initiatives of Adult Education

The school head went above and beyond to give the greatest possible education for its EWS pupils by reaching out to their parents. Experts from the National Literacy Mission (NLM) were called upon for help and support. Their guidance proved to be quite helpful when they hosted a training for their instructors and demonstrated the proper technique to teach EWS parents. They assisted and led teachers through the numerous procedures involved in educating adults (parents of EWS children) who had never attended a school before. This was visualised by the school head as an essential step in helping the children live with dignity, since it taught their parents the importance of education in each person's life.

The principal informed that the adult education classes were started on a regular basis. KG and prep teachers were entrusted with the responsibility to devote morning and afternoon time to the keen and interested parents. Once again, the stationery and notebooks were provided to them and the textbooks provided by NLM were used as a guide to proceed firmly and confidently on this path of enlightening the less privileged ones. Teachers taught the parents sincerely and diligently and parents too took it up as a challenge. Gradually a bond of love, affection and respect developed between the teachers and parents. The efforts of teachers bore fruit and they had a confident set of parents who very proudly were able to sign their names instead of using their thumb impression.

The teachers stated that in a very touching ceremony, the school head honoured the parents who had been punctual and regular in the adult education classes. She expressed gratitude to the parents for their participation and praised their tenacity and perseverance. Small tokens of appreciation were distributed in this ceremony and their school head always assured the parents of constant support and love. Now, these same parents serve as resource people who motivate the other parents to join the Adult Education Programme – widening ripples in the pool of education.

Conclusion

Mainstreaming of EWS children to a large extent depends on the environment these children are exposed to. Various kinds of efforts were made by the School Head for the integration of EWS children by the way of their social inclusion and keeping in view their economic background. There were initially several apprehensions that prevailed around the integration of the EWS children. There were a number of challenges arising out of the social, economic, and psychological barriers of EWS children such as the deficient home environment, uneducated parents, lack of resources . These were taken into consideration and remedial measures as well as school policies were planned by the school head accordingly. The policies adopted by the principal helped the school to negotiate with the diversities arising out of the integration of EWS children in the classroom. The various apprehensions among stakeholders at different levels as well as the financial constraints were strategically dealt with in order improve acceptability and adaptability of the EWS children. Introduction of bilingual medium of instruction at the prep level helped in facilitating not only the two-way communication but also confidence level of the learners. The introduction of support in the form of Big Buddy programme at the junior level , encouragement of the students to participate in extra-curricular activities helped them in learning new skills and gaining confidence, and creating their acceptance among the stakeholders. The changes were implemented gradually by the way of outreach programmes for the community, parents, and orientation of the teachers. but forcefully. Parents were made aware of the issue and encouraged to consider it rationally.

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Pre-service Teachers' Perceptions on Internship in Relation to Integrated and Specific Professional Teaching Courses: A Study

*Animesh Kumar Mohapatra**
*Deepshikha***
*Priyamvada****

Abstract

Internship has an essential role in developing the teaching competency of the pre-service teachers. The objective of this research was to explore the perceptions of teachers under training towards various aspects of internship. Further this study also aimed to compare the perspectives of student teachers enrolled in 4-year integrated and two year specific professional courses. The sample included 250 student teachers from Regional Institute of Education, Bhubhaneswar who had recently completed their internship. Out of 250 students, 150 were from 4-year integrated courses and 100 were from two year courses. Purposive sampling was used for this study. The data collection and analysis revealed that most of the student teachers agreed to the fact that internship is very important as a part of any teachers' training program. Further the findings of the study revealed that there were significant differences in the perceptions of student teachers of integrated and specific courses with respect to appropriateness of duration of internship, number of lesson plans assigned, practice of teaching skills and use of ICT in classroom during internship

Key Words: *Pre-service teachers, internship, integrated professional courses, specific professional courses*

Introduction

Internship has been used as a general notion throughout history. Some research studies in 1980's, directly brought practical aspect of teaching into light which led to the inclusion of practical training in various disciplines of professional teaching courses (Moshfegh Arani, 2003). Raouf (1996) in his study stated that internship puts theory to practice through multiple and cumulated experiences to build skills for teaching. Internship is often synonymously described as teachers' training, teaching practice, and internship. It is the sum of all activities which requires each participant's undivided attention. Learning situations create opportunities for interns' success and failure. Through immersion in a real working classroom, the teachers under training experience several facets of becoming a teacher, like "classroom management, motivation, reflective thinking,

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* Author 1: Animesh Kumar Mohapatra Designation: Professor and Head of Department Affiliation: Department of Education in Science and Mathematics Regional Institute of Education (NCERT), Bhubhaneswar, India, 751022 E-mail: akmncert@gmail.com

** Author 2: Deepshikha, Designation: Masters Student, Affiliation: Department of Zoology, Babasaheb Bhimrao Ambedkar University, Lucknow, India, 226025, E-mail: deepshikha31101999@gmail.com

*** Author 3: Priyamvada, Designation: PhD Research Scholar, Affiliation: Department of Education, University of Delhi, Delhi, India, 110007, E-mail: ppandey@cie.du.ac.in

and differentiation" (Chennat, 2014; Kennedy & Archambault, 2012). In educational institutions, pre-service teachers learn theories and methodologies, then apply them in internships with direction, support, and increased responsibility. The Internship program's main goal is to build and refine pre-service trainees' skills while also preparing them for the profession. It allows new applicants to get experience with the professional environment and requirements of contemporary professional standards (Parveen & Mirza, 2012). Internships needed to be planned in such a way to provide broad range of experience, reflective observation, and varied teaching methodologies for learning and problem solving (Darling-Hammond, Gendler & Wise, 1990). The necessity for effective and comprehensive Teacher Education Courses, aimed at enabling pre-service teachers' professional growth, is becoming increasingly apparent. One of the most important factors influencing pre-service teachers' skill development is the length of these courses. Several policies and surveys, like NEP, 2020, have found that four-year professional programs like B.Sc. B.Ed. and B.A. B.Ed. offer several advantages over two-year B.Ed. courses. The integrated model offers a more comprehensive structure to pre-service teachers in internships, including simultaneous teaching practice and skill development. In order to create more successful teacher education programs, this study aims to explore the variations in perspectives of student teachers in integrated and specific professional teaching courses towards internship.

Review of Related Literature

The integrated approach in teacher education courses was adopted from the United States and adapted to teacher education in India throughout the 1960s, according to previous research (Kundu, 2021). Kurukshetra University and Sardar Patel University were the first to provide integrated courses, which were afterwards followed by Regional Colleges of Education in Ajmer, Bhopal, Bhubaneswar, and Mysore. NCTE announced new teacher training frameworks in 2014, including a 2-year B.Ed course to replace the 1-year B.Ed. course and a 4-year integrated courses with a focus on a combined degree including 3 years of Bachelors of Arts/ Bachelors of Science and 1-year of Bachelors of Education (Siddiqui, Sharma & Arora, 2009). By combining different subject contents with professional courses and teaching the same, integrated curriculum provides learners with additional opportunities for experiences and skill development (Furner & Kumar, 2007; Panda & Tewari, 2009; Szarek et al., 2016). According to Yadav and Ojha (2016), an integrated curriculum is a learning approach that purposefully combines and uses knowledge from several disciplines to properly investigate major issues, problems, and challenges, and encourages interrelatedness of linked disciplines to tackle different challenges. Teaching is getting more complicated, and highly qualified teachers use a variety of approaches for various goals, incorporate and integrate multiple types of information, develop different pedagogic strategies, and respond to diversity of learners in present context. One of the most essential elements influencing student learning is teachers' content mastery in their respective disciplines, as well as their ability in communicating content knowledge to their students (Hendrikse, 2013; Javanbakht, 2014). Internship courses, according to Beggs, Ross, and Goodwin (2008), provide opportunity to engage in professional practice and activities related to knowledge application. The student-teachers under training consider internship programs as a meaningful platform to develop their teaching competencies in a real school context, according to Saleha (2012).

Need of the Study

Internship in teacher education entails putting theoretical knowledge into practice through multiple and repeated experiences in order to gain practical teaching skills. Internship programs are intended to promote the student-teachers to full-fledged members of the profession. There is a growing need for a working and functional model of teacher education program which should encourage professional growth of student-teachers. The purpose of the present study is to identify and analyse the challenges of internship in a teacher training program and to devise proper solutions to tackle such challenges for further qualitative improvement.

Objectives

- To explore the perceptions of pre-service teachers towards internship as a part of professional teachers' training programs.
- To identify any significant difference in the perceptions of pre-service teachers towards internship as a part of four-year integrated (B.Sc. B.Ed., BA. B.Ed.) and two-year B.Ed. curriculum.

Hypotheses of the Study

- There will be no significant difference in the perceptions of pre-service teachers of all three courses towards internship.
- There will be no significant difference in the perceptions of pre-service teachers of four-year integrated and two-year specific courses towards internship.

Methodology

The present study followed a quantitative approach and was conducted in the Regional Institute of Education, Bhubaneswar to study the perceptions of student-teacher trainees on internship. Two types of courses were taken for this study i.e., 4-year integrated and 2-year specific professional courses.

Sample

The sample consisted of 250 final year pre-service teacher trainees of the Institute which includes 100 B.Sc. B.Ed., 50 B.A. B.Ed. and 100 B.Ed. pre-service teachers. The purposive sampling was used to carry out the sampling.

Tools Used

A self-developed close-ended statement-based tool was developed to collect perceptions of teacher trainees which were validated by involving internal as well as external experts. The tool consisted of 19 statements. Against each statement there were three options i.e. strongly agree, agree and disagree. Teacher trainees were asked to read the statements carefully and to put a tick mark against any one option of their choice.

Data Collection

After completion of semester examination in January, 2019 and working with the community in February, 2019 investigators interacted with final semester teacher trainees of B.Sc. B.Ed., B.A. B.Ed. and B.Ed. courses. A separate date for each group was decided and the tool was used to collect feedback of teacher trainees. Before administration of the tool, it was made clear to the teacher trainees that it was not a test nor would it be evaluated for any publication of results. This study was designed to improve the quality of the internship of the institute.

Data Analysis

After the collection of responses from the teacher trainees, the investigators prepared the code for the entire tool for the purpose of entry of data into the Excel. The spread sheets in Excel were further entered into

SPSS 20.0. The frequency and percentage were calculated followed by Mann-Whitney U test as data did not followed normal distribution for comparing the two groups.

Results and Discussion

The results of the present study clearly revealed that teacher trainees of both four-year integrated (B.Sc. B.Ed. and BA. B.Ed.) and two-year B.Ed. courses strongly agreed that internship in teacher education programs is essential for becoming an effective teacher (Figure 1). The Multicultural placement program develops confidence for facing internships and was strongly agreed by half of 4-year integrated and two-third of 2-year trainees. Most of the 4-year integrated (66.66 %) and 2-year (61.84 %) trainees agreed to the fact that the pre-internship conference is important and it helped them to understand all the activities of internship. Majority of four-year integrated and two-year trainees agreed that the internship assisted them to apply the theoretical knowledge of teaching in real school environment. Almost all the trainees from both the courses agreed to the fact that they had gained knowledge about functioning of school and functioning of teachers (Figure 2). However, quite a good number of trainees of both four-year integrated (31.77 %) and two-year course (14.47 %) disagreed that the duration of internship in a semester is not appropriate. The trainees of the four-year integrated course disagreed that 40 days is not sufficient to complete all assigned activities while trainees of the two-year course surprisingly disagreed that four months was also not sufficient. They also disagreed that the number of lessons in each pedagogy subject was adequate for developing teaching competency and facilities available in schools were adequate. Majority

of the internees of both courses agreed to the fact that it is very much essential that cooperating teachers of schools need to understand and have clear ideas about the objectives of internship so that they can guide the trainees effectively. Most of them agreed that school cooperating teachers used to observe their class (Figure 3). However, there were differences in opinions among both the groups. The trainees from both courses mostly agreed to the appropriateness of teaching methodologies advocated by Regional Institute of Education i.e., 63 per cent and 61.84 per cent. Almost majority of the trainees agreed that the pre and post teaching discussions with the institute supervisor helped them out to solve different problems faced during internship. Peer teaching helped in improving the teaching standard—was strongly agreed by majority of the trainees of the four-year integrated and two-year B.Ed. courses. The concept mapping and lesson planning are one of the essential factors in pre-preparedness for the teaching— was agreed by most of the trainees from both the courses (Figure 4). ICT use in teaching helps in developing conceptual understanding of various topics—was strongly agreed by almost half of trainees of four-year integrated and two-year courses. Most of the trainees of four year integrated and two year courses agreed that action research helped them to improve teaching, however, some disagreed as well. Innovative teaching strategies develop only in a real classroom situation when the teacher faces the learners and understands them properly. A classroom is always heterogeneous in nature and the type of strategies which will be effective can be developed through experience—was strongly agreed by trainees of both the courses.

**Figure 1 : Comparison of responses between four-year integrated and two-year
pre-service teacher trainees for statements 1 to 5.**

**Figure 2 : Comparison of responses between four-year integrated and
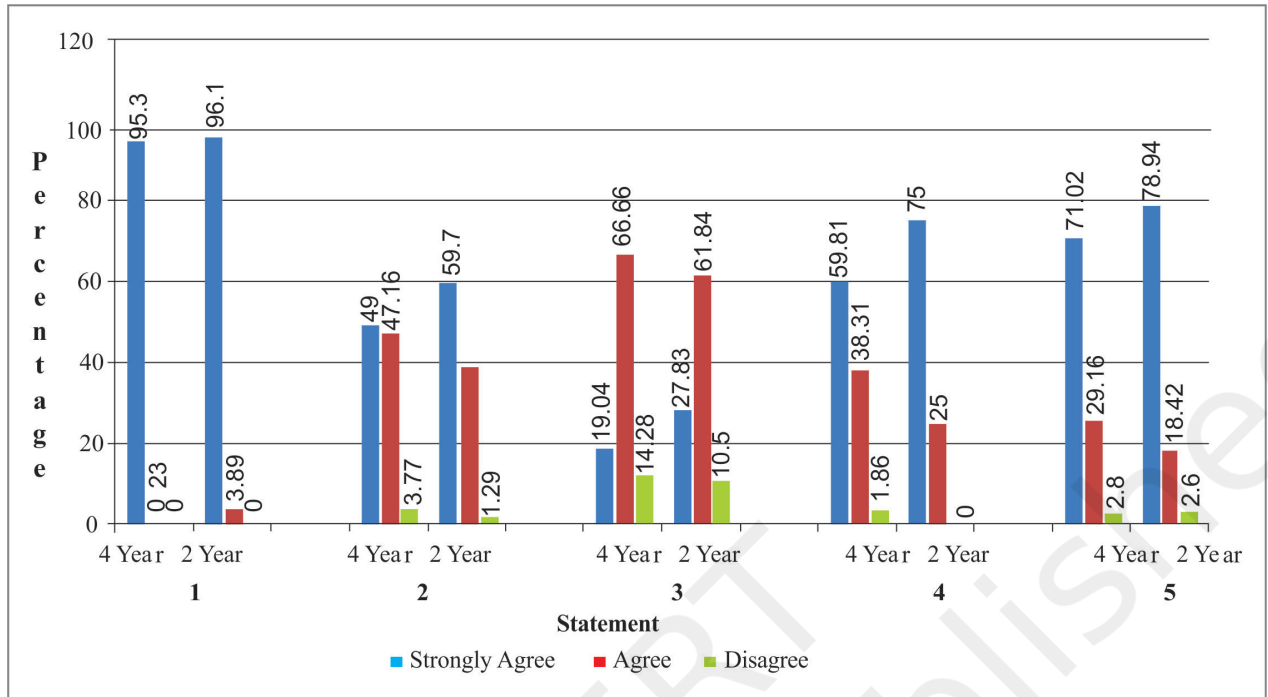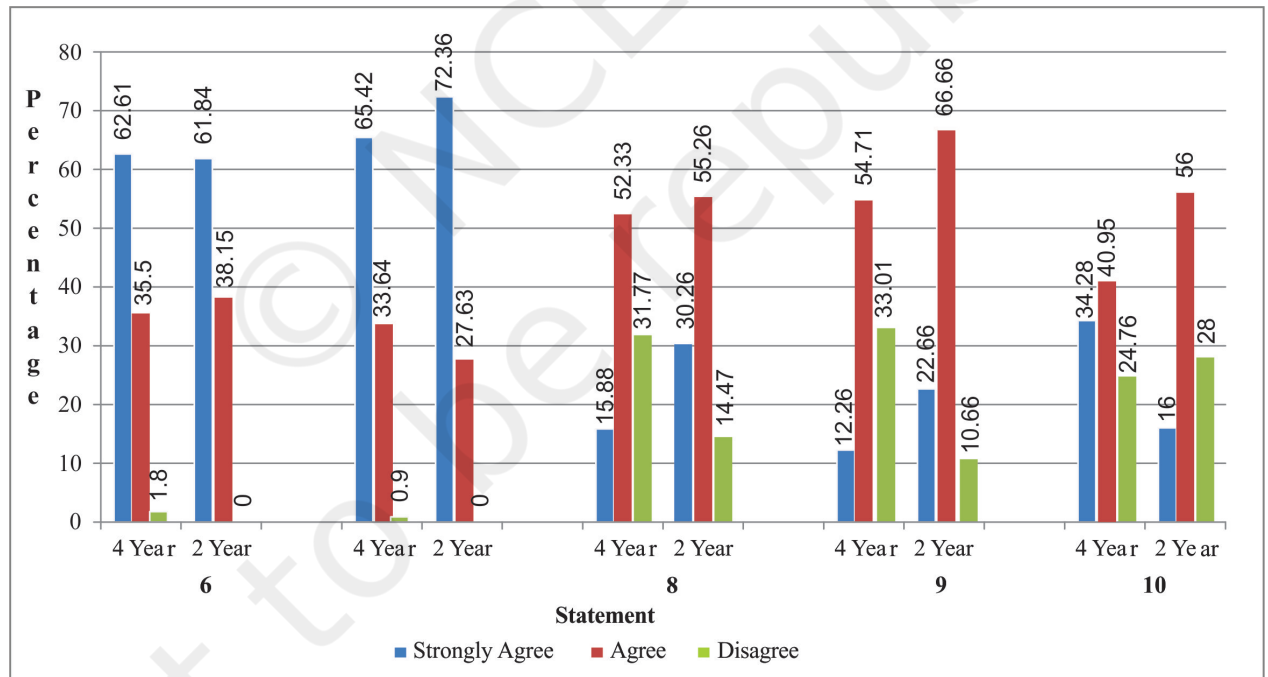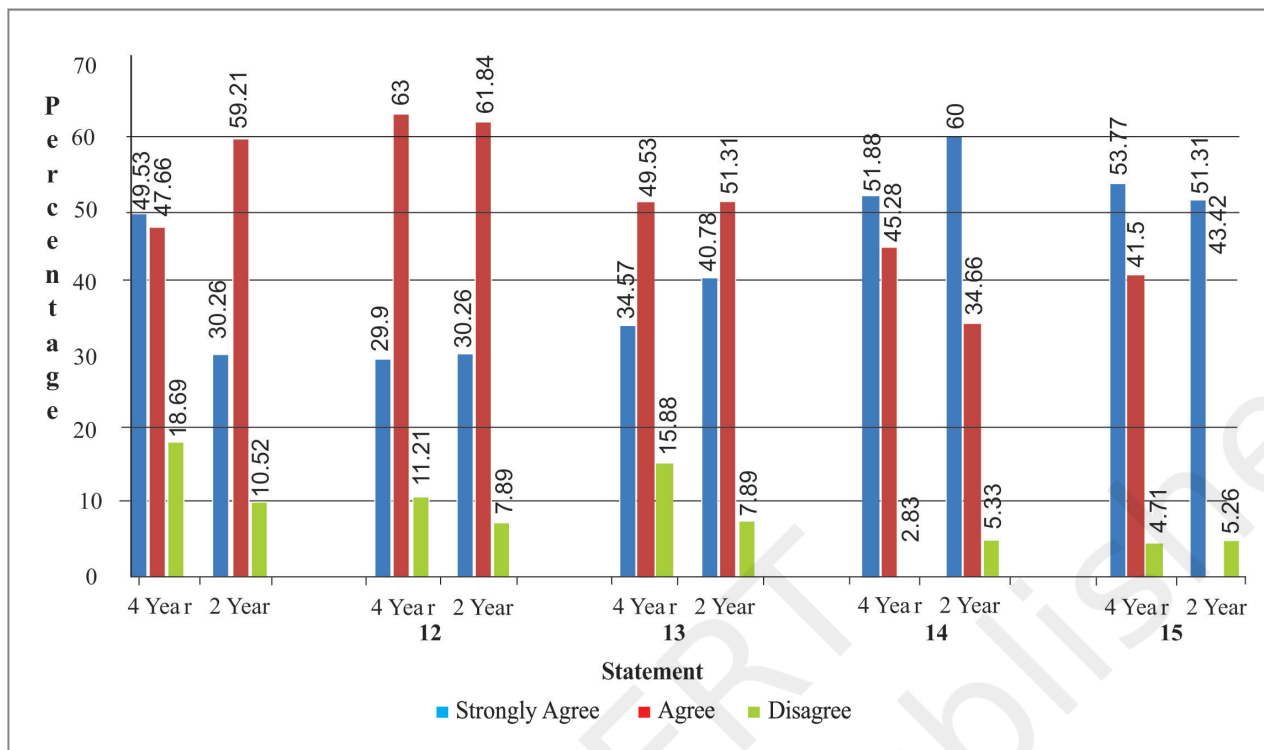two-year pre-service teacher trainees for statements 6 to 10.**

Figure3 : Comparison of responses between four-year integrated and two- year pre-service teacher trainees for statements 11 to 15.
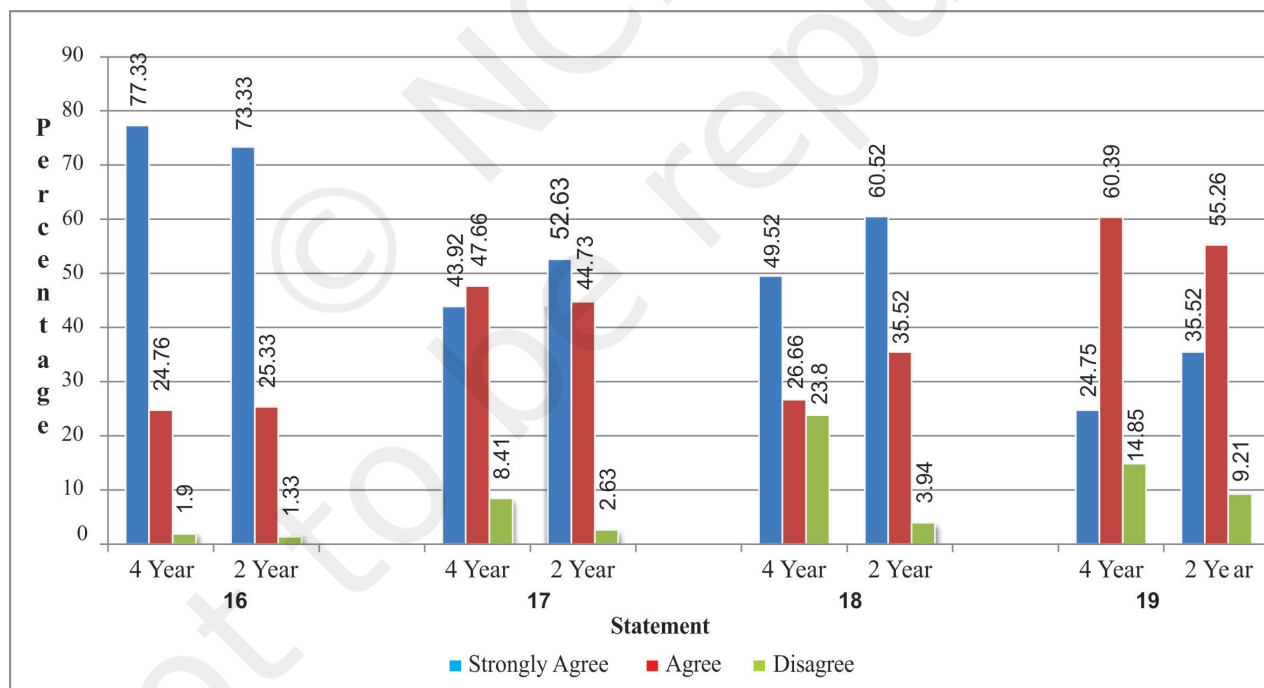

Figure 4 : Comparison of responses between four-year integrated and two-year pre-service teacher trainees for statements 16 to 19.

Further the results of Mann-Whitney U test showed statistically significant difference in the perspectives of pre-service teachers towards practice of teaching different skills during the internship (p=0.028; Table1). Majority of the two year specific professional teaching courses trainees (75%) strongly agreed that the internship helped them to practice different teaching skills while only 59.81 per cent of the integrated course trainees believed that it helped them out (Figure 1). This could be attributed to the fact that the duration of internship in integrated courses was very less, that is only 40 days to practice different skills. The appropriateness of the duration of the internship was also one of the factors where there were differences in the opinions (p=0.002). Though majority of them agreed that the duration of internship was sufficient i.e. 40 days for 4 year integrated courses and 4 months for 2 year courses. However a good number of students (31.77%) from integrated courses disagreed that the duration of internship

was appropriate. In comparison to this relative less number of students (14.47%) disagreed about the appropriateness of internship duration (Figure 2). The opinions of the pre-service trainees of the two courses in respect to the adequate number of lessons required to develop teaching competency during internship differs significantly at p=0.001. Integrated course trainees mostly disagreed with this fact. The results were statistically significant also with respect to adequate facilities available at the school (p=0.05) and whether the school cooperating teachers observe internees classes or not (p=0.00) (Figure 3). Further the differences observed in the perceptions of student teachers in the use of ICT in the classroom during internship differs significantly at p=0.019. Majority of the two year course trainees (60.52 %) strongly agreed that use of ICT helped them while only 49.52 per cent of integrated course trainees believe that ICT could be used during internship (Figure 4).

Table 1: Results of Mann-Whitney U test for differences in the perceptions of 4-Year Integrated and 2-year Teachers Training Courses

Factors/ Statements	Mann-Whitney U	Wilcoxon W	Z
Internship Importance	4087.500	9865.500	-.254
Multi-cultural Placement .127 Importance	3610.000	9281.000	-1.524
Relevance of Pre-internship .159 Conference	3575.000	9140.000	-1.410
Practice of Different .028 Teaching Skills	3429.500	9207.500	-2.193
Practice of Theoretical 240 Knowledge	3751.000	9529.000	-1.174
Basic Understanding about .993 Functioning of School	4063.500	6989.500	-.008
Basic Understanding about .304 Functions of the Teacher	9551.000	3773.000	-1.028
Appropriateness of .002 Duration of Internship	3075.500	8853.500	-3.095

Adequate Number of .001 Lessons to Develop Teaching Competency	2918.500	8589.500	-3.468
Schools have Adequate .050 Facilities for Internship	3312.000	6162.000	-1.959
School Teachers Observe .000 Interns' Classes	2920.000	5846.000	-3.494
Appropriateness of Teaching .726 Methodologies Advocated by RIE	3958.500	9736.500	-.350
Pre & Post Teaching .184 Discussions with Supervisor	3641.000	9419.000	-1.329
Observation of Peer Teaching .381	3709.500	9380.500	-.875
Use of Teaching Aids .735	3923.500	6849.500	-.338
Use of Concept Mapping .982	3931.500	9496.500	-.023
Use of Lesson Planning .147	3610.000	9388.000	-1.451
Use of ICT .019 during Internship	3255.500	8820.500	-2.347
Relevance of Action .083 Research in Improving	3323.000	8474.000	1.733

Several research in recent decade showed that both in-service teachers who are already in job and pre-service teachers who are yet to enter into profession and are under training believe that internship is most important part of any professional teaching program (Wilson, Floden, & Ferrini-Mundy, 2002). The findings of our study were also in the synchronisation with the above findings. While doing internship, the student teachers have chance to develop their attitudes and skills through continuous practice. Keeping in mind how crucial the internship is in developing potential future teachers, only a handful of studies have been conducted in about internship (Giebelhaus & Bowman, 2002; Hawky, 1998). The findings of the present research also showed incapability of school administration, addressing students' needs, lack of use of ICT and other teaching aids to a certain extent. Panda and Nayak in 2014 also found similar results that the new teachers majorly encounters problems related to classroom management, lack of awareness about how to use aids and discipline related issues.

Implications

The following things may be taken care of for successful organisation of internship:

- The student/pre-service teachers should be provided essential basic skills before starting of the internship. The supervisors must demonstrate the lessons and provide positive feedback for better results.
- Various training sessions should also be organised for the supervisors in order to

guide the student teachers effectively.

• The feedbacks received from the student teachers should be included in further improvement in internship programs.

Conclusion

The findings of the study highlights that internship is an effective way to provide training to students who aspire to become teachers. It provides opportunities to integrate the theoretical and practical aspects of teaching. The new trainee teachers got in depth understandings about the roles

of teacher and functioning of schools. They understand different aspects of teaching. Internship provide opportunities for skill development and improvement to develop as true professional teachers.

Acknowledgements

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Understanding Public Discourse on History Textbooks in India

Seema Shukla Ojha*

Abstract

The textbook is a major educational tool for the students in India occupying most of the educational space in schools. With a wide reach and potential to shape the minds of the younger generation, textbooks profoundly influence children on what they learn and how they see the world. Textbooks, are not just pedagogic tools but also a crucial disseminator of what people want to pass on to the next generation all over the world. As a result, textbook content is a hotly debated topic around the world. Among all disciplines, history textbooks invite most contestations and controversies. Some of the most virulent debates on textbooks throughout the world revolve around history textbooks. This is because, unlike mathematics, science, or geography, history deals with issues of nationality, culture, and ultimately, identity. It is history that, to a large extent, defines who we are, where we come from and where we might be going. This is possibly why, in a diverse country like ours, the issue of history textbooks becomes a hotbed of contestations and divergent interpretations. Various debates and controversies erupting regularly over historical distortions, writing and rewriting of history textbooks, attest to this. Therefore, textbook content is critical and has a direct effect on students' educational progress. This paper looks at various such issues and concerns raised in letters by various stakeholders on history textbooks of NCERT from 2005 till 2020 and attempts to highlight public discourse on history textbooks in India and their implications for future history textbook writing.

Keywords: *history textbook, India, historical distortions, controversies, primary sources, multiple perspectives, thematic approach.*

Introduction

As an apex institute, the National Council of Educational Research and Training (NCERT) was established by the Government of India, to advise and assist the Ministry of Education in the formulation, and implementation of policies in school education. It was entrusted with designing the national curriculum frameworks and syllabuses for all the school stages and preparing model textbooks. These textbooks are adopted and adapted by different states of the country. However, education comes under the 'concurrent list' of the Indian constitution, which provides states freedom of adoption or adaption as per their requirement. But several state boards consider the NCERT syllabuses as guidelines for developing their own syllabuses, and textbooks. The NCERTs pioneering efforts in preparing model textbooks are well known. Over the years, these textbooks have been widely used, emulated, adopted and praised for their content and quality. The unique participatory process of design and development of textbooks at NCERT has also made a name for itself. And that is the reason, people have high expectations from

* Professor of History, DESS, NCERT, E-mail - seema.ojhancert@gmail.com

NCERT, and they keep on writing to NCERT through ministry or directly over the content and quality of its textbooks.

The present paper is an attempt to look at various such issues and concerns, raised by various stakeholders, on the history textbooks published by NCERT, in numerous comments, suggestions, queries, petitions, and grievances that the NCERT received since 2005 till 2020.

Curriculum Frameworks and Textbooks in History So Far

The NCERT so far has developed four curriculum frameworks in 1975, 1988, 2000 and 2005 respectively. The first textbooks in history, published by NCERT, appeared in the late 1960s and 1970s, which remained in regular use until 2002-2003. When there was a change in the government in 1999, a process of curriculum revision was initiated. At the end of 2000, a new National Curriculum Framework for School Education (NCFSE) was published; new syllabuses were released in 2001 and new textbooks appeared between 2002 to 2004. After a further change of government, National Curriculum Framework (NCF) appeared in 2005, followed by syllabuses, and the first books were published in 2006.

In India, reports of the Committees, and Commissions set up by the governments or by national leaders are used to select and organise social science syllabus topics and present or publish textbooks. So, the curriculum development agencies here were suggested different approaches to implement change in social science teaching— disciplinary and integrated. Until 2000, the disciplinary approach was followed. History was a separate subject with its own textbooks, alongside other subjects of the social sciences. With the curriculum reform of 2000, an attempt was made to adopt an integrated approach in social sciences from upper primary (Classes VI-VIII) to secondary stages (Classes IX-X), with one textbook for each Class from VI to X. However, these books contained different units for individual component subjects. As in the past, in the higher secondary stage (Classes XI and XII), history remained an elective subject, like other social sciences, and followed a disciplinary approach with separate textbooks.

Following the curricular reform of 2005, social science subjects have been presented as 'interrelated,' subject, though there are separate textbooks for history, geography, social and political life at the upper primary stage and history, geography, political science and economics at the secondary stages. At the higher secondary stage, the disciplinary approach has been followed in all subjects and history remains an optional subject.

Before 2000, history followed a chronological order, presenting Indian and world history separately. With the reform of 2000, a thematically integrated approach in social sciences was introduced, which focused on India and the World at the upper primary stage and Contemporary India at the secondary stage. However, the chronological approach remained in the history units. Topics related to India's ancient, medieval, and modern past and contemporary world history, were focused on in the history syllabus at the higher secondary stage.

The curriculum revision of 2005 brought a new approach to history teaching. The history syllabus at the upper primary stage focuses on Indian history from the earliest times to the present and covers one chronological time span in each class, though the periods are not labeled conventionally as "ancient", "medieval" or "modern." The history syllabus at the secondary stage has made an attempt to study some diverse forces and developments that have shaped the history of the contemporary world locating India within that larger history through selected themes. The syllabus in history at the higher secondary stage has been organised on important 'themes' of World History and Indian History.

Grievances, Suggestions and Queries Received from Stakeholders

As an apex institution, NCERT regularly receives comments, suggestions, queries, petitions, grievances, Parliament Questions, RTIs on the content and quality of its textbooks. It is interesting to note here that one such person, who sent a number of RTIs on history textbooks, prepared following NCF 2005, was dissatisfied and filed a case in the Haryana (a state in India) court later. The same person has also come out with an independent book, the Brainwashed Republic alleging NCERT of the 'insidious distortions' in the present history textbooks. For convenience' sake, while talking in general, the word 'letter' has been used for different types of public grievances and suggestions. If remarks are made for a specific type of letter in the paper, then that has been mentioned clearly.

Types of Letters

The NCERT receives comments, suggestions, queries, petitions, grievances, Parliament Questions and RTIs from different stakeholders, expressing their concern over various aspects of syllabus and textbooks in all subject areas, but maximum is received for History. NCERT receives a lot of grievances through a portal on Grievance Redressal System. The web-based Centralized Public Grievance Redressal and Monitoring System (CPGRAMS) was introduced in all the Government of India's Ministries/ Departments in 2007, but it wasn't, until 2014 that the Department began receiving many grievances. A Parliament Question, is a question put formally to a government minister about a matter they are responsible for by a Member of a Parliament. The Right to Information (RTI) Act was enacted in October 2005, following which any citizen of India may request information from a "public authority" (a body of Government or "instrumentality of State") which is required to reply expeditiously or within thirty days.

So, from 2006 onwards, NCERT has started receiving a lot of RTIs. Cases have been filed in courts of law on the content of history textbooks, while sometimes First Information Reports (FIR) have also been filed against authors of some textbooks. In the past few years, social media platforms like Twitter and Facebook, have also been active in posting/ raising various issues and concerns related to history textbooks.

Who Sends These Letters and Where Do These Come From?

The NCERT receives letters from students, teachers, parents, scholars, researchers, students preparing for various competitive exams, members of parliament, ministers, journalists, common people, societies, and organizations established in names of various personalities and religions, and various school boards, etc. Sometimes people from outside India also express concern over the portrayal of specific personalities in Indian school textbooks. For example, the Minister of Environment, and Green Development of Mongolia in 2014, wrote to the then Ministry of Human Resource and Development, MHRD (now Ministry of Education) over mention of Changzhis Khan as 'man eater' in an Indian History textbook for Class IX.

These comments, suggestions, queries, petitions, grievances, Parliament Questions and RTIs, are received from different parts of the country. Sometimes, NCERT receives letters from people of Indian origin or Indian people living abroad also.

The Subject of the Letters

The subject of these comments, suggestions, queries, petitions, grievances, Parliament Questions and RTIs, varies. The subject of the letters has been identified here based on the frequency of letters received on a particular subject. Depending upon the subject of such letters, the letters may be put under the following four categories:

Grievance/Comments

- Overall structure and framework of history syllabus and textbooks. Questions are raised frequently over the omission of history of important periods of Indian history like the entire Vedic and Post Vedic period (2000-1500 BCE), then 600-1000 CE and the period of the growth of nationalist consciousness, political parties, the Partition of Bengal, Swadeshi movement, etc. during 1858-1915.
- On factual errors in textbooks, particularly related to dates.
- On interpretations of historical artefacts or events, alleging NCERT textbooks of presenting one-sided or biased view. For example, labelling the 1857 revolt as 'mutiny' or 'popular rebellion"; describing '*lingas*' found from sites of Harappan civilization as a 'toy' and not providing other alternative explanations.
- Disrespect to great men and religious leaders. For example, describing Rama and Krishna as mythical characters, distorted history of Jaina Tirthankaras (in textbooks prior to 2002), mentioning Sikh Gurus without honorifics, mentioning Aadi Guru Shankaracharya as Shankara only, Meerabai as a 'wanderer', to name a few.
- Objections are raised over the appropriateness of words like, 'terrorist' for revolutionaries (pre 2002 textbooks) or 'refugee' or '*sharnarthi*' for people who came to India from Pakistan, during partition, use of the word 'invaded' for coming of Indian National Army to free India from British control, etc.
- Objections over stereotyping specific communities. For example, mentioning Nathuram Godse as *Brahman* or use of words like, *Mahar* or 'untouchable' for people coming from specific communities with an intention of stigmatizing a community.
- Objections over alleged 'insidious' distortions like the narrative on Aryan Invasion Theory (AIT). Authors have been alleged that though they are not talking about AIT directly but are peddling the same view through selectively quoting individuals or presenting a narrative, which presupposes the AIT.
- Questions are raised over the dominance of a particular ideology in the textbooks. For example, communist ideas in the textbooks.
- Objections over 'regional imbalance' in textbooks and not portraying the history of various regions, and people like north-east, south, Maratha's, etc.
- Portrayal of Indian history in foreign school textbooks. For example, questions were raised, and comments sought in letters to NCERT over 'distorted' presentation of Indian history in middle school history textbooks of California.
- Questions are raised on the distorted content in history textbooks published by private publishers with a request to rectify it.

