ISSN 0377-0435 (Print)
0972-5628 (Online)

JOURNAL

Journal of Indian Education

Volume XLVII Number 3 November 2021

विद्यया ऽमृतमश्नुते

एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

About the Journal

The *Journal of Indian Education* is a reviewed periodical published in May, August, November and February by the National Council of Educational Research and Training, New Delhi.

The NCERT encourages original and critical thinking in education. The JIE provides a forum for teachers, teacher educators, educational administrators and researchers through presentation of novel ideas, critical appraisals of contemporary educational problems and views and experiences on improved educational practices. Its aims include thought-provoking articles, challenging discussions, analysis, challenges of educational issues, book reviews and other related features.

The Journal reviews educational publications other than textbooks. Publishers are invited to send two copies of their latest publications for review.

The views expressed by individual authors are their own. They do not necessarily reflect the views of the NCERT or the views of the Editors.

OFFICES OF THE PUBLICATION DIVISION, NCERT

NCERT Campus
Sri Aurobindo Marg
New Delhi 110 016 **Phone : 011-26562708**

108, 100 Feet Road
Hosdakere Halli Extension
Banashankari III Stage
Bengaluru 560 085 **Phone : 080-26725740**

Navjivan Trust Building
P.O.Navjivan
Ahmedabad 380 014 **Phone : 079-27541446**

CWC Campus
Opp. Dhankal Bus Stop
Panihati
Kolkata 700 114 **Phone : 033-25530454**

CWC Complex
Maligaon
Guwahati 781 021 **Phone : 0361-2674869**

Single Copy: ₹ **45.00** *Annual Subscription:* ₹ **180.00**

* Printed in ??

ISSN 0377-0435 (Print)
0972-5628 (Online)

विद्यया ऽमृतमश्नुते

एन सी ई आर टी
NCERT

JOURNAL OF INDIAN EDUCATION

Volume XLVII Number 3 November 2021

CONTENTS

Editor's Note

While elaborating the fundamental principles that guide the education system in India, the National Education Policy 2020 has talked about 'recognising, identifying, and fostering the unique capabilities of each student, by sensitising teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres'. The policy has given due importance to the holistic development of each child and has provided multitude of strategies and activities in the form of recommendations to ensure it through school education. Inculcating the values and cultural heritages of our country, providing opportunities to the students to know and involve in our traditional vocations, use of pedagogical strategies with the help of indigenous toys, sports, games, etc., are a few such recommendations that will have a huge impact on our education system in the future. The articles or papers in the present issue of the journal discusses some of these themes, issues and concerns.

Seema Ojha brings into focus the importance of inclusion of Indian culture and heritage in the curriculum. India's education system needs to re-emphasise the rich heritage of ancient and eternal Indian knowledge and thought. Furthermore, the article lays out the integration of vocational educational programmes with mainstream education from middle stage itself in line with the recommendations of NEP 2020 to develop vocational readiness among the students and to orient themselves with the skills required for various occupations. The paper presented by Prachi Ghildyal and Tulika Dey talks on the indispensable topic of holistic development in the teaching-learning process while emphasising on the role of comprehensive assessment for a balanced and integrated development of all the aspects of personality.

Vocational Education, a competence-based education, is the need of the hour for it not only strengthens any country's employment or economic status but also graces students with intriguing carrer opportunities. Rashmi and Abhishek Kumar Singh conducted an empirical study to weigh up the status of vocational education in India through teachers' perceptions in terms of resources, teacher training, curriculum and employment opportunities for students. The gender comparative study evaluated by Suniti Sanwal with reference to vocational interests reflects that the professional preferences of elementary school children followed traditional stereotypes where orchestrating vocational orientations, carrer counselling and advocacy workshops would help these children to unfold the available gender-neutral opportunities in market thus, excelling their carrer growth.

Yoga not only does wonders for physical health but also provides a miraculous tool for building a sound mental health, boosting confidence, focus, strength and mindfulness. It is a pre-eminent bracing tradition followed in the country since ages. R.K. Roshni Raj Lakshmi tries to bring an insight on a notable topic of yoga in pertinence to value education. Her thought provoking paper brings into limelight the interrelationship between yoga and Indian education system and stresses on the benefits of fusion of such a versatile subject in Indian curriculum.

Priyamvada and Deepshikha discuss the positive spin offs of using advanced computer animation tools to dispel students' misconceptions, mitigating their conceptual problems while affirming their learning on basic concepts in the subject. The results also demonstrate the beneficial influence of integrating computer animations in teaching-learning process for sagacious learning of the topics. Information Communication technology and Educational Psychology both are of crucial importance in the education curriculum. Sarita Chaudhary and S.K. Tyagi did an empirical analysis to establish the relationship between ICT and educational psychology. The findings revealed that computer-based instructional package fosters quality teaching-learning and allows the educational institutions to grasp the disadvantaged groups of the society.

Another article presented by Haneet Gandhi and Ruchi Mittal on the pedagogy of Mathematics aims to ease the challenges faced by the teachers while transacting this subject. It analyses the different authority structures in educational settings and discusses how authority functions in classroom settings by reflections of teachers' Mathematics lesson plan. Mamta Singhal conducted a qualitative research study following a constructivist approach to identify and explore primary school children's perceptions and their understanding about plants. Storytelling is an incredible technique of creating a participatory and riveting experience since ages. Romila Soni brings an insight on how the pedagogical practice of storytelling helps improving the foundational literacy competencies and skills of the children during early years while stimulating their interest to facilitate better understanding and learning. Manoj Kumar Yadav and Vinod Kumar Singh did an evaluative research on the learning achievement of Class XI students in biology subject with reference to the independent variables— Conjunctive Concepts, Scientific Attitudes and Self-efficacy. The discussions exemplified the central role of conjunctive concepts in teaching-learning process for acquiring in-depth understanding and learning of the subject.

The study conducted by Soubhagya Ranjan Padhi, Deepthi Shanker and Manash Pratim Goswami analyses the various constraints and opportunities for accessing education among the tribal population in Koraput district of

Odisha, where social, cultural and economic barriers are seen as the foremost players. The paper proposes on restructuring the curriculum reflecting tribal life and culture, besides focusing on dissemination of knowledge and skill development. It also lays stress on the inclusion of ingenious pedagogy combined with rigorous implementation of capacity building programmes for all the stakeholders. Anshul Saluja explores the reason for different school choices of parents. The article emphasises on some of the significant influencing factors that call for the attention of parents while making school choices for their children amongst the government, private-aided and unaided schools. The empirical evidences accentuated the economic factors, occupational status, followed by the safety and hygiene practices and quality education accompanied with the perceptions, infrastructure and facilities offered by these schools.

Motivation acts as a driving force in the pursuit of academic goals while emotions take another indispensable stage in the perusal. Deepmala tries to comprehend the influential role of motivation and emotions in the choice and sustenance of academic goals. Sunita Singh and Kajal Verma report the significant challenges faced by the teachers and students while using the ICT tools and the adverse impact of virtual science classrooms on students' learning during the COVID-19 pandemic threat. The results elucidate that virtual classrooms lack experiential learning, a major factor for epistemic understanding of science and polishing of practical skill sets.

This issue of JIE provides articles and research papers on themes and topics under School Education and Teacher Education which are highlighted in the NEP 2020. We hope that our readers will be able to relate their personal experiences with the issues or concerns discussed by the authors of these articles or research papers. We also look forward to suggestions and comments on the articles published. We invite our readers to contribute to the journal by sharing their knowledge in the form of articles, research papers, case studies and book reviews.

Academic Editor

'Knowledge of India' in NEP 2020
Key to Restore Pride in School Children

Seema Shukla Ojha*

Abstract

The National Education Policy 2020 (NEP 2020) envisions an education system, which can instill among the learners a deep-rooted pride in being Indian, one who understands and appreciates India's rich cultural heritage, the contribution of Indian civilisation to the world civilisation in different spheres of life such as science, art, architecture, heritage, philosophy, etc. Considering that the ancient knowledge in various fields have a great potential and relevance for the future also, NEP recommends 'Knowledge of India' to be taught as one of the core subjects, to be learned by all the students. At the same time, it proposes that these rich Indian legacies to the world heritage must not only be nurtured and preserved for posterity but also researched, enhanced, and put to new uses through our education system. The paper elaborates on the importance of this knowledge area in the school curriculum and suggests possible ways, methods and strategies to help our students have a proper perspective of India's heritage and a legitimate pride in belonging to this civilisation based on objective knowledge.

Introduction

The newly brought out National Education Policy 2020 (NEP 2020) seeks to revisit the whole structure of education so as to align it with the aspirational goals of 21st century education and at the same time build it upon the rich heritage of ancient Indian knowledge and thought.

As mentioned in the NEP 2020, various developed countries of the world have already experienced students' awareness and engagement with their language, culture, and traditions as beneficial to educational, social, and technological advancement. In this context, NEP 2020 considers 'Knowledge of India'

* *Professor*, History, DESS, NCERT, Hauz Khas, New Delhi

as one of the core subjects to be learned by all students to become, successful, innovative, adaptable, and productive human beings.

The NEP 2020 clearly defines knowledge of India as: "Knowledge of India will include knowledge from ancient India and its contributions to modern India and its successes and challenges, and a clear sense of India's future aspirations with regard to education, health, environment, etc." (NEP 2020, p. 51).

Why Knowledge of India is Important for our Students?

It is important that Indian students should understand and appreciate India's rich cultural heritage, which has highly contributed to the world's civilisation in different spheres of life, such as science, art, architecture, heritage, philosophy, etc., along with some of the ancient civilisations. This has become necessary now, as many of the students are not aware of the progress and achievements of the country in various fields in the past and thus, are unable to recognise the great potential and relevance that this indigenous knowledge offers for the future.

There are many benefits of making India's rich culture and traditions an important part of the school curriculum. First of all, it will help in making students aware of the rich knowledge systems and traditions of our country. A strong sense and knowledge of our cultural history, arts, languages, and traditions will further help to build a positive cultural identity and self-esteem in students. This will in turn promote a more objective and informed appreciation of India as a creative civilisation and would enhance cognitive and creative abilities of individuals. This will also help in providing cross-disciplinary thinking; in fact, Indian approach has always been cross-disciplinary. Use of poetical or linguistic devices by Indian mathematicians is an example of this. Awareness of the rich knowledge and culture of one's own country promotes national integration too. To strengthen the unity and integrity of the country, it is important that the cultural heritage, traditions and history of different groups and regions of the country and their contributions are reemphasised, understood and appreciated. This is the key to truly understand the nature of the country's pluralistic society and rich culture. It will not only help in restoring a sense of aesthetics but will also restore an appreciation for our heritage and create a desire to know more, to cherish and to act in favour of preserving it. It will also, help in imparting time tested cultural values like respect for diversity, tolerance, mutual understanding, patience and peaceful co-existence. The ancient knowledge in the fields of governance, agriculture, water management, arts, spirituality, environmental protection, etc., can offer sustainable solutions to our present-day problems.

India: A Treasure Trove of Culture and Traditions

As one of the oldest civilisations in the world, India has been a land of veritable treasures of culture, developed over thousands of years and manifested in the form of arts, works of literature, customs, traditions, linguistic expressions, artefacts, heritage sites, and more. India pioneered in the areas of shipping, metallurgy and textile production. It had flourishing agriculture and external trade; and its indigenous system of medicine is still practised today. It has a long list of innovations in several techniques varying from brick making, jewel making to water management. NEP 2020 acknowledges the contribution of some world-class institutions of ancient India, such as Takshashila, Nalanda, Vikramshila, Vallabhi, which were famous for multidisciplinary teaching and research, and had scholars and students from different backgrounds and countries (NEP 2020, p. 38). NEP 2020 also refers to various great Indian scholars such as Charaka, Susruta, Aryabhata, Varahamihira, Bhaskaracharya, Brahmagupta, Chanakya, Chakrapani Datta, Madhava, Panini, Patanjali, Nagarjuna, Gautama, Pingala, Sankardev, Maitreyi, Gargi and Thiruvalluvar, etc., who significantly contributed to world knowledge in fields such as mathematics, astronomy, metallurgy, medical science and surgery, civil engineering, architecture, shipbuilding and navigation, yoga, fine arts, chess, etc. Indian culture and philosophy have immensely influenced the world. Further, NEP states that, "These rich legacies to world heritage must not only be nurtured and preserved for posterity but also researched, enhanced, and put to new uses through our education system" (NEP 2020, p. 38).

Knowledge of India and School Curriculum

The NEP envisions an education system which is able to, 'instil among the learners a deep-rooted pride in being Indian, not only in thought, but also in spirit, intellect, and deeds, as well as 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' (NEP 2020, p. 40).

Achieving this vision is possible by including this knowledge area in the school curriculum. Established goals and subjects (history, geography, economics, political science, sociology, etc.) in the social sciences provide numerous points of entry for teaching and learning our culture and traditions. And the content of the knowledge of India provides opportunities to connect social sciences with other subjects as well in the curriculum, such as languages, literature and fine arts. The best way to include this knowledge area in the school curriculum is by infusing or integrating it with the existing curriculum rather than creating

new courses or stand-alone units of study. Thus, infusing the knowledge of India with all the disciplines at all stages through various content materials and activities following integrated teaching approach will facilitate the learning of our heritage and culture by the students. It needs to be incorporated in an accurate and scientific manner, wherever relevant. Along with this, the events related to freedom struggle and the sacrifices made by people in different parts of the country should also become a part of this knowledge area.

The knowledge of India should be interwoven with the main content of the topic and not to be put into a box merely as information, which is many times skipped by teachers and students. Before discussing any topic, if there is any achievement made by Indians in that field, it is suggested that it should be presented before initiating the discussion. This could be exemplified by a discussion on democracy in modern times. Before we discuss democracy in modern times, it is always useful to start with highlighting and discussing the democratic traditions in ancient India. These traditions may be different from the present ones, but a discussion on this will help students to easily correlate with the topic.

Similarly, a lively and stimulating pedagogy highlighting the areas of relevance including field visits, mini-projects, videos, debates, etc., may be adopted to generate and sustain interest among students towards 'Knowledge of India' and its various facets. The ultimate goal of these activities will be to inspire and reinforce young people's commitment to preserve our heritage, and to help close the gap between school and society by offering stimulating activities which promote involvement in the community. The policy recognises that the knowledge of the rich culture of India should be experienced first-hand by learners. For this, students may be encouraged to visit different parts of the country to study the history, scientific contributions, traditions, indigenous literature and knowledge of these areas, which will not only enhance their knowledge about these areas but will also help them in appreciating the diversity, culture and traditional practices of different parts of India. Sufficient funds should be allocated for such excursions. Such visits need to be made compulsory, and questions relating to these visits may be incorporated into student assessment to test their knowledge and learning.

To promote the first-hand experience of our culture, craftspersons may also be invited to school, and students may be given an opportunity to observe and partake, and to make them understand how the traditional crafts, which they have seen in museums or craft *melas*, are still being made today. This will not only make them aware of India's extraordinary and rich craft traditions and skilled and talented,

craftspersons, but will also help in learning the dignity of labour and understand the linkages between our identity, heritage and local crafts. Though there is a provision for vocational education as a subject at the secondary stage, students and parents often do not opt for vocational education. This is because students are not able to identify their interest towards any vocation right from the beginning and there is an apparent disconnect between the mainstream and vocational education. This kind of interaction with various craftspersons will help students understand the productive aspect of hand work, develop vocational readiness among them and provide opportunities to the students to orient themselves with the skills required for various occupations. This is in line with one of the important recommendations of NEP to integrate vocational education programmes into mainstream education from middle stage itself.

Students may be suggested to take up projects on topics related to ancient Indian knowledge, e.g., extensive water management system in ancient times in an arid area like Dholavira. This would not only help students to understand the technological advancement of our ancestors but will also help them to understand how people at that time resolved their local problems with the local solutions. Similarly, they could be suggested to research on the themes of the Indian concept of nature. Today everyone talks about the value of tree plantation and conservation practices, but very few people are aware of India's contribution to this field right from the ancient times. Fascinating examples of such concerns can be found in the ancient literary treasures. Similarly, illustrations depicting the importance of nature in art and architecture are available in abundance, for example, images of various trees (especially peepal) found on various Harappan artefacts indicate its importance and sacredness during the period. The tradition of yoga is another example, which can be studied and researched by students. India has massively impacted the world in this area. Yoga is not just a physical exercise but it is a system of self-exploration, which has been practiced in one or the other forms since Harappan times. Many Indus seals depict deities seated in a specific *asana* and various figurines of people in different postures. We get anthropological evidence of people buried in *padmasana* position from Balathal in Rajasthan (1000 BCE). One can still observe this tradition of burying sadhus in this position. This suggests that this ancient tradition is still continuing.

Competitions or exhibitions may be organised in schools for learning various topics and subjects related to Indian knowledge. Similarly, video documentaries on inspirational personalities and achievements of India in Science and other areas, may be created and shown at

appropriate time throughout the school curriculum.

Anyone concerned with education will agree that successful implementation of the above mentioned things depend to a large extent on teachers. Unfortunately, teachers are hardly qualified to teach the various subjects related to Indian knowledge today. They cannot be blamed for this. Had the Indian knowledge tradition been given importance from the beginning in our education system, then this situation would not have arisen. The need of the hour is that in teacher education courses, student teachers should also be made aware of the knowledge of India and its values, ethos, arts and traditions been along with other subjects. Along with this, extensive training programmes should be organised to familiarise and provide expertise to the in-service teachers in this field of knowledge.

India's education system needs to reemphasise the rich heritage of ancient and eternal Indian knowledge and thought. There is an urgent need to encourage students to research, document and explore further the achievements of their country and its contribution to the world civilisation in diverse fields. There is also a need to forge partnerships among curriculum developers, school functionaries, parents, Archaeological Survey of India, museums, heritage professionals and other stakeholders in this regard as concerted efforts are required at all levels to bring the desired results. This would help in building a sense of proper perspective of India's heritage and would induce pride and happiness in belonging to this civilisation.

References

Danino, M. 2016. *Indian Culture and India's Future*. D.K. Printworld, New Delhi.

Guidelines on Pre-vocational Education at Upper Primary Stage. 2019 (unpublished). NCERT, New Delhi.

Ministry of Human Resource Development. 2020. *National Education Policy 2020*. Government of India. New Delhi.

All-round Development and Comprehensive Assessment
Bridging the Gap

Tulika Dey* and Prachi Ghildyal**

Abstract

This paper puts forth ideas about holistic assessment for all-round development of children. It states that comprehensive assessment has been started without ensuring opportunities for all-round development. It begins with the basic question of why should we assess and finds that the goal of assessment is to facilitate all-round development of the learner. Continuous and Comprehensive Evaluation (CCE) was implemented without emphasising the need and methods of all-round development. This effectively led to the assessment of abstract qualities and aspects of a student's personality without having made any prior efforts ever to develop those. Elaborating on the understanding of all-round development, the paper then discusses some strategies for assessment for all-round development. It places more emphasis on assessment of the affective domain and highlights some fallouts of a widespread misunderstanding of assessment.

Introduction

In today's world, we realise the importance of turning out well rounded individuals rather than order youngsters to standardise to fit into traditional and conventional roles of the 'educated'. Therefore, the Indian education system is talking about all-round development. What is exactly all-round development? We know about the three domains of development— physical motor, cognitive and affective domain. Till recently, all our efforts had been focused on developing the cognitive domain to the absolute neglect of the other aspects of personality. Resultant, it has created individuals

* *Associate Professor*, North East Regional Institute of Education, NCERT, Umiam, Shillong
** *Assistant Professor*, North East Regional Institute of Education, NCERT, Umiam, Shillong

who are competitive, single minded and not prepared to delay their gratification or deal with the setbacks in life.

Confronting this lopsided development has probably made educationists understand the need for all-round development. So, all-round development refers to a balanced and integrated development of all aspects of personality—the thinking part, the acting part and the feeling part (thought oriented, action oriented and feeling oriented). Brain development has always been given precedence. We have been telling our children to 'not be emotional' and to think and decide rationally. However, we forget that when we emphasise keeping reason over emotion, we are actually developing just one half of the brain that is related with rational thought. Many teachers in the country have the misconception that emotions have nothing to do with the brain. This was evident in various group discussions with teachers during several training sessions, that there is a popularised understanding of emotions and their origin. Scientific research tells us that emotions are originated from the brain (one hemisphere of the brain). Thus, when we decide to take up all-round development of the child, we are in fact talking about complete brain development.