Suggestions/requests

- On the importance of history and how history should be taught to students.
- Inclusion of life history and works of various personalities. For example, Sukhdev, Rajguru, Shankaradeva, Lachit Borphukan, Martand Verma, Abdul Hameed, Surajmal, Satguru Ramsingh, Maharana Pratap, Shivaji, Shaheed Balak Baji Rout, Banda Bahadur, Sahibzade, Ambedkar, Sikh Gurus, Rani Gaidenliu, Kanaklata Barua, Rao Tularam, Mahatma and Savitribai Phule to name a few. Sometimes specific communities also write to get their important personalities reflected in textbooks like Jhalkari Bai, Uda Devi Pasi, Tilka Manjhi, Suheldev, etc.
- Inclusion of hitherto unrepresented important historical events like the Saragari war, about Indian National Army, naval mutiny, Kuka movement, etc.

- Deletion of some topics or details, particularly on Mughal history.
- Recent advances such as genetic evidence are suggested to be taken into account instead of repeating the age-old Aryan Invasion Theory, not accepted anymore.
- Writing a saint or personality's name correctly like writing Jnaneshwar as Dnyaneshwar, a saint-poet from the Maharashtra region.
- Sometimes researches are shared by people writing letters to get it authenticated by NCERT and accordingly giving space to their researches in the textbooks. For example, success in reading Indus script.
- Sometimes outcomes or proceedings of seminars related to debatable issues like Aryan invasion/migration in history is shared to modify the textbook content accordingly.
- Addition of more content on personalities already covered and presented in some forms in NCERT textbooks. For example, more coverage is demanded to revolutionaries like Bhagat Singh, Chandrashekhar Azad, etc. and people like Vivekananda, Subhash Chandra Bose, Jain Tirthankaras, Mahatma Gandhi, Sardar Vallabhbhai Patel, etc.
- Inclusion of content on post-independence Indian history and 'emergency."
- Frequent requests to have more content on Indian history, particularly India's rich cultural heritage, the contribution of India in different spheres of life such as science, art, architecture, heritage, philosophy, etc., and freedom struggle.
- Frequent suggestions to give space to the messages of all major religions in the textbooks. The majority of letters in this regard want Gita to be taught compulsorily to school students, while others want epics like Ramayana and Mahabharata too to be taught as a part of the school curriculum.
- Having moral education to be a part of history.

- Requests to declare specific days or name roads, hospitals, streets, airports, schools on some personalities. For example, declaring places related to Bhimrao Ambedkar as '*teerth.*'

Queries

- At times articles/news items related to history debates/controversies are sent for clarification.
- RTIs, especially raise the following type of queries:
- Answers to specific questions related to some facts or dates in the textbooks.
- Authentic answer to a particular question or set of questions asked in some competitive exam.
- Most of the times questions seek primary source/sources on specific information/ statements made in the textbooks.
- Minutes/notigs related to textbook development work meetings are also sought.

While browsing through the letters received between 2005-2020, the author comes across a few sporadic but interesting letters. For example, in recent years, after the coming of the new government National Democratic Alliance in power in 2014, some letters enquired/sought content on Nath cult, Kashmiri Pandits, V.D. Savarkar, Kashi Vishwanath temple, etc., in the history textbooks. A similar thing is noticed during the previous United Progressive Alliance government when Muslim organizations and Member of Parliament sought inclusion of Muslim heroes in curriculum who contributed to the freedom struggle.

How Do We Respond? Issues and Challenges

Many letters and representations raising issues and concerns over NCERT's history textbooks are addressed to the Ministry of Education, Prime Minister's office, and President of India's office. However,

other letters are addressed to the Director, NCERT and sometimes to the Head of the Department (HoD) of Education in Social Sciences, which deals with the subject history along with the other subjects of Social Sciences. Letters, thus coming from different quarters, are first received at the C & P Section of NCERT and then marked to the concerned department's head. The HoD, then marks the letter to the concerned faculty member in the subject to respond. Once received by a faculty member, the letter is thoroughly reviewed and an appropriate reply is prepared and submitted to the HoD for onward transmission. Different kinds of letters require different amount of time. For example, some letters which seek clarification or correction in some factual inaccuracy or printing mistake, require less time to respond than letters seeking primary sources for statements in the textbook. Sometimes, a discussion is required among faculty members in the subject to prepare an appropriate reply. Lots of challenges are faced while replying to these letters. Some such issues and challenges are:

• There are some letters, especially RTI applications, which seek information on primary source/s based on which some statements have been made in the textbook/s. This becomes a challenge. The present history textbooks of NCERT were developed during 2005-07. The textbooks for Classes VI-VII were developed by the Textbook Development Committees (TDC), consisting of subject experts and practicing teachers. In the TDC meetings, rough drafts were brought by subject experts, which were discussed, improved upon by the members and activities, and questions were added. For Classes IX-XII, chapters were written by individual authors, and then shared and discussed among the TDC members. The textbooks, thus, prepared, though carry excerpts from many primary sources, don't provide a reference for specific source excerpt/s used in the textbook. In such a situation, it becomes difficult for the department to share the exact reference or source used by an author.

• Letters received on same personalities or event, at times are in conflict with each other. For example, we often get letters to acknowledge and mention the contribution of Suheldev, an Indian king from Sravasti (a place in the present state of Uttar Pradesh) and mention him as a Pasi leader, while other letters do want a space for Suheldev but want to mention him as a Rajbhar king. Both communities (Pasi and Rajbhar) claim that Suheldev belonged to their community. To answer satisfactorily on this matter becomes a challenge, as we don't have sufficient research-based content on these regional personalities.

• Questions raised on the content of history textbooks, published by the states, pose a challenge. In India, education comes under the 'concurrent list' of the Indian constitution, which means both the centre and the states can legislate on any aspects of education from the primary to the university level. So, in case of any misrepresentation of facts or choice of themes or deletion of a topic, NCERT cannot put pressure on states and can only provide suggestions.

• Many times, letters are received raising objections over content in school history textbooks, published by private publishers. In India, thousands of private publishers, publish school textbooks. In the initial pages of most of these textbooks, publishers claim to bring the content as per the curriculum framework and syllabus of NCERT. Some provide quality content, while many others have lots of problems regarding content, presentation of historical facts and interpretation, printing, etc. In India, we don't have a mechanism to regulate the content of textbooks published by private publishers.

• Letters also seek inclusion of a number of topics focusing on regional history, events and personalities. These issues are

difficult to address immediately. These issues are responded to by explaining in detail the rationale and objectives behind the present textbooks, so that, the person writing is able to understand it clearly and see his/her suggestion in the light of the overall curriculum framework, principles, and the bases on which these textbooks were written. Sometimes, a para or some lines is added on a particular event or personality, given their historical importance but the inclusion of many such suggestions pose a challenge as textbooks also have to keep in mind both the physical and mental burden on students.

- Sometimes, letters seek an immediate modification in the textbook citing some recent research finding or alternative interpretation. The academic nature of some such suggestions also poses a challenge for immediate redressal. All such issues require wider deliberation among subject experts and are thus kept for consideration of subject experts for future deliberation.

Evaluation of Textbooks: A Regular Activity

As a part of the regular activity at NCERT, before textbooks are reprinted every year, necessary changes and corrections are made keeping in view the comments, suggestions, and grievances received from all stakeholders. In view of some public controversies, a quick review of all history textbooks was carried out in the year 2013 and 2015 involving subject experts, and accordingly, some modifications were made in the textbooks. In 2018-19, again some materials were added in history textbooks regarding knowledge traditions and practices of India. For example, the addition of material on Vikram Samvat, metallurgy, Shivaji, paika revolt, Subhash Chandra Bose, Swami Vivekananda, Ranjeet Singh, Rani Avantibai Lodhi, Sri Aurobindo Ghose, etc. Similarly, some visuals were also added. Recently,

in the month of February 2021, again a quick review was carried out to look into the grievances, comments, and suggestions received from all stakeholders since the last review in 2015.

What These Letters Tell Us: Reflection

The letters received, tell a lot about the overall framework, syllabus and content of the NCERT textbooks, importance and expectations from history as a subject in public, influence of contemporary political developments, use, and misuse of history, etc.

- History is an important component of our identity formation, who we are or are not, where we come from and where we might be headed — all these are influenced by our understanding of history. This is precisely the reason that people from different regions of the country want events and personalities important to them, at the regional level, to find a place in the textbooks brought out at the national level. However, requests for inclusion of some such events and personalities, are made from different parts of the country, and not from the region where those events occurred or personalities belonged to. This shows that people are conscious of their local history, but at the same time, their concerns cut across the history of different regions of the country.

- Majority of the representations and letters reflect a wish to have content in history textbooks in such a way that students feel proud of the history and culture of their country, freedom fighters and revolutionaries, who sacrificed their lives. For the medieval part of Indian history, multiple grievances raise the issue of omission of description of important personalities of the period like Shivaji, Maharana Pratap, Prithviraj Chauhan and others. At the same time, many letters and representations want to cut down the content on Mughal history/

rulers. This calls for a re-look at the organisation and distribution of content in the history textbooks.

- It seems, people closely relate history with biographies. Majority of letters want more focus on personalities, sometimes personalities from contemporary times like late President of India Abdul Kalam.

- Unlike public perception, history is very much a lively subject. Serious scholars and the public, in general, are concerned about the content and way of presentation and that's why a lot of requests seeking information over the basis of facts presented in textbooks or interpretation of a particular event or aspect, frequently come to NCERT. This is a welcome development.

- The influence of current political developments on the content and preferences in history textbooks is a reality. And this is in no way peculiar to India. This is attested by various issues raised in letters in recent years. For example, in 2019, when Article 370 was revoked, people took note of this situation and sought information on the portrayal of this issue and plight of Kashmiri Pandits in the NCERT textbooks. Similarly, after Yogi Adityanath became the chief minister of Uttar Pradesh (U.P.), the largest state in India in terms of population, letters sought to have some content on Nath community, to which Yogi Adityanath belongs and quite recently when a district court passed an order allowing the Archaeological Survey of India to do a survey of Kashi Vishwanath temple-Gyanvapi mosque complex at Varanasi, NCERT received letters, enquiring about content on Vishwanath temple in the history textbooks.

- Sometimes opposition parties at the centre or in states or some individuals seek NCERT's intervention over the portrayal or removal of historical personalities and events in the textbooks, prepared under the ruling government at the centre or in states and take action against those

who have done it. History textbooks in the state of Rajasthan are an important example of this, where opposing parties have regularly accused the reigning party of distorting/misrepresenting facts in the history textbooks.

- With regard to history, some people seem to be thoughtful, while others seem to be casual as many letters raise concerns over the content of textbooks, which are not published by NCERT anymore. Sometimes, such letters raise concern over some issues, which were resolved even in these textbooks, published by NCERT before 2002. So, it shows that many people who are sending such letters are not updated and it is a reflection on their casual approach.

- General awareness of the rationale behind the overall framework, syllabus and objectives of the syllabus at various stages, and the pedagogical principles of history curriculum are missing and that's why many times, questions are raised over deletion of some topics or lines on personalities like Vivekananda, Netaji in Classes VI-VII history textbooks, which are presently having content on ancient and medieval periods of Indian history. Sometimes people raise concerns over not having chapters on Ramayana, Mahabharata or Indian republics in the Class XI history textbook. The present Class XI history textbook presents selected themes from ancient, medieval, modern, and contemporary periods.

Implications for Future Textbook Writing in History

Understanding of issues and concerns raised in the letters has implications for improving the quality of future textbooks and other curricular materials in history.

- Some consider 'history' a 'boring' subject that involves memorising dates, events, information about personalities and processes and wants it to be scrapped as it serves no purpose. Ironically, history is at

the same time a subject that arouses much public passion over the depiction of their communities and personalities. Every now and then our attention is brought to the historical distortions, 'controversial' topics, writing and rewriting of history textbooks in letters and in the media. During this period (2005-2020) also, some such controversies emerged. The history textbook for Class IX, *India and the Contemporary World*– I, published by the NCERT in 2006 had a chapter on clothing. In this chapter, women from the *Nadar* (also known as *Shanar*) caste in the erstwhile Travancore region, who struggled for the right to wear a blouse, was described. Various caste-based organisations, members of Parliament and political parties in the southern state of Tamil Nadu found the usage of words, 'toddy tappers' and 'migrants' for them as offensive and some of them accused the author of selectively reporting the incident by highlighting only one aspect of historical reality. This led to the modification of content by the NCERT in the later editions of its textbook. Similarly, recently, there has been a huge uproar over NCERT's history textbook for Class XII, *Themes in Indian History, Part II,* wherein it has been mentioned that Mughal emperor Aurangzeb gave grants to rebuild Hindu temples. Many RTIs, letters and social media feeds objected to this, sought primary source for this and termed it a 'historical distortion' or 'partial account of history'.

The important lesson that we get from these controversies is that whatever may be the case/issue, multiple viewpoints and perspectives, need to be discussed. Bharath and Bertram (2008), who conducted a study to analyse historical enquiry in school history textbooks, points out that, "A multi-perspective approach entails the provision of a number of sources relating to the same event from different points of view to provide a basis for comparison. The

historical sources enable the learner to make a judgement or adopt a position with regard to the historical event they are studying" (p.146). Michelle Danino (2015) says that, "our students should not be denied access to such facts of history? And the argument that such unpleasant facts would promote 'communal hatred' is a perverse one: dark chapters of humanity's chequered history may be 'controversial' or unpleasant, but are those we need to study the most if we wish them not to recur (p.21)."

- Many letters point out the lack of awareness among Indian students about the achievements of the country in various fields in the past and hold textbooks responsible for this, suggesting to make learners familiar with India's rich cultural heritage, the contribution of India to the world civilization in different spheres of life such as science, art, architecture, heritage, philosophy, etc. Following this, some information related to India's knowledge traditions and achievements were added in the history textbooks of different classes in 2018-19 in addition to a few things already available in the textbooks. However, a lot more needs to be done in this direction, as this has great potential and relevance for the future also.

- India has a vast, many-layered and complex history and it is not possible to cover the entire mosaic of such a vast history in any textbook of history. In such a situation, the need for making a selection from among enormous historical knowledge becomes inevitable. In an interaction with teachers, the Chief Advisor of history textbooks, developed following NCF 2005, justified selection and focus on certain themes by saying that the idea behind 'thematic approach' has been that if students are able to understand a particular issue from different angles, they will be able to apply the same critical scrutiny to other such issues as well. However, many letters and

grievances questioned the selection of themes in the present history textbooks and accused NCERT of omitting many important themes and periods of Indian history like the entire Vedic and Post Vedic period (2000-1500 BCE), then 600-1000 CE and the period of the growth of nationalist consciousness, political parties, the Partition of Bengal, Swadeshi movement, etc., during 1858-1915. Kaya Yilmaz (2008) says that the method of selecting historical topics or developing history curriculum should be made not only open to public review and scrutiny, but also open to public discussion and revision if necessary. The assumptions and parameters used to choose topics for history curricula must be specified explicitly.

- The use of real evidence/primary sources is widely acknowledged as a significant criterion in the teaching and learning of history. In certain parts of the world, the emphasis in schools has now shifted to using both primary and secondary sources rather than just school textbooks, making history teaching and learning even more useful, enjoyable, and profitable. However, in India, it is only a recent phenomenon. The present history textbooks have excerpts from different primary sources, but without reference. Writing about the objective behind using sources in the new history textbooks, Neeladri Bhattacharya (2014), highlighted the importance of providing students "an idea of the nature of historical knowledge, allowing them to see how in fact historians construct history: the sources they use, the problems of reading these sources, the variety of possible interpretations, and the limitations of different kinds of sources (p.108)". Ironically, it is the reference/source of various such excerpts, which attracted maximum RTIs, queries, grievances and uproar on various social media platforms. Many letters sought to know the source of various statements made in the textbook

and accused authors of presenting primary sources partially, many times of omitting certain words from the primary source to either stigmatise a community, for example *brahmans* or undermine the unity and achievements of the country.

All history textbooks need to clearly mention the sources or references used by the authors. According to Bharath and Bertram (2008), the learner needs to identify the source's author, interpret the source's motivation, and assess the fairness of the argument made there. They (Bharath & Bertram, 2008) say that the lack of provenance (the source's origin, author, and purpose) limits high-level and historical questioning, so textbooks must include more detail about the source and allow for contestation.

- Textbooks are meant to be updated, revised, critiqued, challenged, and changed. Over the years many measures have been adopted by the government agencies while preparing textbooks but to date, we don't have any regulatory mechanism or a statutory body in India to look into textbooks and other curricular materials published by private publishers. One of the CABE Committees (GOI, 2005), set up in 2005 to suggest Regulatory Mechanisms for Textbooks and Parallel Textbooks also reported that "There is hardly any regulation or regulatory mechanism for the textbooks and textual materials used in schools outside the government system (p.17)". This committee recommended setting up an independent institution National Textbook Council to keep an eye on textbooks published by both government organizations as well as by private publishers and also, respond to questions received from the public about the content and quality of school textbooks. Nothing could be done in this direction since then. The establishment of such an independent institution has the potential of increasing public awareness of the content and quality of school textbooks

and also addressing their grievances.

• There is a perception that social science in general and history in particular is a 'text centred' subject and merely transmits information. Besides, textbooks also have to deal with competing claims of different regions/sections of society for incorporation of information that is important in their own ways. Therefore, instead of being 'comprehensive', the present history textbooks have been 'illustrative' in their orientation. But a large number of grievances/comments, not only from common citizens but sometimes from Ministers also, belonging to different regions, have pointed to the absence/less coverage to the people and culture of different regions, especially North-Eastern states of India.

Every effort needs to be taken up to ensure regional balance, by preparing textbooks that represent the history of the country as a whole. At the same time, we also need to recognise the practical difficulty that is associated with the task of covering the rich and varied histories of this vast and culturally diverse country 'in its entirety'. Different strategies may be thought of to address the issue of 'regional imbalance' like having content/exploratory activities on different regions,

its people and culture under QR Codes. All chapters of all textbooks of NCERT are now embedded with Quick Response Codes (QR), which help students to access e-resources such as audios, videos, multi-media, texts, etc. We can also prepare supplementary readers on some aspects of history, culture and people of different regions, etc.

• Today, many enthusiastic individuals, organisations and media (including various social media platforms) are vigilant with regard to the content and quality of textbooks. This has the potential to keep a check on what is being given in the textbooks, it also poses serious challenge for those involved in the preparation of curriculum, syllabus and textbooks in such a vast and diverse country of ours. In order to face this challenge, Michelle Danino (2015) proposes that all academic viewpoints be valued, and that national debates be held free of demonisation. Simultaneously, he recommends to lessen reliance on textbooks, by going beyond textbooks, openly discussing different views and perspectives, and encouraging creative pedagogies, such as, involving students in field trips or mini-research projects to bring history to life.

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Best Practices of a School-based Pre-service Teacher Education Programme

Poonam Sharma*

Abstract

This paper reports the documentation of best practices from the case study of a programme run by Muktangan Education Trust, a Mumbai-based NGO. First, the article enlists the core practices of the programme that were valued by the key stakeholders, including teacher educators, teacher trainees and the school management. It illustrates how these practices were spread across the three years. These practices are deliberated upon in the light of literature that vouches for more practice-based teacher education that gives teachers early exposure to school cultures while simultaneously learning from theoretical inputs as well as personal experience. The paper then accounts for some of the challenges faced by teacher education programmes.

Keywords: *teacher education, best practices and school-based teacher education, pre-service teacher education*

Introduction

National Curriculum Framework 2005 has asserted the need for teacher education (TE) to become more sensitive towards the needs of the students and their contexts. It imagines a teacher who is a capable facilitator of the teaching-learning situation; participates in curriculum renewal; believes in the construction of knowledge in collaborative spaces; understands children's social, cultural and political contexts and is attentive to their own personal and professional growth.

Teacher preparation is a complex and time-consuming process. It requires teachers' cognitive and emotional involvement, exposure to well-formed theoretical ideas and the experiences of others, review of own beliefs and mindsets, and a search for alternatives collectively and cooperatively. Teacher preparation is also influenced by school culture and national policy discourse. There are ongoing debates (Whitty, 2014;

Avalos, 2011; Zeichner, 2012) about making teacher preparation more practice-based where teachers are given early exposure to school cultures while simultaneously learning from theoretical inputs as well as personal experience. Such a teacher education programme is physically and work-wise located in the school as its primary site. From day one, teachers get exposure to the school culture. The idea is that teaching practice is to be learnt within the space of the school while the teacher negotiates her daily work. The inputs in school-based TE programmes are also influenced and shaped by the vision and administrative arrangements of the school.

This paper discusses the practices of a school-based teacher education programme in the light of this literature. This paper is based on a report which was conducted in 2018 as a part of the documentation of best practices in initial teacher education. The report was submitted to the Ministry of Human Resource and Development. The

* Assistant Professor Center for Education Innovation and Action Research Tata Institute of Social Sciences Mumbai, India   E-mail - poonam.sharma@clixindia.org

paper finds that in its attempts to create a more dynamic and rigorous teacher education programme the organisation deals with key challenges faced by the teacher education sector in the country. These challenges include lack of good reading material, teacher trainees' lack of content knowledge, and struggle to balance between exposing students to theoretical ideas and practical experience at the same time.

Literature Review

Practice-based TE is not a new idea; it has been practised and researched in the UK and the US. Teachers' learning in practice-based TE emerges from the teacher's work culture, mentoring, observation of their own practice and reflection on and development of a broader understanding of socio-cultural contexts as necessary in actually being able to learn from practice.

Workplace learning is learning within teacher culture, and school culture is the most productive condition for informal workplace learning (James & McCormick, 2009; Jurasaite-Harbison & Rex, 2010; Sato & Kleinsasser, 2004). It calls for a teacher culture that encourages and values collaborative learning. It asserts that novice teachers learn by observing older teachers and the established culture among the older teachers' group. Teacher culture and school culture highly influence how teachers perceive their work and interact among themselves professionally. Teacher exchanges could be limited to teaching materials or extend to knowledge ideas or researching and reflective practice.

Lesson study and teacher research are significant to teacher development (Avalos, 2011). In these processes, teacher trainees have repeated opportunities to see specific core teaching practices being modelled and rehearse, practice, and receive detailed feedback in the setting where they will be using them in the future. This must also be complemented with participation in inquiry-based communities to learn habits and

skills. The organisational support structure (James & McCormick, 2009) is significant in creating a conducive environment for learning based on assessments, making learning explicit, and promoting learners' autonomy. Collaboration and learning among teachers can be enhanced by a supportive organisational structure and leadership.

Avalos (2011) quotes a study (by María del Pilar Unda) in which teachers observed and were involved in personal questioning of their knowledge and teaching. This aimed to reconsider existing practices, undertake school-based research, develop alternative strategies, and work with students and communities. This allowed the practical knowledge to emerge and be conceptualised and communicated. This study highlighted the construction of pedagogical knowledge based on teachers' personal experiences and those of others. This learning was complemented by improvements in thinking through the writing of journals and discussions.

Ruth Kane (as cited in Avalos, 2011) argues that teaching is not to be viewed as a set of activities that prepare people to manage a curriculum to produce specific learning results and teachers as performers of these specific skills rather than as professionals who can engage in reflective inquiry and action. O Sullivan's article (2002) elaborates on the development of reflective skills among underqualified teachers. Since all trainees in the study were from an education system based on rote learning, activities like brainstorming and sharing ideas did not come naturally to them. The researcher provided alternative experiences to the trainees for asking questions and group or pair discussion, and that increased their confidence and participation. Trainees were also not accustomed to unstructured observation. Therefore, semi-structured observations, containing both factual and reflective types of leading questions, were designed. This helped in increasing teachers' reflective analysis and involvement. Similarly, reflections were to be adapted to the context.

Teachers were given loosely prepared materials to identify problems in them in order to gradually increase their analytical skills. By doing so, student–teachers began to engage in structured reflections. In this manner, teachers reached the first stage of reflection —technical rationality. Teachers could identify the problems in their practice; however, they could not yet devise solutions to them. This study also emphasised the importance of monitoring as key to their learning process.

Mentoring and coaching are crucial in the practice-based TE programme (Marion Johns, 2001). This paper discusses the findings of a comparative study of the role of mentors in school-based TE in England and Germany. It focuses on the mentor's role in terms of 'adviser', 'trainer', 'partner', 'friend' and assessor' and examines the extent to which these aspects of mentoring influence the development of beginner teachers. It points out the need to carefully and systematically observe one's practice and be constructively critical of it. TE needs to build inquisitiveness and the ability to take risk and question one's own beliefs.

Ross and Bruce (2007) proposed a model of teacher change through a process of self-assessment, including self-observation, self-judgment and self-reaction. These processes involve aspects of judgement considered relevant to success, meeting or not meeting the proposed goals and interpretation of the extent to which the goal has been achieved, respectively. These were related to self-efficacy and influenced the future decision-making of teachers. These were also followed up by peer observations, analysis of data and input of teaching mathematics in a way different from the traditional method based on rules and procedures.

The organisation uses an amalgamation of such critical practices and others that have organically emerged within the community-based teacher education programme. This paper attempts to consolidate these practices.

Objectives

The aim of this study was to explore the perspective of the key stakeholders involved in this school-based teacher training programme. It aimed at identifying the practices that teacher educators and teacher trainees valued in the formation of a teacher.

Methodology

Data was collected through interviews, observation of teacher staff meetings and a detailed review of teacher training modules and other curricular material. In-depth semi-structured interviews were conducted with the teacher trainees (4), faculty members (5), alumni (2) and programme director (2). Interviews with the teacher trainees and the faculty members focused on their perspective about the programme, the curriculum material, pedagogy and assessments. Probing was done to explore the justification and rationality given by participants. Questions were open-ended. Interviews were conducted in the Muktangan schools. In addition to that, the curriculum design meetings and lessons plan meetings were observed. Curricular documents, including course materials, training modules, assignments and feedback given to students, were also studied. A desk review of the previous reports published on Muktangan (TISS 2013, L & T 2015) was also conducted. These reports helped in understanding the journey of the organisation and the viewpoints of the other researchers.

About Muktangan

Muktangan is a registered NGO based in Mumbai, India. It has been working with Mumbai Municipal Corporation (BMC) schools and on teacher professional development (TPD) of community-based teachers through an integrated, school-based programme since 2003. The organisation works in a public-private partnership with BMC in seven schools and has trained more than 700 teachers since 2003. At the time of

this study, the TE programme is not affiliated to or recognised by any government body.

The organisation's schools are popular in the community. Its schools and the TE programme have been studied and reviewed at various levels. Its work is related to students' learning, classroom processes, English teaching and learning (TISS, 2013), perception of students and teachers (Nirmala Niketan, 2010) and the impact of its teacher training programme (Larsen & Toubro, 2015) have been documented earlier. The organisation has made an impact on the performance levels of children (SSC results), empowered women from the community and as a result, developed the community (TISS, 2013).

The organisation's model of teacher development is an integrated model organised in three academic years, during which trainee teachers receive extensive opportunities to work in schools and be mentored. This model focuses on developing teachers from the community through a pre-service programme that is merged with a regular internship at a Muktangan school. It allows trainee teachers to construct their knowledge based on theoretical foundations as well as their own observations and classroom experiences. It is believed that since the teachers are from the same community as the students, they are better able to understand the learning context and educational aspirations of the students coming to the schools.

The organisation's schools and teacher development programme is supported by subject departments, including Education, Holistic Development, Socio-emotional, Inclusion, ICT, English, Marathi, Hindi, Mathematics, Science, Social Science and Library. Each department has a department leader, lead faculty and subject faculties. The organisation is committed to demonstrating the effectiveness of alternative approaches to school and teacher education. It aspires to demonstrate how school learning can be a process of growth for students as well as teachers. It intends to create well-rounded educationists creating a work culture of co-learning, trust, collaboration and open communication. There is a policy of inclusion and all students are viewed as potential beneficiaries regardless of their different learning needs.

Rather than focusing on the product, there is a strong belief in continuous curriculum development and improvement of processes. The teacher is believed to be the most important resource for the class. A good teacher is identified as one who is a reflective thinker, an effective communicator and a responsible planner and organiser. It aims to create a 'child-friendly' atmosphere where students learn through appropriately designed activities with the freedom to access the resources, participation in learning by doing and a low teacher-student ratio. The organisation has ongoing assessments for students as well as for teacher trainees. It also strengthens its learning by regular sharing in forums across the education community.

The organisation's school education and its teacher development programme run parallel to and inform each other. For teacher preparation, high priority is given to 'experience of teaching' rather than 'theory-based' TE. In practice-based TE, there is a high level of coherence between the work (how the classes should be conducted) and the teacher's learning. It is definitely a shift from standard TE programmes in the country in terms of its physical location in the school, structures, processes and ideas.

The organisation started as a TDP within the community for candidates between the age of 18 to 45 years. Earlier, candidates with even an SSC or any other medium were accepted as teacher trainees, but with the increasing popularity of the programme within the community and increasing organisational realisation of the challenges of learning English, HSC (12th) in any medium was made the minimum criterion for enrolment in the TE programme. Though not a substantial number, but some of the trainees who come to these schools have already acquired teacher qualification, D. Ed

or B. Ed. A handful of them also come with graduate and post graduate degrees. Those who enter without a professional teacher qualification have to eventually attain a formal degree, because the Muktangan Programme is not yet certified by NCTE. The organisation is empowering teachers from the community and many teachers who have been with the organisation speak of personal transformation, gaining respect in the family or community and resuming their formal education through the distance mode. The organisation continuously works to keep the impetus up with ongoing professional development or else trainees and teachers tend to slide back to traditional ways, as feared by the teacher educators. Discussions and follow-ups are done on a regular basis to keep teachers' motivation high. It must be acknowledged that the organisation works within the constraints of limited infrastructure and financial resources and examination and documentation systems prescribed by the Municipal Corporation.

The organisation is credited with providing English medium education to underprivileged teachers and students. Great importance is given to the development of English language proficiency by providing teachers with multiple exposure and opportunities to practice speaking in English. English is a language of power, and the demand for it has come from the community. English also gains primacy in the TE programme due to it being the medium of instruction.

Valuable Practices at the organisation

NCF 2005 and the Right to Education Act (RTE 2009) imagine a teacher who is professionally qualified, socially sensitive and motivated. The organisation model seems to be developing such teachers. Several innovative practices of pre-service TE have emerged as part of its work in the community. These practices are worth documenting. There is a need to document these practices from their context so that their key elements can be systematically documented, discussed and shared with a wider audience. Given below is an account of the practices that are considered valuable and that have emerged from within the organisation.

1. Content and pedagogy at pre service stage

The organisation's TE curriculum broadly maps to the recommendations of the NCFTE, including the domain of foundations of education, curriculum and pedagogy and school internship. Teacher trainees come from the traditional learning system, having had very little exposure to the internet and to modes of self-learning. The TE classes are exposure for these teachers to new ways of learning and knowing. It is an opportunity for them to move out of traditional modes of learning and experience the pedagogy that is expected of them when teaching in class. Examples of such pedagogy are role-playing, discussions, giving analogies and sharing of ideas. Teachers get to engage meaningfully with these ideas and do things that they have probably never done in the past; they get to experience a different kind of teacher-student relationship and expectations as learners. This enables them to become more confident and willing to try new things.

Exposure visits to other innovative schools are mandatory and are found to be of great value by teacher educators and the student–teachers themselves. This is an alternative learning resource that adds to the teacher's imagination of teaching-learning spaces.

Educational beliefs and understanding self: A teacher's prior beliefs and cultural values are critical in defining her pedagogy in class. In the organisation's pre-service curriculum, it is the first thing to be dealt with in the course Educational Beliefs. Here, teachers are guided to think deeply about their personal beliefs about knowledge, schooling, learning, parenting, educability, and beliefs about self and society. These reflections are important for enabling the student–teachers to observe their own beliefs

and see how they may shape their practice and interaction with students. They develop a deeper understanding of self as a person and as a teacher, thus strengthening their inner self and professional identity.

2. Case study

The practice of writing a case study was put in place in order to enable teachers to move beyond the mere delivery of textbooks to understand the nature of learning by observing a child closely while he/she is completely engrossed in a task. During the course Child Development or Internship, under the close supervision of a faculty member, the pre-service teacher trainees are expected to do an 8-month long case study of two children. The trainee teachers have to observe the children weekly, regularly record their observations in consultation with the supervisor and present a detailed report at the end of the year. Efforts are being made to enable the trainee teachers to effectively make observations of children through regular tutorial meetings. Components of the report include physical appearance, grooming, cleanliness, food habits, toilet habits, areas of development (cognitive, science, history, geography, spellings, speaking and listening, reading writing, library, computer, independent writing, personal socio-emotional development, quality circle time, physical education). Also noted are holistic development; work and experience; singing, drama, dance in zero period; suggestions to parents and faculty feedback. This study provides an opportunity to take a closer look at the life of the child and his/her educational context. It includes observing the child in the classroom and looking into his academic as well as co-curricular activities. There is also a component of visiting the children's homes. It is attached to a tutorial lesson conducted weekly by the pre-service faculty. These small group tutorials are for discussing observations of children and mapping their progress.

3. Individual reading time

The organisation values the culture of reading and attempts to inculcate the habit of reading among teacher trainees. Specific time is allocated in the pre-service timetable during which teachers are expected to do independent reading and writing. Independent reading and writing are at the core of a teacher's practice. At present, the Centre for Learning Resources' series of English language development is being used. There are two main objectives: one is to develop the teachers' English language skills and the second is to enhance their general knowledge as these modules are considered to be a good source for gaining general knowledge. Depending on the level of their English competence, teachers undergo a series of prescribed modules.

The initial idea for the reading time was to let the teacher freely explore reading material and choose what to read for herself, to form the habit of reading to enable her to read and think independently. This is the time when teachers can possibly engage with literature that other courses do not encompass, for example, reading biographies of teachers or children's literature. During this time, teachers exercise judgement and learn to choose the readings they would want to pick up as teachers. Through this process, they can explore the space of education literature and shape their own ideas. In this manner, they can gradually develop a critical view of the text they read and the ability to observe one's thinking while reading. Since it is the time for self-study, it has to allow teachers to read in their language of thought.

4. Curriculum Understanding and Design Meetings

The organisation recognises the value of bringing teachers together and also that of collaboration. The structures of Curriculum Understanding and Design (CUD) and Lesson Design Meetings (LDM) are put in place to facilitate these. CUD meetings are

conducted weekly by the lead faculties under the supervision of department leaders. Every week, teachers from all seven schools come together to dwell on the conceptual knowledge of their particular subjects. The structure is put in place for promoting regular interaction and sharing of knowledge. It is expected to be a platform for interaction across schools and deliberation on practical experience. Two of the observed meetings (Hindi and science) began with a recounting of how much has been covered in each school and where they will be going in the coming days. Another observed meeting was also a deliberation on the concepts of geometry. The teacher educators felt that trainee teachers lag in content knowledge and therefore, it needs to be taken up with them repeatedly. Much of an organisation's energy goes into that. It is important to assess the trainee teachers with regard to requisite content knowledge because only when they have adequate knowledge will they know how to interpret it for teaching and how to present it to students.

Classroom transactions are at the centre of TE at the organisation. The organisation's classrooms must be conducted in a certain way (active constructivist manner as it is known among the Muktangan team), and this becomes an overriding idea for the CUD meetings at times (as also realised by the Muktangan team). Many times, teacher educators become heavily oriented to providing readymade lesson plans because at the end they are the ones responsible for what happens in the student–teachers' classes. In such a scenario, situated learning takes a back seat and trainee teachers do not have enough time to deliberate on their practice.

This is a useful structure where student–teachers can regularly meet people of their own profession to reflect and discuss curricular processes. In the absence of such a structure, teachers might fall back on traditional modes of teaching-learning. The CUD meeting structure is under revision at present. At the time of this study (2018),

subject faculty meeting across schools was being planned. It was envisioned that each school would have its own subject faculties who will assemble at the central point for a weekly subject orientation by leading faculty and they take the learning back to the teachers in their schools. The learning will be shared with student–teachers during school meetings.

5. Lesson Design Meetings

The LDMs are supposed to be for the development of specific lessons and planning and resourcing for class. Planning for the class is an important dimension of the teacher's work. Skills of planning for a class can be learnt while practising under appropriate mentorship. NCF 2005 has recommended daily planning time for teachers to plan the class and review the day. The primary school teachers get daily time to plan for their class. This is the time during which teachers specifically think about class. In the LDM, they plan for their class, but the senior teacher or subject faculty leads the discussion. During this activity, teachers get time to enter the other person's pedagogical framework, and this enables them to experience something that they have not arrived at on their own. It may enable the novice teacher to experience the pedagogical features of the other person's teaching. There were discussions about combining the CUD and LDM meetings in order to facilitate understanding of the curricular topic that will be implemented in the class with students of mixed abilities.

6. Mentoring

Internally trained and developed subject faculties train novice teachers during classroom observations. Each department has an observation tool. Regular meetings and interactions with individual trainee teachers are conducted after class observations. Trainee teachers have the opportunity to speak to someone more knowledgeable and discuss their experiences. Mentoring is the key to practice-based teacher development.

It requires skilful mentoring by faculty members and senior teachers who can help the trainee teacher navigate the situation at hand rather than providing solutions right away. It is through these interactions that trainee teachers can challenge their tacit beliefs and learn to engage with the shared knowledge of the teaching community. They can learn by adopting the other person's pedagogical framework and learning from it. Experience of similar mentorship roles in other contexts can be referred to and learnt from.

7. Reading circle

Reading circles, also known as professional development meetings, are conducted by senior faculty on a fortnightly basis. During these meetings, a reading or topic is discussed; the topics are introduced by the programme director but can also be introduced by the department leaders or faculty members. Topics could be related to a course practice or maybe about a general understanding of the field of education. It is a space for intellectual deliberation on relevant or emerging issues and gives teachers a sense of belonging to a professional community. Faculty members follow up these discussions with their respective department members and then with the teachers. Sometimes, the issues are also identified by student–teachers or from observations made in the classrooms. The communication of the issues to be discussed is believed to be two-way and appropriate time is allotted for these discussions. For example, the issue of homework was discussed recently. The organisation believes that understanding the space of education is a gradual process, and reading circles are an effort to create a learning community. Besides this, most organisational faculties are also engaging in research or other projects of their own.

8. Teacher assessment

The organisation strongly believes in assessment for learning and not merely assessment of learning. The pre-service programme has formative and summative assessment components. At times, the formative assessment is a written exercise having recall-based or application-based questions or could also be in the form of an assignment, project, group work, observation report, demonstration, etc. For some courses, assessment is more flexible and it is up to the faculty to define ways to assess students.

Self-assessment: There is a component of self-assessment in the pre-service programme, it includes 10 points each of critical attributes and key performance attributes. The critical attributes are general skills of being a professional, including regularity, punctuality, teamwork and responsiveness. The key performance indicators are related to the organisation's parameters of a good teacher, including the teacher as a thinker, effective communicator and responsible planner. Thrice during the year, the teacher gets this opportunity to think about herself and make an assessment of her progress.

This self-assessment is shared with teacher trainees at the beginning of the academic year, and they are expected to work with a teacher educator on these attributes throughout the year. There is also a midline and year-end assessment. Self-assessment is very significant as through this, the teacher begins to understand that her work is subject to professional standards and expectations. It is a framework of expectation that enables the teacher to aspire, to set standard for herself and meet them. This practice goes well with the organisation's core belief in creating a culture of collaboration, trust and mutuality. It is not accountability regulation but a culture of building and meeting expectations.