In recent years, there has been growing interest in studying personal qualities like self-control, grit, growth, mindset, and many others. Success and healthy social relationships are based on traits like gratitude, emotional intelligence and social belonging are determined by these personal qualities (Duckworth and Yeager, 2015). Attributes other than cognitive ability have also been attempted to be measured and changed (Willingham, 1985; Naemi, et al., 2012; Heckman and Kautz, 2013; Levin, 2013; Tough, 2013; Stecher and Hamilton, 2014). Some researches have also proven that the personality traits strongly forecast one's academic, economic, social, psychological, and physical well-being (Borghans, et al., 2008; Almlund, et al., 2011; Moffitt et al., 2011; Yeager and Walton, 2011; Naemi et al., 2012; Farrington et al., 2012; Jackson, et al., 2015).

Student-teacher relationships as well as other child-adult relationships, which are warm, caring and supportive, result in better school performance and engagement, greater emotional regulation, social competence, and willingness to take on challenges (Osher et al., 2018). Research studies, using behaviour-based assessments with young children, reveal that nurturing relationships are critically important for encouraging motivation (Pintrich and Schunk, 2002). Furthermore, a sense of belongingness or relatedness is an their essential condition for intrinsic motivation and self-regulated engagement (Skinner et al., 1990; Deci and Ryan, 2000). Teachers' involvement with children strongly predicts their emotional engagement and motivation in school (Skinner and Belmont, 1993),

perhaps because children who maintain a close relationship with their teachers are motivated to be on good terms with their teachers (Urdan and Maehr, 1995). Emotions also influence processes associated with learning and performance (Pekrun, 2006). Campos and Barrett (1985), regarded emotions as motivational and organisational functions, and they highlighted the role of emotions as 'crucial regulators of social and interpersonal behaviour'. Positive affect can facilitate attention, memory, and problem solving (Campos and Barrett, 1985; Carver and Scheier, 2000), whereas negative affect increases cognitive load, impairs working memory, and is thus related to less deep strategy use associated with learning and performance (Turner, et al., 1998; Forgas, 2000; Linnenbrink and Pintrich, 2000). Children who experience shame following poor performance might be motivated to succeed in the future, but might also be more conscious of the outcome and how it appears to be (a performance orientation) than being conscious of the learning process and acquiring new skills (a learning orientation) (Smiley and Dweck, 1994). Shame-prone young children and adults exhibit more anger and aggression (Tangney, et al., 1991; Tangney, et al., 1992; Dutton, et al., 1995; Tangney, et al., 1996; Bryceland and Strayer, 1999; Andrews, et al., 2000; Harper and Arias, 2004). Pride, a feeling of being good and worthy, is related to mastery motivation in young children (Lewis and Sullivan, 2005) and to enhanced adult performance (Herrald and Tomaka, 2002). Therefore, to become productive citizens within and beyond the school, students need positive mindsets about self and school, along with social awareness and responsibilities (Stafford-Brizard, 2016).

Why do we Assess?

Having understood that the goal of education is all-round development of students, we now turn our attention to assessment. Let's begin with asking the most fundamental question— why do we assess?

There are three ways in which assessment is generally viewed:

- Assessment of Learning— Summative assessment
- Assessment for Learning— Formative assessment
- Assessment as Learning— Formative assessment

However, we often remain confined to assessment of learning. This is done by subjecting the students to multiple tests, complicated manifold by the introduction of CCE wherein the continuous part has been understood erroneously as conducting continuous testing. The comprehensive part has remained a non-starter which has been the main issue that this paper tries to deal with—the gap between attempts at all-round development and comprehensive evaluation. This issue relates to the other two views of assessment—assessment for learning and assessment as learning.

The first point to be put forth here is that we generally assess, or at least ought to assess, what has been taught or what we expect the student to have learned. This basic assumption has been at the core of all assessments of learning. However, in case of all-round development, a major gap is seen between what has been taught or learned and what is being assessed. If we have to go for a comprehensive assessment, a major prerequisite is that we should have given a comprehensive input first, i.e., we should have catered to the comprehensive personality development of the learner. This is also understood as holistic development, which includes the development of cognitive domain (as seen in all the curricular inputs) as well as the development of the physical motor and affective domain as is reflected in our present concern with Personal Social Qualities (PSQs) (NCERT—*NISHTHA Training Package*, 2019). We have plunged headlong into assessing the PSQs of the learner without having done much to ensure their development. Thus, curricular areas could be assessed fairly but the assessment of co-curricular areas, especially the PSQs, has been difficult.

Curricular areas can be more easily mapped as compared to the PSQs. We have more or less standardised criterion to evaluate performance against Learning Outcomes and the nature of knowledge being assessed is more or less objective. However, we are stepping in an entirely different sphere when we talk about the assessment of co-curricular aspects or the affective domain, which makes this routine task of asessment difficult.

Though the Learning Outcomes document (NCERT, 2017) includes some PSQs that need to be the outcome of the learning process, but PSQs for all levels of learning have not been stated in the Document. Further, how these can be ingrained or developed and how to assess them is not mentioned. This leads to major chaos in the education community.

For education to be holistic, we need to ensure that we give ample time and effort for developing different aspects of personality, other than the cognitive aspect. Unless there is a measurable input in terms of what learning is being aimed at, how can we measure the output or the 'outcomes'? Holistic education is rooted in the belief that the real world requires more than just marks; it focuses on the overall personality development.

The assessment of affective domain for ensuring holistic development requires us to keep the things listed below in mind.

All the aspects of personality are interrelated such that changes or problems in one aspect impact other aspects as well. We cannot ensure cognitive development while ignoring a child's affective domain, i.e., attitudes, beliefs and values. Knowledge without values can be dangerous. A child who is scared of being laughed at in the class, or is too weak in learning and finds it difficult to sit in class and concentrate on

the lesson, will hardly benefit from instruction.

Furthermore, teachers generally see their students only in the classroom setting. Behaviour can vary across contexts (Mischel, 1968; Ross and Nisbett, 1991; Tsukayama, et al., 2013), and therefore, teachers' observations may not match with those made by parents, who see their child in every context except school. However, correlations between teachers' rating of student behaviour tend to be higher as compared to parents (Achenbach, et al., 1987).

We are obsessed with numbers and quantifications. We feel that once we quantify a dimension, we become scientific in attitude. However, the values and emotions that the affective domain deals with are not always amenable to quantification. Also, numbers do not give us any understanding of the child's emotions. Several disciplines like Psychology that used quantification of human traits and values because of having scientific quality, have realised the fallacy of quantifying things. Descriptive, in-depth understanding of a person as a whole is more valuable and useful than mere quantification of the things that the child knows.

We also need to understand that unlike the assessment done using paper-pencil tests based on a measurable 'curriculum' or 'syllabus', the assessment of personality characteristics requires methods that involve several levels of personal interaction.

The personal and social qualities and their assessment, therefore, are neither confined to a particular subject nor do they require to be allocated a specific time. These are integral to all curricular areas and hence need to be assessed through them in various situations during the teaching-learning when children are engaged in different individual or group learning tasks, which can be indoor, outdoor, within or beyond school. (NCERT, 2019).

Strategies for Assessing the Affective Domain and Other Aspects of Personality

An attempt is now made to suggest some strategies for assessing the affective domain. The very first thing to be done here is to ensure that we provide learning experiences for the development of affective domain. This means we need to ensure that children get the opportunity to develop the right values, attitudes, and behaviours. Emotions need to be addressed and training provided for effectively managing them. Rather than focusing on Intelligence Quotient (IQ), it is imperative to focus on Emotional Quotient (EQ). Before we assess, ample scope has to be provided for the desired qualities to be internalised and enough motivation for it to be reflected in behaviour. The qualities that need to be developed would be determined by the overriding aims of education that a society or collective mass has.

For developing personality traits in the affective domain, some of the

common principles of learning can be used. A basic way of learning is through reinforcement— behaviour that is followed by positive or desirable consequences (rewards) is repeated while that followed by negative or unpleasant consequences (punishment) is extinguished. It thus helps to provide appropriate learning experiences to instil values. Similarly, enough motivation is required to inculcate the internalised values and behaviours, which would depend upon the expected positive consequences or actions likely to be.

These values are then absorbed. This means that a person needs to be embedded in an environment suffused with the right values and behaviours so that these can be imbibed. Infusing the environment means that all those around the developing child need to reflect and demonstrate the desired qualities, values and behaviours. This is also important since a major part of our learning is social learning. A discrepancy between what is being professed and practiced is detrimental to the learning of values.

After ensuring that all-round development is taking place, we can now discuss about how to assess the learner holistically.

Assessment needs to have a positive focus. There are several qualities that a growing child may be expected to have. However, while assessing we need to emphasise the qualities that they are demonstrating and not the ones that are missing. For example, in 'The Animal School' story, the animals organised a school to help their children deal with the problems of the new world. However, the teachers focused on making each animal excel in things they were not born for, in the process destroying forever their innate talents and abilities.

Therefore, a better approach is to invest time to improve the areas that are already relatively strong and find ways to compensate for the gaps. When the system allows the children to pursue what they are good at, they develop mastery in that particular field. It builds their self-esteem and gives them a sense of purpose in doing the specific task.

It is also imperative to keep in mind that the overriding goal of all these efforts is to bring up children who are well adjusted, have a sense of well-being, happy and resilient enough to withstand failures and stress in life. Failures and stress are inevitable and education should prepare a child to accept them and move on. Also, they should not get demotivated nor turn to ineffective ways of mitigating stress like drugs and withdrawal.

The purpose of comprehensive assessment should not be to label the child. Rather, the focus should be on progressive development of the child keeping in mind their needs, interests and abilities.

Some core psycho-social competencies need to be identified specific to each age or developmental stage and the child's progress in terms

of each may be recorded. This record should avoid focusing on the absence or presence of such competencies but the child should be graded in terms of their varying levels. Work done in terms of psycho-social competencies that are expected in a child after certain years of schooling need to be taken up along the lines of Learning Outcomes that are mostly curricular in their present form.

A few suggestive personal social outcomes relevant to particular stages of development are presented below as an exemplar of what may be taken up on a large scale in future.

Note: A number of PSQs start developing ever since the child's first interactions with others. Here we are focusing on those PSQs that can be developed in the school setting. In the process of developing PSQs, the school and family both need to share the responsibility of turning out well-adjusted, happy and resilient children with a strong sense of self and sensitivity towards the community.