9. Film festival

Every year during the summer vacation training, a film festival is organised. All teachers attend it. Relevant movies are screened to enable teachers to reflect on societal issues. Screenings are followed by a discussion and movie review. This gives

teachers exposure to alternative learning resources and expands their sociological imagination. The movies are chosen by faculty members. This is exposure in nature and not related to any subject; no assessment is attached to it.

Conclusion

Learning to teach is a complex process that involves not only learning specific skills and mindsets but also developing the practice of reflective inquiry. A good teacher education (TE) programme develops teachers' knowledge, skills, attitude and ability to reflect on their work. It enables the teacher to collaborate and work with colleagues, develops the skill of questioning pedagogic knowledge, manages challenges in diverse contexts, understands the field and develops the habit of self-regulation and evaluation. It must also allow the teacher to judge and act in different situations and engage with discussions of diversity.

Organising an effective teacher training programme is full of challenges. One of the biggest challenges is to find appropriate reading material that is relevant, context-specific and yet easy to consume. On one hand, there is literature that is highly theoretical and academic that is hard to penetrate and on the other, there are over-simplistic versions of popular theories available that are primarily used for reproducing information during B. Ed and other popular exams. The task of a community-based teacher education programme is even tougher because they have to take up the uphill task of training teachers from vernacular medium. There is a dire need of the sector to have good reading material available that allows for deep engagement and critical reflections. Education-related literature in Indian languages needs to be made available and accessible. There is a need to have literature based on teacher's experiences and observations that can be useful for various courses during the first year of the programme.

When we talk about the busy lives of teachers, reading time sounds like a luxury, but as emphasised by the organisation's practices, this is one habit that needs to be diligently followed and inculcated among the teachers. This allows the teacher trainees to develop educational imagination as well as linguistic capabilities. In addition to this, reflective journaling also needs to be made part of teacher's everyday lives. As recommended by National Curriculum Framework for Teacher Education, the reflective journal is a really useful tool for learning from experience in a practice-based teacher education programme. A formal structure for reflecting on one's practice and writing about it has to be put in place in the timetable so that teachers have designated time for this.

Today, one is witnessing an increasing number of experiments and interventions related to school teachers, from teacher training to teacher assessments. There is a narrowing and micromanagement of her role and an imagination for her work as being limited to the development of specific skills among students. In such a scenario, the organisation is making consistent and thoughtful efforts to develop a teacher's ability to understand the context of her work and plan her pedagogy most effectively. The practices described above contribute immensely to developing the teacher's intellect and professional self. Being based in the school, this teacher education is complete in many senses and offers a great deal to learn from.

Acknowledgement

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Unpacking the Meaning of a Standards-based Education System

Madhumati Manjunath*
Shilpi Banerjee**

Abstract

Countries all over the world have increasingly been adopting standards-based reforms in their school systems. A proliferation of concepts and terms related to the concepts of standards-based education systems has followed as well. Thus, there is a need for papers that help clarify concepts and terms related to standards-based education systems. This paper provides an overview of the features of standards-based education systems, with a brief discussion on standards-based reform in India. More importantly, it clarifies the meanings of terms related to standards-based curricula—aims, competencies, goals, learning outcomes, and instructional objectives—with examples specifically related to the Indian context. The paper discusses some caveats associated with standards-based education systems and concludes with suggestions for improvement and implementation.

Keywords: *Standards-based system, Competency-based education, Standards, Learning outcomes, NEP 2020*

Introduction

In many parts of the world, there have been convergent reforms in education systems and school curricula in the late 20th and 21st centuries (Gouëdard, Pont, & Huang, 2020). These reforms have been driven by the demands of the 21st century, which is characterised by rapid and unpredictable developments in many academic, vocational, and professional domains. Thus, traditional curricula that emphasisedthe memorisationand mastery of content in tightly partitioned school subjects have fallen out of favor. Traditional curricula only prescribed the content to be covered within a given amount of time. They did not define the levels of knowledge, skills, and attitudes that students had to display at the end of instruction to be successful learners (Richard Zagranski, William T. Whigham, & Patrice L. Dardenne,2008).

In response to the problems associated with traditional curricula, many countries carried out curricular reforms in the late 20th and 21st centuries. School curricula in the 21st century aim to help learners integrate knowledge, attitudes, skills, and multidisciplinary capabilities for solving ill-structured problems in unique and ever-changing environments. The need to ensure equity, accommodate diversity among learners, and promote the autonomy of teachers and administrators has also spurred curricular reforms (Gouëdard, Pont, & Huang, 2020).

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* Research Associate, Azim Premji University, Bangalore, E-mail : madhumati.manjunath azimpremjifoundation.org
**Assistant Professor, Azim Premji University, Bangalore, E-mail : shilpi.banerjee@azimpremjifoundation.org
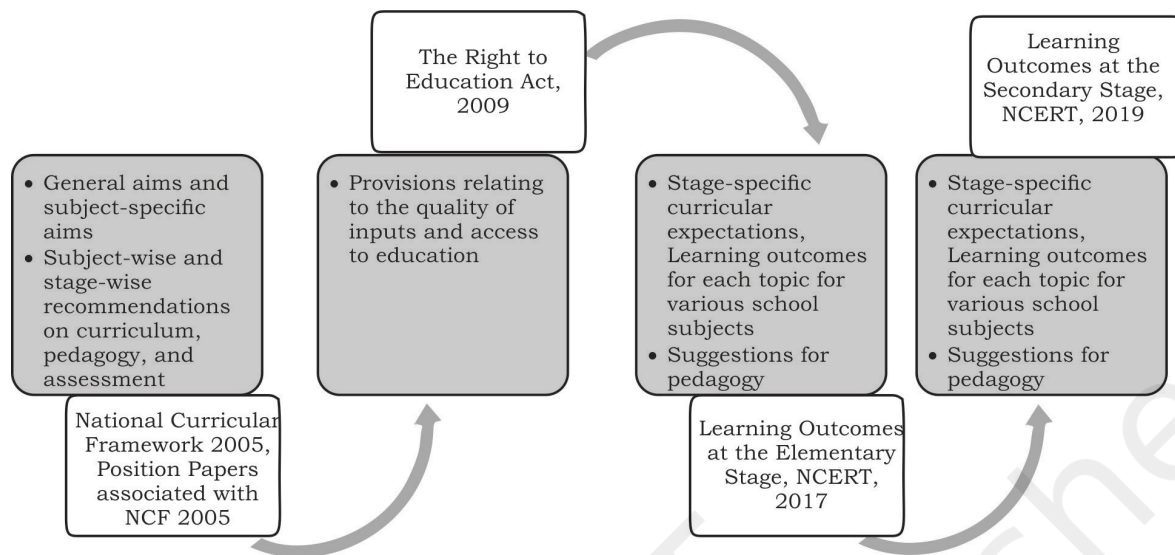
Figure 1: Standards-based Reforms in India

As a result of these reforms, several terms emerged for the curricula in the education systems. These terms include "proficiency-based," "mastery-based," "standards-based," "competency education," and "competency-based" curricula (Sturgis, 2014). In this paper, the term "standards-based" will be used consistently. The central idea of standards-based systems is to define standards, which are expectations of learning from students. Standards are the criteria against which the performance of students and stakeholders will be measured. Standards are defined in such a way that they articulate the same expectations for everyone while, at the same time, providing stakeholders with flexibility in materials and methods for meeting those expectations (Sharma, 2015; Tognolini & Stanley, 2007). Thus, standards ensure equity, accommodate diversity, and allow for autonomy at the same time.

Standards-based Reforms in India

The Indian education system has been taking steps towards standards-based reform for improving the quality of the education system. The National Curriculum Framework (NCF) 2005 by NCERT and its associated position papers articulated the general and subject-specific aims of education. They also provided subject-specific and stage-specific recommendations on the features of good quality curricula, assessments, and pedagogy. The Right to Education (RTE) Act, 2009, came into being to enforce education as a fundamental right as enshrined in Article 21a of the Constitution of India. The RTE Act, 2009 specifies the need for providing good-quality education to children. However, the act has not provided clear and unambiguous standards for learning that have to be met to ensure good-quality education (Sharma, 2015).

As a step towards remedying the lack of specified standards, NCERT published curricular expectations and learning outcomes for children in Classes I to VIII in 2017. Learning outcomes for students in the secondary stage were published in 2019. Draft learning outcomes for the higher secondary stage have been published for the higher secondary stage as well.

The National Education Policy 2020 (MHRD, 2020) has articulated a vision of a standards-based system that will fundamentally revamp teaching-learning processes and assessments. The NEP 2020 envisages a combination of experimental learning, formative assessments, and

standards-based systems in improving the quality of student learning (MHRD, 2020, p. 12, para 4.6). The assessments, whether formative or summative, will be competency-based and aligned to the learning outcomes for the specified grade levels (MHRD, 2020, p. 17, para 4.34). These assessments will also rigorously test higher order skills such as analysis, critical thinking, argumentation, evaluation, etc. School exit examinations will become competency-based as well. They will focus more on testing core capacities and concepts than content (MHRD, 2020, p. 18, para 4.37).

As the reforms proposed by NEP 2020 are in the process of being implemented, it is important for all stakeholders of the education system to develop a basic understanding about standards-based systems.This paper is an attempt to unpack the meaning of a standards-based system through a discussion on some of its features, terminologies, and associated caveats. It discusses some important features, terminologies, and caveats associated with standards-based systems.

Features of Standards-based Systems

It is given that each country has a unique education system that has been shaped by historical, socio-political, and economic circumstances. However, there are some common features of standards-based systems around the world.

1. Having clear definition of standards

- One of the most important features of standards-based systems is the existence of standards.Standards are statements of curricular intent that specify what students should know and be able to do with respect to the curriculum (Hamilton, Stecher, & Yuan, 2008; Print, 2020; Sharma, 2015; Tognolini & Stanley, 2007).

2. Aligning teaching-learning and assessment to standards

- Teaching-learning processes, curricular content, and assessments are aligned to and referenced against standards(Hamilton, Stecher, & Yuan, 2008; Print, 2020; Sharma, 2015; Tognolini & Stanley, 2007). A clear road map for student achievement pegged against standards helps ensure that stakeholders' efforts are not directed towards wasteful activities and resources, which ultimately result in poor educational attainment. At the same time, a standards-based system also allows for considerable stakeholder autonomy and accommodation of diversity. Teachers are free to use curricular materials and activities that suit their students' needs as long as those are well aligned with the standards (Rao & Meo, 2016; Sharma, 2015; Tognolini & Stanley, 2007).

- Assessments are unique in standards-based systems in that they are usually criterion-referenced rather than norm-referenced (Sharma, 2015; Tognolini & Stanley, 2007). Student performance is reported relative to performance in standards as opposed to performance of other students.

3. Using standards for accountability purpose

- Administrative and governance activities are geared towards ensuring that students, teachers, and schools have the necessary resources and support for meeting standards

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[1]Murray (2020) has defined curriculum intent as follows:

Curriculum intent' is a term which is not widely used in the literature yet as a concept it is commonly and constantly applied in practice. It may be defined as the direction that curriculum developers wish learners to go as a result of participating in the curriculum. Curriculum intent incorporates the various forms of aims, goals and objectives found in curriculum documents which together provide directions that will hopefully be achieved by learners as they interact with the curriculum (p. 121).

(Hamilton, Stecher, & Yuan, 2008). Assistance is available to schools in the form of teacher training, capacity building, and financial provisions to ensure that schools are meeting standards (Tognolini & Stanley, 2007). At the same time, accountability provisions are built into the system (Hamilton, Stecher, & Yuan, 2008; Tognolini & Stanley, 2007).

A Vignette from Haryana on the Use of Standards-Referenced Large-Scale Assessments in India

Source: Michael & Susan Dell Foundation, CSSL, ConveGenius, Central Square Foundation, EI, n.d.

Haryana has undertaken a programme called Saksham Haryana in 2017 to improve its academic performance. The state set a target of 80 per centattainment of grade-level competencies in a standards-referenced large-scale assessment conducted with its partners EI and CGI. As a result of its reforms, attainment in grade-level competencies improved from 40 per cent in 2014 to 80 per cent in 2019.

One of the key ingredients of this programme's success was the involvement of the Chief Minister's Office, which created the Saksham Haryana cell in 2017 to monitor the programme. The Chief Minister and senior officials in the Education Department frequently reviewed the programme to monitor progress.

The other ingredient for success was ensuring decentralised accountability by making teachers, school principals, and block-level officers responsible for results. Officials who achieved the Saksham status were recognised and rewarded, and best practices were disseminated to others.

Teaching, learning and assessment was referenced to a competency framework called Saksham Taila, which was based on the NCERT Learning Outcomes for the Elementary Stage document. The competencies were presented in an easy-to-use manner that would help teachers track progress and map resources.

There was frequent communication at the school, block, district, and state levels. WhatsApp groups and channels were widely used to establish two-way communication. Thus, this enabled easy and frequent monitoring for the programme, while enabling quick access to support.

Terminology Used in Standards-based Systems

In most standards-based systems, some common terms are used. These terms are statements of curriculum intent and are as follows: aims, competencies, goals, learning outcomes and instructional objectives. The terms have been defined and explained below.

1. Aims

They are broad, non-technical and encompassing statements of curriculum intent and are long-term in nature. They specify the end results of a long period of schooling and often reflect societal aims and desires (Print, 2020).

In India, NEP 2020 has laid out the following aims of school education:

to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical mooring and values. It aims at producing engaged, productive, and contributing citizens for building equitable, inclusive, and plural society as envisaged by our Constitution(MHRD, 2020, pp. 4–5).

2. Competencies

There is no one single definition of competencies. However, competencies can be understood as broad and domain-general sets of knowledge, dispositions, and skills required for attainment in all domains of the curriculum(Gouëdard, Pont, & Huang, 2020; Looney, 2011a; NCERT, 2005). Some examples of competencies include critical thinking, argumentation, information-gathering, and self-management (Gouëdard, Pont, & Huang, 2020). The following text box obtained from Looney (2011a) provides some more examples of how competencies have been conceptualized in other countries. Competencies are embedded in the aims of the curriculum and have a long-term nature.

Box 2. Defining competences - Selected examples from European Countries

European countries define comprehended in a variety of ways. These different approaches have implications for how learning assessed.

- Austria defines "dynamic skills" (Dynamische Fertigkeiten), which are transversal, and not tied to specific subjects.

- Finland has introduced the concept of "themes" i.e. challenges with social significance.

- France defines the foundation (socie) competences s including both subject-based and cross-curricular competences.

- Germany defines subject-independent, general competences essential for learners personal and working lives. The key competences apply to different subjects and subject areas are useful for solving complex tasks in real-life contexts, and are transferrable to situations not covered in the curriculum.

- Greece has introduced in interdisciplinary cross-curricular thematic framework (DEPPS). Linkage all subjects horizontally.

- Hungary defines competences as "capabilities", values are included in the capabilities (i.e. the capability to understand and apply norms and values).

- In Italy, schools help each primary school student to define his or personal competences in each subject and cycle.

- The Netherlands defines "core objectives" related to specific subjects and "general objectives" (cross curricular).

- Portugal has introduced essential competences – that is the development of skills and attitudes helpful for using knowledge in different situations.

- Slovenia defines key competences in thematic fields (e.g. learning to learn, social skills, ICT entrepreneurship, environmental responsibility, etc.

- Sweden defines "steering through goals", including goals to strive for and goals to be attained. Goals represent a broad range of developmental goals, and cover all aspects of education. Sweden does not use the term "competences".

- Across the United Kingdom and in Ireland, the terms "skills", "core skills" and "key skills" are used. There is a strong emphasis on personal "capabilities" (Northern Ireland) and on the need for young people to become active members of society (Scotland). England emphasis skills for independent thinking creativity, team work and effective participation, and self-management.

Source Gordon et al, 2009

3. Goals

They are statements of curriculum intent that are derived from aims. They are generally medium to long term in nature and phrased in a non-technical language. Goals are framed for broad areas of content and skills in the curriculum(Print, 2020).

In India, goals are defined for each curricular stage in each subject of the curriculum. These goals are called curricular expectations in India and are listed in the NCERT learning outcomes documents(NCERT, 2017, p. xi).

For instance, consider the curricular expectations for EVS in the primary stage (Classes IIIto V): They are as follows:

- Acquire awareness about immediate/wider surroundings through lived experiences on various themes related to daily life, e.g., family, plants, animals, food, water, travel, and shelter, etc.; nurture natural curiosity and creativity for the immediate surroundings.

- Develop various processes/skills, e.g., observation, discussion, explanation, experimentation, logical reasoning, through interaction with immediate surroundings.

- Develop sensitivity for the natural, physical and human resources in the immediate environment.

- Point out and raise issues related to equality, justice and respect for human dignity and rights.

The curricular expectations for science in the upper primary stage (Classes VIto VIII) are as follows:

- Scientific temper and scientific thinking

- Understanding about the nature of scientific knowledge, i.e., testable, unified, parsimonious, amoral, developmental and creative

- Process skills of science which includes observation(s), posing question(s), searching various resources of learning, planning investigations, hypothesis formulation and testing, etc.

- Appreciation for historical aspects of evolution of science

- Sensitivity towards environmental concerns

- Respect for human dignity and rights, gender equity, values of honesty, integrity, cooperation and concern for life

By comparing the curricular expectations for the primary and upper primary stages, it is possible to identify both continuity and change. In both stages, the emphasis on inculcating values such as sensitivity, respect for others' dignity and rights, care for the environment, and a sense of justice remains, although the dimensions of these values deepen in the upper primary stage. Both stages also focus on imparting process skills, but the process skills become more subject-specific in the secondary stage. There is a departure from developing general awareness and generic concepts to developing understanding of subject-specific concepts. There is also a focus on the question of how knowledge in the sciences is generated in the upper primary stage, unlike the primary stage. To sum up, the extent of abstraction in both the content and the processes increases from the primary to the upper primary stages.

4. Learning Outcomes

Learning outcomes are assessment standards or benchmarks for assessing educational achievement (NCERT, 2017). Learning outcomes are derived from aims and goals(Print, 2020). Learning outcomes specify the knowledge, skills, abilities, attitudes, and understanding that learners would have attained after engaging with a relatively narrow area of the curriculum, which may be a unit, module, chapter, or concept (Adam, 2006). To illustrate the scope of learning outcomes, the following Grade 1 Measurement and Data Mathematics standards from the Common Core (n.d.) are provided. As is apparent, the standards cover relatively narrow areas of the curriculum,

attain at the end of a period of instruction in a curriculum (Anderson, et al., 2001). For instance, the Common Core standards depicted above specify that at the end of Grade 1, students should be able to measure lengths indirectly and by iterating lengths, tell and write time, and represent data in simple categories. Thus, learning outcomes set standards for educational attainment in a system.

Measure length indirectly and by iterating length units

CCSMATHCONTENT1MDA1
Order three object by length; compare the length of two objects indirectly by using a third subject.

CCSSMATHCONTENT 1MDA2
Express the length of an object as whole number of length units, by laying multiple copies of a shorter objet (the length unit) end to end: understand that the length measurement of an object is the number of same-size length units that span it without no gaps or overlaps. Limit to contexts where the object being measure is spanned by a whole number of length with no gaps or overlaps.

Tell and write time,
CCSSMATHCONTENT1DB3
Tell and write time in hours and half-hours using analogue and digital clocks
Represent and interpret data.

CCSSMATHCONTENT1MDC4
Organize, represent and interpret data with up to three categories; ask and answer questions about the total number of data points. how any in each category, and how many more or less are in one category than in another

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Source: http://www.corestandards.org/Math/Content/1/MD/

However, learning outcomes are framed in a way that (a) they have been arrived at by broad consensus;(b) they are reflective of the aims of education; and (c) they are flexible enough to allow teachers to use their own methods of transacting the curriculum(Sharma, 2015; Tognolini & Stanley, 2007; Rao & Meo, 2016). In India, NCERT's learning outcomes documents contain the learning outcomes for all the topics in each subject and grade. The following excerpt illustrates a sample of two learning outcomes for Class VIIIEnglish from the NCERT *Learning Outcomes at the Elementary Stage* document (NCERT, 2017).

A Sample of Class VIII English Learning Outcomes from NCERT's *Learning Outcomes at the Elementary Stage*

The learner—
- Respondstoinstructionsand announcements in school and public places viz., railway station, market, airport, cinema hall, and act accordingly.
- Introduces guests in English, interviews people by asking questions based on the work they do.

A revised version of Benjamin Bloom's taxonomy of cognitive, affective, and psychomotor domains provides a useful framework for writing learning outcomes. Action verbs providing evidence of measurable and demonstrable learning at various levels of cognitive, affective, and psychomotor processes can be used to frame learning outcomes(Anderson, et al., 2001).

5. Instructional Objectives

Learning outcomes can be broken down further into instructional objectives. According to Anderson, et al. (2001), the scope of instructional objectives is to teach and test "narrow day-to-day slices of learning in fairly specific content areas" (p. 16). There is one word of warning. Instructional

objectives must not be conflated with a single teaching activity or an assignment topic. Instead, an instructional objective can be addressed in many ways through classroom activities and assignment topics. For instance, the following excerpt from the Principal's/Teachers' Consultation for CBSE Learning Standards frameworks(CBSE Academics & Trainings, 2022)illustrates how a learning outcome can be broken down into instructional objectives.

Content Domain, Chapter, Key concepts (Chemistry – Class X)	Learning Outcomes – NCERT	Content Domain Specific Learning Outcome	Instructional Objectives
Materials Chapter 5 – Periodic Classification of Elements Key Concepts Classification of elements –Dobereiner's triads, Newlands' law of octaves, Mendeleev's Periodic table, Modern Periodic table; Position of elements in the modern periodic table, trends in the modern periodic table – atomic size, valency, metallic/ non-metallic character.	Explains processes and phenomena, such as nutrition in human beings and plants, transportation in plants and plants, extraction of metals from ores, placement of elements in modern periodic table, displacement of metals from their salt solutions on the basis of reactivity series, working of electric motor and generator, twinkling of stars, advance sunrise and delayed sunset, formation of rainbow, etc.	Explains the features of modern periodic table and reactivity of elements based on their position in periodic table.	Explains the arrangement of elements in Modern Periodic Table based on increasing order of atomic number. Explains periodicity of properties of elements like atomic size, valency, metallic character across periods and down groups in the Modern Periodic Table. Explains how the reactivity series of metals is linked to their atomic structure and position in the Modern Periodic Table.

Definitions of Key Terminologies

Aims are broad, non-technical and encompassing statements of curriculum intent and are long-term in nature (Print, 2020). They specify the end results of a long period of schooling and often reflect societal aims and desires (Print, 2020).

Competencies can be understood as broad and domain-general sets of knowledge, dispositions, and skills required for attainment in all domains of the curriculum(Gouëdard, Pont, & Huang, 2020; Looney, 2011a; NCERT, 2005).

Goals are statements of curriculum intent that are derived from aims(Print, 2020). They are generally medium to long term in nature and phrased in a non-technical language(Print, 2020). Goals are framed for broad areas of content and skills in the curriculum(Print, 2020).

Learning outcomes are specific statements of curricular intent that are derived from aims and goals(Print, 2020). Learning outcomes specify the knowledge, skills, abilities, attitudes, and understanding that learners would have attained after engaging with a relatively narrow area of the curriculum, which may be a unit, module, chapter, or concept (Adam, 2006).

Instructional Objectivesare statements of curricular intent whose scope is to teach and test "narrow day-to-day slices of learning in fairly specific content areas" (Anderson et al., 2001, p. 16).

Some Caveats Associated with Standards-based Systems

In theory, standards-based systems have a revolutionary approach of alignment for focusing the efforts of all stakeholders in an education system and hence increasing the system's efficiency. However, there are some caveats associated with standards-based systems. As India is moving towards a standards-based education system, it will be useful to have an understanding of certain issues that hamper the efficacy of such systems. Many of these caveats are based on research that has happened in the United States and have been discussed far more elaborately in Hamilton, Stecher, and Yuan (2008).

To begin with, defining standards has been difficult, and efforts to define standards have been contentious. Reaching consensus for criteria on evaluating standards has also been difficult. Thus, there is a need for robust mechanisms to develop and evaluate standards.

In many states in the US, high-stakes, annual standardisedtests are given to students of certain transition grades. These standardisedtests have been criticisedfor testing low-level and easily assessable areas of the curriculum, as opposed to the more cognitively challenging standards. The narrowness of testing has implications for the validity of inferences about student attainment with reference to standards.

The results of standardisedtests have high stakes for teachers and administrators in a school (Bellwether Education Partners, n.d.). Schools that underperform consistently across years are subject to various interventions based on the duration and extent of their underperformance. Reforms can range from district intervention in terms of training and staff support, to replacement of school leadership and teaching staff, to conversion of public schools to charter schools, and, finally, school closure (Bellwether Education Partners, n.d.).

There is some evidence that these accountability provisions have helped improve school performance. However, they also create pressures for teachers to "teach to the test". Teachers may focus more on test performance than performance relative to standards. So, they may rely on strategies like familiarisingstudents with item formats, focusing on widely tested standards, and using drill-and-practice methods. Administrators may also direct more funding and support to the widely tested subjects and curricular areas and neglect those that are important but don't feature in high-stakes assessments. Thus, high-stakes tests have a distortionary effect on teaching and classroom instruction in a standards-based system.

Conclusion

The central idea of standards-based systems is to define standards, which are expectations of learning from students. Standards are the criteria against which the performance of students and stakeholders will be measured, and they are defined in such a way that they articulate the same expectations for everyone while, at the same time, providing stakeholders with flexibility in materials and methods for meeting those expectations. Thus, standards ensure equity, accommodate diversity, and allow for autonomy at the same time.

Standards-based systems have many features that make them desirable for improving the quality of education. The idea is that pegging student achievement and activities of stakeholders ensures that education systems achieve their aims efficiently. However, for standards-based systems to work well, standards should be defined clearly and coherently. High-stakes assessment should not distort the activities of stakeholders or provide misleading pictures of student achievement either. Standards-based systems should achieve a good balance between accountability and support to work.

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Vision of Science Education in National Education Policy-2020

Mamta Singhal*
Manisha Wadhwa**

Abstract

Science and technology have profound impact on our lives. The advancements in the various fields of science such as telecommunication, medicine, agriculture and energy on one hand have made our lives easy but at the same time have resulted in environmental degradation and other concerns related to health and mental well-being. Our education system has a crucial role to play in understanding and addressing these concerns right from the beginning of school education. It is well understood and emphasised in several policy documents that all citizens should develop a scientific temperament, possess basic process skills and knowledge of scientific concepts in order to make informed and meaningful choices in the situations concerning science, technology and society. This ability is also called scientific literacy. National Education Policy (NEP) 2020 has envisaged bringing major educational reforms to achieve the Sustainable Development Goals (SDGs) of Agenda 2030. This paper discusses the vision of NEP 2020 with respect to science education in schools and how our education system can possibly contribute towards making scientifically literate citizens and achieving the SDGs of Agenda 2030.

Key Words: National Educational Policy, Science Education, Scientific Literacy, Scientific Temper, Experiential Learning

Introduction

On May 16, 2020 a channel, TV9 aired a story about dangerous and infected tomatoes. The news video titled Mystery Virus in Tomatoes was widely circulated through various social media groups. It was claimed that a new version of coronavirus will be transmitted to humans if they consume infected tomatoes. Covid 19 is transmitted through person to person. When an infected person coughs, sneezes, talks or breathes within six feet or shakes hands with any other person then the infection (virus) is transmitted to another person. Then at that time (April-May 2020) it was also understood that Covid 19 is also transmitted by touching contaminated surfaces (like lift buttons or tables). This news suddenly added another angle in people's thought that Covid 19 can be transmitted by eating tomatoes. It had an impact on the market (for a few days till the time it was countered) and people stopped buying tomatoes. A lot of people believed random news without questioning any data or verifying findings. It is not only a single instance, there are many instances when people circulate fake news and morphed videos. Most of the people in this chain of forwarded messages believed those to be true. Dr Tedros Adhanom Ghebreyesus, Director General, WHO, said on February 15 2020, that "fake news travels faster and more easily than this virus and is just dangerous;

* Assistant Professor, IHE, DU, Email: manishaw@aditi.du.ac.in
** Associate Professor, AM, DU, Email: mamta.singhal@ihe.du.ac.in

…. we are fighting an *infodemic*". According to Merriam-Webster dictionary "*Infodemic* is a blend of 'information' and 'epidemic' that typically refers to a rapid and far-reaching spread of both accurate and inaccurate information about something, such as a disease. As facts, rumours, and fears mix and disperse, it becomes difficult to learn essential information about an issue." In this world of information explosion, why are we unable to differentiate between accurate and inaccurate information? Why is it that we circulate or forward information without verifying its authenticity? It seems the spirit of scientific temper is not developed through our educational processes.

Pt. Jawaharlal Nehru in his book *The Discovery of India* said that, "scientific temper is the refusal to accept anything without testing and trial, the capacity to change previous conclusions in the face of new evidence, the reliance on observed fact and not on preconceived theory". Constitution of India under Article 51A (h) states, "It shall be the duty of every citizen of India to develop the scientific temper, humanism and the spirit of inquiry and reform. It shall be the duty of every citizen of India to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem."

The Curriculum for the Ten-year School — A Framework (1975) focused that the science curriculum at the upper primary level should be integrated and "should provide enough opportunities to learners to attain some basic levels of scientific literacy". Thus, science along with skills of scientific temper should also focus on developing scientific literacy.

In India science is a compulsory subject till Class X. One of the aims of Science Education at school level is to "acquire the skills and understand the methods and processes that lead to generation and validation of scientific knowledge" (*Position Paper on Teaching of Science,* NCERT, 2006). It implies that curriculum, classroom transaction, and learning spaces within the school setting should focus on creating opportunities for learners to innovate and verify the given facts and theories and be scientifically literate. Who is a scientifically literate person? What is the vision of National Educational Policy 2020 on Science Education? How can these issues be addressed?

Scientific Literacy and its Importance

The term 'scientific literacy' was coined in the late 1950's and since then, various conceptual definitions, purposes and ways of assessment have been suggested by science educators, researchers and policy makers. In the most common sense, a scientifically literate person possesses the basic knowledge of scientific concepts, has necessary skills and scientific attitude to use science and technology in an informed and meaningful manner. The Organization for Economic Co-operation and Development (OECD) conducts an international assessment for Mathematics, Science and reading for different countries worldwide. This test is known as Programme for International Student Assessment (PISA). It assesses students across nations on aspects beyond academic achievements. PISA (2015) defined scientific literacy as "the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person, therefore, is willing to engage in reasoned discourse about science and technology which requires the competencies to: (1) Explain phenomena scientifically: recognize, offer and evaluate explanations for a range of natural and technological phenomena. (2) Evaluate and design scientific enquiry: describe and appraise scientific investigations and propose ways of addressing questions scientifically. (3) Interpret data and evidence scientifically: analyse and evaluate data, claims and arguments in a variety of representations and draw appropriate scientific conclusions."

PISA believes that every individual should be able to think scientifically about the evidence they encounter in their real-life challenges. Students are required to use the knowledge that would be gained from the

science curriculum and apply it in novel and real-life situations.

Scientific literacy has been advocated as one of the most significant goals of science education across the world. National science education standard overview (NRC, 1996) states several reasons for promoting scientific literacy for all Americans:

- We need scientific information to make choices in our daily lives.
- Important issues that involve science and technology require informed public debate.
- The collective decisions of an informed citizenry will determine how we manage vital natural resources, such as, air, water, and forests.
- There is personal fulfilment in understanding how the natural world works.
- Science contributes to vital workplace skills of decision-making, creative thinking, and problem solving.
- To compete on a global scale in the world market, we need a capable citizenry.

In Indian context, the need to promote scientific literacy has been explicitly stated by various policy documents. National Curriculum for School Education 2000 talked about teaching of 'science and technology' in place of 'science' at upper primary and secondary stages so as to familiarise learners with various dimensions of science and technological literacy. NCF 2005 further emphasised the distinction between science and technology and how technology and science are related to each other. It mentions that our progress is linked with advances in science and technology. It clearly stated scientific literacy as one of the guiding factors of teaching science at the upper primary and secondary stages.

Further NEP 2020 states that "the purpose of the education system is to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical moorings and values." It emphasises that there should not be any hard separation between arts and science; curricular and extra-curricular; and academic and vocational spheres. The constitutional values like empathy, respect for others, cleanliness, courtesy, democratic spirit, spirit of service, respect for public property, scientific temper, liberty, responsibility, pluralism, equality, and justice should be of great importance and individuals must think critically and logically to bring and achieve sustainable development. The policy also aspires to focus on developmental goals of the 21st century including Sustainable Development Goals of Agenda 2030. While SDG 4, that is, access to inclusive and equitable quality education is the prime focus of NEP 2020, the other SDGs such as, SDG 3 — good health and well-being; SDG 6 — clean water and sanitation; SDG7 — affordable and clean energy; SDG 13 — climate action directly relates to scientific literacy and have been emphasised in the policy at several places. The policy acknowledges that with the growing advancements in science and technology there may be high demand for skilled workforce trained in multidisciplinary fields of science, social science, humanities along with specific abilities to deal with machines, data science and artificial intelligence. It also mentions that the entire education system may have to be re-configured to support and foster learning so that all the targets and goals (SDGs) of Agenda 2030 can be achieved.

With so much of focus on integration of science and technology with societal need and sustainable developmental goals for future, it becomes imperative that science classrooms in our country are ready to embrace these changes. While the changes would affect all levels of education including higher education, the changes in school education are of prime importance as all citizens need to develop the fundamental understanding of their role in society and should be able to contribute meaningfully and productively towards a sustainable

environment for the future generations. In fact, NEP 2020 has specifically highlighted that we need to understand and address the issues concerning climate change, pollution, depleting natural resources and outbreak of epidemics and pandemics with collaborative research in social and scientific spheres.

Despite understanding the importance of scientific literacy and its mention in various policies, the situation at the ground is not very encouraging. As per the assessment conducted by PISA-2009, India has not done very well in this regard. PISA aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students who have completed the end of their compulsory education. It is designed to assess how well they can apply what they learn in school to real-life situations. Over 90 countries have participated in the assessment so far, which has taken place at three-year intervals since 2000. India participated in the PISA test in 2009. In this test of PISA, students from Himachal Pradesh and Tamil Nadu sat for the test, and India ranked 72 out of 73 countries. This kind of scenario surely asks for a reflection and action so that scientific literacy does not remain a distant dream. The PISA test is unlike any school examination which is mainly focussed on content learnt in classroom through specified textbooks; rather it focuses on the application of skills and knowledge in real life situations. It intends to assess students' overall ability to solve problems, take action and preparedness for the future. This goes beyond their academic achievements. In the context of scientific education, a test like PISA is clearly related to assessment of scientific literacy. Scientific literacy is basically related to persons' ability to use their knowledge and skills in solving real life problems and take informed decisions about various socio-scientific issues like global warming, health, environment, etc., which are also the themes under SDGs. The poor score of Indian students in PISA is a reflection of lack of scientific literacy among them and suggests that our science curriculum, pedagogy and

assessment need to be oriented towards building scientific literacy. Certain aspects of NEP 2020 resonate well with the idea of extending scientific knowledge for addressing issues related to health, environment and disaster management. Also, the policy has indicated the use of indigenous knowledge as well as technology integration in science teaching which seems to be a positive step towards adopting a more flexible and context driven system.

Below is an attempt to capture the essence of NEP 2020 with regard to science education in India.

NEP 2020 and Science Education Experiential learning

National Education Policy (NEP 2020) advocates experiential learning. It is learning through reflection and doing. The idea of experiential learning in the modern context was given by Kolbe (1970), which was influenced by the works of John Dewey and Jean Piaget.

Let's take classroom examples in which learners are expected to identify good conductors in their homes.

Case 1: Learners follow the instructions of the teacher and set up a circuit. They test the given objects and classify those into conductors and insulators. They record their findings in their notebook.

Case 2: Learners set up the circuit using their previous knowledge of flow of electric current and electrical circuits. Then, they make a list of things they would like to test. They predict the nature of each object before passing electric current through them. After that they conduct the experiment and see whether their predictions were right or wrong. Then they reflect on findings like why is tap water a good conductor of electricity and bottled water is not?

In the first case learners are doing experiments and learning science process skills – —observation, classification and recording. While in case 2, learning goes beyond the 'hands=on experience'. Here

learners are thinking and reflecting on the findings, questioning results. In the words of Martin (2003) it is also called a 'hands-on minds-on' approach. NEP has emphasised the need of reducing the curriculum load so that focus in the classroom can be shifted from dissemination of information to conducting inquiries, discussion, discoveries in the classroom; thus, promoting experiential learning and thereby making spaces for critical thinking and rational thought and developing skills like problem solving, computational thinking, scientific temper and hence, scientific literacy. Experiential learning is not essentially doing the experiments but using learners' experiences to not only verify the existing fund of scientific knowledge but also to question it if needed. The specific experiences of learners coming from diverse backgrounds should find a place in the classroom and they should be used to enrich the textbook knowledge. For instance the experiences emerging from agriculture sector in different landscapes should integrate with the textbook chapters on plants in both science and social science books thus helping the learners to not only learn what about basic concepts of photosynthesis, nutrition and reproduction in plants but also to enable learners to reflect upon and contribute towards issues concerning agricultural practices, environmental concerns, use of pesticides, socio-economic condition of farmers and future course of action.

Flexible and Multidisciplinary Approach in Curriculum

In the current education system subjects are classified in different streams – Sciences, Arts (Humanities) and Commerce. Students who have opted for commerce should study the subjects — Commerce, Business Studies, Accounts and Economics with or without mathematics. Under no circumstances can they opt for biology or political science, as these subjects are different cohorts. NEP (2020) has advocated this kind of flexibility to students that understanding of biology or political science cannot be limited to only one particular group of students. Thus, students can choose subjects as per their interest and also the difficulty levels (core or advanced). In Section 11.3, the policy has advocated for multidisciplinary education, without any hard separation between subjects. Such an approach will change the current nature of undergraduate education programmes in the country. Its implementation would mean that students studying science can opt for history or music or any other subject, depending on their interests and abilities. At the same time, they can even decide the level (core or advanced) and rigour (major/minor) of that subject. In today's rapidly changing world, choices of subjects cannot be restricted. The policy also emphasised on introducing new subjects like Artificial Intelligence, Design Thinking, Organic Living and Environmental Education. All these are offshoots of sciences and linked to various professions. For instance, nowadays everyone is expected to have basic knowledge of science concepts associated with our lives. For example-should genetically modified foods be introduced in the Indian market? Should India promote growing crops like jatropha for fuels? Is organic farming sustainable considering the larger areas of land requirement? Would a plastic ban lead to increased deforestation?

It is only possible when flexibility is given to students in choosing disciplines and also at the same time science education should focus on scientific literacy. With this flexibility available to students, curriculum developers need to design courses as per their requirement. Student who would like to pursue research in science and technology will study a different course when compared to students who would like to make informed decisions about science and technology in their everyday lives. The implementation of such decisions will not be easy, especially in our country where every student is used to study the same course. The implementation will focus on providing a basket of courses as the need, ability and interest of learners.