A checklist for observable outcomes can be prepared by teachers. These observable behaviours may occur at several times. The teachers may need to design the learning space in such a way that it gives opportunity to children to engage in the activities to bring forth their PSQs. The strategies listed in the table below are some ways of doing that. The teacher can tick mark a behaviour if it occurs. However, not being able to observe a behaviour may not always reflect the absence of that particular PSQ.

Remember that while trying to develop a PSQ, though the aim will be achieving one particular quality, several others may become a by-product. For example, a person with honesty has implicit courage. A child who refuses to cheat in tests also has the courage to go without getting high marks.

Table 1
Suggestive Exemplar for Stage-wise Personal and Social Qualities (PSQs)

Stage of Development	PSQs to be Developed	Strategies	Observable Outcomes
Pre-school	Positive sense of self	Give doable tasks followed by appreciation of efforts and results.	The child initiates conversations, asks questions and volunteers for tasks.
	Trust in those around	• Be sensitive and accommodating to the child's needs, imperfections and fears. Talk to the child about his fears and anxieties.	• The child asks for help with personal or classroom tasks. • The child shares his feelings with the teacher or even with the classmates.

		• Let children work in small groups on simple tasks where each child has an assigned role that helps in task completion. After the task, give a brief winding-up talk on how we all need each other's help and will get it when we ask for it.	
	Sharing	• Encourage group work and provide tasks that require two to three children to work together. • Organise picnics where not only food but also responsibilities are shared.	• Share eatables with friends during tiffin break. • Share ideas in group work • Shares responsibilities for any assignments.
	Impulse control	Encourage participation by all children in activities following a rule that a second chance will be offered only when everyone in the group has got the chance.	• Waits for his turn in games and activities. • Eats tiffin or drinks water only at scheduled times. • Does not pick up other children's belongings.
	Gender equality	• Be aware of gender stereotypes. • Avoid using statements like 'brave boys do not cry'. • Avoid colour and toy stereotypes in classroom activities. • Encourage role plays with boys and girls playing each other's roles.	• Freely plays with all kinds of toys and does not show any preference to 'gender appropriate toys' like guns for boys and dolls for girls. • Expresses emotions and does not try to hide pain and hurt.

Primary School	Honesty	• Follow up honest confessions not with punishment but with appreciation. • Reward the acts of honesty.	• The child accepts responsibility for a mistake. • The child does not make excuses for not completing assignments, etc.
	Courage	• Encourage children to volunteer for tasks that look difficult and tedious. • Encourage them to express their viewpoints and ideas freely even if they are different from others.	• Volunteers to help others • Volunteers to give up one's advantageous position or role for another child, for example, offers to give the main role in a skit to another child. • Owns up mistakes. • Does not hesitate in expressing views different from the majority.
	Sensitivity	• Expose children to the difficulties faced by people (like the old, destitute, etc.), by organising visits to related institutions and encouraging children to volunteer for at least one task in one school session.	• Show acts of kindness to other children in the class. • When projects are being discussed, suggest taking up volunteer activities for the disadvantaged children. • Donate toys and personal possessions during such campaigns in school. • Is careful about saying or doing things that may hurt the sentiments of classmates, teachers, etc.

	Personal hygiene		• Is neatly dressed • Trims nails and hair regularly • Washes hands before eating
Elementary School	Justice	• Give all children a fair chance in all the activities. • Give children a reasoning activity where they are prompted to use logical reasoning to arrive at just solutions for justice related conflict situations or moral dilemmas.	• The child draws attention to another child who has been missed or sidelined in a group activity or distribution of responsibilities or distribution of privileges. • Stands up for the rights of classmates.
	Protecting environment	• Sensitise the child to the need for conserving the environment by giving basic facts and data about the dangers of not doing so. • Show them documentaries and films on the negative effects of environmental degradation and how some parts of the world are struggling for basic things like clean air and potable water.	• Puts off lights and fans before leaving the classroom • Doesn't waste water • Throws wastes in dustbins only • Appreciates the beauty of nature • Is particular about people not burning the wastes and plastics that would lead to air pollution.
	Protecting the school property	• Establish clear rules and consequences related to the misuse and destruction of school property.	• Takes care of the physical infrastructure of the school. • Prevents others from damaging the school property.

		• Give responsibility to each child to take care of school property in turns. • Allow all children access to school resources like books, play and sports equipment, etc., with the condition that they will be responsible for its upkeep.	
	Empathy	• Conduct role plays where children get to play the part of people facing a problem, or in a disadvantaged situation. • Conduct quizzes on feeling words to enable children to learn emotional vocabulary. • Organise activities for recognising feelings through facial expressions and body gestures.	• Understands the feelings of others. • Does not hurt or bully animals like stray pups in and around the school campus. • Is able to express feelings accurately • Is able to understand what another child is trying to express in class.
	Accepting failure	• Don't give the same group of children all the responsibilities and prominent roles in the class or activity. • Identify children who are competitive and give them roles where they have to work under another child's leadership. • Motivate children who struggle with class tasks and pair them up with the highly competitive ones (for some activities only, not always).	• Open to trying new things especially difficult ones. • Participates in activities without any expectations of winning or to be the best but just for learning and experiencing.

		• Hold regular motivational talks with children to discuss the uniqueness of each child and failure as only a step in the long journey to get success. • Be available for children who face difficulties in accepting failure. If required, arrange counselling sessions for them.	
	Accepting the self	• Give each child unconditional positive regard, i.e., respect them for the kind of person they are. • Avoid comparisons with other classmates or telling them to become like another child. • Avoid portraying any one child as the 'perfect' child. • Remind the class often that each person is unique with abilities that others don't have. Also remind them that we can always change and grow if it is really required but all of us have a role in the world— we just need some time to find our special purpose. • Counselling sessions, especially to prepare them for adolescence, may be arranged.	• Is not unduly bothered about what they cannot do or be. • Takes pride in one's own work or creation • Accepts one's physical appearance • Not clamouring to be like others in the class or owning and doing things like others. • Accepts one's feelings and manages the emotional experience and expressions appropriately.

	Dignity of labour	• Engage children in the routine activities of the school by encouraging them to spend a day with the school staff like gardeners, cleaners, etc. • Give the children responsibility to clean the classroom, maintain the school kitchen garden, help in the cooking of mid-day meals for the smaller children or serving them meals, etc. • Encourage children to share the household chores with their mothers and take the responsibility of doing at least one daily chore at home. • Teachers need to demonstrate the same positive attitude towards these activities and towards the people engaged in doing those activities, as expected from children.	• Addresses the peon, guard, helpers of school with politeness and in the same way as they do with their teachers, (e.g., wishing them). • Willingly takes up cleaning of the classroom, watering the plants, etc. • Shares how they help at home

Stories and skits or dramas can be very effective ways of communicating values at the preschool stage, so they should be used often. The child experiences the importance of a value by dramatising it.

Most values originate in the preschool years. However, different stages of development some are more apt to emphasise some specific values.

Conclusion

We may conclude by reiterating that the current need of our education system is to focus on the development of affective domain in order to make the process of education meaningful. One step towards achieving that is to organise the learning environment in such a way that children get the chance

to practise appropriate behaviours, which would help in the development of the desirable PSQs. An important understanding that needs to be developed is that these PSQs should be gradually inculcated in the child at early stage. Preschools and preschool facilitators have a major role to play in this. Assessment should be aimed at assessing child's all-round development after some efforts have been made for the child to absorb values from his environment. Assessment and all-round development need to go hand in hand to enable children and youth to be grounded in their values.

References

Achenbach, T.M., S.H. Mc Conaughy and C.T. Howell. 1987. Child/Adolescent Behavioural and Emotional Problems: Implications of Cross-informant Correlations for Situational Specificity. *Psychological Bulletin.* Vol. 101, No. 2. pp. 213–232.

Almlund, M., A.L. Duckworth, J.J. Heckman and T.D. Kautz. 2011. NBER. Working Paper Series. Cambridge, MA: National Bureau of Economic Research; Personality Psychology and Economics. No. w16822.

Andrews, B., C.R. Brewin, S. Rose and M. Kirk. 2000. 'Predicting PTSD Symptoms in Victims of Violent Crime: The Role of Shame, Anger, and Childhood Abuse', *Journal of Abnormal Psychology*. Vol. 109, No. 1. pp. 69–73.

Borghans, L., A.L. Duckworth, J.J. Heckman and B. Weel. 2008. 'The Economics and Psychology of Personality Traits'. *Journal of Human Resources*. Vol. 43, No. 4. pp. 972–1059.

Bryceland, C., and J. Strayer. 1999. Shame and Guilt: A Functionalist Reconceptualisation Applied to Adaptive-Maladaptive Continua. Poster presented at the meeting of the Society for Research in Child Development. Albuquerque, New Mexico.

Campos, J., J. and K. C. Barrett. 1985. 'Toward a new understanding of emotions and their development'. In C. E. Izard, J. Kagan, and R. B. Zajonc (Eds.). *Emotions, Cognition, and Behaviour*. pp. 229–263. Cambridge University Press.

Carver, C.S. and M.F. Scheier. 2000. Origins and functions of positive and negative affect: A control-process view. In: Higgins ET, Kruglanski AW (Eds.). *Motivational Science: Social and Personality Perspectives*. Psychology Press, New York. pp. 256–272.

Deci, E.L. and R.M. Ryan. 2000. The "What" and "Why" of Goal Pursuits: Human Needs and the Self-determination of Behaviour. *Psychological Inquiry*. Vol. 11, No. 4. pp. 227–268.

Duckworth, A.L. and D.S. Yeager. 2015. Measurement Matters: Assessing Personal Qualities other than Cognitive Ability for Educational Purposes. *Educational Researcher*. Vol. 44, No. 4. pp. 237–251; https://doi.org/10.3102/0013189X15584327.

Dutton, D.G., C. van Ginkel and A. Starzomski. 1995. The Role of Shame and Guilt in the Intergenerational Transmission of Abusiveness. *Violence and Victims*. Vol. 10, No. 2. pp. 121–131.

Farrington, C.A., M. Roderick, E. Allensworth, J. Nagaoka, T.S. Keyes, D.W. Johnson and N.O. Beechum. 2012. *Teaching Adolescents to Become Learners*. The role of noncognitive factors in shaping school performance: A critical literature review. Chicago, IL: University of Chicago Consortium on Chicago School Research.

Forgas, J.P. 2000. Affect and information processing strategies: An interactive relationship. In: Forgas JP (Ed.), *Feeling and Thinking: The Role of Affect in Social Cognition*. Cambridge University Press. New York. pp. 253–280.