Blend of Traditional and Modern Knowledge

Have you heard of the name of Mokshagundam Visvesvaraya (also known as Sir MV) or Dr Muthulaksmi Reddy? Sir M Visvesvaraya (1860- 1962) was a civil engineer and designed the water supply and drainage system of several cities in India. He designed and patented automatic water flood gates for reservoirs. It was first installed at Khadakvasla, Pune. Dr Muthulaxmi Reddy (1886-1968) was the first woman student in the medical college. She was the first woman surgeon appointed in Government Maternity and Ophthalmic Hospital Madras. In the history of India there are numerous Indian scientists (some of them are —Ancient India: Bhaskaracharya, Shustra, Kanak, Aryabhata; Modern India: Jagdish Chandra Bose, Satyendra Nath Bose, Meghnad Saha, C.V. Raman, Har Govind Khurana, Vikram Sarabhai, Homi Bhabha, Salim Ali) whose contributions, if incorporated in curriculum and textbooks will develop a sense of pride among learners. Such "knowledge of India' as emphasised in NEP, 2020 will develop a sense of appreciation for the country among learners.

In another example from history of science, some tribes in India (Bengal) were practicing 'inoculation' to prevent smallpox in the tenth century (Fenner etal., 1980). It was much before Jenner discovered vaccination (1896) for it. These tribes used to collect pus from individuals suffering from smallpox, keep it for a year and then inject it into healthy people. They had noticed that people thus inoculated got a mild fever but never suffered from smallpox. Through their experience and observation, they had discovered the process of inoculation. Reading and understanding such tribal knowledge would promote indigenous and traditional ways of learning. The policy has also suggested a separate course on Indian Knowledge system and inter-state cultural exchange programme at the secondary school level. These curriculum and methodologies would develop a sense of

tolerance, diversity and pluralism among learners.

Focus on Health and Hygiene

The Sustainable Development Goal 3 (SDG3) focuses on good health and well-being of individuals and SDG 6 emphasises clean water and sanitation. These goals will be achieved if we focus on developing concepts of health, mental health, good nutrition, personal and public hygiene, and sanitation that are linked to the practical situations in life. We need to understand which water is fit for drinking? What are the standards of drinking water? Industrial effluent pollutes water. If this kind of polluted water is used for growing vegetables, then it is like a slow poison for the health of individuals. All these are complex questions which require a clear understanding of scientific concepts and informed decision making. It is only possible when the science curriculum focuses on real life issues and makes students understand linear cause-effect relationship does not exist. All concerns (whatever they may be — use of plastic in our lives, loss of biological diversity, rising air pollution levels in cities, climate change, natural disasters etc) have multiple perspectives. Only science and technology can offer solutions to the problems the world is facing today. It is of utmost importance that science education develops open mindedness, inquiring minds and scientific literate learners.

Textbooks with Local flavour and Content

If science textbooks have too much content to be covered in an academic year, then there is a pressure on students and teachers to complete the entire syllabus before the examination. Teachers and learners resort to the lecture method and memorise content in the textbook. This methodology of teaching (classroom interaction) reduces the spaces for experimenting, inquiry and discussion. For developing conceptual clarity

in learners, it is of utmost importance that fewer concepts with greater depth be taken up at each level of schooling. The Yashpal Committee report (1993) emphasised the idea of reducing the academic burden of content load on learners. The report was instrumental in reducing content load but still a lot of rethinking is required on further reducing the too much information given in science textbooks. NEP 2020 advocated reduction in content of textbooks with local contexts. The multidisciplinary and integrated approach may be quite helpful in this direction. For instance, the concepts of science and social science at least till middle school are overlapping and a theme-based approach to concepts may be used instead of subject based approach. A common example is that of 'water cycle'. The concept is taught is science by explaining the processes like evaporation, condensation and precipitation. Through a very simplified process, children are explained that rain occur due to water cycle. The process of evaporation and condensation results in the formation of clouds which when become heavy pour in the form of rain. A lot children ask questions like, why does it rain more in certain month(rainy season); Why certain parts of the country have more rainfall then others?; If evaporation and condensation is happening every day especially in costal areas, why does it not rain everyday. The science teachers often do not deal with questions and tell the children to ask these in their social science(geography) class. Such as fragmented approach not only hinders the acquisition of concepts in holistic manner, it also increases their curriculum load.

The section 4.6 of the policy focussed on pedagogies that "must evolve to make education more experiential, integrated, inquiry-driven, discovery-oriented…" It is only possible when any inquiry is based in the context of the learner. For instance, learners are able to relate to the biodiversity more if they are living in and around forests. Probably they know much more than the content given in the textbook. In such situations, pedagogies should be discovery oriented or project work or case studies. Such kind of local flavour to the content given in textbook will make learning more meaningful to children. The other argument in favour of reducing content load often cited is that it is not possible to teach everything and everything to learners. There is information overload. The need of hour is to reduce the information basedcontent in the textbooks and to focusmore on development of 21st century skills like critical thinking, logical reasoning, decision making among learners.

Transforming Assessment

Teaching, learning and assessment are essential components of education. Any change in one component will influence the other. If information is disseminated through teaching, then learning would be rote memorization and assessment would be done through recall-based questions. In science if we would like to focus on experiential learning then our questions should be assessing skills of critical thinking, logical reasoning and other higher order skills. NEP (2020) advocates the idea of adaptive/ formative system of assessment wherein students will be assessed on various dimensions making the assessment more holistic andalso in a continuous manner.Also, the progress card of the learner should be reported in a manner that it covers all aspects of learning and also makes sense to parents and students. In the words of NEP(2020) it should be "holistic, 360, multi-dimensional report card". The source book on assessment (2008) also focussed on meaningful reporting of progress of learning to different stakeholders. With reference to science, the report card should mention how learners have made progress in different skills – observation, classification, communication, experimentation, prediction and estimation and others.Thus, there is an urgent need to make assessment multi-dimensional by using project work, laboratory work, case studies and field work in addition to classroom based paper-pencil test.

Inclusion in Science Education

One of Focus areas of NEP (2020) has been ensuring inclusion at all levels including gender, persons with physical and learning disabilities and socio-economic disadvantaged groups. The spirit of inclusion has to been embraced by making structural and philosophical reforms in our education systems. The NEP (2020) talks about making various provisions such constituting a gender inclusion fund, identifying special education zones where schemes for SEDGs (socio-economic disadvantaged groups) could be implemented and implementation of recommendations of Right of persons with disabilities(RPWD)2016 act for inclusion and equal participation of children with disabilities in ECCE and school education. NEP(2020) also suggests measures like organizing activities/ workshops in the form of clubs, called 'science circles' for encouraging and motivating students to participate. Such circles may provide supplementary enrichment materials and hands-on activities for engaging learners in science.The other suggestion is to provide free boarding facilities for girls on the line of Jawahar Navodaya Vidyalaya. Moreover, it is also important to sensitise teachers that they do not discriminate between boys and girls in their participation in activities. They need to ensure that girls do take interest in science and motivate them to opt for science courses in school and in higher education.

It is very much needed that the science classrooms embrace and align with this spirit of inclusion. It is commonly witnessed that science education knowing or unknowingly keeps certain social groups at the margin. For examples persons with physical or learning disabilities are usually negligible in science classroom especially at higher education as they not considered fit for research and field work that might be required in science. NEP (2020) has emphasized the importance of using assistive technologies and software, special textbooks and training of teachers to overcome all barriers to inclusion. All India Higher Education Survey (AIHES, 2018-19, pp38) showed that number of females per 100 males are 70 in Bachelor of Computer applications, 79 in Bachelor of Pharmacy, 106 in Bachelor of Sciences, 40 in Bachelor of technology and 54 in Master of technology. The low number of female enrolments in professional science and related courses at higher education is worrisome. PISA report (2015) on learning achievement of 15 years old found that boys and girls perform at similar levels. This result was the same across 40 countries under study. There is a need to challenge the prevalent stereotype that boys perform better in sciences and mathematics.

The question however is the successful implementation of all provisions and most importantly changing the mind of all stake holders including teachers, administrators and society at large.

Conclusion

National Education Policy (NEP-2020) has set very ambitious goals which are not limited to immediate and national concerns but are in alignment with sustainable development agenda of 2030. The policy seems to resolve the social and environmental concerns through educational reforms. It also acknowledges that the relentless advancements in the field of science and technology demand collaborative research and integration of science and social science. NEP (2020) has proposed flexible curriculum to make it possible but the question is whether the infrastructural and human resources would support this change and what shall be done to make it successful. The policy has also highlighted the significance of blending traditional knowledge with modern scientific knowledge. From the point of view of science classrooms, it would mean changes in textbooks and pedagogical approaches which should not become lopsided. It would require focus on an important dimension of scientific literacy called "cultural scientifc literacy" but at the same scientific temperament and

spirit of inquiry should prevail. Inclusion is another significant aspect of NEP 2020 and concrete steps like making institutions in terms of physical infrastructure, curriculum and pedagogies accessible to differently able learners needs to be taken to make it possible especially in the context of science education.

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Private School Culture and Pedagogical Practices: Glance into EWS Children's Experiences

*Ashu Kapur**

Abstract

The emerging trend of proliferation of private schooling in India forces to reflect on the confluence of elitist private school culture, teaching-learning discourse and Economically Weaker Section (EWS) or disadvantaged children's class-cultural conundrums within the school space. It has important implications for tiling the pathway for inclusion of disadvantaged children in the private school ambit, considering the provision in the RTE Act, 2009 for inclusion of 25 per cent children from disadvantaged sections in unaided private schools. This paper is an attempt to interpret the socio-cultural confluence of private school culture, teaching- learning processes and class-cultural specificities embedded in disadvantaged children's experiences as unravelled in private school setting.

Introduction

The Indian education system is one of the largest systems in the world, catering to millions of children each year. Fundamentally, it is largely a divisive school system that engulfs India's educational space with parallel co-existence of public and private school system cutting across differing cultures, student population, fee structure, etc. The shifting trend towards private school education is not just an Indian phenomenon, but such that is palpable worldwide, hinting towards private schools emerging as a popular choice among parents. A discourse on current trends of schooling in India indicates towards complex web of privatization, school choice, and social- class cultural distinctions used as axes to understand the enmeshed school choice discourse. The boundless hopes that private school education instil in parents who seek upward mobility and life-changing impacts by making their children study in English-medium private schools is consequential to the preference for private

school education that has burgeoned to cut across different social class strata. One can easily ascertain the indispensable role that private schools have commenced to play in the education sector by having a glance at the soaring numbers in which they exist. Noting the remarkable shift, the District Information System of Education (DISE) data (2015-2016) on percentage of schools by management reveal that nearly half of the schools in Delhi are privately managed; i.e. out of 5655 schools in Delhi, 46.38 per cent of schools fall into the category of private unaided schools (NIEPA, 2016).

With the advent of Right to Education Act (2009), and the provision of section 12 (1) (c); "25 percent reservation is provided for children from disadvantaged sections in private unaided schools". It is contended that by making 25 per cent reservations for EWS children in the private schools, the popular perception is that State is extending a 'fair chance to the children from weaker sections. However, ambiguity looms large over the implementation of the Section 12 (1)

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* Academic Consultant, NESTS, Ministry of Tribal Affairs, Government of India,
  Email : ash_rhyme22@yahoo.co.in

(c) at the grassroots intending to bring parity and equality of educational opportunity for children to gain quality education. Certainly, it has resolved a proportion of the problem by opening the doors for the economically weaker sections, who till now were standing on the periphery; however, still fundamental struggles persist which necessitate immediate reflection and redressal.

Characterisation Of School Culture And Climate

The word culture can be understood in several ways. Culture teaches any person to make sense of the world and its ways which would not have been possible otherwise. Theorizing about culture, Geertz (1973) states, "Undirected by cultural patterns- organized systems of significant symbols- man's behaviour would be virtually ungovernable, a mere chaos of pointless acts and exploding emotions, his experience virtually shapeless" (p. 167). Sociologists tend to view the formal school system as an abstraction, the layers of its abstraction getting concretized by way of understanding how this abstraction incarnates in a particular social setting. The particular act of symbolizing or attaching specific meanings to things or events has several implications in every sphere of life; schools being no exception. Culture of an organization can influence its productivity, leading towards life-changing impacts for its members. Few researchers who have studied the impact of school culture and its effectiveness reveal how such culture has its impact on students' achievements and effectiveness (Fyans & Mehr, 1990). Researchers cite the link between organizational climate and school culture with school effectiveness as direct. Since, the term organizational climate and culture may appear vague and elusive, it becomes pertinent to operationally define it for the sake of empirical data collection. For the study, the culture and ethos of the private unaided school was described under broad heads, namely— schools'

physical layout, admission process, vision and philosophy, space-time sites, and its classroom processes.

Research Design And Methodology

The study is contextualized in 'naturalistic qualitative frame' with the intent of locating the research work in the everyday life of the field i.e. private unaided schools of Delhi. Qualitative research has been metaphorically conceived as *"an intricate fabric composed of minute threads, many colours, different textures, and various blends of material"* (Creswell, 2007, p. 34). The study was designed within the concords of the similar metaphorical definition of 'qualitative research' as shared above, taking an interpretive stance of 'critical analytic perspective.' The study is an ethnographic exploration, where the focus has been to ascertain an in-depth account of the events, relationships, experiences, interactions, and processes occurring in the field naturally. It is recognizable that *"human beings interact in diverse and dynamic environmental socio-cultural settings; consequently their behaviour cannot be understood without examining these varied relationships"* (Van Dalen, 1979, p. 295). In the aforementioned context, attempt has been made to understand the nature of interaction between things and people concerning school ethos, processes, pedagogic interventions, peer relations, parents' expectations, teacher's perceptions, children's aspirations, so on and so forth.

Data Collection And Research Methods

The choice of the schools as falling under the ambit of 'private unaided' was specific as the purpose was to understand the school experiences of EWS children in the light of the provision 12(1) (c) of RTE Act. The participants of the study include school heads, parents, teachers, and children. In all, there were 20 participants who shaped the present research study. Sample of Schools— Two private unaided schools have been chosen for

the present study. Sample of Grades— One section each of Grade VIII was chosen for the present study. Sample of EWS children— Six EWS children studying in Grade VIII of both the schools have been chosen for the present study. Sample of Parents— The parents of all six EWS children participated in the study. Sample of Teachers— Six teachers (one class teacher and two subject teachers of each of the sample class) were chosen for the present study. Sample of Administrators— Principals of both the schools were chosen to be part of the present study.

It is widely acknowledged that interpretive methodologies are but one way of telling the stories about society, phenomena, culture or lived-reality, and every methodology just tells the different kinds of stories (Denzin and Lincoln, 2000). They rightly affirm that *"there is no correct telling of the event…Each telling, like light hitting a crystal, reflects a different perspective on the incident"* (ibid. p. 6). Since, there were layers of meanings surrounding the school culture and EWS children's school experience, the choice of qualitative research methods seemed most appropriate and suitable. Since, each method is appropriate for acquiring particular set of data; out of all the qualitative for data collection, it was Observations, Interviews and Narratives were used generate varied interpretations of how children made sense of their schooled world. These methods yielded rich and comprehensive data collected from the field which aided to look at the phenomena from different angles. This also allowed for 'methodological triangulation' that brought authentication to the research results.

Interpretive Discussion Of Findings

The literature on high-brow school culture and its effectiveness in fostering the culture of inclusion considering the diverse student population invigorated the research with questions as: What does the private school culture embody? How teaching-learning processes crisscrossed disadvantaged children's notions and experiences of private schooling? How children's socio-economic and class-cultural situatedness interact with school's elite class cultural practices?

The findings of the study as delineated below highlight the social-class-cultural insinuations as a result of crossings between elite private school culture and disadvantaged children's class-cultural backgrounds. The hidden cultural messages unveiled how the school culture personified elitism excluding upper-class children's primary habitus, while being oblivious to the virtual cultural baggage that disadvantaged children carried along to school. Three dominant themes that emerged from data collection hinting towards adverse home-school continuity are spanned below.

- **Deep Structure of School Culture and Climate**

Colossal school building with aesthetically built infrastructure and air-conditioned premises, imitated model of no less than a 5-star hotel adorned with digitized smart-board classrooms, and enforcement of English as a medium of instruction ritualized in the school lending obvious familiarity of language to the majority of upper-class children part of the school. In the word-association tool used to ascertain EWS children's connectedness with the school, the students used the words as "*sapne-jaisa*" (dream-like) which typified their experiences in the school setting.

Immense significance attributed to social class by school became visible through intense admission screening procedures that were followed during the year-round school admissions. The admission criteria fixed by the school invariably focused on culture shared between parents and schools with maximum numbers (while screening) allocated to parents' parental income, and occupation level, thereby emphasising the necessity of viewing home-school relationship as a "strategic one."

The kind of professional and extra-curricular exposure that the school provided by offering Robotics, Animation,

Geospatial Technology, etc. necessitated not just the availability and access to the material/ technological objects such as computer systems, laptops, tablets back at home, but also indicated general know-how and inherited proficiency in operating the same, This invariably, hinted towards disadvantaged children's lack of resources as also familiarity with use of the same.

How the school function to reproduce social-class membership with symbolic elements gets also manifested by adopting different strategies that articulate the school's philosophy and vision to the parents at large who were the schools' favourable clients. The school's vision of creating leaders who excel in the top fields indicated the broad philosophical underpinnings, where the potentialities and capabilities of majority of its children convincingly ensured "elite outcome that lasts lifetime." The school created a social space, where the differences in children's talk, behaviour, and attitude produced different types of "ideal" students in view of both, teachers and principal. The extent to which children were able to internalise school goals and learn what is it that holds value inside the school speaks volume about how in different characterizations, social class differences were played out disguisedly.

At school, certain responsibilities were accorded to a particular set of children and capabilities were determined by children's manifestation of the same in different arenas at distinct stages of schooling. Those who were expected by the teachers to bring laurels that could be showcased and mounted in the school reception's glass-cases were entrusted with most of the key responsibilities, and that could not be a matter of mere chance that none of the EWS children's achievements showcased on wall of fame.

- **School as an Epistemic Space: Function of Teaching-learning Process**

Teaching and learning is what engages teachers and students most inside the school. NCF 2005 places immense stress on the pedagogic practices followed by the teachers inside the classroom so as to ensure optimum learning— that which is meaningful and child-centric. It is essentially the teaching and learning process that assumes centrality in day-to-day school processes. During observations, it was revealed how the exchange of ideas between the teacher and the children from the initial stage of brainstorming to latter stage of explanation of the text saw complete absence of participation by EWS children. For instance, during one of the classes making use of Video Presentation, before the video was played, EWS children were seen to be eagerly looking forward to it; however as soon as the video played, the English accent in which the narrator spoke made it hard for them to grasp the exact words and initiate the process of meaning-making at their end. When asked about their non-participation inside the class, it was shared, *"Maam kuch samajh hi nahi aa raha tha kya bol raha tha woh"* (Maam I was not able to understand anything that he was saying). Although, smart boards were used regularly inside the classroom to induce better learning in children; their relevance in terms of enabling the EWS children to advance learning through different teaching aids stood meaningless because of the teaching contents' class cultural trait. Even during periods of other subjects, the entire teaching-learning process was defined through the lesson plan that the team of subject teachers prepared every fortnight. The lesson-plan was a standardised template designed by the school, to be filled by the teachers adding learning objectives, teaching aids, teaching content, homework and assessment tools without much variation or scope for individual attention and support.

While teachers were engaged in the process of teaching; the learning on the part of the EWS children was not definitive. Most of the times, children were found to be excusing themselves for water or washroom, and even practicing the habitual act of keeping their heads down during lessons. During the teaching-learning process, the teacher

hardly made any attempts to ascertain the EWS child's readiness or interest and just as books were considered sacrosanct in the conventional teaching; lesson plans were meticulously followed without any deviation under the garb of progressive approach that the school claimed to practice; thereby keeping the entire process as disconnected and lifeless for the weaker section students.

As far as teaching within the classrooms was concerned, the teachers were found to be experimenting with the pedagogical practices and the lecture method was not observed to be the dominant teaching method used in the classroom. The teachers took initiatives in creating a participative classroom, where the children were encouraged to actively participate in the teaching-learning process; however such participation was essentially definitive, where only "bright" children (who also happened to be of upper class) were encouraged to share their views and opinions on the topic taught. Observations revealed that no extra focus or special attention or individualised learning was fostered by the teachers inside the class to cater to diverse students' needs. During interviews, the teachers often cited additional administrative burden of maintaining online assessment portals for every student's progress as a barrier to meet the goal of providing inclusive education.

For the teachers, ensuring discipline was more important than experimenting with teaching methods or ensuring individualised learning. The teachers justified their inconsiderateness and indifference to children's backgrounds by labelling children's own disinterest in studies as the root cause of their under-achievement and non-participation. The teachers had found justifications in the children's 'social backgrounds' also which according to them were such that were responsible for the lack of generating any interest or motivation in studies. Non-involvement of parents in children's studies provided legitimacy to indifference of teachers. This way they could shift their responsibility on children

and their familial milieu which according to the teachers clutched children to make any progress inside the school. The teacher-student interaction inside the classroom was strained as the teachers hardly felt any motivation to teach to 'these' children.

The unfaltering emphasis on English language to be used as a medium of communication at each space-time site manifested the school's commitment towards producing a "high-brow" culture. The pedagogic practices emphasising on the use of English as a medium of instruction and interaction at school, which in most significant ways reflected upon the educational pursuits of children who are familiar with the language and demonstrated fluency separating from those for whom English language was as alien as the school set-up.

• **Maintenance of Social–Class functions at School**

To understand how social–class differences were re-produced inside the school, a microscopic view of everyday practices as prevalent inside the schools was done. The private school essentially constituted a homogenous group comprising upper class children belonging to rich and affluent families. Close home-school continuity was discernible as the destinations chosen by children for vacations were more or less same as the ones chosen by school itself. On an occasion, soon after the summer vacation, when the teacher decided to ascertain children's experiences during holidays, brimmed with emotions and excitement the children of the class had so much to share, using optimally the free-flow pedagogic space extended to them. To the same setting there was another sight that showcased a group of children who were muted discretely on that day; complete silence engulfing EWS children. Children's narratives revealed solemn reflections on their holiday experiences to be trivial and inconsequential, and hence not worthy of being shared publicly. In the absence of such an inclusive scenario, the

routinised teaching and learning process inside the classroom became a highly class centric space; a space where children from differential backgrounds and experiences found no space to participate and share their own experiences; as they are not considered legitimate. Their personal knowledge, their experiences, their world-views were pushed out of the brackets of 'normativity' and considered not worthy of providing any insights or contribution to the knowledge pool. What is necessitated in schools is clearly marked by Bourdieu (1990) when he says it is "*the scholarly mastery of scholarly language and know how than practical mastery of the mother tongue and know-how*" (p. 72). When probed later about children's non-participation inside the class, it was shared, "*Meri koi vacation thi hi nahi.... main sirf nani ke ghar gaya tha rehne... woh koi vacation thodi hoti hai*" (I did not have any vacation, I just went to my *Nani* house and that is not a vacation). Elaborating further it was added, "*Aur bache to kaha-kaha gaye... horse-riding... scuba pata nahi kya hota hai woh kiya... main to sirf khela nani ke ghar pura din... stapoo, gallery, maram pitti bas yahi*" (Other children went at so many places... they did horse-riding and scuba I don't know what that is.. I just played all day at grandmother's house). Thus, in children's view, vacation could be defined only in one way as defined, perceived and accepted by the class teacher.

The nature of homework that was given to children was always the most contested terrain for EWS children at school where they used to get daily worksheets in almost all school subjects. So as to enhance children's learning, every week they were given practice questions and activities in the form of worksheets that were uploaded on the children's portal (to be printed by children themselves). Children were expected to get the printouts and paste the worksheets in their notebooks after duly completing the same. This kind of routine homework by the teachers came as a burden for EWS children who did not have computers or printers

at their home unlike other children of the class. As a result, EWS children almost always failed to complete their homework on time; subsequently witnessing guilt and embarrassment when as a punishment they were made to stand at the back of the class (at times even out of the class) due to delayed submission and incompletion of work. The children faced unequal distances from academic culture that was prevalent back at home and at school. While other children had the necessary resources and know-how; the EWS children faced challenges on both the counts.

A complete absence of EWS children from the Olympiads organised by the school in different subjects manifested not only their incapacity to shell out extra-money for the test fees, but also exorbitant investment that such tests call for in terms of amassing competitive books and encyclopaedia which opens the gates for knowledge enrichment. Inside the school, it was the class teachers who prepared the list of children who she anticipated held cognitive supremacy and academic ascendancy for achieving ranks in the Olympiads. Beside, a formal list created by respective class teachers, the other children were also voluntarily invited to seek participation in it. The final list necessarily included names of the subject-wise toppers who happen to be also belonging to the upper-class; besides voluntary participation of middle-class children; invariably leaving out those who were considered academically less-able. The teacher's low expectations from the EWS children made children also internalize the same at different steps of their educational journey.

Conclusion

The findings reveal some ideas in the direction as to how the cultural composite of an elite private school life intersects with the disadvantaged children's experiences at school. The issue of quality of private school education presents different sets of challenges for children belonging to EWS category. *EWS children's every day school*

realities were characterized by their inability to understand the official language of the school; the unavailability of free pedagogic spaces to share their real-life experiences; lack of systemic support provided by school authorities to relieve the economic burden; children's continuous absence from classroom discussions; school teachers' prejudiced assumptions regarding children's socio-economic backgrounds; adoption of conventional or clichéd teaching methods by teachers (even when classroom discussions happen, they cater to "intelligent" children of the class); hegemonic representations of the textbook content; severe disciplinary mechanisms adopted by school adults; archetypal parental aspirations, and so on. The research findings raise crucial questions on two pertinent points; first pertaining to the nature and character of quality education provided by the private schools; and second pertaining to the extent of inclusion of EWS children in these private schools. The findings revealed how schooling becomes an ongoing struggle for EWS children to pave their trails to success. The daily interaction between school experiences of EWS children as "students" inside the schools with their social–class situatedness back at home, clearly brings to the fore a crucial fact that *while state distributed 'free entitlements' to these children as benefactors at the policy level; the schools, at the grassroots refrained from making any systemic or pedagogic interventions to make the illusive dream of 'inclusion' for EWS children possible.* In such a scenario, for EWS children, having access to private schools, was not a meaningful "addition" to their educational strivings. Hence, EWS children's journeys from margins to the core, for it to be meaningful must go beyond their official inclusion in numbers to participatory inclusion in excellence.

The study unveils the hidden class–cultural messages that breed entitlement and entrench inequality, thereby widening the gap between privileged and disadvantaged. This indeed has important implications for recommendation in RTE Act for inclusion of 25 per cent children from disadvantaged sections. For inclusion to go beyond access, and ensure equitable participation and achievement among disadvantaged sections, the private schools need to re-work on their structures, functions, character and culture characterising the expectations inscribed in NEP 2020 to impart inclusive and equitable education.

*Dr Ashu Kapur is an Academic Consultant at NESTS, Ministry of Tribal Affairs, Government of India. She is a researcher and government affair professional and has a decade of experience in the field of education and research. She has also worked at national and international organisations such as, NCERT, National Testing Agency (Ministry of Education), Centre for Assessment, Evaluation and Research (CBSE), and United Nations Development Programme (UNDP).

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Strengthening Teachers' Knowledge of Students' Conceptions in Physics

Shruti Chopra*

Abstract

Understanding learners' constructs about various physical phenomena is an essential part of science teacher's knowledge of teaching. This study explores the entailments of strengthening physics teachers' knowledge of learners' conceptions regarding Thermodynamics and Kinetic Theory of Gases by engaging them in collective reflection on their classroom processes and students' thinking. It was found that despite several years of experience of teaching, the teachers lacked a comprehensive understanding of learners' alternative conceptions, learning difficulties and pedagogical strategies to address students' ideas. The goal of the study was to develop a model for teacher learning through a research-based, content-specific approach to promote teaching practices that is more responsive to developing students' understanding.
Key words: Physics teachers, Thermodynamics, pedagogical content knowledge, alternative conceptions

Introduction

Inquiry into children's thinking about scientific concepts over the last few decades has led to increasing awareness about how children perceive and build internal representations of various phenomenological events (Duit and Treagust, 2012). Recognition of the process of learning as a perturbation in the existing equilibrium through constant interweaving of 'assimilation' and 'accommodation' (Piaget,1976) posit learners at the fulcrum of the teaching-learning process where-in knowledge of their existing ideas is a pre-requisite for teachers to design a pedagogical intervention for conceptual development (Vosniadou et al., 2001). From this constructivist standpoint, teachers are viewed as mediators in the process of child's personal construction of the world by creating creative classroom spaces that enable learners to find their voices (NCF, 2005). Facilitating learning in such a context

requires teachers to familiarise themselves with knowledge of students' specific requirements for learning a particular concept, their alternative conceptions as well as learning difficulties. This knowledge of students is considered to be an essential domain of teacher's knowledge of teaching. It empowers teachers to pick a representation from their representational repertoire that creates dissatisfaction among learners with their existing conceptions, thus, creating conditions for conceptual change.

However, research on teacher knowledge has revealed that they lack a comprehensive understanding of students' reasoning and thinking about science concepts (Magnusson, Borko, & Krajcik, 1994). Considering science as an absolute, uncontested body of knowledge, science teachers often confine themselves to impersonal dissemination of 'fixed' textbook knowledge to learners who, according to them, do not seem to possess any relevant ideas (Scott, 1987).

* Assistant Professor (Science Education), Lady Shri Ram College for Women, University of Delhi
  Lajpat Nagar, New Delhi-110024, Email id: srhythm7@gmail.com

Although such concerns regarding teachers' traditional beliefs and knowledge about science teaching and learning have been articulated in literature (Fives, et al., 2015), no clear pathways have been formulated which promote topic-specific knowledge of learners' thinking among teachers through 'reflection-on-action'. Even in cases where teachers acknowledge the importance of probing students' intuitive ideas, they fail to understand its implications on organising classroom processes. Their own limitations in terms of a lack of comprehensive content knowledge prevent them from designing appropriate pedagogical tasks to address students' learning difficulties (Dawkins, et al., 2008). One of the reasons for such gaps is the failure of teacher education programmes to address content and pedagogy in an integrated manner and encourage teacher learning through inquiry into classroom processes (NCFTE, 2009/10).

In light of the arguments presented above, this study aimed at exploring and strengthening teachers' knowledge of students' conceptions about Laws of Thermodynamics and Kinetic Theory of Gases—a topic that is an integral part of both physics and chemistry curriculum. During my experience of teaching physics, I found learners and teachers struggling to understand the basic tenets of thermodynamics. The absence of hands-on activities in the school curriculum to support the understanding of the complex concepts made it tougher for pupils to comprehend the abstract ideas. Students' learning difficulties and alternative conceptions related to Thermodynamics have been identified in research (eg., Loverude et al., 2002) but little literature exists on teachers' understanding of the students' ideas about these topics. This study recognises the dearth of research in this field and therefore, attempts to contribute in this area by inviting teachers to participate in a research-based programme designed to strengthen teacher knowledge about students.

Theoretical Framework

Research into children's alternative conceptions in science has led to the emergence of perspectives on how children's conceptions interact with new incompatible ideas and result in a conceptual change. Despite disagreements on the process of knowledge construction in science, there has been a growing realisation among researchers and educationists that children's naïve conceptions are not 'wrong' and 'distorted' ideas to be ignored or discarded. Instead, these conceptions, constructed by children using their reasoning and logic, need to be identified and elicited as they serve as important 'raw materials' to introduce a conceptual change towards scientifically accepted explanations. These constructivist perspectives on conceptual change informed the design of the study.

One view on conceptual change, broadly termed as 'knowledge-as-theory' (eg. Posner et al., 1982; McCloskey, 1983; Vosnaidou, 1994; Chi et al., 1994) classifies children's personal constructions as coherent, systematic representations of the world. Drawing parallels between Kuhn's description of progress of science (Kuhn, 1962) and conceptual change, this view argues that a radical change in child's naïve views may happen if the child is dissatisfied with the existing conceptions and finds the new idea intelligible, plausible and fruitful (Posner et al., 1982). Arguing conceptual change to be a gradual process, Vosniadou (1994) proposed a 'framework theory' according to which, children's conceptions are constrained by their underlying suppositions within which they are embedded. When confronted with new information, they may attempt to fit it into the existing underlying suppositions resulting in misconceptions or synthetic models. For example, Vosniadou & Kempner (1993) found that children's presupposition that hotness and coldness is a characteristic of objects constrained the sense they made of their observations of thermal phenomena. The process of initiating a conceptual

change, therefore, requires teachers to identify the existing suppositions underlying their naïve conceptions and design learning experiences that helps learners recognise the inadequacy of the existing frameworks in solving the problem at hand. The other view on conceptual change, termed as 'knowledge as pieces' assumes children's conceptions to be fragmented and discrete elements, organised in the form of cognitive structures called *p-prims* (DiSessa, 1993). It is due to the activation of an alternate p-prim by a child in response to a question that results in a wrong answer. The process of conceptual change, thus, requires the use of instructional strategies that aid in re-organization of the prior notions among children in order to develop a scientific understanding of the natural world (DiSessa, 1993).

It is worth noting that the perspectives explicated above argue against instructional practices aiming at straightforward exposition of scientific facts and emphasise the need for eliciting children's prior conceptions and underlying presuppositions to bring about a shift in their naïve conceptions. Recognising teachers as potential change agents, it emphasises the need to probe and identify pupils' prior notions and beliefs and learn to take their points of view into consideration while designing instructional strategies. By making students aware of their implicit representations, teachers could lead them towards understanding the limitations of their explanations and motivate to change them.

Outline of The Study

Any reform in science education cannot be actualised until it takes into account the perspectives of teachers and students. The study was carried out in multiple phases with 160 students and 30 physics teachers from 19 schools in Delhi as participants. Various methods of qualitative research including interviews, questionnaires, design experiment as well as classroom observations were used for data collection

over a period of two years to develop an understanding of complexities of dynamic educational settings (Kelly & Lesh, 2000). Before probing teachers' understanding about students' ideas, it was important to gauge students' thinking about these topics and identify common conceptual difficulties and alternative conceptions. Therefore, in the first phase of the study, I set out to explore students' conceptions about thermodynamic phenomena from macroscopic as well as microscopic perspective through questionnaires comprising conceptual problems. The attempt was not to record the number of right or wrong answers but understand the reasoning employed by students to arrive at the answer. The responses from 160 students of government and private schools provided insights into their thinking about thermal phenomena and raised the following questions which guided the subsequent phases of the study: Do teachers possess knowledge of students' alternative conceptions? What are their beliefs regarding the role of learners' conceptions in instructional planning? How do these beliefs and knowledge about learners influence classroom processes? To understand how their beliefs and knowledge about students' conceptions shaped the discourse of classroom process, I interviewed the physics faculty teaching in those schools and observed the classroom interaction during teaching of thermodynamics. We engaged in discussion around several issues related to teaching-learning of these topics including core concepts of thermodynamics and kinetic theory of gases that the students were supposed to learn; how students think about the specific concept and different ways used by the teacher to unpack and represent the content to make it learnable. Discussion on topic-specific tasks provided an opportunity to teachers to reflect on classroom processes which helped me gain insights into their beliefs, pedagogical decisions and challenges faced in addressing students' alternative conceptions. It has been found that teachers' stated beliefs

might differ from the enacted beliefs (Haney & McArthur, 2002) due to a variety of reasons including time constraints, paucity of resources, administrative responsibilities, etc. The classroom observations helped me in understanding and categorizing beliefs that teachers deemed central to their teaching-learning as well as the ones that were articulated in the interviews but could not be actualised in practice.

The insights gained from the conversations with teachers and observations of their classroom processes informed the design of the workshop which aimed to empower teachers to collectively build an understanding of students' thinking about thermodynamics through sharing of experiences, critically evaluating their practice, engaging in conversations around students' work and conceptions identified in the first phase of the study and exploring alternate methods to address the erroneous notions. During the course of the nine-day workshop, 30 teachers participated in various content-specific tasks, hands-on activities and inquiry-oriented problems to develop teaching practices that are more responsive to development of students' understanding. We explored the meaning and role of scientific modeling in physics through tasks that called for using models as tools for making predictions and providing explanations. These interactions enabled teachers to reflect on the role of representations in physics teaching-learning to embody objects, interactions and processes. Further, it provided an opportunity to teachers to understand the inherent assumptions in modeling, its possibilities and limitations, thus, helping them to look at textbook representations critically. Several representations given in the textbook were examined for the alternative conceptions they may promote among children if the assumptions are not made explicit. It was noticed during classroom observations that teachers' core belief of viewing Thermodynamics as an abstract, theoretical topic translated into teaching practices involving memorisation

of definitions and practicing derivations. Such beliefs were debunked in the workshop through discussion on problems involving application of thermodynamics in daily life, demonstration of hands-on activities designed to address students' alternative conceptions as well as exploring the affordances of technological tools, such as, Geogebra and Netlogo in helping students model and visualise the behavior of gases and identifying the critical features of the 'object of learning' (Ling Lo, 2012). The teacher-researcher relation visualised in this study was that of scaffolding and conducting collective inquiry into students' responses and ways in which these ideas can be challenged and scaffolded. The goal of this design experiment (Cobb et al., 2003) was to evolve a research-based model from the richness of students' topic-specific ideas and teachers' practices that could serve as a potential exemplar of teacher learning and science teacher education.

Findings & Reflections

NCF (2005) advocates designing of learner-centred pedagogical approaches and relating school subjects to daily lives of the learners. However, changing instructional strategies without taking into consideration 'teacher thinking' would only result in teachers making superficial changes towards using learner-centred approaches in the classroom (Cohen, 1990). The purpose of the present study was to engage teachers in a collaborative inquiry towards reflecting on their beliefs and topic-specific knowledge about learners through a research-based programme. The analysis of students' responses to questionnaires revealed that they struggled to make sense of some fundamental concepts of thermodynamics, resulting in alternative conceptions. Irrespective of the school the students belonged to, they were found to be having difficulties comprehending the concept of thermal equilibrium, relationship between work and heat, multivariate relationships such as the ideal gas law, visualizing the the behaviour of gases

under ideal conditions, etc. This indicated commonalities and overlaps in the nature of conceptual difficulties faced by students across contexts.

Many of these alternative conceptions arose due to erroneous underlying suppositions concerning the concepts of temperature, heat transfer, pressure and the relationship between them. For instance, it was found that students possess an inadequate understanding of the ideal gas law— a fundamental law in Thermodynamics. The ideal gas, PV=nRT defines relationship between four thermodynamic variables, pressure, volume, temperature, number of moles that define thermodynamic state of a system. It was observed that students struggle with multivariable relationships such as the ideal gas law and often consider only two variables at a time. For example, when asked about the change in volume of the gas, one student wrote, "*Volume will decrease because pressure increases*". There was no mention of the variation in temperature during the process. They failed to take into cognizance that for the law to be applicable in this case, the remaining two thermodynamic variables (temperature and number of moles of the gas) must remain unchanged. Similarly, another student commented, "*Pressure will increase because temperature increases*". Here, the student seemed to believe that pressure is always proportional to temperature, irrespective of the variation in gas volume. It was seen that students made a preferential association between the variables depending upon convenience without recognizing the contradiction in their responses.

Moreover, it was seen that students often resorted to microscopic model while offering explanation for thermodynamic phenomena. However, many of these explanations reflected a faulty understanding of the microscopic model. For example, while predicting the reason for change in pressure, a student wrote, "*Pressure will not change as kinetic energy of the molecules is same*". Here, although the student was correct in saying that the pressure would not change,

the reasoning offered pointed towards an incorrect understanding of the microscopic model of gas where it was assumed that any change in (average) kinetic energy of the molecules would always correspond to a change in pressure. This was a very common alternative conception found among students. They seemed to believe that for every thermodynamic process, increase in the number of molecular collisions would forbid free movement of molecules, thus, decreasing the average kinetic energy per molecule of gas. Students' alternative conceptions were identified for other thermodynamic processes as well including adiabatic process and isothermal process.

The insights into students' thinking guided the subsequent phase which involved investigation into teachers' knowledge about students. Teachers' interviews revealed that most of the students' conceptual difficulties were rooted in teachers' inability to comprehend and explain these concepts in the classroom. With regard to ideal gas law, it was found that teachers too, made a preferential relationship between any two gas variables and assumed that pressure being directly proportional to temperature (ignoring change in volume) would decrease. Likewise, students' tendency to think of an explanation in microscopic terms was found to be prevalent among teachers as well with many of them offering explanation of change in pressure in terms of collisions and average kinetic energy per molecule. It was suggested by students and teachers alike that a change in average kinetic energy will always lead to lesser number of molecules colliding with the walls of the container. A teacher claimed, "*Pressure will also decrease. When the temperature decreases, molecules will become less energetic, so they will transfer less momentum in the collisions. That is why pressure decreases.*"

Interaction with teachers during the interviews revealed their alignment with transmissionist view of teaching where the focus was on practicing numericals, learning definitions, memorising steps of derivations

of formulae instead of emphasing the need of probing students' alternative ideas and underlying suppositions. Certain core practices were found to be used regularly by teachers. These included strictly following the textbook, avoiding students' mistakes by emphasizing correct answers, absence of critical voices, focus on expected answers and lack of experiential learning experiences. It was observed that despite several years of experience of teaching, teachers possessed an inadequate understanding of students' ideas about thermal phenomena and the ways in which appropriate learning environments could be designed to address them in the classroom. They struggled to provide justification for students' responses to the questionnaire and the underlying conceptual difficulties. I also found that teachers' identification of gaps in students' reasoning was constrained by their limited conceptual knowledge of the laws of thermodynamics and kinetic theory of gases.

With the aim of strengthening teachers' 'pedagogical content knowledge' (Shulman, 1986), the workshop helped in initiating a dialogue among teachers on pedagogical issues that arise in the context of teaching as well as examining their own content knowledge and beliefs through assertions, arguments and counter-arguments in response to the tasks and activities. For instance, an activity was designed by me to address students' and teachers' alternative conceptions about the relationship between gas pressure, volume and temperature (ideal gas law). As shown in Figure 1 below, pressure and volume were varied using a pressure gauge and syringe and the readings were recorded on the laptop using an Arduino board.

Figure: 1

The graph illustrated an inverse relationship between pressure and volume at constant temperature, thus, demonstrating the Gas law. Such activities helped in demonstrating ways in which knowledge about students' ideas could be used as the basis of designing pedagogical activities to address their alternative conceptions.

Similarly, visualization of microscopic behavior of gas to understand changes in gas variables was facilitated through an agent-based modeling environment (Netlogo). For instance, the following model (Figure 2) was constructed by me to help teachers in visualising the invariance in average kinetic energy of gas when the gas expands into empty space. This helped in addressing teachers' and students' conceptions related to factors affecting change in the average kinetic energy of gas per molecule. It showed that average kinetic energy per molecule of the gas would not change with the increase in gas volume due to free expansion.

During the sessions, teachers also engaged in critical examination of diagrams, definitions given in the textbooks and recognize how representations and their own teaching could be sources of misconceptions among students. Teachers' learning from the workshop was reflected in their feedback and responses to the questionnaire given to them at the end of the workshop. Sharing her experience of exploring these resources, a teacher said, *"I never thought adiabatic and isothermal processes could be explained in such an interesting manner".* They appreciated the tasks and activities conducted during the sessions and requested for similar workshops for other physics topics as well. Teachers mentioned that the sessions made them reflect on their own understanding as well as students' thinking about thermodynamics and how important it is for lesson planning and addressing students' alternative conceptions. The sessions provided an opportunity to teachers to understand how learners' voices and conceptions could be the basis for decision-making and designing of pedagogical approaches for teaching-learning of thermodynamics.

Conclusion

The study attempted to understand and strengthen teachers' knowledge about learners' thinking regarding thermodynamics and kinetic theory of gases. Understanding students' constructs about scientific concepts constitutes an essential component of teachers' pedagogical content knowledge. It was found during the course of the study that teachers lacked a comprehensive knowledge about content and students' topic-specific ideas. The teacher engagement that happened during the workshop sessions illustrated how opportunities for teacher learning can be created through shared reflection on students' topic-specific responses, identifying the 'critical features' that need to be emphasized while teaching of a concept, encouraging them to articulate their beliefs and conceptions as well as laying down the criteria for designing and assessing teaching resources.

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Voices of Student-Teachers on Teacher Education During Covid-19 Pandemic: A Case Study of D.El.Ed Students

Sumbul Khalil*
Urvashi Gupta**

Abstract

The Government of India declared a countrywide lockdown of all educational institutions on 16th March, 2020, due to the spread of Pandemic COVID-19. A year has passed since then when the entire educational system in India, including school and higher education institutes switched from face to face mode of teaching learning to virtual mode. The educational institutions chose to operate partially or completely through online mode acting according to the circumstances and ease of lifting of the lockdown. In the present study, student teachers of D.El.Ed participated to share their experiences and reflections related to classroom teaching- learning (online and traditional), assignments and assessment, workshops, School Experience Programme (SEP) and overall learning in a teacher education course during COVID-19 pandemic.

Keywords: COVID 19 pandemic, student teachers, Teacher Education programme, online teaching-learning, School Experience programme

Introduction

The pandemic arising due to the novel coronavirus, originating in Wuhan city of China in 2019, was to change the face of the world. While it claimed many lives, it brought about a change across the world in the daily lives and lifestyle of the people who survived. Hardly any sphere of our lives has been left untouched by its effect and the Indian education system is no exception. It experienced a sudden shift from traditional face-to-face mode to a virtual mode.

Many research studies poured in during this one year contributing to the body of knowledge on the impact of the pandemic on education. Schleicher (2020), in a report on Impact of COVID-19 on education of OECD countries, highlights that the most marginalised groups are at a risk of falling behind during the pandemic. The report also brings to notice the decrease in financial expenditure on education in the near future. It notes, '...spending on education may be compromised in the coming years. As public funds are directed to health and social welfare, long term spending on education is at risk despite short term stimulus packages in some countries. Private funding will also become scarce as the economy weakens and unemployment rises.' The news may not be good, but in developing economies like India, Maslow before Bloom, seems to be the way as of now.

Other themes that have emerged from studies are a need for change in pedagogy for online teaching (Pokhrel&Chetri, 2021; Carillo& Flores,2021), problems of affordability and accessibility of online infrastructure (Carillo& Flores, 2020; Pokhrel&Chetri,2021;

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* Sumbul Khalil, Department. of Education, School of open Learning, University of Delhi, sumbul021@gmail. com, ORCID No.- 0000-0002-2084-3174
** Urvashi Gupta, Asst. Professor, D.I.E.T (Dist. East), SCERT, Delhi, ORCID No. - 0000-0002-5520-4831

Mishra et al, 2020), problems of learners of distractions, domestic violence, financial constraints (Ravichandran & Shah, 2020 cited in Pokhrel&Chetri, 2021; Mishra et al, 2020), challenges of teachers while conducting a class in virtual setting (Pokhrel&Chetri, 2021; , 2020; Joshi, 2020; Gupta & Gupta,2020) and perceptions of student teachers who were left stranded in the middle of school internship (Varela &Desiderio, 2021; Dickeson, 2021; Weber, 2021) or adapting to online teaching of pre-kindergarten/kindergarten children during school internship(Kim,2020). Some studies have highlighted the positive and negative impact of COVID-19 on education (Jena, 2020; Gupta &Goplani, 2020) while others have explored the perceptions and experiences in online classrooms (Ahammad, 2021; Jain &Soriya, 2021; Das, 2021).

Review of Literature

Based on the review of studies conducted on teachers and students in higher education and student-teachers specifically, certain themes have been identified and this section has been arranged accordingly.

Studies related to Classroom teaching–learning(traditional and online)

Carillo& Flores(2020) note that effective online teaching and learning is subjective to the development of a student presence which enhances supportive and productive interactions, mediating the learning process across presences. Teachers had to adapt to new pedagogical concepts and modes of delivery of teaching, for which they may not have been trained (OECD,2020).

Joshi (2020) studied the challenges faced by faculty members on switching to digital teaching during the lockdown period. The findings reveal a problem of student engagement (chatting, switching off camera purposely, listening passively, casual attitude of the students towards online attendance, etc.). Teachers reported drain in time and energy as both academic and technical issues needed to be taken care of. Some teachers preferred making their own videos and the process of recording, compressing, and uploading was exhausting. Teachers accepted that they were unable to resolve the doubts of students completely and fulfil students' satisfaction level due to varied challenges faced by them in the initial stage of online teaching-learning (Mishra et al, 2020).

Gupta & Gupta (2020) noted that it was difficult to replicate peer learning, participation in extracurricular activities and sports, experiential learning and development of emotional intelligence and leadership ability. Lack of parental guidance for the young is a challenge when both parents are working (Pokhrel&Chetri, 2021). Das (2021) reported a decrease in student attendance however student queries in online class had increased.

Das (2021) found that classroom teaching (face-to-face) mode was rated best. Although classroom teaching through direct mode was nearer to traditional classroom teaching, yet indirect teaching mode was found more useful in this study. This was due to the removal of space and time constraints of traditional classroom teaching. Ahammad (2021) found online teaching has positive effects on the teaching-learning process of the learners. In this study, 73 per cent found online learning useful in Higher education. Fifty eight per cent believed that academic performance has improved with the initiative of online learning method.Seventy seven per cent reported that their institutions provided online learning material while Zoom App was voted as the most useful online app for teaching-learning.

Jain &Soriya (2021) also found eighty seven per cent students preferred the blended format of learning. ANOVA analysis revealed that use of online platforms for higher education is independent of age and educational qualification of learners. However, it was also found that science

students spent more time in online learning than commerce, humanities and others. Results obtained from the study on post graduate students demonstrated positive perceptions towards blended learning. Study revealed that students were optimistic about incorporation of Blended learning in Higher Education. Therefore, with the help of technology, blended learning can be used as an alternative approach in teaching-learning in order to motivate students (Badre&Badre, 2020).

Studies related to Assignments and Assessments

Sintema, (2020) expected the level of academic performance to drop for classes held for both year-end and internal exams because of decreased contact hour for learners and lack of consultation with teachers when facing difficulties in learning/ understanding. Mishra,*et al.* (2020) warn that not understanding the individual difference of the students may result in biased conclusions specifically as online teaching mode which is in its infancy, may not meet its desired end. Pokhrel&Chetri (2021) note that authentic assessments and timely feedback are essential components of learning, but educators in Bhutan were challenged for authenticity of work and actual learning as assignments and examinations were conducted from home. However, in the Indian context, in Higher Education, mixed results were found. Joshi (2020), in her study reported that the rate of submission of assignments was poor. (20% on time, 5% late, rest never). Contradictory to this, Das (2021) found a higher rate of submission and higher 'A' graders than traditional classroom teaching through online teaching via both direct and indirect mode. In her study, 43 per cent of the difficult access group and 16.1 per cent in the zero access group (groups based on access to online infrastructure) performed better through online teaching via indirect mode. The difference in the results may be attributed to the time periods during which

data was collected. While Joshi gathered the data from 20 faculty members, over a period of 8 days in April, 2020, when lockdown was in its initial phase in India, Das collected data from undergraduate college students for a period of two months from March to May 2020.

Studies related to School Experience Programme

The School Experience programme, had started or was about to start in many countries, when their states announced closure of schools due to the spread of novel coronavirus. Some student-teachers worked remotely if they were quarantined, while some worked as substitute teachers while their teacher was quarantined (Weber, 2021). Some student-teachers expressed worry and frustration over not being able to complete student teaching in the classroom, while others appreciated their experiences of switching to online teaching/ remote teaching. They learnt the importance of parental involvement, technological proficiency, student inequities, screen fatigue and creating bonds in a virtual setting (Varela &Desiderio, 2021; Weber, 2021). Tse (2021) writes that keeping students motivated and getting kids to talk on Zoom was a challenge. Similar findings were reported by Dickenson (2021) and Weber (2021).

Learning subject content is a major purpose for online teaching (Yildiz and Isman, 2016) and Kim (2020), experimented with student teachers in an early childhood education practicum through online mode, teaching music to pre Kindergarten/ Kindergarten students. The findings reveal that student teachers experienced feelings of success in learning about processes about online teaching and had developed confidence in utilising technology and managing a group of children 'properly' online. Student teachers still needed to develop their presentation skills through online mode as these are different from classroom teaching and their students always mentioned the hands-on

activities as their favourite part of the lesson. Dickenson (2021) also mentions that some student teachers felt more prepared to teach their own class and can use some techniques that they have learnt virtually in the near future. In blended learning, smaller class size helped to know students better. "They had just been black boxes for so long", remarked one student teacher (Weber, 2021; Tse, 2021).

Studies related to Workshops

Studies directly related to workshops in teacher education during this period were not available. However, studies on laboratory work reveal that laboratory and practical work was difficult because it required systematic demonstration of the whole process in the presence of students(Mishra et al, 2020), while no lab work could be carried out during lockdown which was regarded as a huge drawback.(Das,2021)

It is evident from the above review of literature that very few studies have been conducted on student-teachers in India during the COVID-19 pandemic. Therefore, this paper attempts to describethe experiences of student -eachers enrolled in D.El.Ed (2019-2021).

Research Questions

The research questions for this study are:
1. What experiences did the student-teachers have regarding classroom teaching?
2. How were these experiences compared to traditional classroom teaching?
3. What experiences did the student-teachers have regarding assignments and assessments?
4. How do student-teachers describe their experience regarding the School Experience Programme?
5. What experiences did the student-teachers have regarding Workshops that are conducted as a part of the Teacher Education Programme?

6. What are the reflections of student-teachers on their learning during the COVID-19 pandemic?

Methodology

In this study, data was collected from D.El. Ed second year students(2019-2021). A questionnaire with objective type questions was administered and an interview was conducted on the participants to describe their experiences and reflections on teacher education programme during the pandemic. Mixed method approach using convergent parallel design (Creswell, 2012) was used for analysing both quantitative and qualitative data. Based on the themes identified during the literature review and corroborating them with teacher education curriculum, a theme-based questionnaire was developed and was followed by an interview of participants to compare it with the findings of quantitative data (data from questionnaire). This step was thought to be significant as there are student teachers from both English and Hindi medium and any discrepancies arising due to language barrier can be ruled out.

In order to maintain validity of the qualitative data, a technique of peer debriefing (Lincoln and Guba, 1985) was used.

Findings

In this study, 54 D.El.Ed students from the 2019-2021 batch from a government D.I.E.T participated. The students from this batch were considered ideal for the study as they had experience of studying a Teacher Education course in both traditional/ face to face mode and online mode.

Experiences related to Classroom teaching – learning (traditional and online)

With respect to classroom teaching-learning, the student-teachers considered Physical/ traditional/ face-to face mode to be the best.

These findings are supported by studies of Das (2021). Reasons for this preference were more because of the challenges faced by them during online teaching learning. The students pointed out that the student becomes a passive learner in this mode of learning. Concept clarity through online teaching is not the same as in a physical classroom. The teacher is unaware whether the student is attentive and mentally present in an online classroom. These findings are in contrast to findings of Ahammad(2021), Jain &Soriya (2021), Badre&Badre(2020), who found online and blended learning in higher education to be preferred by students.

Many studies have reiterated the issue of accessibility and affordability of online infrastructure (Carillo& Flores,2020; Pokhrel&Chetri,2021; Mishra et al, 2020). Das (2021) had classified the sample on the basis of access to online facilities. In the present study, 53.7 per cent had easy access to online infrastructure, i.e., they owned phones, tablets or laptops with good data connection while 44.4 per cent students had difficult access, i.e., had to borrow phone or laptop etc., from others or experienced poor data speed and connection. However, one of the student-teachers remarked, "I had my own phone and it was a distraction. While attending classes online, I was tempted to open other apps on the phone."

46.3 per cent attended the same number of classes as in a physical classroom, while the same percentage attended fewer classes than in a physical classroom. These findings are in contrast to findings of Das (2021) who found a decline in attendance in online classes.

57.4 per cent students felt that the online classroom environment was worse than the physical classroom. They cited lack of interaction, issues of internet connections as reasons. A few respondents shared, "Sometimes students disconnect purposely, sometimes make excuses for disconnection". Some complained of audio or video not playing or being incompatible with their devices. Joshi (2020) reported similar results

in her studies. 79.6 per cent of the students, however, empathised with the teachers who were not conversant with technology as online teaching-learning pedagogy was new for them also.

With respect to queries and doubts during online teaching and learning, 40.7 per cent student-teachers felt that there was no difference between physical and virtual classroom in terms of answering queries or clearing doubts.29.6 per cent opined that the teachers were easily accessible and cleared doubts better than in a physical classroom, while 27.8 per cent found that it was difficult to access the teacher and they did not answer queries or cleared doubts satisfactorily. 1.9 per cent said that teachers do clear doubts but physical mode is far better.The findings of this study is in line with the findings of studies of Mishra,*et al* (2020).

Experiences related to Assignment and Assessments

38.9 per cent of the students found the assignments in online teaching mode to be less interesting than physical mode while 29.6 per cent found it to be the same as physical mode. A very few percentage of the students found the assignments to be interesting in this mode. Student-teachers shared that mostly assignments were to be made in the form of PPTs, which were easy to make. However, some complained of eye strain while typing assignments on the phone.
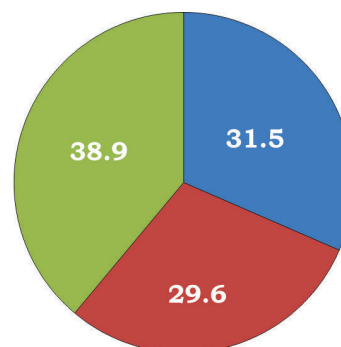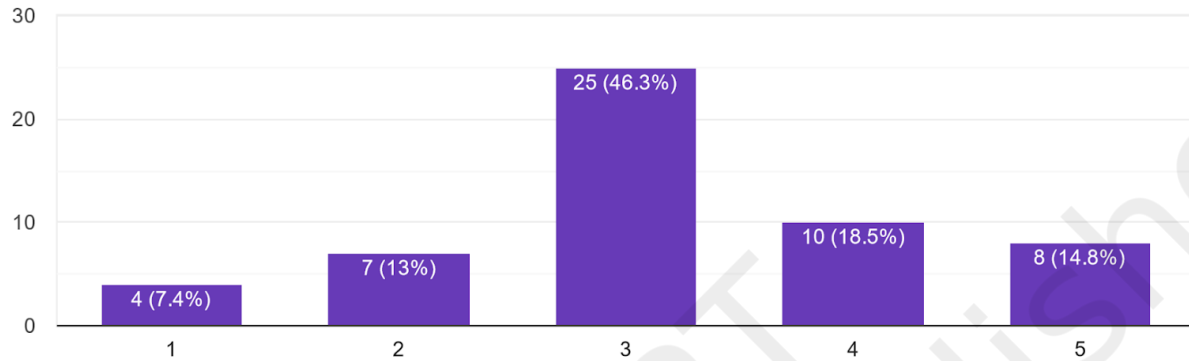

- More interesting than physical mode
- Less interesting than physical mode
- Same as physical mode

With respect to time consumption, on a scale of 5, the maximum rating was 3 (46.3% of students), i.e., it was the same when compared to time consumption for preparation of assignments in physical mode.

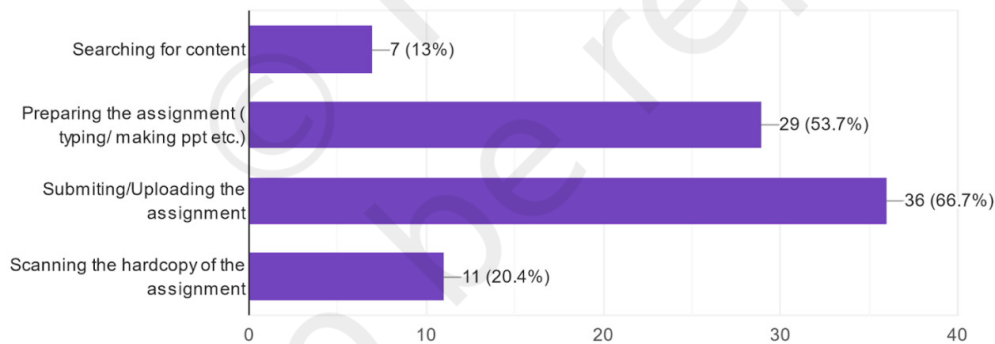Rate your preparation of assignments w.r.t to time consumption.

54 responses

The most difficult part in making assignments was rated to be submission or uploading of assignments.
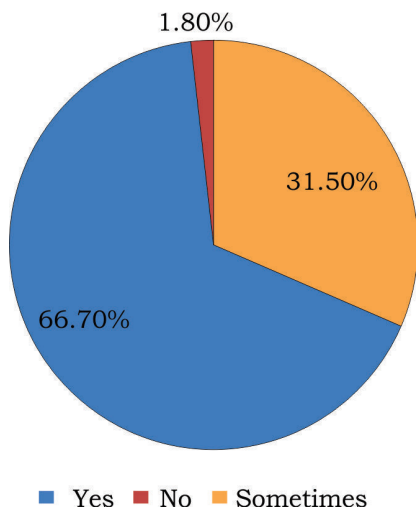
What was the difficult part in making the assignments? (can choose more than one option)

54 responses

66.7 per cent of the students submitted the assignments timely, while 31.5 per cent of the respondents could sometimes make it on time.
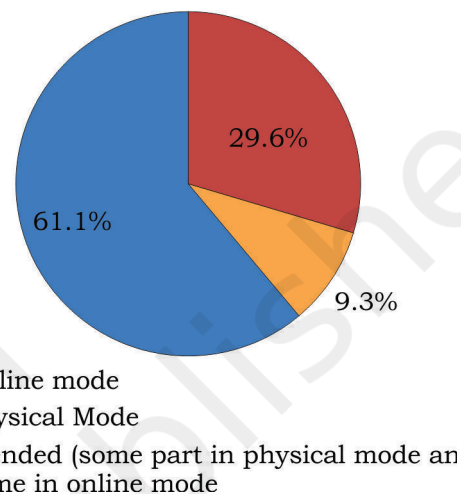
Were you able to submit the assignments on time? 54 responses

- ■ Yes ■ No ■ Sometimes

Student-teachers shared, "Making assignments is faster in online mode because phone typing is predictable and content is available on the internet which can be easily copy - pasted. But, uploading assignments was an issue. We had to message our teachers regarding the problem. Scanning assignments through the phone was difficult. Sometimes

it required a laptop or desktop. Late submissions were due to uploading issues". In studies of Joshi (2020), very poor rates of assignment submission were found. However, Das (2021) had reported similar findings.

In terms of ease of conduction, as a stude your preference for conduction of examin 54 responses

- ■ Online mode
- ■ Physical Mode
- ■ Blended (some part in physical mode an some in online mode
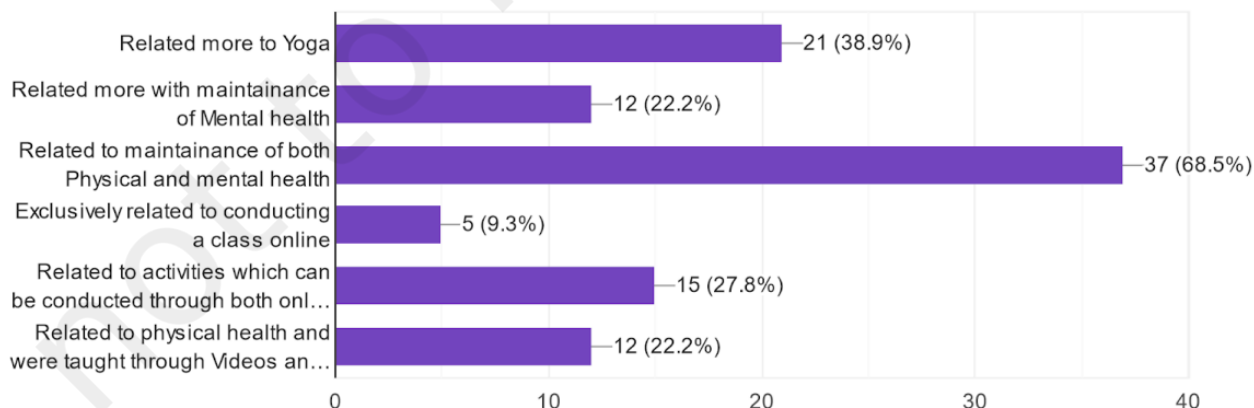
In terms of ease of conduction, as students, they preferred online mode for conduction of exams.

Experiences related to Workshops

Workshops are an important part of the Teacher Education Curriculum. It provides

2. The Workshops related to Health and physical education were- (can choose more than one option)

54 responses

the student-teachers with hands-on experience about preparation of Teaching- Learning Material(TLM), practical subjects like Art Education, Work Education and Health & Physical Education.

Workshops conducted for making TLM for online class were interesting (38.9%) but difficult to follow and make (37%). 33 per cent agreed that they required a new approach when compared to preparing TLM for a physical classroom.

Workshops related to Health and physical education this year were related to Yoga and maintenance of both physical and mental health (68.5%). It was followed by workshops related to activities that can be conducted in both physical and virtual modes. However, these were fewer in number compared to workshops on Yoga and maintenance of both physical and mental health.

Workshops related to Performing Arts education were Conducted through demonstration by Resource person and were not much interesting as they were conducted online(38.9 %).

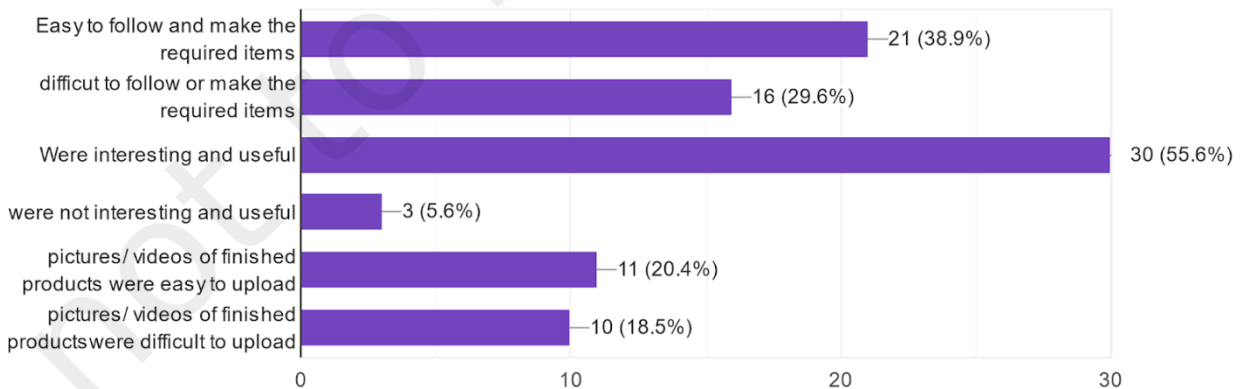3. Workshops related to Performing Arts education were-

54 responses
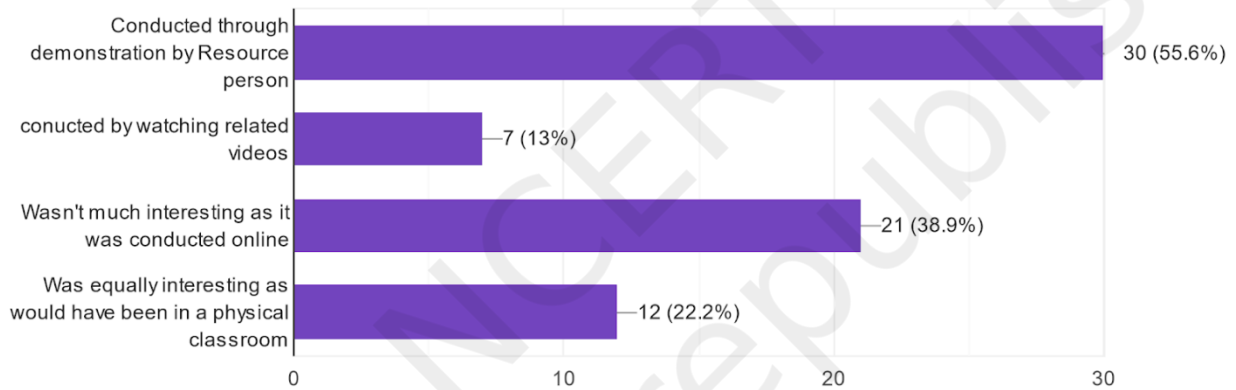
Workshops related to Work Education and Art Education were interesting and useful (55.6%) and easy to follow and make the required items(38.9%).

4. Workshops related to Work Education and Art Education were-(can choose more than one option)

54 responses

Sharing their experiences, the student-teachers said that they found online workshops to be good but in face to face mode one could ask practically to show/demonstrate again. "In online workshops there is nobody to identify your mistake or demonstrate again as compared to physical mode".While some students switched on video or audio during the workshop, it used to be a disturbance.

"Workshops conducted online were based more on lecture method than activity method" ,complained one student-teacher.

For Work Education and Art Education workshops, they received a message a day before for materials to be arranged. However, on the day of workshops only few students used to be present with materials.

In pre pandemic times, workshops conducted were considered better because students were learning and performing in front of teachers, performing group activities and getting inspired by others' creativity also.

Speaking on the financial front, the student-teachers said, "It was economical otherwise, but arranging for materials in lockdown and data consumption was an issue".

Some student-teachers did not find the workshops conducted online to be interesting and attended them for attendance sake.

After attending workshops on Art education, Work Education and Health & Physical Education, 16.7 per centof the student-teachers felt confident of carrying out activities in a Physical classroom while 14.8 per cent were confident of carrying out activities in an online classroom. 57.4 per cent student-teachers opined that they were confident of carrying out activities in both physical and online classroom and 11.1 per cent did not feel confident of carrying out activities in any type of setting.

After attending workshop on Art education, Work Education and Health and Physical Education–
54 responses
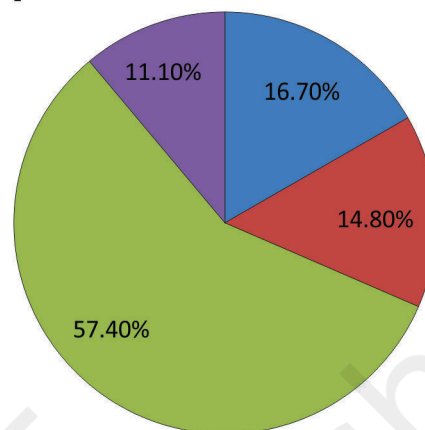
- ■ I am confident of carrying out activities in physical classroom
- ■ I am confident of carrying out activities in online classroom
- ■ I am confident of carrying out activities in physical and online classroom
- ■ I am NOT confident of carrying out activiti in any type of setting

Since studies on workshops conducted in online mode for Teacher Education during pandemic times are not available, these findings will help to fill the gap in literature.

Experiences related to School Experience Programme (SEP)

Gray (2019) writes about the importance of preservice teaching in a study on first year student-teachers who reflected on their experience to develop effective classroom management systems (cited in Varela and Desiderio, 2021). Smith and Rayfield (2017) and Aglazor (2017) reiterate the importance of student teaching as an opportunity of transformative experience (cited in Varela and Desiderio, 2021).

The School Experience Programme (SEP) was conducted in physical/ face-to-face mode in 2019-2020 (pre-pandemic) in government schools. However, due to the

pandemic, the schools have remained closed for students since March 2020, in India for elementary school students. Therefore, for the session 2020-2021, SEP was conducted online and the peers (D.El.Ed students) acted as students from school (simulated practice teaching).

The major challenges faced during SEP were hectic schedules as daily two to three lesson plans had to be delivered and making related ppts, related TLM were challenging. Pupil participation or motivating them to attend classes was a major challenge. It got the highest percentage of votes (50%). 44.4 per cent students also experienced difficulty in conducting classes online. "Network issues were there. I had to move to the terrace or other places for connectivity", remarked one student-teacher. Concerns of affordability and accessibility of online infrastructure have been raised and discussed in studies of Carrillo & Flores, (2020), Pokhrel&Chetri, (2021) andMishra et al., (2020).

"Student interaction was poor which led to frustration", added another. Tse(2021) had also reported similar findings. "Since peers acted as students, framing of questions was challenging", shared another student-teacher.

Making TLM for online classes was voted as another major challenge(48.1%). In terms of preparation of TLM for online classes,44.4% of student-teachers rated it 3 on a scale of 5. Showing concrete objects as TLM was difficult in online classes.

The student-teachers felt that real students from school should be for practice teaching. "One gets a feeling of real teaching and gets actual responses", said one student-teacher." A sense of responsibility/ accountability was more in physical mode,"shared another.

Incomplete supervision and feedback is a major challenge in teacher education. (Kumar & Azad,n2016 and Yan & He, (2010). Sharing their experiences about online supervision of lesson plans, the student-teachers felt that supervision was better in physical mode. 57.4 per cent felt feedback

from the supervisor was timely and detailed while 40.7 per cent got timely and brief feedback from their supervisor. Khalil (2020) warns that under no circumstances the student-teacher should be left unsupervised as they may make conceptual mistakes while delivering the lesson plan either due to lack of confidence or inexperience. The supervisor should also ensure that all lesson plans are checked by subject experts before delivering them in the class.

Varela and Desiderio (2021) write, "Educator preparation programs are also encouraged to view this experience and student-teacher responses as an indication of the necessity to revamp teacher training to include and enhance use of technological resources and related pedagogical strategies. Preservice teachers must now be equipped to plan and deliver instruction virtually, to assess student learning and differentiate for students from a social distance, and to effectively collaborate with parents and colleagues online."

Reflections on overall learning during COVID-19 Pandemic

Reflecting on their experiences about their learning as student-teachers in COVID-19 pandemic,74.1 per centstudent-teachers were glad that the pandemic happened during TeacherEducation course as they got to learn alot about online teaching-learning. 61.1 per cent of the student-teachers considered technical proficiency to be very important for future teachers. These findings are supported by studies of Varela &Desiderio (2021) and Weber (2021). 70.4 per cent of them rated difficulty in adapting to online pedagogy as 2 on a scale of 3.

31.5 per cent rated their learning during the pandemic as fair, 27.8 per cent felt good, 25.9 per cent were satisfied while 14.8 per cent were unsatisfied with their learning.

However, 77.8 per cent felt confident about taking a class in any type of setting. Dickenson (2021) and Kim (2020) had reported similar results.

They expressed that they had a lot of opportunities to explore. "We were not just sticking to books, but had to think out of the box. It boosted our creativity." Another student added, "In a physical classroom, students are asked to search and study certain topics beforehand. The response rate is poor. However, in online class, students can search at the very moment". "We got to learn alot about technology.We usually studied from books, but now we use ppts and videos etc. as study materials also".

Conclusion

Through this study an attempt was made to present the voices of student-teachers about their academic experiences during COVID19 pandemic. They have shared their experiences and reflections related to classroom teaching-learning (online and traditional), assignments and assessment, workshops, School Experience Programme and overall learning in a teacher education course. Some of these experiences are similar to previous studies in Indian or global contexts, a few were completely new, filling the gap in literature. Since student-teachers are an important stakeholder of Teacher Education courses, their voices and experiences hold significance in revamping and designing Teacher Education curriculum worldwide.

Findings of the present study reveal that the offline mode was preferred in all aspects taken up in this study. However, it cannot be ignored that going into an online mode completely was the only possible alternative against 'no education at all' in these times of crises. As a nation, we have invested in the digital infrastructure and have sped up the process of online learning. In this regard, the pandemic has turned out to be a blessing in disguise. The best way ahead is to strengthen blended learning as an option. The government and NGOs have to work together to reduce the digital divide. Mukherjee and Kuri (2021) have identified

lack of awareness, financial instability, occupational uncertainty, low educational qualifications of parents, etc., as significant factors of the digital divide. Providing the students with good quality digital devices and access to internet connection at affordable rates will definitely resolve a major chunk of the problem.

Qazi,*et al* (2020) highlighted the relationship between use and access to online classes and student's satisfaction level as a possible reason for not favouring online learning. Reducing and removing the barriers of accessibility is an important step before considering blended learning as an option.

Blended mode of learning brings out the best of both face-to-face and online mode. With reference to the recommendations of NEP 2020, UGC has also released a concept note on Blended mode of Teaching and Learning. The colleges and universities are allowed to teachsome percentage of the courses through online mode.

Technology however should also be used judiciously and not for the sake of boastingof modernity. SEP should also be conducted in this mode so that the prospective teachers are well equipped with both online and offline pedagogies for classroom learning and assessments. Khalil (2020) points out that student-teachers' experiences during teaching practice shapes their attitude towards the profession. More than 3/4th student-teachers participating in this study have shared that they were confident of taking classes in any type of setting. They considered the pandemic to be an opportunity to learn online pedagogies as a part of their curriculum. The prospective teachers have also considered technical proficiency to be of importance as future teachers. Since the learners have shown a positive attitude towards online learning despite facing challenges, it can be hoped that they would accept the blended form of learning with open arms.

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Influence of Gender and Parents Education Level on Mathematics Achievement of Madhyamik Passed Students in South 24 Parganas, West Bengal

Dr. Arup Kundu*

Abstract

This study investigated the influence of the parents' level of education on Mathematics achievement of secondary education (Madhyamik) students in South 24 Parganas district of West Bengal. The study utilized a descriptive and inferential survey research design. A sample of 430 Class XI students from 12 schools participated in the study. The sample of the study was selected through simple random sampling techniques. The mathematics score of the Madhyamik examination was used to assess the academic achievement of mathematics. The data were analysed using t-test and F-test inferential statistics on MS Excel and SPSS-23. The result showed that Mathematics achievement was not gender-independent. Male students generally achieved higher mathematics scores, than female students. Further, data showed that the parents' education levels have significant influence on the mathematics achievement. The finding indicated that higher parents' education were indeed amenities to the acquisition of higher scores in mathematics.

Keywords: *Parents level of education, mathematics achievement, secondary education*

Introduction

Education has an indispensable role in nation-building as well as improvement of an individual character. It is a tool which can be used for the future generation to inculcate value, sense, proficiency and competencies. Education of a child needs very serious endeavor. A child spends most of his time at home with the members of family and the diverse type of environment he or she is brought in also assimilates their emotional and cognitive development. The learners, teachers, schools and parents all play a vital character in the process of learning. The academic background of the parents' is such an inspiring factor for a child and influences his/her future.