Harper, F.W.K. and I. Arias. 2004. The role of shame in predicting adult anger and depressive symptoms among victims of child psychological maltreatment. *Journal of Family Violence*. Vol. 19, No. 6. pp. 367–375.

Heckman, J. and T.D. Kautz. 2013. Achievement tests and the role of character in American life. In: Heckman J., Humphries JE, Kautz T. (Eds.). The myth of achievement tests: The GED and the role of character in American life. Chicago, IL: University of Chicago Press. pp. 1–71.

Herrald, M. and J. Tomaka. 2002. Patterns of Emotion-specific Appraisal, Coping, and Cardiovascular Reactivity during an Ongoing Emotional Episode. *Journal of Personality and Social Psychology*. Vol. 83, No. 2. pp. 434–450.

Jackson, J.J., J.J. Connolly, M. Garrison, M. Levine and S.L. Connolly. 2015. Your friends know how long you will live: A 75-year study of peer-rated personality traits. *Psychological Science*. Vol. 26, No. 3. pp. 335–340.

Levin, H.M. 2013. The utility and need for incorporating noncognitive skills into large-scale educational assessments. In: Von Davier M., Gonzalez E., Kirsch I., Yamamoto K. (Eds.). *The Role of International Large-scale Assessments: Perspectives from Technology, Economy, and Educational Research*. New York, NY: Springer Netherlands. pp. 67–86.

Lewis, M. and M.W. Sullivan. 2005. The Development of Self-conscious Emotions. In: Elliot A., Dweck C., editors. *Handbook of Competence and Motivation*. Guilford; New York. pp. 185–201.

Linnenbrink, E.A. and P.R. Pintrich. 2000. Multiple Pathways to Learning and Achievement: The role of goal orientation in fostering adaptive motivation, affect, and cognition. In: Sansone C., Harackiewicz JM (Eds.). *Intrinsic and Extrinsic Motivation: The Search for Optimal Motivation and Performance*. Academic Press; San Diego, CA. pp. 195–227.

Mischel, W. 1968. Personality and Assessment. Hoboken, NJ: John Wiley and Sons, Inc. *Journal of Educational and Psychological Measurement.* Vol. 28, No. 3. pp. 968–970.

Moffitt, T.E., L. Arseneault, D. Belsky, N. Dickson, R.J. Hancox, H.L. Harrington and A. Caspi. 2011. A Gradient of Childhood Self-control Predicts Health, Wealth, and Public Safety. *Proceedings of the National Academy of Sciences*. Vol. 108, No. 7. pp. 2693–2698.

Naemi, B., J. Burrus, P.C. Kyllonen and R.D. Roberts. 2012. Building a Case to Develop Noncognitive Assessment Products and Services Targeting Workforce Readiness at ETS. Princeton, NJ: Educational Testing Service; Dec. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1075.6346andrep=rep1andtype=pdf

National Council of Educational Research and Training. 2017. *Learning Outcomes at the Elementary Stage*; ISBN 978-93-5007-785-6.

_____ . 2019. *Continuous and Comprehensive Evaluation — Guidelines*; ISBN 978-93-5292-128-7.

_____ . 2019. NISHTHA Training Package. First ed. ISBN 978-93-5292-158-4.

Osher, D., P. Cantor, J. Berg, L. Steyer and T. Rose. 2018. Drivers of human development: How relationships and context shape learning and development. *Journal of Applied Developmental Science*. Vol. 24, No. 1. pp. 6–36. DOI: 10.1080/10888691.2017.1398650.

Pekrun, R. 2006. The Control-value Theory of Achievement Emotions: Assumptions, Corollaries, and Implications for Educational Research and Practice. *Educational Psychology Review*. Vol. 18, No. 4. pp. 315–341.

Pintrich, P.R. and D.H. Schunk. 2002. Motivation in Education: Theory, Research, and Applications. *Journal of Creative Education*. Second ed. Merrill Prentice Hall. Columbus, OH. Vol. 7, No. 3.

Ross, L. and R.E. Nisbett. 1991. *The Person and the Situation: Perspectives of Social Psychology*. Mcgraw-Hill Book Company. New York. p. 286.

Skinner, E.A., J.G. Wellborn and J.P. Connell. 1990. What it takes to do well in school and whether I've got it: The role of perceived control in children's engagement and school achievement. *Journal of Educational Psychology*. Vol. 82, No. 1. pp. 22–32.

Skinner, E.A. and M.J. Belmont. 1993. Motivation in the Classroom: Reciprocal Effects of Teacher Behaviour and Student Engagement across the School Year. *Journal of Educational Psychology*. Vol. 85, No. 4, pp. 571–581.

Smiley, P.A. and C.S. Dweck. 1994. Individual Differences in Achievement Goals Among Young Children. *Child Development*. Vol. 65, No. 6, PP. 1723–1743.

Stafford-Brizard, K. B. 2016. Building Blocks for Learning: A Framework for Comprehensive Student Development. *New York: Turnaround for Children*. https://turnaroundusa.org/what-we-do/tools/building-blocks/

Stecher, B.M. and L.S. Hamilton. 2014. Measuring Hard-to-Measure Student Competencies: A Research and Development plan. Santa Monica, CA: RAND Corporation.

Tangney, J.P., P.E. Wagner, S.A. Burggraf, R. Gramzow and C. Jr, Fletcher. 1991. Children's shame-proneness, but not guilt-proneness, is related to emotional and behavioral maladjustment. Poster presented at the meeting of the American Psychological Society; Washington, DC.

Tangney, J.P., P. Wagner, C. Fletcher and R. Gramzow. 1992. Shamed into Anger? The Relation of Shame and Guilt to Anger and Self-reported Aggression. *Journal of Personality and Social Psychology*. Vol. 62, No. 4. pp. 669–675.

Tangney, J.P., Wagner P.E., Hill-Barlow D., Marschall D.E. and R. Gramzow. 1996. The relation of shame and guilt to constructive versus destructive responses to anger across the lifespan. *Journal of Personality and Social Psychology*. Vol. 70, No. 4. pp. 797–809.

Tough, P. 2013. How children succeed: Grit, curiosity, and the hidden power of character. New York, NY: Houghton Mifflin Harcourt.

Tsukayama, E., A.L. Duckworth and B.E. Kim. 2013. Domain-specific impulsivity in school-age children. *Developmental Science*. Vol. 16, No. 6. pp. 879–893.

Turner, J.C., P.K. Thorpe and D.K. Meyer. 1998. Students' reports of motivation and negative affect: A theoretical and empirical analysis. *Journal of Educational Psychology*. Vol. 90, No. 4, pp. 758–771.

Urdan, T. and M. Maehr. 1995. Beyond a two-goal theory of motivation: A case for social goals. *Review of Educational Research*. Vol. 65, No. 3. pp. 213–244.

Willingham, W.W. 1985. Success in college: The role of personal qualities and academic ability. College Entrance Examination Board. New York. p. 245.

Yeager, D.S. and G.M. Walton. 2011. Social-psychological interventions in education: They're not magic. *Review of Educational Research*. Vol. 81, No. 2. pp. 267–301.

Teachers' Perception Towards Vocational Education
Status, Standing and Challenges

RASHMI* AND ABHISHEK KUMAR SINGH**

Abstract

Vocational Education is the core of any educational system in the world. The present study investigates the perception of vocational education teachers towards vocational education. This study was conducted by adopting the survey research method. A total of 250 vocational education teachers working in Government and CBSE mode were surveyed randomly with the help of a self-made questionnaire. Statistical analysis involved percentages and chi-square. Results indicated that most vocational education teachers perceive that the current status of vocational education in India is satisfactory. Yet, there is a lack of coordination among the government and different regulatory bodies. The findings contribute to the discussion and reform in the quality of vocational education in the country, specifically to increase the number of students opting for vocational education and bridging the gap between theory and practical.

INTRODUCTION

Lately, Vocational Education has gained momentum across the globe. Competence-based education is an essential consideration in recent educational reforms in various countries like Australia (Smith, 2010). Vocational Education prepares students better for the specific craft and career, identifies their competencies and enhances them. It tries to bridge the gap between school and college education and the workplace's environment (Brockmann *et al.*, 2008). The need for vocational and competence-based education was felt because it was observed that pass out students

* *Researcher*, H.N.B. Garhwal (Central) University, Srinagar Garhwal Uttarakhand.
** *Assistant Professor*, P.S.S. Central Institute of Vocational Education, Bhopal.

had sufficient knowledge for a particular job, but they lacked skills and attitude for the same (Biemans, et al., 2004). Vocational Education assists students in being skilled and, in turn, provides better employment opportunities. The importance of vocational education is increasing with each passing day, since the working world is expecting to recruit those individuals who already have the required skills for the job (Kaushik, 2014).

Vocational Education strengthens any country's employment and its economy (Kaushik, 2014). Sustainable Development Goals (SDGs) 2030 has 17 goals, and among them, SDG 4 is dedicated to quality education. It favours providing affordable technical, vocational and higher education to a number of skilled people. Indian education system recognises the role and importance of vocational education. It offers both full time and part time courses in vocational education.

In vocational and skill based education, it is essential to mention *nai taleem* or basic *shiksha yojana*, as proposed by Mahatma Gandhi in 1937 (Chitra and Sugra, 2009). The Government of India established the National Council for Vocational Training in the year 1956. There is a buzz of skill based education across the country off late. Different vocational education organisations offer various programmes and courses for the students. Competence and skill based vocational education has been trending all over the world (Achtenhagen and Winther 2014; Biemans, et al., 2004).

Despite the momentum and buzz, it is heard that students do not have the necessary skills for the working world. The 12th five-year plan estimates that less than 5 per cent of the Indian workforce of 19–24 age group received formal education (MHRD, 2020).

Similarly, various other challenges are also faced by vocational education. Vocational education teachers are the core strength of the system. Hence, it is essential to understand the status of vocational education from vocational education teachers' point of view. Researchers have consulted various studies in vocational education and found that there were only ten studies that put forward teachers' perceptions. Thus, a need is felt to conduct such a study to bridge this gap. Vocational Education is an important variable that needs to be explored, especially from the perspective of its stakeholders, and teachers that are one of the major stakeholders in education. The present study attempts to understand the status of vocational education in India from the point of view of vocational education teachers.

Objective of the Study

The objective of the present study is to assess the perception of vocational education teachers towards vocational education.

Research Question

What is the perception of vocational education teachers towards vocational education?

Methodology and Research Design

The current study is descriptive and the researchers have used quantitative data. The selection of sample was based on the objective and focus of the study and consequently vocational education teachers from all over the country were selected randomly. Since, the data was collected during the Covid-19 pandemic, researchers had to opt for the online mode of data collection. Online mode provides the opportunity to get versatile data in less time than offline mode. Hence, teachers' vocational education across the country were included in the sample. Researchers constructed a 5 point scale to assess the perception of vocational education teachers towards vocational education. For the construction of the scale, researchers reviewed the literature accordingly. Some online tests were also consulted, and then initially, 30 statements were framed. The scale was then sent to a few experts in the field. Their suggestions were incorporated into the scale, and finally, 16 statements were chosen in the final draft of the scale. Face and content validity were established for the scale. The questionnaire was then sent to 300 vocational education teachers (working in government and CBSE mode) through a Google form all over the country. 250 teachers responded to the form, and their records were retained, which constituted the final data for the present study. Descriptive and inferential statistical techniques, including percentage and chi-square, were applied to assess the data.

Table 1
Respondents' Profile

Gender-wise distribution		
Gender	Frequency	Percentage
Female	90	36
Male	160	64
Total	250	100
Area-wise distribution		
Area	Frequency	Percentage
Urban	138	55.2
Rural	112	44.8
Total	250	100

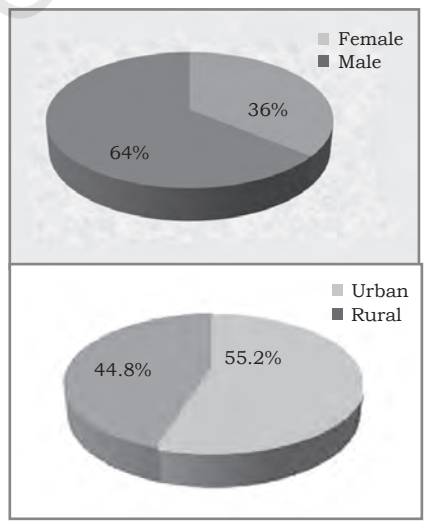


Fig. 1: Gender and Area-wise Distribution of Sample

Table 1 displays the profile of respondents based on gender and area. It can be seen from Table 1 and Figure 1 that 36 per cent of vocational education teachers were female and 64 per cent of teachers were male. Similarly, 55.2 per cent of vocational education teachers were from urban areas, and 44.8 per cent of vocational education teachers were from rural areas.

Results and Interpretations of Data

Table 2 provides the details of chi-square test for the opinion— 'Current Status of Vocational Education in India is Satisfactory'. f_o represents the number of observed frequencies, and fe represents the number of expected frequencies. The calculated value of Chi-square with 4 df for this statement was 62.32, which is greater than the critical value (13.28), and hence, it is significant at 0.01 level of significance. This difference is due to the highest frequencies of 'Agree' (A) and the lowest frequencies that belonged to 'Strongly Disagree' (SD). Figure 2 also denotes that 34 per cent of vocational education teachers agreed to the statement, and only 3.60 per cent of teachers disagreed with the statement.

Thus, it can be inferred from Table 2 and Figure 2 that most vocational education teachers believed that vocational education in India is satisfactory.

Table 2
Frequency and Chi-Square for Statement 1

Statement 1	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
The current status of vocational education in India is satisfactory	250	SA	51	50	0.02	62.32
		A	87	50	27.38	
		N	46	50	0.32	
		D	57	50	0.98	
		SD	9	50	33.62	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

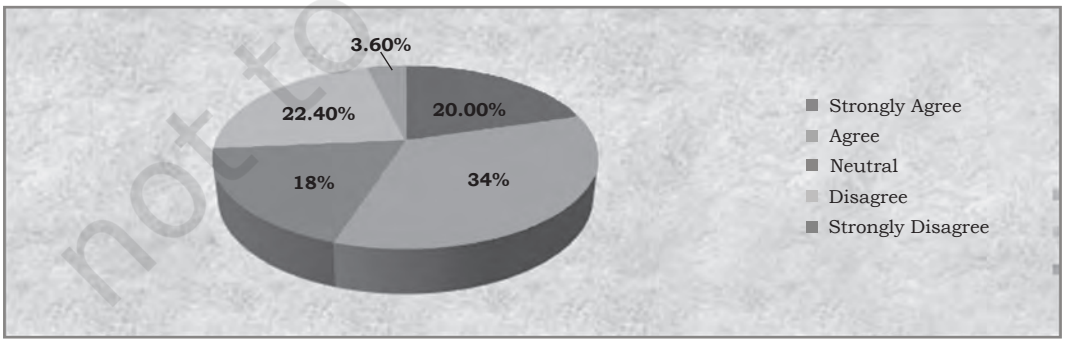


Fig. 2: Graphical Representation for Statement 1

Table 3
Frequency and Chi-Square for Statement 2

Statement 2	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Teachers are well qualified and trained to impart vocational educational to the students	250	SA	113	50	79.38	252.76
		A	110	50	72.00	
		N	12	50	28.88	
		D	10	50	32.00	
		SD	5	50	40.50	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

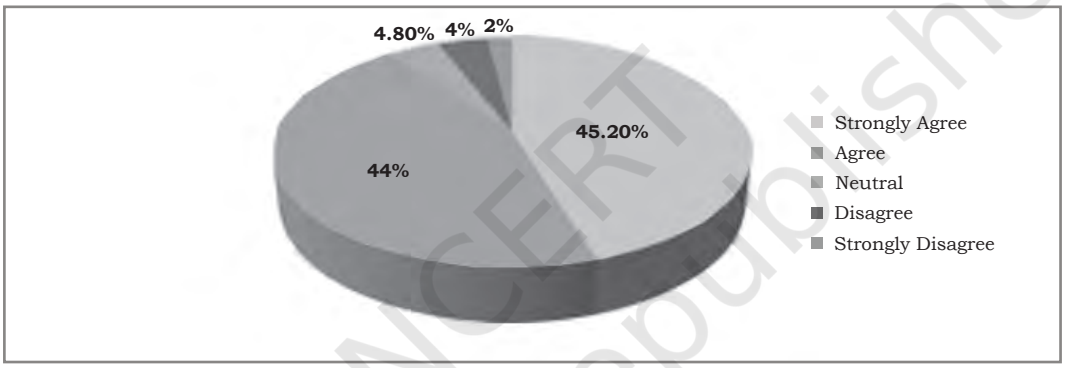


Fig. 3: Graphical Representation for Statement 2

Table 3 highlights the details of the chi-square test for the opinion— 'Teachers are well qualified and trained to impart vocational educational to the students'. The calculated value for Chi-square with 4 df for this statement was 252.76. This value is greater than the critical value (13.28), and it is significant at the 0.01 level. This difference can be attributed to the highest frequencies of 'Agree' and 'Strongly Agree'. Figure 2 also represents that 45.2 per cent vocational education teachers agreed with the statement, and 44 per cent strongly agreed with the statement.

Therefore, it can be inferred from Table 3 and Figure 3 that most vocational education teachers believed that teachers are well qualified to impart vocational education to the students.

Details of the chi-square test for Statement 3, i.e., 'Schools are well equipped and furnished to impart vocational educational to the students' are given in Table 4. The calculated value of Chi-square with 4 df was 27.18. This value is

Table 4
Frequency and Chi-Square for Statement 3

Statement 3	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Schools are well equipped and furnished to impart vocational education to the students	250	SA	67	50	5.78	27.18
		A	74	50	11.52	
		N	57	50	0.98	
		D	31	50	7.22	
		SD	21	50	1.68	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

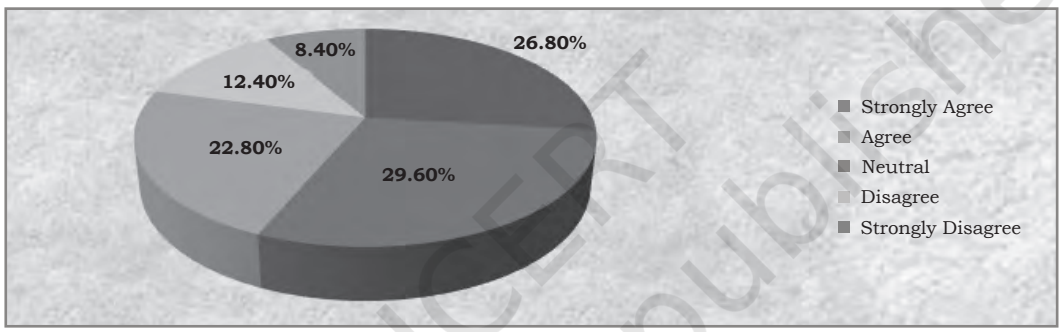


Fig. 4: Graphical Representation for Statement 3

greater than the critical value (13.28) and is significant at the 0.01 level. This difference can be attributed to the highest frequencies, which belonged to 'Agree'. It is evident from Figure 4 that 29.60 per cent of vocational education teachers agreed to the statement, and 26.80 per cent of teachers gave neutral response to the statement.

It can be concluded, based on results given in Table 4 and Figure 4, that the majority of vocational education teachers believed that schools are well equipped to impart vocational education to students.

Results of chi-square test for the opinion— 'There is a gap in theory and practice about vocational education' are presented in Table 5. It is evident from Table 5 that the calculated value of chi-square was 89.48 for this statement, and it was significant at a 0.01 level of significance. This difference is due to the highest frequencies of 'Agree.' Figure 5 also depicts that 40 per cent of the participants agreed to the statement.

Table 5
Frequency and Chi-Square for Statement 4

Statement 4	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
There is a gap in theory and practical in relation to vocational education	250	SA	42	50	1.28	89.48
		A	100	50	50	
		N	45	50	0.5	
		D	56	50	0.72	
		SD	07	50	36.98	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

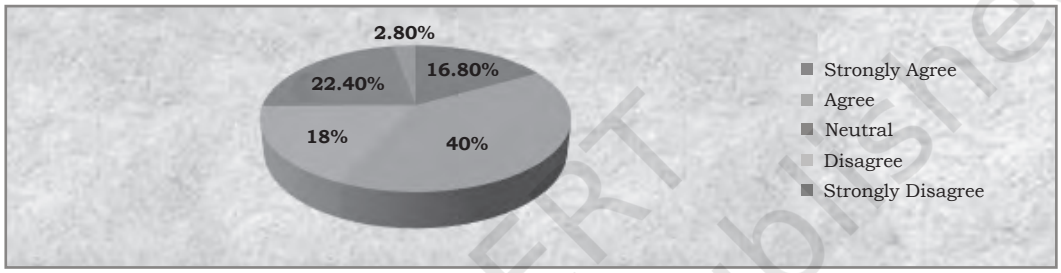


Fig. 5: Graphical Representation for Statement 4

Therefore, based on the results given in Table 5 and Figure 5, we can infer that most vocational education teachers perceive a gap in practical and theory in relation to vocational education.