Parents' level of education may have impact on children's academic achievements. However, for parents to positively motivate their children to execute better, they need to have the means and be aware of the need for education so that enough support in terms of material and finances can be given to their wards (Bakari, 1997). According to Davis – Kean (2005) parental educational status is a necessary predictor of children's educational and behavioral outcomes. Studies by Grisemer, Kirby and Williamson (1994) and Okantey (2008) reported that parents' status of education is a strong predictor of academic achievement of students. According to Young and Smith (1997) students of well-educated parents on an average achieve better on academic assessment tests than students of only high-school-educated parents. Khan, Iqbal and Tasneem (2015) pointed out that there is a relationship between the parents' level of education to their children's academic performances. A mother's education has a higher dominance than father's, so mother's

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* Assistant Professor in Mathematics, Govt. Training College, Hooghly, West Bengal-712103, India
Email:arup.cu.edu@gmail.com

education is more significant. Ogoye (2007) reported at Mombasa, Kenya, that illiterate parents were unable to guide their children with homework.

Literature review

Qadri (2018) in Hyderabad district conducted a study of parental educational level and academic performance of 500 secondary school students. He used their last examination results to measure academic achievement of students. The result indicated that there is a significant association between parents' education and level of academic performance of students.

Imam & Singh (2015) conducted a study in central Uttar Pradesh on the influence of gender, parental education on mathematics achievement of 1127 secondary school students. The results indicate that male as well as female students were equally good in mathematics achievement. However, he found that children of highly educated parents are likely to have significantly higher mathematics achievement scores as compared to the children of lesser educated parents.

Kundu (2017) in Bankura district conducted a study of parents' educational status and students' performance of geometry on 351 Class XI learners. The result indicated a significant difference between parent qualification and student geometry thinking. **However, he found that higher parental qualifications resulted in higher levels of geometric thinking of students.**

Panneer Selvam (2013) in Taluk of Namakkal districts studied effect of parental education and students' achievement on 150 Class XI students. He used an achievement test of vector analysis of 50 marks. The result showed that there is no significant difference between male and female, rural and urban, literate and illiterate parents of higher secondary students with respect to the impact of parents' education. However, he found a significant difference among government, aided and higher secondary

students with respect to influence of parents' education.

Nigure and Amollo (2017) in Nairobi, conducted a study influence of parents' education level on academic achievement of pre-school children in Embakasi on 27 parents, 27 children and 5 teachers. The result indicated that most parents had low academic performance since majority of them were KCSE certificate holders and hence were not suitable to assist their children on academic matters leading to poor academic performances.

Amuda and Ali (2016) in North eastern state of Nigeria conducted a study on parent's level of education and academic achievement of NCE students of colleges of education on 1200 sample out of a population 13529 NCE students from six colleges. The result indicates that father's and mother's levels of education were not significant predictors of academic achievement. However, they found that there was no significant relationship between parents' level of education and academic performance.

Baliyan, Rao and Baliyan (2012) conducted a study on the influence of parental education on the performance of 168 senior secondary students in Botswana. The result indicates that the level of father's education was found to be higher than that of the mother's. However, they found that mother's and father's education levels have significant impact on the achievement of students in mathematics which indicate that these factors are significant predictors of the achievement of student mathematics.

Azhar, Nadeem, Naz, Parveen (2013) conducted a study on the influence of parental education and socio-economic status on the performance of 250 university students in Pakistan. The results indicate that the students belonging to strong financial status perform better than those who face financial problems. However, they found that parental education boosts up their children's achievements.

The literature review identifies studies

that suggest parental education influences students' achievements in Mathematics and other studies that don't. This entire section could be significantly condensed by stating the conclusion and then referring the studies that arrived at such conclusion, instead of repeating this for each study.

Rationale of the study

The secondary level is vital because it is the gateway to a successful professional and social life. **As the researcher is a mathematics teacher-educator, he got attracted to find out the possible reasons among the Class XI standard students, if there exist any gender differences influence of parents' education level achievement in mathematics.** The research is restricted to the students of Class XI , as they are at an essential stage where, after the completion of first public examination they will be ready to study various streams of study there by paving the way for their future career.

Based on the literature review, the limited research carried out the parents' education level and their academic performance in mathematics of students especially in India. Hence this present study focuses on parent educational status and academic performance in0 mathematics that has a **dynamic** value in teaching-learning the **parents' children dynamic**.

Objectives of the study

i To measure the level of parents' education of Madhyamik-pass students.
ii To find out the difference between male and female with respect to academic achievements in mathematics of Madhyamik-passed students.
iii To find out the relationship between father's education and academic achievements in mathematics of Madhyamik-passed students.
iv To find out the relationship between mother's education and academic achievements in mathematics of Madhyamik-passed students.

Hypotheses

H0G: There is no significant difference in academic achievements of Madhyamik-passed students in mathematics between the two gender groups.

H0F: There is no significant difference in academic achievements of Madhyamik-passed students in mathematics among the five-father education level.

H0M: There is no significant difference in academic achievement of Madhyamik passed students in mathematics among the five-mother education level.

Methodology

Research Design:
The study was a survey based on quantitative techniques. The researcher surveyed parents' level of education and academic performance in mathematics of Class XI students.

Sample of the study

Population of the study consisted of Madhyamik-passed students in South 24 Parganas.

The population of this study comprise of boys and girls studying in Class XI in West Bengal Council of Higher Secondary Schools of South 24 Parganas. Two subdivisions from the five subdivisions of South 24 Parganas district were randomly selected. Two blocks from each sub division were randomly selected. Three schools were randomly selected from each block.

The sample consisted of 430 Class XI learners all of whom were present on that particular date of data collection from 12 schools. Formal approvals from the school heads were obtained in order to conduct this research.

Table 1 : Multistage random sampling strategy employed across South 24 parganas district numerically.

District	Sub-divisions	Blocks	No. of Schools	No. of Students
South-24 Parganas	Baruipur	Baruipur	3	125
		Sonarpur	3	119
	Diamond Harbour	Mandir Bazar	3	95
		Magrahat –II	3	91
			Total:12	Total : 430

Table 1A : Streams-wise and Gender-wise distribution of participating students

Gender	Streams			Total
	Science	Arts	Commerce	
Male	93 (34.8%)	80 (30.0%)	94 (35.2%)	267 (62.1%)
Female	37 (22.7%)	89 (54.6%)	37 (22.7%)	163 (37.9%)
Total	130 (30.2%)	169 (39.3%)	131 (30.5%)	430(100%)

Delimitation of the study

Sample was collected from schools affiliated to West Bengal Council of Higher secondary Education, in only South 24 Parganas district of West Bengal.

Tool employed

'The Interview Schedule' it consisted of particular information about the participants that is name, age, gender, stream, name of school, medium of instruction, marks obtained in mathematics in Madhyamik examination, father's and mother's education level, etc. The interview schedule was administered on an individual basis in quiet and peaceful environments. The respondent was first put to light conservation and the interview schedule was gradually and orally administered.

Data analysis

The researcher personally visited the schools for the collection of data. The interview schedule was administered to the sample and the responses were scored and tabulated, and subjected to descriptive and inferential statistics.

Objective:

i To measure the level of parents' education of Madhyamik-passed students.

The mathematics scores and parents' education levels were tabulated and analysed with reference to:
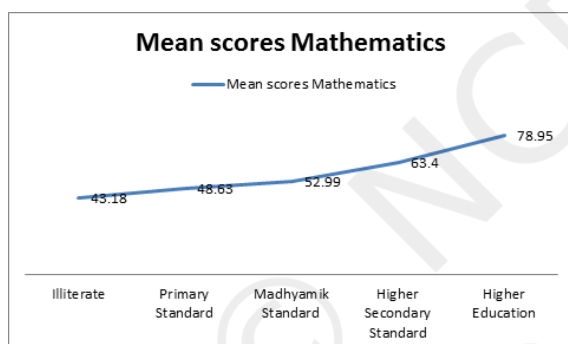
- Father's education level-wise analysis
- Mother's education level-wise analysis

Table 2 : The descriptive statistics of father's education level pertaining to the 430 samples are shown below:

Father's education Level	Illiterate	Primary Standard	Madhyamik Standard	Higher Secondary Standard	Higher Education
N=430	19 (4.4%)	114 (26.5%)	109 (25.3%)	57 (13.3%)	131 (30.5%)
Math Scores: Mean	43.18	48.63	52.99	63.40	78.95
Math Scores: Std. Div.	14.91	20.49	20.49	21.34	19.93
95% confidence interval for Mean	38.75 to 48.51	43.42 to 52.95	49.10 to 56.88	57.74 to 69.07	75.50 to 82.39

(Source: Primary data from field study)

From the above table, it is inferred that there are 4.4 per cent minimum number of fathers who are illiterate, 26.5 per cent of fathers have primary-standard education level, 25.3 per cent of fathers have madhyamik-standard education level, 13.3 per cent of fathers are having higher secondarystandard education level and maximum 30.5 per cent number of fathers are higher educated.

Figure: 1 Father's education level-wise mean achievement scores in

Mathematics

Only participations with comparatively low scores in mathematics had fathers who were illiterate.

Some of the students whose fathers were illiterate achieved better marks but had not obtained full marks. Students with higher sores in mathematics had a remarkable number of fathers who were graduates or were more educated. Average mathematics score of participants is 43.18 had fathers who were illiterate. Average mathematics scores of participants is 48.63 had fathers who were Primary standard education level. Average mathematics scores of participants is 52.99 had fathers who were Madhyamik standard education level. Average mathematics scores of participants are 63.4 and 78.95 had fathers who were higher secondary and higher education level respectively. Participation of students with illiterate fathers those who were to comparatively better in education levels were average mathematics scores monotonically increasing. Thus, this indicated that the fathers' education level was related to the students' mathematics achievement.

Table 3 : Descriptive statistics of mother's education level pertaining to the 430 samples

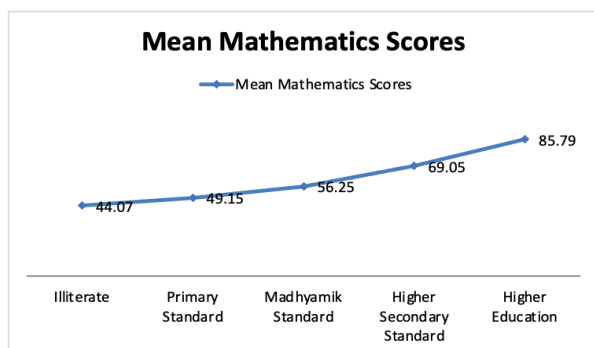| Mother's education Level	Illiterate	Primary Standard	Madhyamik Standard	Higher Secondary Standard	Higher Education
N=430	45(10.5%)	138 (32.1%)	102 (23.7%)	61 (14.2%)	84(19.5%)
Math Scores: Mean	44.07	49.15	56.25	69.05	85.79
Math Scores: Std. Div.	16.59	18.61	18.97	20.24	16.27
95% confidence interval for Mean	39.08 to 49.05	46.02 to 52.28	52.52 to 59.97	63.87 to 74.23	82.25 to 89.32

Figure: 2 Mother's education level-wise mean achievement scores in Mathematics

Only participations with comparatively low scores in mathematics had mother who were illiterate. Some of the students whose mothers were illiterate achieved better marks but not obtained full marks. Students with higher sores in mathematics had a remarkable number of mothers who were graduates or were more educated. Average mathematics scores of participants is 44.07 had mothers who were illiterate. Average mathematics scores of participants is 49.15 had mothers who were Primary standard education level. Average mathematics scores of participants is 56.25 had mothers who were Madhyamik standard education level. Average mathematics scores of participants are 69.05 and 85.79 had mothers who were higher secondary and higher education level respectively. Participation of students whose mothers had illiterate to comparatively better in education levels were average mathematics scores monotonically increasing. Thus, this indicated that the mothers' education level was related to the students' mathematics achievement.

Objective:

ii To find out the mean difference between male and female with respect to academic achievement in mathematics of madhyamik-passed students.

The null hypothesis is

H_{0G} : There is no significant difference in academic achievement of madhyamik-passed students in mathematics between the two gender groups.

The descriptive and inferential statistics of mathematics achievement scores pertaining to each gender is shown below:

Table 4 : Significant difference between Male and Female of Madhyamik passed students with respect to achievement in mathematics.

Gender	N	Mean	Std. Div.	t- value	Df	Sig (2 tailed)
Male	267	64.01	22.46	4.341	428	.000
Female	163	54.17	23.35			(Significant)

The t-test shows that the difference between the gender groups is significant at 1% level. Thus, H0G is to be rejected, and there is a significant difference in mathematics achievement between male and female. Table 4 shows that male shows higher mathematics achievement than female. Hence, it can be concluded that, there exists a significant gender wise difference in mathematics achievement in favour of the male.

Objective:

iii To find out the relationship between father education and academic achievement in mathematics of Madhyamik passed students.

The null hypothesis is

H_{0F}: There is no significant difference in academic achievement of Madhyamik-passed students in mathematics among the five-father education level.

The inferential statistics of mathematics achievement scores pertaining to each father's education level is shown below:

Table 5: Significant difference among father's education level of Madhyamik-passed students with respect to achievement in mathematics.

ANOVA

<p align="center">Table 5 : One Way Mathematics Achievement by Father's Education Levels0</p>

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	77222.062	4	19305.516	52.882	.000
Within Groups	155152.889	425	365.066		
Total	232374.951	429			

The F test shows that the difference in mathematics achievement among the father's education level is significant. Therefore, H0F is to be rejected, and this is a significant difference in mathematics achievement among different father's education level.

To find out where this difference lies, the t-tests were carried out between 'Illiterate and Primary standard', 'Primary standard and Madhyamik standard', 'Madhyamik standard and Higher secondary standard' and 'Higher secondary standard and Higher education' Levels. These tests show that 'Primary standard and Madhyamik standard', 'Madhyamik standard and Higher secondary standard' and 'Higher secondary standard and Higher education' levels are significant at 1 per cent level but 'Illiterate and Primary standard', is not significant.

Since the table is self-explanatory, the textual descriptions can be made far more concise. Also, the ANOVA tables can be clubbed with the earlier table/graph showing the data collected on Maths scores and parental education levels.

<p align="center">Table 6 : A summary of the t- tests is as follows:</p>

Mathematics Achievement between different Father's education levellevel			
Illiterate and Primary Standard	Primary Standard and Madhyamik standard	Madhyamik Standard Higher secondary standard	Higher Secondary Standard and Higher education standard
t-value: 0.625 Sig.: .533 Not significant	t-value: -2.846 Sig.: 0.005 Significant*	t-value: -3.065 Sig.: .003 Significant*	t-value: -4.810 Sig.: .000 Significant*

• : 1% level of significant

Therefore, one may conclude that the mothers' education level has an influence on the students' mathematics achievement. That is, mothers with higher education are more likely to have children with higher mathematics achievement. Unfortunately, children of mothers who are illiterate appear to suffer in this regard.

Objective:

iv To find out the relationship between mother education and academic achievement in mathematics of Madhyamik passed students.

The null hypothesis is

H_{OM}: There is no significant difference in academic achievement of Madhyamik passed students in mathematics among the five-mother education level.

The inferential statistics of mathematics achievement scores pertaining to each mother's education level is shown below:

Table 5: Significant difference among mother's education level of Madhyamik passed students with respect to achievement in mathematics.

Table 7 0: One-way Mathematics Achievement by Mother's Education Level

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	89914.479	4	22478.620	67.060	.000
Within Groups	142460.472	425	335.201		
Total	232374.951	429			

The F test shows that the difference in mathematics achievement among the mother's education level is significant. Therefore, H0M is to be rejected, and this is a significant difference in mathematics achievement among different mother's education level.

To find out where this difference lies, the t- tests were carried out between 'Illiterate and Primary standard', 'Primary standard and Madhyamik standard', 'Madhyamik standard and Higher secondary standard' and 'Higher secondary standard and Higher

education' levels. These tests show that 'Primary standard and Madhyamik standard', 'Madhyamik standard and Higher secondary standard' and 'Higher secondary standard and Higher education' levels are significant at 1 per cent level but 'Illiterate and Primary standard', is not significant. Since the table is self-explanatory, the textual descriptions can be made far more concise. Also, the ANOVA tables can be clubbed with the earlier table/graph showing the data collected on Mathematics scores and parental education levels

Table 8 : A summary of the t- tests is as follows:

Mathematics Achievement between different Mother's education level			
Illiterate and Primary Standard	Primary Standard and Madhyamik standard	Madhyamik Standard Higher Secondary standard	Madhyamik Standard Higher Secondary standard
t-value: -1.633 Sig.: .104 Not significant	t-value: -2.895 Sig.: .004 Significant*	t-value: -4.066 Sig.: .000 Significant*	t-value: -5.515 Sig.: .000 Significant*

Conclusion

Based on the findings of this study, it was concluded that the students' performance in Mathematics is influenced by the qualifications of their parents. In other words, the main source of acculterization, by reasoning, attunes to the adoption of knowledge by the students in the family (Kundu & Ghose, 2015). In this case, the acquisition of visual spatial skill and numeracy ideas depends on the educational level of the both father and mother. Comparatively more educated parents are more likely to belief of the gravity of

mathematics on their children's lives. Thus, they transmit their positive feelings and attitudes to their children (Hong, You &Wu, 2010). Once students are exposed to positive mathematics feelings and attitudes, their intrinsic motivation towards mathematics can increase (Gottfried, Gottfried, & Oliver, 2009) and they want to be in concord with the present findings. For example, Demir, Kilic and Unal (2010) find that students whose parents are highly enlightened and manifested to mathematics in their lives tend to show more success in mathematics than peers whose parents are less acquainted and not exposed to mathematics. Because

highly acquainted parents know the learning requirements and provide opportunities for the congenial educational ambience for their children (Alomar, 2006), their children are exposed earlier to mathematics in the most effective educational environment.

The above data analysis revealed that females lag behind males in mathematics achievement. This is not surprising, given the social background from which the sample was taken. Mathematics is supposed to be a subject with male bias (Alex & Mammen, 2014); subject which can propel boys into careers. Females are not expected to like mathematics, but to be inclined towards more 'cultural' pursuits like the study of humanities and arts. Thus, perceived gender roles play a decisive part in the preference of subjects of study. This, in fact, is not peculiar to Indian cultures alone, but rampant in most other parts of the world (Billington, 2007; Wentzel, 1998). However, perceptions in the contemporary world have changed, and more girls are inclined to take up careers that may require mathematical and geometrical skills (Eisenberg, Martin and Fabes, 1996). Psychologically speaking, literature indicates that girls are less skillful at visual activities than boys (Corballis,

1997; Harris et al. 2000; Milivojevic, Hamm and Corballis, 2009). Other literature refutes this idea and attributes the gender-wise difference to social drawbacks (Halat, 2006; Alex and Mammen, 2014). This idea is reinforced by data which show that the gender gap is closing over recent times as people learn to circumvent social mores (Panneer Selvam, 2013, Eisenberg, Martin and Fabes, 1996).

The 'Genetic inheritance versus Environmental factor to human development' debate is one of the oldest issues in psychology. The debate has not been solved and it remains that with the right kind of nurturance children may be able to develop with more awareness and greater rational sense and hence enhanced power of conceptualisation. Consequently, children of educated parents have the favour of being enveloped within an ambience of discourse that is directly or indirectly affected by their cultivated knowledge. Educators are constantly concerned with the inharmonious performance of the learners in different branches of mathematics. The inferences of this research identified a remarkable factor that could explain why learners experience difficulties with school mathematics.

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Making History Relevant In 21ˢᵗ Century: An Indian Perspective

Dr. Ajit Kumar Bohet*
Rashmi Rekha Dash**

Abstract

The general perception among the students, teachers, guardians and all stakeholders is that History is a non-utility subject, and that it is irrelevant in respect to providing career opportunities in general, and job prospects in particular. It has been felt that while the yardstick for giving a judgment on the aspect of 'Relevance' of a subject in the market-oriented world of the 21st century largely depends on its potential towards providing pecuniary benefits, but there are other attributes which can be considered as benchmarks for determining the utility aspect of a subject. And the most striking of them is the role of the subject in presenting a platform for providing 'Competency-based Learning', which has assumed a significant dimension after the declaration of the National Education Policy 2020. The paper takes into account the indicators of quality education and examines them in the light of teaching History at the senior secondary level, where a key component is activity-based learning targeted towards development of the spirit of inquiry, and it thus establishes the relevance of the subject in the 21st century.

*(**Key words:** Relevance, Utility, NEP 2020, Quality Education, Competency, Skill, Activity, Interdisciplinary, Stratigraphy, Critical Thinking)*

The National Education Policy 2020 which took birth after a long spell of 34 years after the declaration of the National Policy on Education 1986, draws the attention of academia by emphasising the need of reformulating the existing education system in the line of competency-based education in order to close the gap in the achievement of learning outcomes (NEP 2020, P.12). The rationale behind this insistence may be more clearly understood from the vision of the Policy, which states that the National Education Policy envisions an education system which has its roots in Indian ethos and traditions and makes direct contribution towards transforming India, which is Bharat.

It calls primarily for providing high-quality education to all, targeting sustainability, equity and a vibrant knowledge society with the much-desired goal of making India a global knowledge superpower. The Policy invites the attention of the academia to the fact that the objectives of the curriculum and pedagogy of our institutions must be to develop among the students a deep sense of respect towards the Fundamental Duties and Constitutional Values, such that they can internalise a bonding with their country, and become consciously aware of their upcoming roles and responsibilities in a changing world. "The vision of the Policy is to instil among the learners a deep-rooted pride in

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*   Dr. Ajit Kumar Bohet, Assistant Professor, Department of Teacher Training and Non-Formal Education (IASE), Faculty of Education, Jamia Millia Islamia, Delhi. Email: jamiab.ajit@gmail.com

**   Rashmi Rekha Dash, Research Scholar, Department of Teacher Training and Non-Formal Education (IASE), Faculty of Education, Jamia Millia Islamia, Delhi. Email : history.rasmi@rediffmail.com

being Indian, not only in thought, but also in spirit, intellect, and deeds as well to develop knowledge, skills, values and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen".

With the backdrop mentioned above as reference, the paper attempts to decode the meaning of competency-based learning in history at the Higher Secondary Stage.

What do we mean by 'Competency'?

Competency is a set of skills, abilities, knowledge that helps an individual perform a given task in real life (CBSE, Acad-34/2020). While elaborating the meaning and significance of competency-based education, Ojha (2021, p.141) recommends that learners need to understand the purpose and usage of a 'concept'. She stresses the importance of the real-life application of a 'concept' taught in the classroom. In addition, she informs that the ultimate goal of learning is not achieving mastery over the content as content is only the medium used to develop competency. The idea further gets extended through her proposal of engaging children in such pedagogical processes which will prepare them in demonstrating competencies like creativity, critical thinking, community skills, etc., in their daily lives.

The vision of NEP 2020 and the pressing need of competency-based education no doubt raise a few questions like why does an education system look for global standards? What is the need of preparing young minds for Global Citizenship? Why do we need to restructure an education system?

Scott (2015, p.2) argues for such questions by stating that preparing students for work, citizenship and life in the 21st century is daunting. Factors like globalisation, new technologies, migration, internal competition, changing markets and transnational environmental and political challenges all drive the acquisition of skills and knowledge needed by students to survive and succeed in the 21st century.

The above-mentioned issues demand an outcome-based education system that prepares young learners for the future. The more the world is evolving with new situations, the more competencies will be obligated.

At this backdrop, what is the relevance of learning history in the 21st century? Can history make children future ready? The authors strongly believe that history has the innate potential to prepare children for the life. Let us see how?

The Draft Learning Outcomes for Higher Secondary Stage prepared by the National Council of Educational Research and Training (2020, p.142-143) in the line of the features of Competency Based Education, throws light on the following curricular expectations from the students at the Higher Secondary Stage.

- As the first principle of studying history at this stage, the curriculum expects the students to develop an understanding of how historians write history. Thus, to start with, they are expected to appreciate the way historians follow the trails that lead to the past by way of selecting, assembling and then reading their sources critically. Secondly, as a part of this process, they are expected to figure out what different types of sources can reveal and what they cannot. Finally, they are expected to acquire an overall understanding of how the historians analyse different types of sources, the various problems and difficulties they encounter while interpreting each type of source, and at the end, the way they draw a larger picture of the past by connecting different events and processes.

- Secondly, having gone through the process of studying history through a thematic approach, the students are

expected to have a capacity of relating and comparing developments in different situations, understanding connections between similar processes located in different time periods, and finding out the contributions of various methods of social inquiry which feed into historical investigations. In addition, the students are also expected to have an idea of the specific debates that surround each theme even as they acquire a sense of the wider historical processes, which connect them.

- Finally, the students are also expected to understand the utility of different pedagogical tools and techniques such as maps, timelines, flow-charts, pictorial illustrations, numbering of figures, citations, colour coding different activities and use of proper terms and concepts that are innate to delineating history and use them appropriately.

In addition, the Cognitive Development Theory proposed by Jean Piaget which has been discussed vividly by Black and Pope (2008) indicates that children after 12 years of age enter into the Formal Operational Stage and start looking at things critically due to the complex mental abilities. Hence, if we look from the point of view of this theory, the curricular expectations affirmed by the NCERT are aligned with the mental ability of the young learners studying at the Higher Secondary Stage.

We shall now see how history can act as a catalyst to the needs of the 21st century by referring to some instances from the history textbooks of Class XII prepared by NCERT. The authors reiterate that, at this

level the learning of history has to be critical and should not be taken for granted by promoting rote learning. The justification stands robust, keeping the curricular expectations in mind. Hence, the teaching-learning environment should be created in such a way that the learners get ample scope to develop aptitude and skills along with the content knowledge for the subject with the help of various pedagogical initiatives. Given below are two activities for teachers, who are the bridge between learners and competency-based education. These activities may help teachers to plan their lessons as per the curricular expectations mentioned earlier.

Activity 1

Reading the Sources Critically

According to Hitchcock (2011, p.1), there are certain key features, which are— clarifying meaning, analysing arguments, evaluating evidence, judging whether a conclusion follows, and drawing warranted conclusions. Who is an ideal "critical thinker"? She is open and fair-minded, a keen observer who keeps searching for evidence, has the right kind of knack for being properly informed, is attentive and tolerant to the opinions and reasons put forth by others, applies her mind for duly proportioning belief to the evidence, and is never averse towards considering alternatives and revise beliefs.

In the light of the above, it is worthwhile to reflect upon the Historical Thinking Chart created by the Stanford History Education Group, which is about proposing some significant questions to be asked while interpreting a source as mentioned below.

HISTORICAL THINKING CHART

Historical Reading Skills	Questions	Students should be able to...	Prompts
Sourcing	• Who wrote this? • What is the author's perspective? • When was it written? • Where was it written? • Why was it written? • Is it reliable? Why? Why not?	• Identify the author's position on the historical event. • Identify and evaluate the author's purpose in producing the document. • Hypothesize what the author will say before reading the document. • Evaluate the source's trust worthiness by considering genre, audience, and purpose.	• The author probably believes... • I think the audience is... • Based on the source Information, think the author might... • I do/don't trust this document because...
Contextualization	• When and where was the document created? • What was different then? What was the same? • How might the circumstances in which the document was created affect its content?	• Understand how context/background Information influences the content of the document. • Recognize that documents are products of particular points in time.	• Based on the background Information, I understand this document differently because... • The author might have been influenced by _____ (historical context)... • This documents might not give me the whole picture because...
Corroboration	• What do other documents say? • Do the documents agree? If not. Why? • What are other possible documents? • What documents are most reliable?	• Establish what is probable by comparing documents to each other. • Recognize disparities between accounts.	• The author agrees/disagrees with • These document all agree /disagree about... • Another document to consider might be...
Close Reading	• What claims does the author make? • What evidence does the author use? • What language (words, phrases. images, symbols) does the author use to persuade the document's audience? • How does the document's language Indicate the author's perspective?	• Identify the author's claims about an event. • Evaluate the evidence and reasoning the author uses to support claims. • Evaluate author's word choice; understand that language is used deliberately.	• I think the author chose these words in order to... • The author is trying to convince me... • The author claims • The evidence used to support the author's claim is...

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(https://sites.google.com/site/btrgrad/curriculum-planning/content-specific/history-social-studies/stanford-history-education-group?tmpl=%2Fsystem%2Fapp%2Ftemplates%2Fprint%2F&showPrintDialog=1)

From the above-mentioned premises, it is clear that the presence of primary sources in the NCERT textbooks has ample scope to train young learners to evaluate sources like the professional historians. Simultaneously, proper approach towards the evaluation of sources may prepare learners to look into different sources critically. Let us see a source from the NCERT textbook of Class XII, Themes in Indian History-Part II (P.160), with a closer look to understand its utility in a time dominated by Science and Technology.

Themes in Indian History - Part II

Source 9

Declining a Royal Gift

This excerpt from a sufi text describes the proceedings at Shaikh Nizamuddin Auliya's hospice in 1313:
 	
    I (the author, Amir Hasan Sijzi) had the good fortune of kissing his (Shaikh Nizamuddin Auliya's) feet… At this time a local ruler had sent him the deed of ownership to two gardens and much land, along with the provisions and tools for their maintenance. The ruler had also made it clear that he was relinquishing all his rights to both the gardens and land. The master … had not accepted that gift. Instead, he had lamented: "What have I to do with gardens and fields and lands?… None of… our spiritual masters had engaged in such activity."
 	
    Then he told an appropriate story: "… Sultan Ghiyasuddin, who at that time was still known as Ulugh Khan, came to visit Shaikh Fariduddin (and) offered some money and ownership deeds for four villages to the Shaikh, the money being for the benefit of the dervishes (sufis), and the land for his use. Smiling, Shaikh al Islam (Fariduddin) said: 'Give me the money. I will dispense it to the dervishes. But as for those land deeds, keep them. There are many who long for them. Give them away to such persons."

Considering the curricular expectations in mind if we look into the source, we can see that not only it is supplying content knowledge, but also it is leading toward methodological understanding of the source. The gift envisaged here pertains to gardens and land, which are immovable properties. The story brings out the difference envisaged between the approaches of handling the movable and the immovable properties. As far as the issue of the immovable properties are concerned, the legal scenario at this stage assumes quite a significant importance. The teacher concerned in the classroom, thus may initiate a discussion by raising questions as under, contextualizing the legal implications along with the Curricular expectations and prompts by replicating the above said HISTORICAL THINKING CHART.

Historical Reading Skills	Questions	Students should be able to …	Prompts
Sourcing	• Who wrote this? • What was the purpose behind writing it? • When was it written? • Where was it written? • How was it written? • What is the degree of reliability of the source?	• Identify the stand taken by the author about the historical event concerned • Hypothesize the objective of the author behind writing the text and test them following the Inquiry based approach • Fix the event in time and space	• The author was perhaps of the opinion… • The reason behind declining the gift was perhaps… • On the basis of the source, I feel that the author might have… • I do/don't believe in the text because…

		• Assess the nature of resources available to the author for writing • Take a stand on the trustworthiness of the document based on the socio-cultural scenario of the time and space concerned	
Contextualization	• What were the basic tenets of the law of land during the early 14th century? • What was the value of real estate in comparison with movable property at the time of writing the text vis-à-vis the present-day scenario? • Was any apprehension about the hazards of maintenance of the properties a sort of a latent reason behind denial of the gift? • Why did the context of the approach taken by the spiritual masters turn out to be an important consideration in decision making?	• Acquire the basic knowledge about legal scenario and proceedings at the time of writing the text • Make a judgment in the matter in her/his own way • Make an assessment about the resources available for maintenance and upkeep of the properties and the complications, if any, of the related legal issues • Identify the reasons behind giving a high degree of importance to the spiritual masters	• I shall take a stock of knowing about the evolution of law during the 14th century... • I need to frame an opinion regarding the take of the then society about the movable and immovable properties... • It is crucial for me to know about the problems faced in respect of maintenance and legal matters pertaining to a real estate during the 14th century... • I think the spiritual masters left a lasting impression...
Corroboration	• What are the views expressed by other related documents? • How can I get access to other documents? • Are any related documents available in the Internet? • If any other document exists, then how does its degree of reliability compare with the given document?	• Remove bias as far as practicable • Get a scope to analyse the issues of disagreement, if any • Make a meaningful result-oriented survey of the Open Education Resources	• There is agreement/disagreement of the author on the following points... • The contents of all available documents are consistent about... • Some other possible documents can be...

Close Reading	• What are categorically the claims of the author? • What is the nature of evidences used by the author? • Does the language used by the author indicative of any kind of bias? • Has the author used any kind of lingo (words, phrases, idioms, images, symbols, etc) to bring home his point to the audience faced by him?	• Identify with exactitude the claims made by the author • Make her/his own judgment based on the evidences • Make an assessment about the influence of the language used, in particular, towards convincing the reader of his times as well as that for the posterity	• The claims made by the author are… • The evidences given in support of Claims 1,2,3 are … • The evidence given in support of Claim 4 is not convincing because… • It seems that the author used the words, for the purpose of…

If such questions are initiated in the classroom, the learners get a feel of the work of professional historians with a sense of respect towards the discipline—history. Most importantly, this mental exercise also instils the value of appreciating the role of evidences in our daily lives. In this context we shift our attention to 'Spirit of Inquiry'. It is inter alia enshrined in the Constitution of India (Article 51A) as a fundamental duty of a citizen. One of the existing practices of most of our classroom situations is that, the learners receive extensive support to develop writing skills, but very seldom it encourages instilling of questioning skills. Hence, the cited source and the suggested activity should be taken as one of the instruments to carry a sense of responsibility toward our fundamental duties.

Activity 2: Puzzle

Let us take the example of the connection between History and Archaeology through the study of Indus Valley Civilization as presented in the Textbook of History of Class XII—Themes in Indian History- Part I (p.20,21). It inter alia talks about the excavation work undertaken under the stewardship of John Marshall (JM), the then Director General of the Archaeological Survey of India (ASI) and his successor R.E.M. Wheeler (REMW). It has been mentioned that Wheeler had observed an apparent lacuna in the study conducted by John Marshall.

Before launching the plan of excavation, one has to make a hypothetical assessment regarding the location of the artefacts and the relics, and it is understood that it is unlikely that these would have followed a geometric order. JM had in a way assumed that the relics would be available in horizontal layers which was not the case. It is stated that JM had undertaken the process of digging a mound mechanically along the uniform horizontal lines, and thus in the process many artefacts which actually were located on strata, basically inclined to the horizon at some angle, got lost. So, REMW went ahead with the method of 'Stratigraphy'. The students generally have problems in grasping the concept of 'Stratigraphy', and the 'Chalk and Talk' method alone cannot make the desired impact. It needs to be supplemented with some activity.

In order to make learners understand the 'concept' of Stratigraphy the teacher may follow the approach given below.

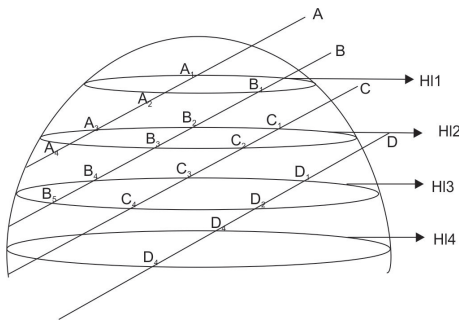## Step-1: Draw the following figure on the board.

Figure 1 : (Representative diagram of a mound along with horizontal layers and strata)

Step- 2: Explain the following points to the class

I- The hemispherical shaped structure represents a mound.

II- HL1, HL2, HL3 and HL4 are horizontal layers.

III- A, B, C, D are Stratigraphic layers (shown parallel to each other as a matter of convenience).

IV- Excavation should have ideally been done along A, B, C, D…

V- Instead, it was done along HL1, HL2, HL3, HL4…

VI- As a consequence – B1 got mixed with A1, A2.

VII-(C1, C2); (B2, B3) ;(A3, A4) got mixed. And similar cases occurred in layers HL3, HL4.

A typical combination of artefacts should have been A1, A2, A3, A4. But we only got A1, A2. A3, A4 got lost.

Now, to check the learning outcome of the explained 'concept' the teacher may enter into Step-3.

Step-3: Distribute the print copies/e-copies of the following figures among the students. Post distribution, make them listen to the following instructions carefully

Figure 2 : (6x6 Square with numbers from 1 to 36)

Figure 3 : (6x6 Square intercepted by horizontal lines. Difference between consecutive numbers= 1)

Figure 4 : (6x6 Square intercepted by vertical lines. Difference between consecutive numbers= 6)

Figure- 5 : (6x6 Square intercepted by diagonal lines. Difference between consecutive numbers= 7)

Figure 6 : (Merging horizontal, vertical and diagonal interceptions)

- The 6*6 square of Figure 2 has been given as a LEGEND to trace the artefacts.
- One will be able to trace the artefact provided one goes along the line which passes through that sequence of numbers where the common difference is 7. Which are the lines?

Step-4: Ask the students to present their findings and make a careful observation of Figures 3, 4, 5 and 6.

Expected Learning Outcomes

1. A comparison of the horizontal (common difference=1) [Figure 3]; vertical line (common difference=6) [Figure 4]; diagonal line (common difference= 7) [Figure 5] will establish that the diagonal lines are those which are required. Considering this square as section through a mound, students can be facilitated to draw analogy between horizontal excavation, vertical excavation and stratigraphic excavation respectively with the horizontal, vertical and the diagonal lines. Figure 6 presents an overall pictorial summary of the processes undertaken.

2. Number System, Sequence, Series and their connection with Geometry and extending all these to the study of history happen to be the hallmark of this approach. While riding the vehicle of this significant connection one can undertake a journey towards further interdisciplinary projects.

3. The learners were made to think about the shortcomings in the approach of John Marshall, and how it was set right by R.E.M. Wheeler. It brings them into their first tryst with the field of 'Archaeology'. They understand the role of Archaeology as a significant part of historical understanding.

The above-mentioned activities will assist teachers to plan their classroom activities keeping the curricular expectations in mind. However, keeping the available resources/ challenges in mind, teachers may plan their own pedagogical practices that will bring competencies to the lives of young learners.

Utility of History as a Discipline

Let us sum up the findings from the point of view of History as a discipline; in order words, let us seek an answer to the question —Why a learner would study History? And the answer on the basis of our study is manifold —

- It develops the thinking faculty in a student.
- It develops the skill of questioning and a spirit of inquiry.
- It has the inbuilt capacity of engaging a student in multiple facets of learning by making them aware of the 'processes' behind a historical event.
- It equips her with the technique of following the method of scientific inquiry in order to look into the events and processes of the 'past'. In this context, Keyser, Rogiers and Truyen (1998) argues that, "although the past is an inspiration source for film, literature or television, the youngsters probably won't be confronted with history in their future professional life. Nevertheless, we are convinced that the basic principles of the historical research method can be of great importance for the general development of young people. The problem-oriented gathering, arrangement, analysis, interpretation, and evaluation of information are indispensable skills to orient oneself in the complex world of today and tomorrow."