Details of results of the chi-square test for Statement 5, i.e., 'Present curriculum including textbooks are not relevant and updated according to the current needs in the employment sectors', are presented in Table 6. Table 6 shows that the calculated value of chi-square for this statement with 4 df was 51.04, more significant than the critical value (13.28). This value is significant at a 0.01 level of significance. The difference can be attributed to the highest frequencies of 'Agree.' Figure 6 displays that 36 per cent of the participants agreed to the statement.

Therefore, based on the results given in Table 6 and Figure 6, we can infer that most vocational education teachers perceive that the present curriculum, including textbooks, is not relevant and updated according to the current needs in the employment sector.

Results of chi-square analysis for opinion 'There is a lack of professional teachers in vocational education' are displayed in Table 7. The calculated value of chi-square with 4 df was 62.96. This value is greater than the critical value, and it is significant at a 0.01 level of significance. The difference that occurs can be attributed to the highest frequencies of 'Disagree' response. Figure 7 also depicts that 39.20 per cent of the respondents disagreed with the statement.

Table 6
Frequency and Chi-Square for Statement 5

Statement 5	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Present curriculum, including textbooks, is not relevant and updated according to the current needs in the employment sectors	250	SA	30	50	8	51.04
		A	90	50	32	
		N	34	50	5.12	
		D	60	50	2	
		SD	36	50	3.92	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

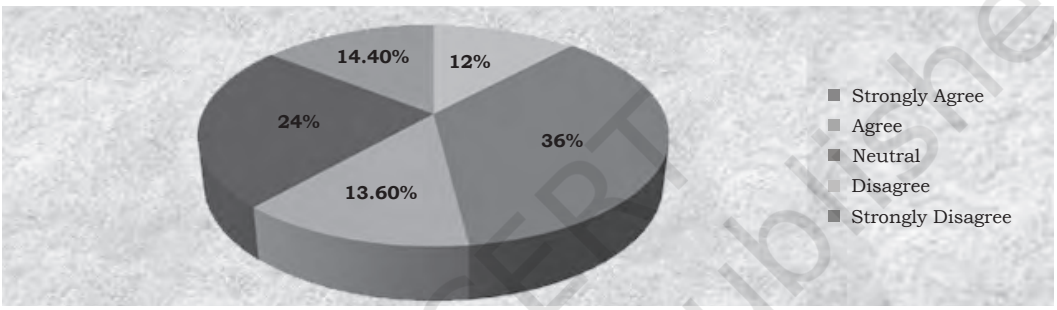


Fig. 6: Graphical Representation for Statement 5

Table 7
Frequency and Chi-Square for Statement 6

Statement 6	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
There is a lack of professional teachers in vocational education	250	SA	31	50	7.22	62.96
		A	51	50	0.02	
		N	39	50	2.42	
		D	98	50	46.08	
		SD	31	50	7.22	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

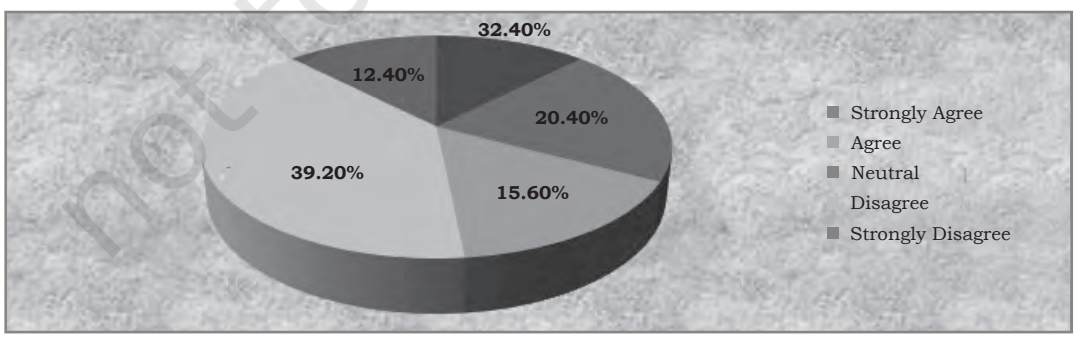


Fig. 7: Graphical Representation for Statement 6

Hence, based on the results displayed in Table 7 and Figure 7, we can infer that most vocational education teachers perceive that there is no lack of professional teachers in vocational education.

Details of chi-square test results for the opinion—'Students prefer vocational education over traditional education' are given in Table 8. The calculated value of chi-square with 4 df was 156.92. This value is greater than the critical value (13.28), and it is significant at 0.01 level of significance. The difference which occurs can be attributed to the highest frequencies of 'Agree' response. Figure 8 also displays that 45.60 per cent of teachers agreed with the statement.

Thus, it can be inferred that majority of the vocational education teachers perceive that students prefer vocational education over traditional education.

Details of results of chi-square analysis for Statement 8 are presented in Table 9. Statement 8 states, 'There are common (uniform) programmes of vocational education running all over the country'. The calculated value of chi-square with 4 df was 115.56. This value is greater than the critical value (13.28), and it is significant at 0.01 level of significance. The difference

Table 8
Frequency and Chi-Square for Statement 7

Statement 7	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Students prefer vocational education over traditional education	250	SA	75	50	12.50	156.92
		A	114	50	81.92	
		N	22	50	15.68	
		D	35	50	4.5	
		SD	4	50	42.32	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

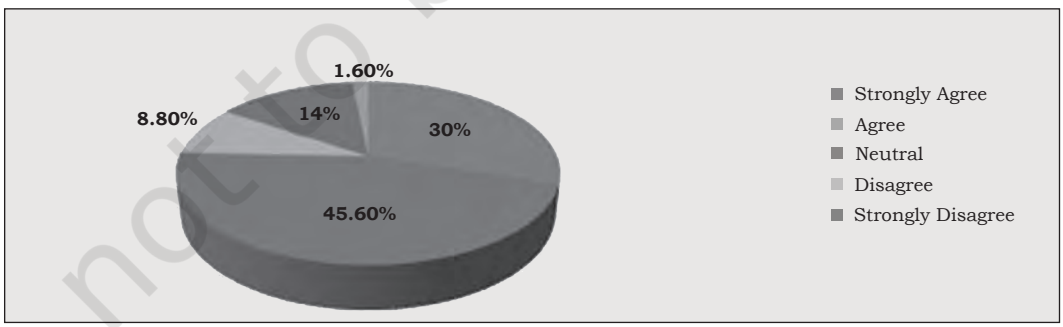


Fig. 8: Graphical Representation for Statement 7

Table 9
Frequency and Chi-Square for Statement 8

Statement 8	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
There are familiar (uniform) programmes of vocational education running all over the country	250	SA	43	50	0.98	115.56
		A	110	50	72.00	
		N	40	50	2.00	
		D	52	50	0.08	
		SD	5	50	40.5	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

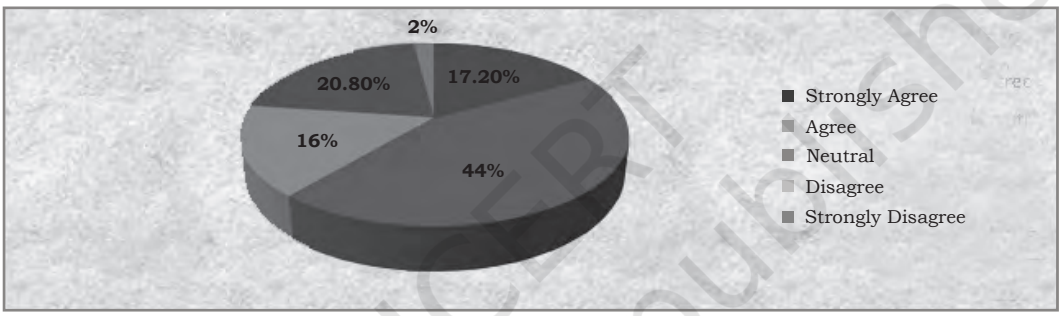


Fig. 9: Graphical Representation for Statement 8

can be attributed to the highest frequencies of 'Agree' response. Figure 9 also depicts that 44 per cent of the respondents agreed with the statement.

Hence, based on the results displayed in Table 9 and Figure 9, we can infer that most vocational education teachers perceive that there are common (uniform) programmes for vocational education running all over the country.

Table 10 highlights the details of chi-square analysis for Statement 9, i.e., 'Vocational education in India is preparing the students well for the working world'. The calculated value of Chi-square was 157.72. This value is greater than the table value (13.28), and it is significant at 0.01 level of significance. The difference can be attributed to the highest frequencies of 'Agree' and 'Strongly Agree' responses. Figure 10 also displays that 40 per cent vocational education teachers agreed with the statement, and 38 per cent of them strongly agreed with the statement.

Therefore, it can be inferred from Table 3 and Figure 3 that most vocational education teachers thought that vocational education in India is preparing the students well for the working world.