Further, going a step ahead, the authors have visualised the whole scenario from the perspective of evolution from industrial to information society. This inevitable transformation from industrial to information society has created new possibilities for

transaction of history in the classroom and today's teacher should be prepared to reap the benefit out of it. It has to be kept in mind that the education system currently faces the challenge of preparing individuals for the information society in which one of the most important objectives is to 'handle information'. Here, history education can play a crucial role. Our society today is very significantly controlled by news media and the phenomenon of information explosion. It has created the dire need for citizens to be critical in respect of handling information, no matter how it is presented and whatever be the source. The situation calls for a paradigm shift in the aims related to the historical use of source materials and it is important that this transferability be duly internalized by students, teachers and all concerned.

Concluding Remarks

The Cambridge English Dictionary provides multiple meanings of the word 'Utility'. Some of which are – useful, advantageous, beneficial, constructive, and salutary. To conclude let us sum up the paper by justifying the relevance of learning history in the 21st century in the light of these meanings.

- It is useful as it has the capability of developing the competency-based skills in a learner.
- It is advantageous as it opens the gate for adopting an interdisciplinary approach.
- It is beneficial as it inculcates the spirit of inquiry in a learner which she can make use of while studying other subjects.
- It is constructive because it provides a new perspective to the learner about the cardinal traits of learning which are the ability to listen to; to read; to write and speak about a subject of critical importance properly.
- It is salutary for its capability of establishing meaningful linkages with the past and archaeology.
- So, we find that all the above meanings are commensurate with the perspectives provided by the authors about learning the subject which is a testimony to the potential of 'History as a discipline' to carry forward the futuristic targets of NEP 2020.

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Teacher's Recruitment, Salaries, and Development: Equity and Quality issues in Eklavya Model Residential Schools

Dipak Karmakar*

Abstract

Eklavya Model Residential Schools (EMRS) are a scheme for establishing schools in tribal pockets across the country to provide quality education for Scheduled Tribes (STs). The present study focused on the necessity of qualified regular teacher recruitment across EMRSs concerning equitable quality education for tribal children. It also intends to explore the current status of teacher recruitment concerning qualification, salary structure, and responsibilities. The study revealed that massive contractual teacher deployment affects the quality of schooling concerning equity parameters compared with other Govt. Schools. The study also validates that contractual recruitment of teachers limits their responsibility. Therefore, a sense of belongingness and teacher leadership beyond the classroom is lacking in these schools. Thus, in a nutshell, it questions equitable quality education for tribal children in terms of teacher recruitment policy, as skilfully qualified teachers are the prime resources for quality schooling.

Keywords *EMRS, Teacher Recruitment, Tribal Student, Equity, Quality Education.*

Introduction

Schools with a higher percentage of underprivileged pupils have more challenges, leading to poor performance and ripple effects throughout the educational system. School leadership, especially teachers, are the key players in transforming the performance of schools with disadvantaged students. However, qualified, trained and skilful teachers are often not recruited regularly or supported to exercise their argentic role in these schools (OECD, 2005). To strengthen teachers' argentic force, teacher training and professional development programs should give both fundamental expertise and specialised knowledge to tackle the challenges of schools with disadvantaged groups. Even though teachers significantly impact students' performance, schools for disadvantaged groups are not always staffed with well-qualified teachers. Policies must encourage teacher quality and regular teacher recruitment for disadvantaged schools and children by providing targeted teachers' training to ensure teachers have the skills and knowledge required to work in disadvantaged schools (OECD, 2012).

Schools like Eklavya Model Residential Schools (EMRS) for tribal children are important for quality schooling. Such residential school with required facilities can influence the achievement, motivation, and learning performance by creating equitable and inclusive school culture within the school system. Across countries it is seen that students from marginalised sections get inadequate opportunities to avail themselves in school and access very fewer school resources and facilities in terms of qualified/skilful human resource, instructional time for teaching-learning, participation in and after school activities (OECD, 2010). Even many times they need extra efforts from teachers, study materials, extra care for coaching to

* Ph.D. Scholar, NIEPA, New Delhi, E-mail - dipak.karmakar91@gmail.com

enhance their academic performance but due to lack of available resources these schools fail to support them (Kumar & Naseema, 2018). Thus, competent and experienced teachers are essential resources for schools like EMRSs with underprivileged students.

Equity and Quality in Education

Equity is the philosophical basis of broader ideas of justice and fairness. Education emphasises the pragmatic views of "equal opportunity" and "equivalent treatment" regarding access to school and required facilities (OECD, 2012). Equity provides personalised resources that enable all workers to attain common goals. To put it in another way, all students have the same goals and expectations, but the support they require to reach those goals varies. Ensuring all students have access to high-quality education also recognises the intrinsic value of diversity and the dignity of all individuals (UNESCO, 2016). An equitable education system means a fair and inclusive academic culture that supports students in reaching their learning potential without barriers or obstacles (Schleicher, 2014). The goal of equity in education is to support those learners who are from poor backgrounds; by ensuring quality education for them with the best support so that they can acquire a basic and more advanced skill for their overall development as well as the progress of an inclusive society (Field, Kuczera and Pont, 2007). Fair and inclusive resourcing is the priority to achieve equity at the school level to ensure quality education, especially for underprivileged children.

The most effective education systems combine quality and equity so that most students can achieve a high level of knowledge and skills (OECD, 2012). They provide all children with access to high-quality education through the system and school-level policies that encourage equality and quality to help marginalized students and schools. It looks into system-level and school-level policies to promote equity and quality in education to support disadvantaged students and schools. Equity

in the education system needs to be fair and inclusive in its design (conducive systems and paths across the education system), practices (inclusive in-school and out-of-school practices), and resourcing (equity priorities, resources, and targets). It would help the school facilitate a fairer education for the marginalised students per their needs and make a more equitable society by reducing the underprivileged learning gaps.

Context of the Research

The context for this research explores the critical status of the teachers of Eklavya Model Residential Schools (EMRS) across West Bengal. EMRSs are considered a sustainable educational environment for tribal children that focus on equity; students must develop the knowledge and skills they need to engross and become efficient members of the society. Specifically, the schools dedicated to the education of tribal people need more support on the ground of expertise in human resources, expenditures, infrastructures, and other relevant resources from the governments or managing bodies to improve school readiness and create fair, equitable support to meet every need of tribal students (OECD, 2012).

Realising the importance of quality education, as it is associated with quality of life, the Government of India (GOI) introduced the Eklavya Model Residential School (EMRS) scheme for residential schooling facilities dedicated to Scheduled Tribes (STs) students following the Jawahar Navodaya Vidyalaya (JNV) as a model pattern. The main focus of the EMRS scheme is on providing quality education to Scheduled Tribes (STs) at upper primary to higher secondary levels. The aim of the EMRS scheme is not only to empower tribal students to take advantage of reservation in higher and specialised courses or secure a good job in public and private sectors but also for the empowerment of each student as a change agent from school, family, village, and society (EMRS Guidelines, 2020, Ministry of Tribal Affairs, Govt. of India).

Aims of the Research

The overarching aim of this research was to revisit the nature of appointments of teachers across the EMRSs in the state of West Bengal. Specifically, the study focused on how teachers are being recruited and their quality and qualification concern to the equity of access to school. The study also focused on how teacher recruitment has become an essential factor for the quality of school education in a disadvantaged context like EMRSs. Thus, this paper's prime concern is teachers' qualifications, expertise, and professional development to meet the set standard of government policies.

Methods

This paper is a part of more extensive research done by the researcher. The research was primarily based upon data drawn from the interview of school principals of EMRSs located across the state of West Bengal. The researcher prepared a basic information schedule to collect data regarding school information related to the study by interacting with the administrative staff, school principals, and teachers. The collected information from the interview was transcribed in textual form, and then the researcher analysed the data by employing a systematic assignment of codes and themes. The information about the sampled schools was analysed by applying different techniques, such as, percentage analysis, tabulation, etc.

Teachers' profiles of EMRSs in West Bengal

Teaching and learning are the hubs around which education systems are organised. The role of teachers remains central to the processes of teaching. The role of the teacher in the classroom, in society, and the world at large has changed from the past. A qualified teacher is an essential resource and support for a good school. It becomes even more critical in a situation where marginalised communities are seeking to be inducted into modern education systems. In such cases, teaching becomes a mission, and the result is expected to bring in the marginalised as equal participants in a learning quest. Such an enterprise will require equal empathy, understanding, and knowledge.

Therefore, imparting equitable quality education, especially to marginalised students, will only be possible if they have access to qualified teachers in their schools. The inadequate number of teachers in the schools for the marginalized students is a concern to all of us to ensure their educational needs. The insufficiency of teachers affects the regular school activities and fails to support the learning needs of the learners. Most EMRSs across the state of West Bengal are running with an insufficient number of regularly appointed teachers.

Table 1: Teachers' Profile of EMRSs in West Bengal

Teachers' Profile of EMRSs in West Bengal							
School name	No. of teachers	Gender		Nature of appointments			School name
		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, 2021

Among all the EMRSs in West Bengal, only EMRS Satyabanpalli has the highest representation of total teachers (44 teachers) although out of total appointed teachers there, 27.27 per cent teachers are appointed as contractual, and 72.72 per cent teachers are appointed as guest teachers. The average representation of regular teachers is significantly less across all the EMRSs, and the number of contractual teachers is the highest, followed by guest teachers. Approximately 60 per cent of teachers across the EMRSs were appointed as contractual teachers, 25 per cent as guest teachers, and only 15 per cent as regular teachers. Thus, despite EMRS being residential, the meagre salaries of the contractual and guest teachers free them of the binding to stay on campus, leaving little benefit in teaching-learning that the children can derive from residential set-ups.

Moreover, the temporary teachers are either paid per lecture or a fixed monthly remuneration. Hence, their responsibility gets limited to the delivery of subjects only. Also, in these EMRSs, approximately 21 per cent of teachers do not have proper teacher training (B.Ed. and M.Ed.) qualifications. Adding to the concern, many teachers who are appointed as regular teachers also do not have any teacher training degree. The lack of teacher training degrees compromises the quality concern of these teachers and the schooling structure. As Bennell & Akyeampong (2007) contends that, delivering quality education depends on having a sufficient supply of adequately trained, motivated, and driven teachers.

According to the Rashtriya Madhyamik Shiksha Abhiyan (RMSA) norms, a secondary school with up to two sections in each class should have a minimum of five subject teachers. Because the RMSA criteria call for a Student Classroom Ratio (SCR) of 40:1, a two-section school would generally have 160 students enrolled. Even if the enrolment is fewer than 160, a minimum of

5 subject teachers must be given. According to the RMSA norm of PTR of 30:1, one additional teacher may be provided for every incremental enrolment of 30 students. But the actual number of regular appointments is not found to be more than 4 in any EMRS across the state of West Bengal. EMRS Satyabanpalli has zero representation of regular teacher appointees. So it becomes imperative to realise that buildings and infrastructure devoid of its teachers cannot provide quality education. It also found that political willingness to open new schools and residential set-ups for the marginalised are most welcome if they are backed by well-qualified and systematically recruited regular faculty.

Snapshot of the school principals as school leaders

Out of seven EMRS in West Bengal, it was discovered that only two EMRS have regular appointments of School Principals, and three EMRS have contractual appointments of School Principals, while the other two EMRS have Teachers-in-Charge as Principals. West Bengal Public Service Commission is the responsible government agency for the regular appointment in EMRSs across the state. Each school is directly managed through a district committee, as per EMRS establishment provision. This district committee of the respective school is responsible for recruiting contractual and other appointments. Vice-principal positions, which are required for better management at the school level, have not been observed by the researcher in these institutions. Except for two principals who lack teacher training credentials, all of the EMRSs principals in West Bengal are well-educated. No principal has prior experience in residential schools, especially in the context of tribal children. They do not get access to any training for leadership or other professional training for better management at the school level.

Table 2 : School Head Profile

School Principals' profile of EMRSs in West Bengal					
Name of the schools'	Nature of appointments	Qualifica-tion	Previous experience	Leadership training	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, 2021

Residential Status of Teachers on the School Campus

These residential schools are expected to house students as well as teachers. However, in most cases, teachers stay away from the hostels. A sense of belongingness, ownership, and a family feeling would give a caring, safe and secure environment conducive to learning and which otherwise gets compromised. Moreover, when teachers stay away from school, it also limits the teacher's interaction time with students. Teachers who are culturally, linguistically, and socio-economically from different strata and do not get to spend sufficient time with children find it challenging to accept and appreciate the differences and hampers healthy relationship building; instead, creates socio-economic boundaries. EMRSs are located primarily in tribal pockets, and these are fully residential schools where teachers and students have to stay on the same school campus. However, it was observed that in most EMRSs, there are significantly fewer teachers residing with the students in the school campus. An average of 19 per cent of total teachers resides at the school campuses of EMRSs across the state. Out of the total residing teachers, only 15 per cent of female teachers live on the school campus. Out of all the seven functioning EMRS within the state, only female teachers reside within the school campus in EMRS Kankutia and EMRS Raghunathpur. Out of seven school principals, only three live at the school campus, and the other four principals do not reside at the school campus; they prefer to travel from outside. Since the majority of the teachers do not live on the school campus, there is technically very little support for students after school hours. Thus, technically there is hardly any support for students on campus after school hours as most of the teachers do not reside in the school campus.

Recruitment Procedure

As per the EMRS guidelines, the state government is responsible for the management and effective functioning of EMRSs. Thus, in West Bengal, at the state level, Paschim

Banga Adibasi Kalyan O Siksha Parshad under the Tribal Development Department is responsible for managing EMRSs across the state. Teachers in EMRSs across the state have been appointed in three categories; regular, contractual, and guest teachers. The regular teachers have been recruited on merit basis following the West Bengal Public Service Commission (WBPSC). It follows state government rules and regulations for recruitment, so they conduct a written test and interview to select candidates. For the recruitment of contractual and guest teachers, each District Level Committee (DLC) is responsible, and they recruit these contractual teachers as per the respective school's present needs. After consulting with the school heads, the District Level Committee advertises for the required vacancy, selecting the candidate through an interview.

Table 3 : Nature of Teachers' Recruitment across EMRSs in West Bengal

Nature of appointments	Regular	Contractual	Guest
Recruiting authority	WB PSC	District Level Committee (DLC)	District Level Committee (DLC)
Recruitment procedure	Written test and interview	Interview	Interview
Eligibility criteria	As per state govt. norms	As per state govt. norms	Decision taken by DLC
Salary structure	As per state govt. pay scale	Monthly remuneration of Rs. 25000/- only	Rs. 700/-per Day (Maximum 3 days in a week)

Source: Field, 2021

The salary structure of teachers in EMRSs is not equal for every teacher as there are mainly three categories of teachers appointed. Therefore, based on the nature of the appointment, a different salary structure exists for the teachers. The teachers selected for a regular post receive the salary as per the Sixth Pay Commission scale from the West Bengal Government. All the contractual teachers in EMRSs receive a consolidated salary of 25,000 rupees per month, and guest teachers are paid 700 rupees per day (3 days a week). No additional allowances or incentives are given to the teachers in EMRSs. As we know, a residential school's workload and other responsibilities are more in other day schools. But in this context, teachers appointed as guest teachers receive a very meagre salary, which is a vital source of dissatisfaction and demotivation for the teacher, leading to a consequent lack of ownership and commitment to the profession (CBPS, 2017).

Gender Distribution

The guidelines of EMRS have encouraged the recruitment of more female teachers, but the average representation of female teachers in all the seven EMRSs across West Bengal is approximately 27 per cent only. According to the field data, these schools do not have any female school principal or vice-principal. The study also revealed that it is unclear whether female teachers are drawn to EMRSs because female teachers, particularly those from tribal communities, would have benefited from being friendlier with female students than male teachers. All the EMRSs have reflected a high representation of male teachers, whereas only EMRS Satyabanpalli, located in Jhargram District, has found 48 per cent female teachers in the school. Thus, a very small number of women in the teaching workforce in these schools are an additional factor for raising questions concerning the quality of schooling parameters.

Experience in Teaching Tribal Context and Tribal Roots of Teachers

The study reflected that most of the teachers in EMRSs across West Bengal belong to non-tribal communities, and there are very few teachers from tribal groups. Managing schools in tribal areas requires understanding the socio-cultural contexts of tribal communities (CBPS, 2017). The effectiveness of non-tribal teachers in addressing the issues of students from tribal backgrounds is hampered by their relative tribal experiences. It all leads to non-empathetic attachment between non-tribal teachers and tribal students. Thus, a good number of teachers from tribal communities or with good knowledge and experience about the tribal cultures in these schools would be more effective towards quality teaching-learning.

Opportunities for Professional Development

Teachers in these schools do not get access to specialised training programs to meet the unique challenges and needs during the teaching-learning process. There is no in-service training or induction program for the Eklavya Model Residential Schools teachers by the "Paschim Banga Adibasi Kalyan O Siksha Parshad" or the School Education Department of the West Bengal Government. Professional development can raise the calibre of existing employees and help teachers tailor their knowledge and abilities to the needs of their pupils and the school. Professional development is more effective when it is methodical, persistent (for as long is necessary), and in line with the needs and objectives of the school (Darling-Hammond, 2010).

Different types of training, such as tribal exposure in residential school contexts and practices, new curricula and age-appropriate classroom teaching, pedagogical subject training in a tribal context, etc., are needed for the teachers in EMRSs. When compared with other residential schools such as Jawahar Navodaya Vidyalayas (JNVs), they have more qualified and higher-paid staff. In JNVs, they provide regular in-service training conducted by the Navodaya Vidyalaya Samiti (NVS), which is missing in EMRSs. As the management of EMRSs varies from state to state, thus there exists a difference in teacher management. Regular training is necessary for the teachers working in EMRS as it helps in keeping high motivation and job satisfaction.

School Leadership Management and Teachers Training

Headmasters and principals must receive leadership training to ensure every student receives a high-quality education. The school heads must be aware of the school's strengths and weaknesses to build robust strategies to monitor curriculum, and lesson plans, conduct competency-based assessments, and track and analyse students' performance, attendance, and retention rates. The headmasters'/principals' job as school leader is to develop motivation among teachers and other staff regarding punctuality and attendance in daily schooling activities. The school leader must also assure the availability of resources in the school and appropriate distribution with optimum utilization as an effective manager (RMSA Guidelines, 2014, Ministry of Human Resource Development, Govt. of India).

There is no such provision or opportunity for in-service teacher training, orientation program, or induction program for the teachers working in EMRSs across the state. There is no tribal sensitisation program for the teachers, as most teachers come from the non-tribal group and have little knowledge about tribal cultures and practices. Therefore, for most teachers, it is very hard to understand the basic learning needs of these tribal students. Additionally there remains a hidden communication gap between teachers and students during teaching-learning hours. These Eklavya Model Residential Schools were established

only for the quality education of deprived tribal children; in this specialized context, regular teacher training is a significant concern for the overall progress of the school and students. Different training or orientation programs are needed for schools of different contexts like EMRSs. Compared with other residential schools such as JNVs, they have more qualified and higher-paid staff. JNVs provide regular in-service training conducted by the Navodaya Vidyalaya Samiti, which is missing in EMRSs. As the management of EMRSs varies from state to state, thus there exists a difference in teacher management. To keep high motivation and job satisfaction, regular training is much needed for the overall progress of EMRSs.

Roles and Responsibilities of Teachers in EMRSs

The major roles and responsibilities of the teachers in EMRSs are centred on academic support as per the needs of these tribal students. These tribal children belong to deprived socio-economic backgrounds, most of whom are first-generation learners, so they need individual academic support to cope in these schools. EMRS follows English as the medium of instruction, and most tribal children complete primary schooling in Bengali or Santali. Initially, these tribal children faced lots of language issues. It is also challenging for the teachers, as most are from the non-tribal community and do not have any prior experience or knowledge about tribes, cultures, and their home languages. To make it worse, no induction programs are conducted to introduce the teachers to the culture and language of the students and their communities. Thus, teachers in Eklavya Model Residential Schools, especially those fulfilling the role of matrons or mentors, should either belong to tribal backgrounds or have sensitivity and understanding of tribal culture and language. Having a better experience of equity and efficiency problems becomes much more challenging for the teachers (CBPS, 2017). Besides this, all the

teachers have a significant responsibility in the broader management of the day-to-day affairs of the residential school. In these schools, the different responsibilities are distributed among the teachers by setting up various committees. The responsibilities of teaching and coaching classes for weak students are the primary concern of the teachers in this school. Most of the teachers do not reside at the school's staff quarters; they travel daily to come to the school. As most schools do not have sufficient staff quarters, and the conditions of available staff quarters are not as good to stay with family. Thus, this infrastructural lacuna needs to be addressed by the responsible agency of the EMRSs management.

A Lack of Governance and Management Support

Governance structure at different levels plays a crucial role in the effective management of schooling processes as it incorporates rules, regulations, and authority in the functioning of a school system. The governance and management of EMRSs across the country has three levels of governance structures, such as Central-level (Ministry of Tribal Affairs, Government of India), State-level (Tribal Development Department, State Government), and District-level (School-level). However, a National Education Society for Tribal Students (NEST) has been established separately on behalf of the Ministry of Tribal Affairs to plan, construct, establish, endow, and administer the Schools as well as to carry out all acts and things necessary for or conducive to tribal education across the nation. State-level Tribal Development Department of the respective state government is responsible for maintaining, controlling, and managing the schools as per the EMRS establishment guidelines and norms formulated by the Ministry of Tribal Affairs (MTA), Government of India. A committee has been established at the district level to supervise the school's day-to-day functioning. Department of

School Education and Literacy under the Ministry of Education, Government of India, neither has any direct roles and responsibilities nor has any linkages with governance and management structures of EMRSs in collaboration with MTA/NEST, which reflects a central level support gap as a flawed governance structure. Governance structures for the effective functioning of EMRSs need to be associated with an efficient and effective administration in a democratic framework. EMRS was established along the lines of the Jawahar Navodaya Vidyalaya model but failed to develop the governance and academic structure like JNVs wherein there are regional offices with capacity-building centres for training and a national leadership institute at the headquarters in Delhi, which collaborates coordinates, and conducts regular capacity building programs both for the school leaders as also the teachers.

The overall governance structure for the management of EMRSs across the state of West Bengal is only restricted under the setup structured by the Tribal Development Department (TDD), Government of West Bengal. The School Education Department (SED), Government of West Bengal, has a limited role and responsibility in managing/ providing support for the quality concerns of EMRSs across the state. As there is no inter-departmental collaboration or link between TDD and SED, it projects a flawed governance structure for the management of EMRSs across the state concerning the equity and quality education parameters. This structure is controlled by the state bureaucracy that follows a top-down approach with a centralised controlled operating mechanism. Thus, the individual school remains isolated from the decision-making structures of governance at the state level. There is neither a direct link nor scope for one to establish direct communication between someone from the bottom-tiers with any of the structures higher-up. As these schools function in a particular context, they need a specially focused

and experienced leadership to address their varied locational needs. Therefore, it directly or indirectly affects establishing a unified teacher recruitment policy, teachers' regular professional development, school supervision & monitoring program, etc. In the case of EMRSs, the Tribal Development Department and District Level Committees have been given responsibilities, where education is one of its roles apart from other tribal development works and public administration responsibilities; thus, it lags focus on education. Moreover, at the field level, there are hardly any inter-ministerial linkages at the national and state levels.

Discussion

Since India's independence, expanding its educational system without a parallel commitment to equity in educational opportunities or educational quality has been one of the country's largest concerns. Even while the Right to Education Act of 2009 (RTE), at least in theory, aimed to guarantee equal opportunity, many children, especially those from the most marginalised groups, continue to have low learning levels and poor educational achievements. The Eklavya Model Residential Schools (EMRSs) are being established for STs in the light of the trend of creating high-quality residential schools for the advancement of education and to also assure the all-round development of tribal students throughout the country (EMRS Guidelines, 2020, Ministry of Tribal Affairs, Govt. of India). The schools (EMRSs) are aimed to provide quality education from upper primary to higher secondary levels to tribal students in tribal-dominated areas. The EMRSs are also designed to enable tribal children to access the best opportunities in education for bringing them into parity with the mainstream community.

Access to school and schooling facilities is one of the important aspects of equity and quality education. Regarding this fact, teachers are the most important human resource for any school system. Thus, if there is any lack

or gap in the quality of human resource support in terms of eligibility, qualification, appointment criteria, salary structure, etc., it will automatically affect the entire system. Evidence from several countries reveals that contractual appointment hurts motivation and social status (Stromquist 2018). Key factors influencing students' learning include teachers' competency and dedication (Bennell and Akyeampong, 2007). It is commonly known that qualified, well trained teacher is essential to encouraging student learning (Leithwood and McAdie, 2007). The effectiveness of teachers' instruction, in turn, is significantly influenced by a mix of their teaching skills, enthusiasm, and motivation. According to research, teacher motivation is a crucial element of teacher effectiveness and has a greater impact on the teaching-learning process than teacher competency (VSO, 2002, Upmanyu, 2016).

The paper argues that a mental model regarding job satisfaction is important for any individual, which depends highly upon the degree of ownership teachers feel concerning their recruitment policy and facilities. Therefore, the appointment of teachers with a good salary structure and other required facilities like incentives are of utmost necessity. The study found that teaching in schools like EMRSs is not easy; here, in this specialised context, a teacher is a leader in his own right, as teachers embrace certain dispositions, knowledge, and skills for the betterment of the whole school's progress. Several studies also suggested that educational policy developers believe that by redeveloping and restructuring the education system, prevailing teaching practices will change fundamentally (Ball, Maguire, Braun, & Hoskins, 2011). However, that is not true; we need to create systemic support that recognises and rewards teachers as important human resources for a school system to meet its quality concern. Teaching is an important component of delivering quality education, and teachers' education and training are crucial for ensuring quality teaching. In turn, they facilitate the transformational power

of education for individuals, communities, and nations. It is particularly important for schools with disadvantaged students to have effective teachers. First, a benefit of highly competent teachers is that they can have a significant impact on students' learning outcomes, effective enough to enhance students' achievement. Second, they might aid underperforming learners in catching up and advancing. Thus, effective teaching strategy is needful for under achievers; however, they are the ones who are deprived of it (Darling-Hammond, 2000, OECD, 2005).

Conclusion

Education is the key to any kind of development. It is no different for the tribal community. Due to poor educational status among tribal communities, their development is also quite slow. Only drastic measures can improve the status of the tribal. The importance of qualified and well-trained teachers cannot be overstated when it comes to improving student learning outcomes. It is against the law to employ unqualified and undertrained teachers under the RTE, 2009. Policies that don't consider teacher sentiments will lead to a highly demotivated workforce, jeopardising student achievement (Kembhavi, 2011). Towards the achievement of the Sustainable Development Goals (SDG-4), the United Nations emphasises the importance of investing in and having professionally qualified teachers in order to ensure that all children acquire the knowledge and skills they need for a sustainable, culturally rich future. As a result, teachers, as the frontline leader, play a critical role in achieving five of the seven targets of SDG-4 goals through their knowledge, beliefs, attitudes, and practices of teaching (Sarangapani, et al., 2021). In the context of quality education for tribal learners, EMRSs in West Bengal are run mostly by contractual and guest teachers. Only 15 per cent of teachers, out of the total teachers of all the seven EMRSs, are appointed as regular teachers. Thus, the

lack of regular teacher recruitment affects the common teaching-learning process innovations, inspiration, and motivation. The representation of female teachers across the EMRSs is very low. It is seen that many teachers engaged across the EMRSs of the state do not have any teacher-training degree. There is a lack of teachers from tribal communities as most of the teachers in EMRSs across the state belong to non-tribal groups, and their social background does not match the that of the tribal student. Therefore, a communication gap between teachers and students prevails, which affects the quality of schooling. Sometimes, the negative attitude of non-tribal teachers toward the tribal students affects the learning outcomes of the poor tribal students and further leads to dropout (CBPS, 2017). In schools staffed with tribal teachers, especially those from the same community, tribal children have been more likely to participate in school, as these teachers understand and respect their culture better. The tribal teachers would be more natural candidates. In spite of this, all teachers including the teachers who have tribal roots need specialised training, both on course materials and on appropriate behaviour with tribal students. It is also important to readdress the flawed governance structures of EMRSs so that it can remove the structural obstruction of equity and quality education concerns of EMRSs by establishing unified teacher recruitment and teachers' professional development policy

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Emergent Investigations in Design Practice: Lessons from Engaging the Social Sciences Undergraduates in Design-based Concept Learning

Ritesh Khunyakari*

Abstract

This paper reports the findings from an engagementof social sciences undergraduates in design thinking, whichencouraged them to identifyrelevant conceptual ideas in life sciences that can be applied for societal welfare. About 12 groups of 4 to 6 undergraduates (participants)worked collaboratively on a design task around an idea identified and owned by the group itself. A case study approach enabled closefollow-upon the group's workby analysing their visual and written productions, and prototype outcomes. Evidence from two casesis used to exemplifydesign-based concept learning and understand how the experience of designing necessitated emergent investigations. The design thinking process afforded close attention to structure-function relationships, deepened an understanding of concepts, conscious understanding of material properties and assemblies, and building empathetic perspectives for appreciation of natural design and human-designed technologies. The emergent investigations undertaken by a group during the various phases of designing suggests its critical role in systematically evaluating formative design ideas, supporting iterative reflexivitythrough an interplay of materials, sketches and models that afforded conceptual transitions.

Keywords: *emergent investigations; design-based concept learning; scientific and technological literacy; STEAM education*

Background and Rationale

The need for building scientific and technological literacy (STL) through the curriculum echoes in education reforms across the globe (de Vries, 2012; Saracho&Spodek, 2008; Fourez, 1997). However, the meanings, thrusts, and educational valuesattributed to scientific or technological literacy demonstrate changing interpretations over time. For instance, an analysis of the past 20 years of literature by Valladares (2021) suggests a transition from a transmissive educational vision of scientific

literacy that equipped learners with scientific concepts and processes for its application to a transformative vision that involvesa stronger engagement with social participation and emancipation. Similarly, Dakers (2014) noted a shift from an earlier emphasis on "being" technologically literate (denoting a telos or end-state),which encouraged critical awareness of the technological lifeworld to the renewed envisioning that articulates technological literacy as an ever-dynamic, on-going process of "becoming" literate within the changing technological world. Amidst this changed conceptual positioning,

* TISS-Azim Premji School of Education, Tata Institute of Social Sciences (TISS), Turkayamjal, Ranga Reddy District, Hyderabad 501 510, E-mail - ritesh.k@tiss.edu

there has been a growing recognition for engaging with concepts and ideas beyond the orthodox disciplinary boundaries. On the global scene, this change reverberates in the Next Generation Science Standards (NGSS), which articulates the role of three distinct and equally important dimensions of learning: disciplinary core ideas, science and engineering practices, and cross-cutting concepts in the curriculum, enabling build a cohesive understanding of science over time (NGSS, 2013). On the Indian scene, a much greater emphasis on multi-disciplinarity approach has been promulgated in the recent National Education Policy (NEP) 2020. Overall, reimaginingeducational space holds the critical responsibility of engaging learners in conceptual content by providing knowledge through disciplines as well asaffording opportunities that facilitate meaningful connections of concepts, encourage modellingof ideas, and situate learning within authentic life experiences of learners. In seeking STL, the advice of Kirschner (2009)aboutmaintaining a distinction between the learning and doing of science is helpful. Often, the non-cognisance of this distinction results in the tension between epistemology and pedagogy. Among other ideas, the NEP 2020 emphasises the principles of synergy in curriculum across all levels of education, multi-disciplinarity, and holistic education (GoI, 2020). In such a context, the larger question concerns the kind of opportunities,which promote STL that can be carved within curricular spaces thatallow for productive learning engagement.

Several educationists (Saltmarsh, 2010; Kincaid & Pecorino, 2004) and pedagogues (Kumar, 2009; Pathak, 2018) have argued the need for engaging with research and experimentation to rejuvenate pedagogies and conceptual ideas. The educational experiences centredon *designing*have been known to establish empathetic connections between the content and learners (Surma-aho&Hölttä-Otto, 2022). Retracing the notion of design suggests two critical threads of impact on educational practice. Etymologically, design connotes a noun, verb, and adjective. This implies that design refers to both the process and outcomes involving the act of designing. As an adjective in design thinking, itdelineates from the other forms of thinking, highlighting the qualitatively salient and discursive learning experience rather than a mere categorical distinction. Conceptually, design has been argued, by its proponents, as representing a "third culture", distinct from the other two dominant cultures of arts or humanities and the sciences.

Table 1 summarises ideas identified by Cross (2006, 1982) to discern the nature of focus and process of engagement in the three cultures. While these distinctions may have helped in the past to characterise the nature of disciplinary orientations, in contemporary times, these serve to seek balanced appreciation of learning, especially in ensuring multi-disciplinarity exposures that enrich our practice. The extensive proliferation of *designerly* orientations in reimagining educational studies and practice is a case in point. Examples manifest in design-based research methodologies (Anderson & Shattuck, 2012), design experiments (Collins, 2010; Cobb, Confrey, diSessa, Lehrer & Schauble, 2003), and design-based learning (Kolodner, Camp, Crismond, Fasse, Gray, Holbrook, Puntambekar and Ryan, 2003) approach to learning. Scott, Wenderoth and Doherty (2020) assert that design-based research investigates the "learning ecologies" that move student thinking toward mastery. Given the transformations in the educational landscape, it becomes crucial to ask how can the educative experiences be orchestrated with design thinking so as to provide authentic, meaningful and enriching opportunities for learning about science and technology.

Table 1: Distinctive features of the "three cultures"(adopted from Cross, 2006).

Criteria	The culture of		
	Sciences	**Arts / Humanities**	**Design**
Phenomenon	The Natural World	Human experience	The Artificial World
Methods used	Controlled experiment, classification, analysis	Analogy, Metaphor, Criticism, Evaluation	Modelling, Pattern-formation, Synthesis
Values	Objectivity, Rationality, Neutrality, and concern for 'truth'	Subjectivity, Imagination, Commitment, and concern for 'justice'	Practicality, Ingenuity, Empathy, and concern for 'appropriateness'
Purpose of education	Transmission of knowledge about a phenomenon of study	Training in appropriate methods of enquiry	Initiation into the belief systems and values of the 'culture'

Theoretical and conceptual orientations

The study design and analysis have been informed by the socio-cultural tradition of Vygotsky (1978),which characterises human thinking and action as critical to learning. The mediational interactions *with* and *through* materials, tools, symbols, and social communication that support thinking and transform practical activity are dimensions of interest in this study. Further, the experiences of practical activity involving designing and making afford for a focus on the processes of learning. The analysis zoomed into moments involving collaborative engagement to understand learners' cognitive struggles to scope ill-structured problems through the use of materials, use of prior knowledge and imagination, influences that contoured reflective transformations of ideas, and fluid movements between cognitive and physical modelling of ideas. While an exhaustive discussion of all these ideas will be difficult to achieve in this paper, the effort is to capture transitions noticed during the process of design engagement and highlight the prospect of "emergent investigations" in enabling contextual motivation for pursuing the use of scientific concepts through design thinking. In this study, design thinking is envisaged as a mediated activity that affords empathetic, contextual navigation between the social and the individual.

The process of designing is acknowledged as a specialised kind of problem-solving, which deals with wicked or ill-structured problems (de Vries, 2020). Inquiry or investigations have been of critical interest to the learning of science. Based on the relative extent of autonomy to learners concerning the formulation of goal, question and procedure (method) pursued, Heather and Bell (2008) identify a four-level continuum to classify the levels of inquiry in an activity as confirmation, structured, guided and open inquiry. The student-generated questions of 'wonderment' (comprehension, prediction, anomaly detection, application and planning) kind, as opposed to those addressing 'basic information' or 'surface learning' approach, have been found to be productive in enabling science learning(Chin & Brown, 2002) and support open investigations(Chin &Kayalvizhi, 2002). Further, Chin (2002) underscores the critical agency of teachers in helping students to identify the worthwhile problems to investigate. However, studies in science education caution us to challenges associated, which arise from the open-ended investigations being perceived differently by the teachers (Dunlop, Diepen, Knox & Bennett, 2020) or from a mismatch between the intended and the student-experienced curriculum (Hume & Coll, 2010). Metz (2004) noted that learners' appreciating and addressing uncertainty in their own investigations is critical for effective scientific

inquiry. The contexts of design problem-solving involve investigations that are not just open-ended but also ill-structured and engage with uncertainties, often both for the learners as well as teachers.In the context of technology education, Kimbell, Stables and Green (1996) consider investigation as an initial phase and refer it to "any activity which involves pupils in collecting information which is directly relevant to their task. This could be achieved from a wide range of sources, including books, CD-ROMs, experiments with processes, material tests, conversations with, demonstrations by, or questions to the teacher or any other 'expert'. It occurs at any point in a project." (p. 54). Although investigation can happen at any point, it seems to be conceived as a structured activity with the explicit intent of gathering and supplying information to the participants who have been given a design brief engaging them into design thinking.In such endeavours, the investigations are often pre-planned and scripted by the teachers. What are the contexts and kinds of investigations initiated and led by the participants? Studying the context in which investigation sets into motion and how it impacts design thinking is a line of interest that needs perseverant engagement. Further, investigations can reveal the internalised concepts and processes of engagementin learning, especially in contexts that demand connections across the disciplinary domains.

Design thinking can be related through features of design culture and *designerly ways of knowing* (Cross, 2006). *Designerly* thinking mediates curricular content and proffers imaginative transfer of understanding to the appropriated contexts identified as relevant by the learners, encouraging us to harness the confidence and interest of learners in STEAM (Science, Technology, Engineering, Arts and Mathematics) education (Kijia& Sun, 2021). Design as an iterative process of sustained thinking, consolidating and reflecting is also mediated through sketches and material explorations. The diverse role of sketching in enabling human cognition during the design process has been well established across all ages, from the early age (Hope, 2018) to professionals engaging in designing (Goldschmidt, 2017). Tracing the sketches allows track progression in ideas and provides a window into design cognition (Khunyakari, 2015). Acknowledging design as a fundamental human cognitive capability manifested through cognitive modelling (Roberts, Archer, & Baynes, 1992) favours a discursive role for design in learning. While Wells (2013) argues for the role of design thinking in building technological literacy, Kimbell & Stables (2007) assert the relevant need and salience of building the design capability with the curriculum. At a meta-level, a group of researchers identify close parallels between the ideas of design progression and the biological process of evolution (Ziman, 2000).While the instrumental mediation of design for accomplishing the curricular and pedagogical goals are often underscored, an elaborate understanding of design process engagement in diverse learning contexts is revealing. The study reported in this paper attempts to elaborate on both these aspects.

Barlex (2009) has argued that science can be used in teaching and learning design and technology education. This study attempts to present an alternate proposal wherein the design thinking process can support authentic and meaningful learning of the sciences. The study seeks to demonstrate that design and technology education experiences can be reliably used to drive learners' motivation into thinking scientifically and encourage learners to search and navigate knowledge ideas relevant to their immediate context of design. If structured carefully, the context may open prospects for deep learning, guided by an empathetic stance towards society. This viewpoint is consistent with the idea of design-based concept learning (DBCL) in science and technology education proposed by Ineke-Henze and de Vries (2021). Characterised as belonging to the family of social constructivist approaches to learning, the DBCL framework argues for convergence of concepts, design-based processes, and

multi-disciplinarity in education. Further, the DBCL framework foregrounds the valued contribution of design experience in making abstract concepts tangible or operable, enriching knowledge through systematic iterations while designing and the crucial agency of teacherin supporting learning.

Research questions

The study investigated how an experience of design thinking, included within the teaching and learning of life-sciences course, impacted learners' thinking and reflective engagement. The study retraces learnings assimilated from the design experience and explores the dialectical interconnections between science and design process, mediated through emergent investigations. The study addressed the following research questions.

1. How does the process of design thinking manifest during the various points of collaborative engagement? What insights does it bring in developing an appreciation of the design process in pedagogic practice?
2. How are emergent investigations salient to the process of design thinking and science learning?

Operationalisation of critical constructs

Constructs, critical to the study, are operationalised by drawing upon relevant ideas from the literature and analytical observations gathered from the data.

Designerly ways of knowing

An engagement in design thinking has been known to involve five aspects that characterise *designerly ways of knowing*.These include tackling ill-defined problems, mode of problem-solving being solution-focused, mode of thinking being constructive, use of codes that translate abstract requirements into concrete objects and employing codes to read and write in object languages (Cross, 2006).

Emergent investigations

The features that characterise emergent investigations are based on when they occur during the design process, how they contribute to shaping ideas and the purposes they serve for the learners. Unlike predetermined, structured investigations leading to the next course of actions, emergent investigations arose at various points during the group's project engagement: while exploring design ideas, during sketching design ideas, while working with materials, while evaluatingartefact sub-componentsand assembly functioningand during the making. Observations or inferences from these investigations visibly impactedthe group's designideas.Inotherwords,theinvestigations shaped or transformed the group's earlier ideas. Theseinvestigations were self-directed and rendered to meet specific, immediate objectives, which contributed to clarifying, refining or evaluating ideas for going forward in the design-and-make project. Given these characteristics and their generative nature, these investigations have been collectively referred to as "emergent investigations". They represent conscious systematic efforts, closely follow principles of scientific methodology, and often result in nudging the disciplinary knowledge base of life sciences that hasbeen historically assimilated over the years.

Methodology

The research design used is a descriptive case study (Yin, 2003). Cases allow studying a phenomenon in its context, using evidence drawn from various data sources. Since the participants collaboratively engaged in design thinking, the problematisation of the goal, generation of design ideas towards potential solutions, and reflections were all co-produced by group members, creating a cohesive space for studying their cognitive engagement. Besides representing a cohesive collective guided by a sense of purpose and direction, the case as a unit of analysis allowed for systematic capturing of evidence

for progression in design ideas and insights about contexts that afforded opportunities for expanding understanding of life sciences. At one level, the bounded nature of cases could be mapped directly with the theme that each group chose to work on. At another level, discussion about findings from cases afforded opportunities for reconciling some interesting insights from across cases that follow the same thematic area—for instance, insights from cases that studied prosthetics.

Study participants

The study participants included 57 learners enrolled in the 5-year Integrated Bachelors of Arts in Social Sciences (BASS) programme at the university. The author, a teacher-researcher, developed and taught a core course on Introduction to Life Sciences. The participants were from across the country and represented diverse socio-cultural, disciplinary backgrounds (from the arts, commerce and science streams) and linguistic exposures. Usually, the social sciences undergraduates aim for a career in the social development sector and often come with disinterest in the sciences. Addressing the disinterest and seeking relevance between the sciences and the social sciences in the beginning year poses a challenge. The study reported was an integral part of course teaching and involved participants who volunteered to work in 12 groups, each group constituting 4 to 6 members. Individuals within each group were encouraged to work collaboratively towards identifying and developing design ideas that they considered addressed a social problem and required the use of knowledge of life sciences. Groups worked on projects spread over a month and a half in which they modelled their design ideas and, in the end, communicated their work to the entire class.

Context and process of design engagement

The life-sciences course aimed to develop an appreciation of fundamental ideas that have contributed to the advancement of human knowledge. Going beyond just explaining the concepts, the pedagogic effort was to help students locate ideas within their historical contexts, relate to the processes involved in the discovery of scientific insights, and develop an understanding of the nature of socio-cultural and political influences that shaped scientific endeavours. The course was organised around five critical questions: (1) how do we understand life, (2) what organisation makes life possible, (3) how does life lead to a new life, (4) what explains the diversity and connectedness among living beings, and (5) how can an understanding about life benefit thinking about society. In attending to these larger questions, the course discussed the salient ideas which transformed erstwhile knowledge and reformed human thinking and understanding. For instance, establishing the biological cell as the structural and functional basis of life, the role of biomolecules in complex functioning, processes in transmission of characters (Mendelian genetics), and change over generations (evolution). Through revisiting ideas, course participants were encouraged to find the relevance of ideas in contemporary contexts.

This study discusses the specific effort of encouraging learners to seek the relevance of life sciences ideas for the present-day society. Each group brainstormed ideas that they thought necessitated knowledge of life sciences and contributed to society. The ideas brainstormed by all groups were listed on the blackboard. From these ideas, those found to be interesting, different (challenging), and practically doable (where laboratory or workshop will not be required, but visits to such spaces were possible) were selected and confirmed by groups through class discussion. The intent and the manner in which the study has been conducted represents a case of what has been characterised as Design-based Concept Learning (DBCL). The analysis and insights drawn from the design-based projects are the focus of this paper.

Data: Sources, Processing and Analysis

Each groupwas requested to maintain a portfolio, which capturedthe process of design thinking leading to the development oftheirgroup's model artefact. In the portfolio, groups were encouraged to maintain minutes of their meetings, sketches and descriptions used during ideation, records of investigations undertaken, recordany empirical data gathered, and the outcome (model) produced from the project engagement. Some groups included reflections on the process they experienced.

Through a careful revisiting of records, the portfolios helped trace progression in the learners' thinking. Towards the end of the project, each grouppresentedto their peers, allowing critical appreciation and feedback opportunities. The processing of data led to developing case descriptions for each group and then identifying evidence for connections with life science ideas and the nature of shifts noted in thinking.

Analysis and findings

The analysis of engagement in design-based concept learning (DBCL) elicited three salient insights about learner engagement: (a) learners subscribed to *designerly* ways of thinking, (b) they used emergent investigations to support their *designerly* engagement, and (c) they creatively deployed scientific concepts and methodologyin design tasks.

Two exemplar cases present interpretative analysis involving 12 groups engaged in DBCL. To achieve a non-hierarchised representation of the salient insights, the reportingmaintainsa normative structure consisting ofcase description, manifestedevidence of *designerlythinking*, exemplars of *emergent investigations in design practice*, and a *reflective commentary*on each case. The brief yet comprehensive case description attempts to capture thedesign intentof members in the collaborating group, the process involved, and the outcome (model) from the engagement.

Case 1: Multipurpose footwear (for all occasions, all seasons)

Case description: A group consisting of four individuals collaborated towards developing ideas for comfortable, steady, and multipurpose footwear suitable for all occasions and seasons. The group initiated into design thinking by raising questions to reflect on why people prefer a brand, what considerations of materials and durability shape our choices, and the kind of preferences noticed among different age groups. The brainstorming led the group to explore details about the different materials and kinds of footwear available. It motivated them to dig deeper into aspects of history, culture, religious beliefs, and product usage patterns. The knowledge gained from different explorations enabled group members to reflect on technical considerations, preferences of potential users and provided a context to relate to the human need for appropriate footwear. The group explored the anatomy of human legs and feet. They anticipated that the bodyweightmight correlate with the user's desire for comfortable footwear. They planned an empirical investigation to identify whether user preference patterns could be linked with the structure of feet and the body mass index (BMI). They invested in understanding and discussing diseases associated with faulty footwear by the explorative reading of articles and consulting an orthopaedic. Figure 1 depicts different emergent investigations conducted by the group to understandappropriate footwear, which fed into their design ideas. The process culminated in detailed designs represented as drawings of the component parts and assembly structure. A crude attempt was made to model the layers and assembly through cardboard, thin foam, and other readily available materials (see Figure 2).

Designerly thinking: The design process elicited many exciting opportunities for engaging with concepts and the process
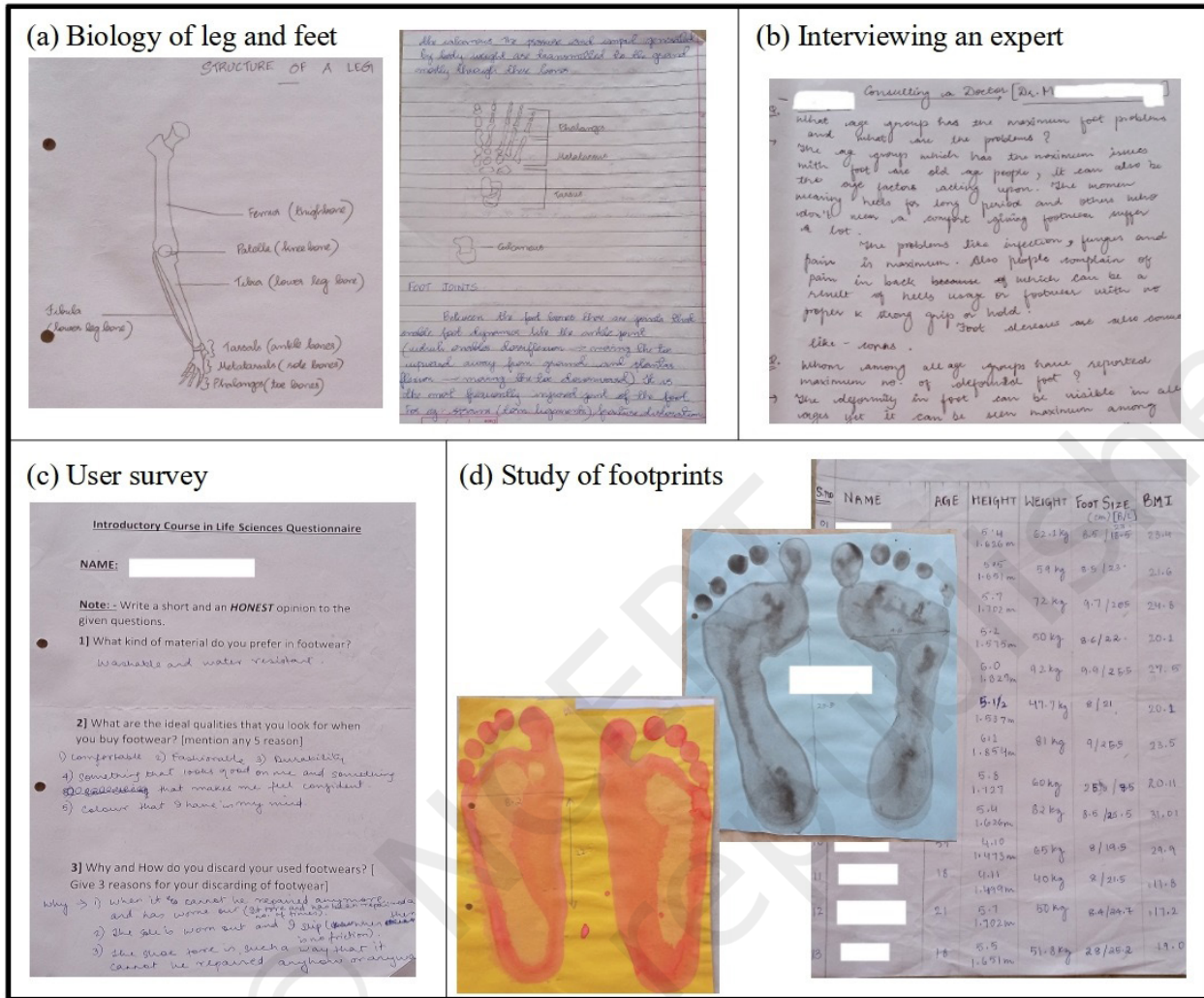
Figure 1: Modes of emergent investigations

of doing science. The historical investigation using books and internet resources about the advent of the human use of footwear led the participants to fascinating facts and features about footwear. For instance, the archaeological evidence of the first shoe in the middle palaeolithic period (about 40,000 years ago) helped them appreciate the connection between human livelihood activities and society's technological inventions. The participants were able to map changing materials and designs to the evolving periods of human civilisation; for instance, the prominence of foot injuries during the nomadic period to the demands

posed through agricultural labour. The material diversity included footwear developed from cork, rubber, leather, wood, jute, cloth, plastic, etc. A map of diseases caused by inappropriate footwear during different periods (wherever records were easily accessible) was made. The group discussed the specific causes of conditions such as calluses, corns, hammer-toes, claw toes, etc.

The association of footwear in religious beliefs revealed a revered symbolism. The removal of footwear outside a temple, mosque, or home symbolises the sanctity of a place. Leaving footwear outside these
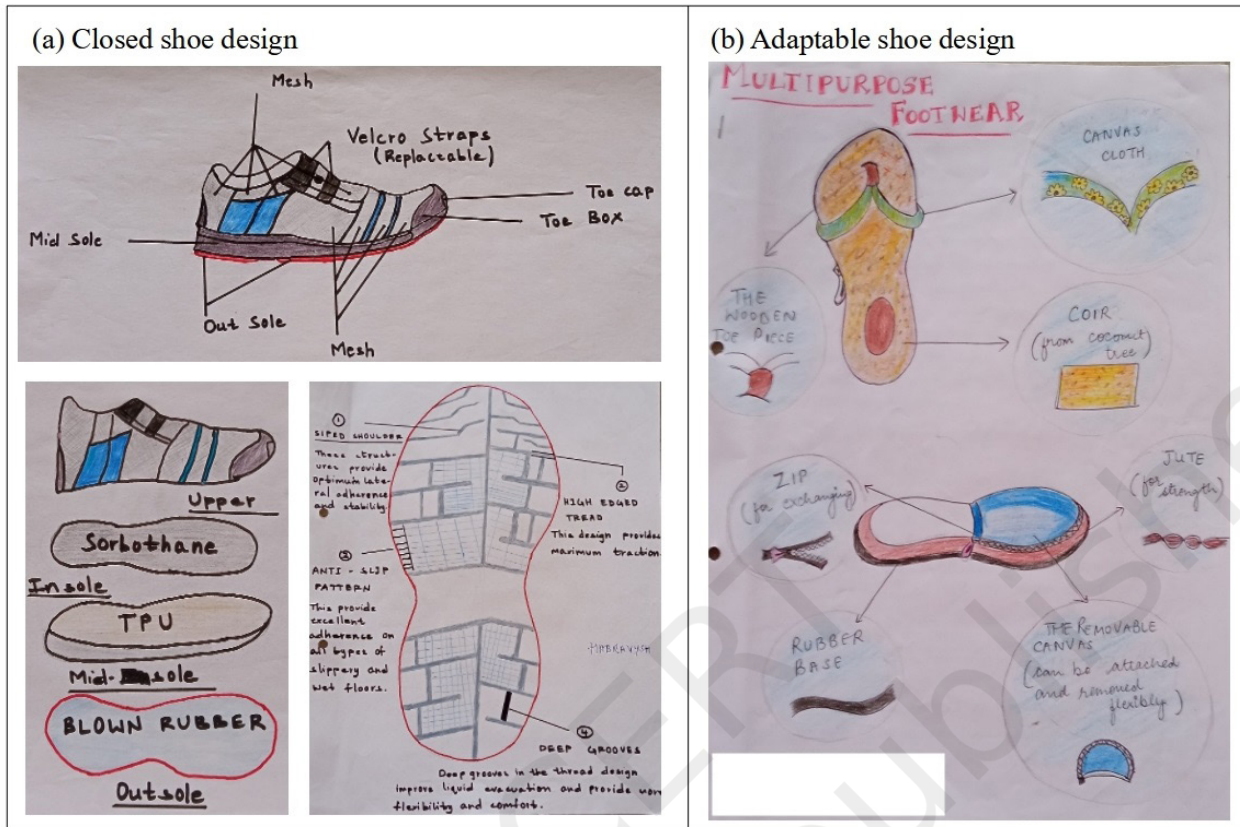
Figure 2: **Multipurpose footweardesigns**

spaces suggests a mark of respect and humility in Hindu and Muslim cultures. Ironically, on the other hand, footwear has been the object of social discrimination in a caste-ridden society (Ilaiah, 2007). *Dalits* or untouchables have been considered "impure or polluted" and are still prohibited from entering households of the upper caste wearing footwear. Linking to a caste-based understanding is to identify who makes footwear. Making footwear is traditionally looked down upon as a livelihood, practised by the *dalit* community of *Chamars* (footwear-makers or leather workers). The group reflected on how the industrial revolution or mass production has affected small-scale production of footwear and what it means for the footwear producers to become labourers in mass production factories.

Emergent investigations in design practice: The group investigated the morphology (length, arch, area, etc.) and anatomical details of the foot (bone, nerves, etc.) by referring to books on biology and footwear. In the process, the participants gathered appropriate vocabulary related to the natural architecture of feet, which they used later in their designs. Through references, they identified ways for suitably measuring and detailing feet structure, which includes the concept of sole dimensions, arch elevations, measuring depressions. They carried these constructs to their empirical investigation.

The interview with a doctor allowed the group to gain informational patterns like recognising that old-aged persons and women largely sought foot treatment for pain in feet, fungal infections or swelling in feet. The age group of 30 to 45 years reported deformities owing to inappropriate footwear, improper hygiene, or allergies to leather or synthetic materials. In this context, the group discovered the value of eco-friendly or natural materials, which they later on used in their designs.

Apart from gathering information about footwear from knowledge sources, the group undertook some empirical investigations. The group explored the relation between foot shape and structure with regard to age, body composition, and gender. Interestingly, footprint analysis revealed slight differences in the left and right feet. Typically, the average foot length of males was found to be larger than that of females, with a mean difference of 2.15cm. The role of BMI suggested that individuals with varying BMI scores had the same foot length. But, in general, a person with a BMI greater than 25 demonstrated a tendency to have flat feet, while those with BMI less than 18 showed slender feet with well prominent arch impressions. The relative quantities of adipose in persons with different BMI may be a plausible reason for this trend. The survey of individual preferences suggested that,

> "Most of them …focussed on aesthetics, comfort, and durability. However, tall and overweight people preferred a larger size and strong base. They have problems in finding the right size footwear. As a result, our footwear will focus on all sizes."

These investigations led participants to ascertain the criteria that they considered salient and incorporate these in their envisioned designs. Such an approach of using design opportunities for authentic use of diverse sources and perspectives to scaffold learning from real-life contexts and work towards inclusive designing is gaining increased attention (Rieger & Rolfe, 2021).

The idea of footwear for all occasions and all seasons was mooted in the early stages and persisted through the process. Such enduring ideas that get associated early on, sustain themselves and inform design have been referred to as "primary generator" (Darke, 1984). Findings from investigations also seemed to endure and contribute to design imagination. These tended to serve as "adjunct primary generators" (to borrow Darke's idea of a primary generator). Khunyakari (2019) noted that the underpinning of ideas to contextual values often strikes a chord with the participants engaged in designing.

Reflective commentary: Reflecting on this case, we notice a reflexive and iterative relation between participants' emergent investigations and their evolving design ideas. While the investigations addressed some specific goals, they seemed to serve a dual purpose in design thinking. At one level, they enabled to decipher the contextual salience and relevance of an idea to the larger goal. On another level, emergent investigations provide perspectives and evidential insights from different standpoints. This seemed to feed into alterations that the group explored during the course of designing and in their final ideas. For instance, the considerations of firmness, safety, and comfort guided the development of the closed shoe model (Figure 2a). In contrast, flexibility, eco-friendliness and comfort guided the notion of an adaptable shoe design (Figure 2b). Avenues to the self-motivated pursuit of knowledge and process of science manifested in conducting emergent investigations, adopting vocabulary, choosing materials, weighing alternatives, considering assembly and structural reinforcements.

Case 2: Biomimicry and ioinspiration – The robotic hand

Case description: A group of six individuals collaboratively brainstormed to work on an idea close to the life-form functioning. They thought of exploring biomimicry in tools and toys, but they wanted to cover different age groups. Group members decided to visit the local market to identify the kind of everyday stuff that is either inspired by nature or mimics it (for example, jewellery, toys, etc.). They arrived at the idea of designing an instrument that helps pick everyday objects (scissors, paper, string, straws, etc.) and places it elsewhere. Eventually, they realised that developing a robotic hand is what they would like to design and construct. The group's designmetamorphosed at various points, taking into account ideas and insights from the emergent investigations

conducted. The evolution in design does not merely reflect a change in design ideas but also demonstrates changes of reconsideredmaterials, crafting, assembling, and even desirable functionality.

Designerly thinking: It is interesting to notice how the journey from designing an instrument to pick artefacts to the robotic hand was governed by self-motivated investigations,which enabled the participants to scope and eventually bring greater orientation to an ill-defined problem. The solution or goal of achieving basic vertical and horizontal movements seemed to steer their design decisions. These included the choice of materials, changes in structure, expanding or even refining design ideas for achieving coordinated control of digits. Interestingly, both thoughtand material transformations were supported through sketches, models and investigations with concrete materials. Ideation through sketching brought out the language use of design and technology and contoured the group's imagination of evolving design ideas (Figure 4). Tracing the progression in the group's design ideas suggest some critical transitions. These include moving from the use of the principle of suction to a digitate mechanism in early design, a shift from a 4-digitate contraption to a 5-digitate structure that conceptually parallels human hand, moving from the cylindrical pipe as a suitable structure for fingers to a flat, cardboard structure with a textured finish for grip, and the struggle to use strings instead of wires organised like muscles to achieve co-ordinated movement of digits. These design decisions represent an internalisation of material solutions that offer pragmatically feasible affordances for meeting design needs.

*Emergent investigations in design practice:*In the initial stages of the design process, group members proposed ideas with a semblance to the morphological structure of hand: funnel for palm structure, pipes for fingers. They were intrigued about the basic functions that their robotic handscould do. The group decided to study the hand

structure, and they started documenting routine functions of the hand, such as grasping a bottle, opening the lid, holding a pencil, etc. Through the encounters of various objects, they realised the role of a broad palm that provides support and works in conjunction with fingers for achieving *horizontal functions* like holding a bottle, pushing things, etc. In contrast, the fingers work together for attaining*vertical functions* like turning the lid, lifting, pulling, etc. (see Figure 3a). They were able to deduce the critical structure and positioning of the thumb in relation to other fingers (note the dotted line connecting the tip of the thumb with parts of digits and visually represented deduction about the "main moving part" in Figure. 3b).The group's empirically derived understanding of the structure and functioning of the human hand closely resonates with Purcell's analytical retracing of humankind's technological progress to the biological benefits afforded by the unique structure of mammalian hand.

> *"…mammals whose hands and feet have fingers and toes ending in nails rather than claws. Not only that, but the tip of the thumb can touch the tips of the other four fingers.*
>
> *These "prehensile" – that is, grasping – hands with their "opposable" fingertip-touching thumbs are one major benefit that (hu)man enjoys because (s)he is a primate." (Purcell, 1982, p.4)*

The group developed two design variants: (i) a complex, hemispherical model with strategically placed digits and (ii) a cardboard base with four finger-like projections held together by a rubber band and operated by strings. The evolution from (i) to (ii) is evident through a change in materials, refinementsto accommodate the need for serving to hold and pick things. The larger purpose of the model was to emulate the hand structure and functioningto achieve some fundamental movements.

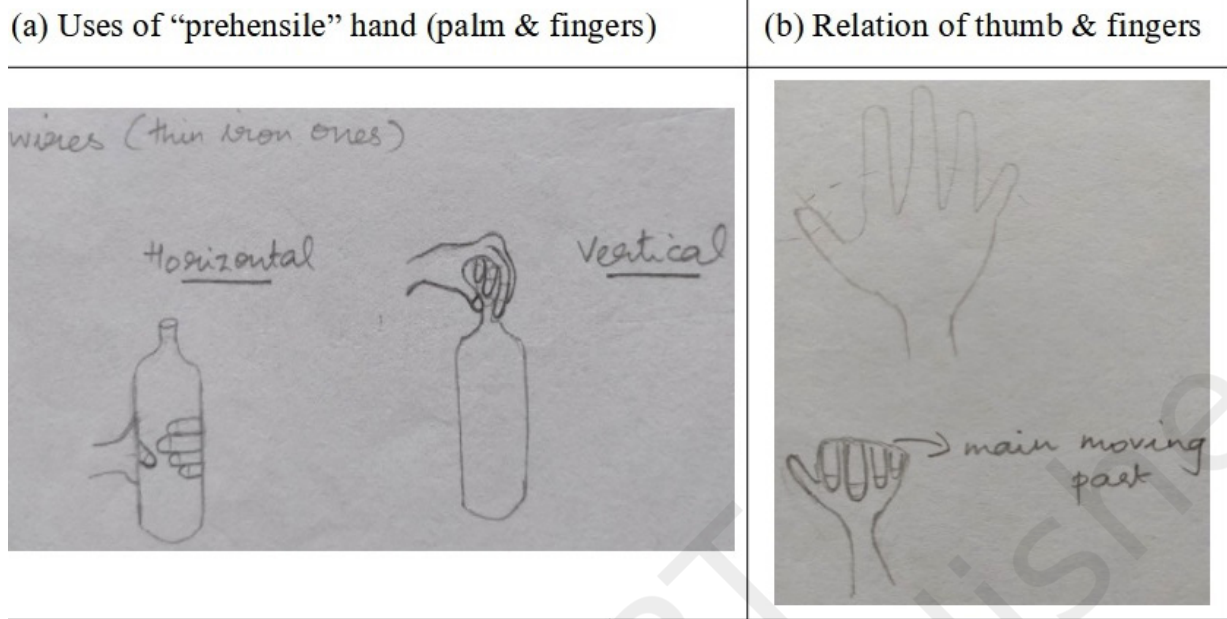The emergent investigations anchored initial ideas and supported developing a

(a) Uses of "prehensile" hand (palm & fingers)	(b) Relation of thumb & fingers

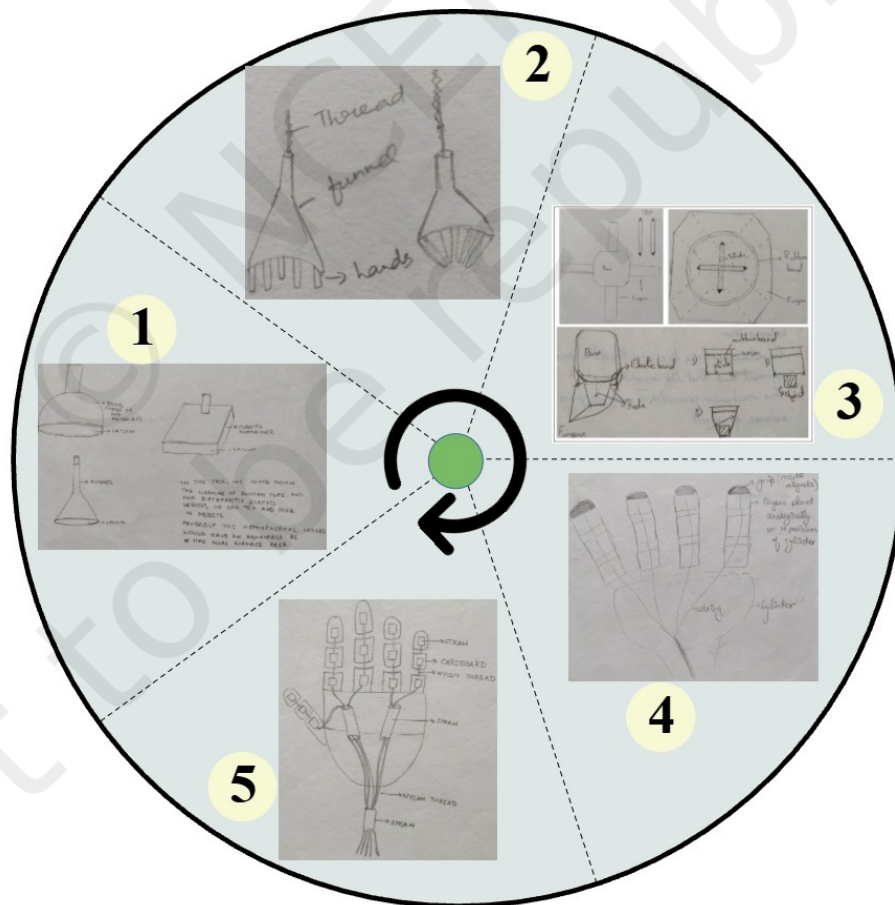*Figure 3:* **Explorative investigations of hand structure and functioning**

Figure 4: **Evolving ideas of the robotic hand**

refined understanding of specific aspects that inform the group's design ideas. For instance, the group identified bare essential movement as horizontal and vertical following a systematic exploration of materials in the immediate vicinity. The ideasdrawn from these investigations sustained and significantly shaped their design decisions. Further, the investigations initiated by participants contributed to scoping the range of associated ideas, thereby opening up newer possibilities (mechanical controls of varied kinds – electromagnetic, mechanical wires or strings) and enabling focus and attending to the details (from rods to pipes and jointed parts for a finger to achieve flexible control). The idea of closely studying the human hand as part of explorative investigation allowed the group to not just scope a range of possible functions for their robotic arm but also anchored the basic idea of digitate hand, which endured and even got refined through subsequent, iterative changes while designing. Two things can be deduced from the retracing. One, the initial idea of the digitate hand sustained itself over time and served as the "primary generator" in their thinking process. The idea endured even though it got refined, restructured or transformed radically. Second, the grounding of initial ideas gained anchor through self-directed investigations like sifting through examples that mimic natural forms, exploring a range of hand movements, closely detailing structure and functioning of the human hand, etc. One such exploration led the group to see stretched palm and map a relation between the structure of thumb and other digits (see Figure 3b), appreciate the 3-component structure of each digit and its contribution tothe functioning of the hand (refer to Figure 4). This understanding was incorporated by making the digits of the robotic arm flexible.

The desire to achieve coordinated movement was realised through a later shift to cardboard model and using strings to organise the arrangement of the digitate robotic hand. Interestingly, through the process, the role of muscular structure in hand seemed to shape the organisational detailing of string arrangement. In the overall process of emulating the human hand to create a robotic hand, the role of analogical mapping manifested seemed to go beyond mapping the surface details of the base analogue (artefact serving the motivation) (Gentner&Maravilla, 2018). Instead, the emergent investigations established deeper, conceptual connections between the structure-function of the human hand and the modelled structure (Stevens, Kopina, Mulder & de Vries, 2020). The evolution in design ideas bears a testament to this fact.

Reflective commentary: The retracing of design ideas suggests that the design idea has been in flux and was getting refined by considerations arising from investigations, materials, and even practical purposes. The struggle with the evolving course of ideas suggests an almost invincible drive of the participants to convert their design ideas into practically realisable existence. While the design of the robotic hand could well have served the intentions of prosthetics, the design development was induced and followed copiously as a case of bioinspiration, suggesting that motivation and intentionality of designers has a *prima facie* role in developing design thinking for learning. This point becomes evident in another case, where the contrast manifests in how the group engaged in design thinking. Another group pursued investigations on prosthetics by surveying ideas about prosthetics. Their enquiry led them to empirically establish that most respondents did not consider artificial eyes or spectacles as prosthetics. The group decided to deepen their understanding further, as revealed in their reflections.

> *"As the days progressed, we delved deeper into the field of prosthetics, implants and silicones. We discovered how little awareness we people have about such an expanding field and an important one...Even implants and spectacles come under the purview of prosthetics." [Case 3: Team Pro(sthetics)]*

Engagements in such authentic learning experiences based around ideas of diversity and inclusion can help develop a sense of belonging and positive STEM identities (Singer, Montgomery &Schmoll, 2020).

Discussion

This study is about how an experience of design thinking, included within the teaching and learning of life-sciences course, impacted learners' thinking and reflective engagement. We draw upon the analysis of the two cases reported and extended them with empirical generalisations from analysis of other cases in an effort to consolidate some shared insights. From a synthesis of cases, one can reasonably deduce that the design and technology education experience was used by social science undergraduates to think of diverse design problems through which they connected their knowledge of life science to society. Although their themes were different, each of the 12 groups did engage in some act of designing and making an artefact of relevance for society. The participants' wide range of topical areas required different levels of attention and engagement. Some projects were information-oriented, and design was guided towards means to developing sensitisation on topics like psychoactive drugs, abortion, biotechnology and its applications, social behaviour of dolphins, and breast cancer. Other projects probed existing alternatives and developed prototypes such as the topics on biomimicry & bioinspiration (robotic

hand), waste management, vermicomposting and camouflage. Still, other projects demanded creative experimentation and data-based designing, such as topics on prosthetics, multipurpose footwear, and narcotics. Invariably, the cases seemed to be guided by an empathetic stance towards society.Further, the cases seem to exemplify substantive engagement with the concepts in science and technology; involve design-based processes of iterative reflection with ideas and materials; and engaged with knowledge and skills appropriated from multiple disciplines. Such a convergence makes these educative experiences examples of design-based concept learning. The teacher's involvement in learning discourse demanded versatility in facilitation depending on the demands posed by different cases, a salient characteristic of the DBCL approach.

For the participants, the necessity of an alternate, artefact imagination pushed them not just to foresee ambitious connections but also to deal with challenges in taking their ideas to a pragmatic solution. The process of collaborative thinking has a reciprocal impact on participants within a group, often creating opportunities for supportive contributions by individual members towards meeting a common goal, direction and mutually sharing the sense of purpose. Across the groups, collaborative interactions seemed to have an emotive, inspirational impact. A closer analysis of the two cases following the characteristics of *designerly ways of knowing* suggests interesting variations that manifested and are consolidated in Table 2.

Table 2: Designerly knowing evidenced in the two cases.

Elements of designerly knowing	Case 1	Case 2
Tackling ill-defined problems	Multipurpose footwear for all occasions and seasons translated into comfortable, sturdy and lasting footwear or as customisable by altering component parts.	The robotic hand as an expression of biomimicry and bioinspiration, not as a prosthetic.

Solution-focused mode of problem-solving	Constraints (eco-friendly materials, alterable parts) and considerations (stability, comfort, etc.) imposed through investigations.	Regulated and controlled movement of the parts of the artificial hand.
Constructive mode of thinking	Anatomy of human feet, consulting a doctor (experience of an expert), survey to gain user needs, empirical study to correlate BMI and shoe needs.	Mechanical, regulated digitate structure arrived by exploring-functions of the human hand.
Codes to translate abstract requirements into concrete objects	Sketching, interviewing experts, conducting surveys, collecting data using tools, feet impressions and measures.	Sketching, extending analogies (funnel, suction cup, etc.), and using mechanical principles.
Codes to read & write in object languages	Feet impressions, knowing anatomical details, re-fashion or alterable designs, considerations translated in choice of materials.	Regulatory movements of artificial hand-digits explored through different mechanisms; models used to figure out structures & functioning.

Across all cases, the transitioning from seed idea to progressive alternatives during the various phases suggested a process of appropriation and iterative refinement, mediated through sketches, choices in material resources, and guided by findings from emergent investigations. The prior knowledge and imagination seemed to get tailored through the emergent investigations, encouraging a fluid movement between the cognitive and physical modelling of ideas. Cognitive modelling through non-verbal (sketches and gestures) communication allowed scope for creative tinkering with conceptual ideas, mechanisms and assemblies. At the same time, exploring materials and allied artefacts allowed opportunities to validate and test ideas. For instance, cylindrical pipes and flat metal plates for fingers of the robotic arm were modified to jointed fingers and reinforced cardboard structure in the final design to achieve grip and flexibility. The exploration of scientific ideas and principles seemed to have been integrated with their emergent investigations. In this sense, the emergent investigations became salient to the process of design thinking as well as extendingtheir knowledge and skills from learning science. The social investment and time varied for

the emergent investigations across groups. Some investigations required continuous and focussed investment of group members (for example, social survey on perception of prosthetics), others required continual follow-up after regular periods of time (for example, standardisation of medium for vermicomposting). The discussions around observations from emergent investigations were intense, demanding and salient in reshaping the group's design outcomes of product or process formulations.

Conclusions and implications

This paper reports a teaching-learning experience that centred design thinking as a means to providing authentic and meaningful opportunities for engaging participants with ideas in life sciences that can be extended to society. In the process, the participants drew upon concepts from science and technology and used them effectively to shape their design ideas. It was illuminating to note that the participants resorted to "emergent investigations" that were not pre-planned or occurred at a particular phase in their project. These were not directed to merely satisfy their immediate curiosity. The contexts and kinds of these participant-initiated investigations

suggest the salience of these emergent investigations of being carefully organised to meet specific aspects of their evolving design thought. Interestingly, it related to developing an understanding of a *physical* (what affordances are possible in a particular arrangement of robotic hand?), *natural* (does BMI correlate with feet structure?) or *social* (what artefactual extensions of the human body get perceived as prosthetics?) phenomenon under consideration. Conducting these investigations called into play knowledge and skills of doing science, although they were not prepared to systematise their investigations and feed into iterative reflexivity in their design ideas. The findings suggest the need to pay closer attention to participant-led investigations rather than just considering it as one of the beginning phases of the instructional plan to get the participants kick-started into design-and-make engagements. The analysis of cases as examples of design-based concept learning (DBCL) engagements elicited three salient insights about learner engagement: (a) learners subscribed to *designerly* ways of thinking, (b) they used emergent investigations to support their design thinking, and (c) they creatively deployed scientific concepts and methodology in design-based concept learningengagements.

In conceptualising and attending to the larger idea of connecting life science concepts for societal welfare, the participants brainstormed on topical areas. As they advanced towards developing and refining their ideas, they started using *designerly* ways of knowing. The cases elaborated substantiate the evidence for such an engagement. Analysis suggests that during design thinking, the participants chose to conduct systematic, specific goal-oriented investigations that had a profound, lasting impact on design decisions. Ideas from emergent investigations that persisted and informed design decisions are described as adjunct primary generators. The transitions in design thinking illustrate how empathetic perspectives got internalised through the emergent investigations. For instance, detachable component parts became a unique aspect of the multipurpose footwear design. The emergent investigations were not premeditated but served as tools for navigating the contexts, concerns of purpose, and operationalising need in relation to the end-users – a rather muddy space of ideas. It seemed that the emergent investigations brought iterative reflexivity to design ideas, whereas thinking with materials, sketches and models afforded conceptual transitions enabling design ideas to fructify.

The retracing of progression in ideas and how participants related to design ideas demonstrated dialectical interconnectedness between sciences and the design process. Layton (1993) argued that articulating science with practical action would help project a more authentic view of the nature and creative foundations of scientific knowledge, thereby humanising the subject. Interestingly, the Indian social scientist, Ilaiah (2007) argued that the technical work of skilled artisans, craftspersons and labourers embodied an internalised scheme of practices that we tend to put together as science. The very motive of science can be realised through a serious acknowledgement and celebration of such practices in the curriculum and encouraging questioning about entrenched inequities in society. Analysing design engagement and emergent investigations hold the prospect of developing insights about how the growth of critical ideas in sciences and technology can be incorporated and supported through design-and-make exposures, especially in the higher education spaces related to the social sciences. Integrating design thinking with science learning offers the possibility of dissolving the three silo cultures and questioning the perceived identity of education as a "soft discipline" (Sarangapani, 2011) to move into a more eclectic and transformative space for deepening connected understanding.

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