Table 10
Frequency and Chi-Square for Statement 9

Statement 9	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Vocational education in India is preparing the students well for the working world	250	SA	95	50	40.50	157.72
		A	100	50	50.00	
		N	26	50	11.52	
		D	26	50	11.52	
		SD	3	50	44.18	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

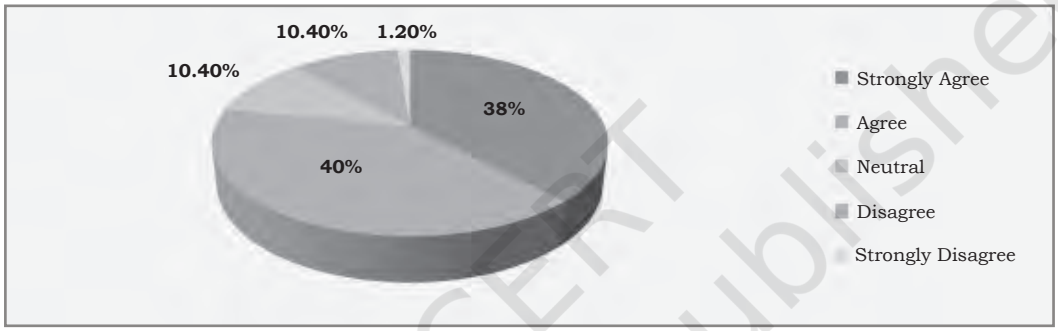


Fig.10: Graphical Representation for Statement 9

Details of chi-square test results for the opinion—'vocational education teachers are satisfied with their salary' are given in Table 11. Table 11 shows that the calculated value of chi was found to be 149.84. This value is greater than the critical value (13.28), and it is significant at 0.01 level of significance. The difference can be attributed to the maximum frequencies of 'Strongly Disagree' and 'Disagree'. Figure 11 also displays that 48.40 per cent of the vocational education teachers strongly disagreed with the statement.

Therefore, based on the results given in Table 11 and displayed in Figure 11, we can infer that most of the vocational education teachers believe that they are not satisfied with their salaries.

Table 12 shows the details of the chi-square test for the opinion—'Vocational education programmes are creating enough employment opportunities for the students. The calculated value of Chi-square was 129.64. This value is greater than the critical value, and it is significant at 0.01 level of significance. The difference can be attributed to the highest frequencies of 'Agree' and 'Strongly Agree' responses. Figure 12 displays that 44 per cent of vocational education teachers agreed with the statement, and 28 per cent

Table 11
Frequency and Chi-Square for Statement 10

Statement 10	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Vocational education teachers are satisfied with their salaries	250	SA	11	50	30.42	149.84
		A	42	50	1.28	
		N	21	50	16.82	
		D	55	50	0.5	
		SD	121	50	100.82	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

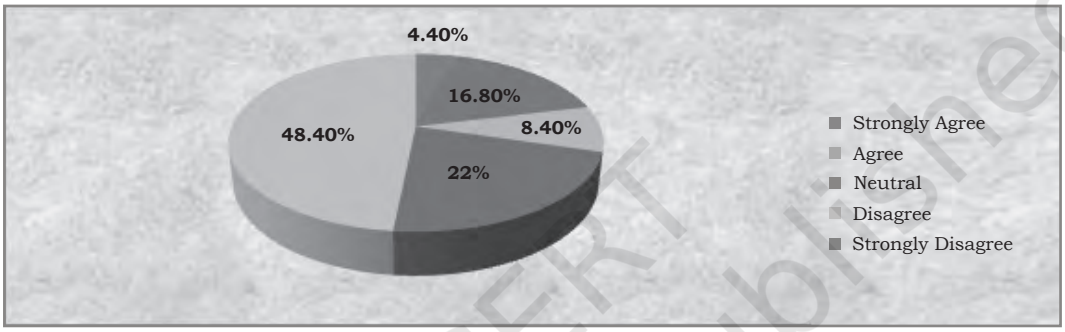


Fig.11: Graphical Representation for Statement 10

Table 12
Frequency and Chi-Square for Statement 11

Statement 11	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Vocational education programmes are creating enough employment opportunities for the students	250	SA	70	50	8	129.64
		A	110	50	72	
		N	35	50	4.5	
		D	26	50	11.52	
		SD	9	50	33.62	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

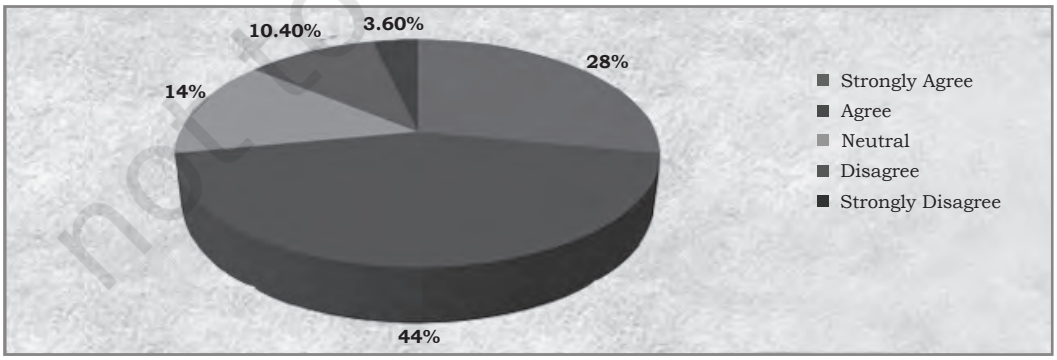


Fig. 12: Graphical Representation for Statement 11

of teachers strongly agreed with the statement.

Therefore, it can be inferred from Table 12 and Figure 12 that most vocational education teachers believe that vocational education programmes are creating enough employment opportunities for the students.

Results of analysis of Chi-square for Statement 12 are given in Table 13. Statement 12 states—'there is sufficient funding from the government to improve the quality of vocational education in the country'. Value for Chi-square at df 4 was found to be 59.88. This value is higher than the table value, and it is significant at 0.01 level of significance. This difference can be attributed to the highest frequencies of 'Agree' response. Figure 13 also displays that 35.20 per cent of vocational education teachers agreed to the statement.

Therefore, based on the results given in Table 13 and displayed in Figure 13, it can be said that the majority of vocational education teachers were of the opinion that there is sufficient funding from the

Table 13
Frequency and Chi-Square for Statement 12

Statement 12	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
There is sufficient funding from the government to improve the quality of vocational education in the country	250	SA	28	50	9.68	59.88
		A	88	50	28.88	
		N	35	50	4.50	
		D	70	50	8.00	
		SD	29	50	8.82	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

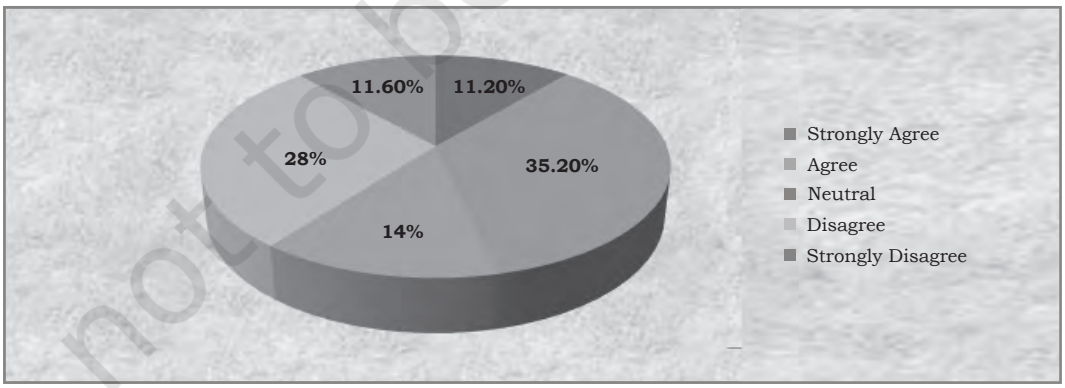


Fig. 13: Graphical Representation for Statement 12

government to improve the quality of vocational education in the country.

Results of analysis of Chi-square for statement 13 are presented in Table 14. Statement 13 states—'Students with vocational education are getting good placements in different working sectors'. The value of chi-square for df 4 was calculated as 114.14. This value is greater than the critical value (13.28), and it is significant at 0.01 level of significance. This difference can be attributed to the highest frequencies of 'Agree' response. The same can be seen from Figure 14; 44 per cent of teachers agreed with the statement.

Thus, it can be inferred that the majority of the teachers perceive that students with vocational education are getting good placements in working sectors.

For statement 14, the results of the Chi-square test are given in Table 15. Statement 14 states— 'There is a need to increase the number of pre-service and in-service training programmes for teachers to improve their vocational attitude'. Chi-square value for df 4 was calculated

Table 14
Frequency and Chi-Square for Statement 13

Statement 13	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Students with vocational education are getting good placements in different working sectors	250	SA	49	50	0.02	114.14
		A	110	50	74.42	
		N	44	50	0.72	
		D	40	50	2.00	
		SD	7	50	36.98	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

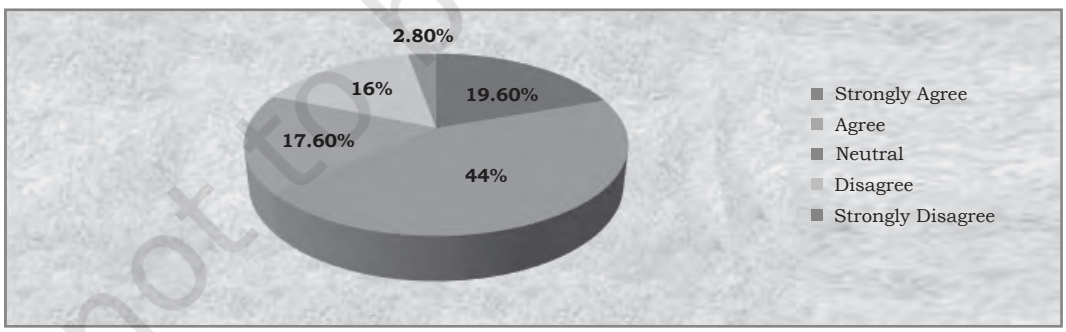


Fig. 14: Graphical Representation for Statement 13

as 218.84. This value is greater than the critical value (13.28), and it is significant at 0.01 level of significance. The difference is due to the highest frequencies belonging to 'Agree' response. Figure 15 also depicts that 48 per cent of teachers agreed with the statement.

Hence, it can be inferred that most teachers believe that there is a need to increase the number of pre-service and in-service training programmes to improve the quality of Vocational Education.

Results of Chi-square analysis for Statement 15 are presented in Table 16. Statement 15 says— 'Students dropping out from vocational courses is due to the working world's lack of interest and scope'. The Chi-square value for df 4 was calculated as 126.48, greater than the critical value (13.28). This value is significant at 0.01 level of significance. The difference can be

Table 15
Chi-Square for Statement 14

Statement 14	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
There is a need to increase the number of pre-service and in-service training programmes for teachers to improve their vocational attitude	250	SA	90	50	32.00	218.84
		A	120	50	98.00	
		N	29	50	8.82	
		D	10	50	32.00	
		SD	1	50	48.02	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

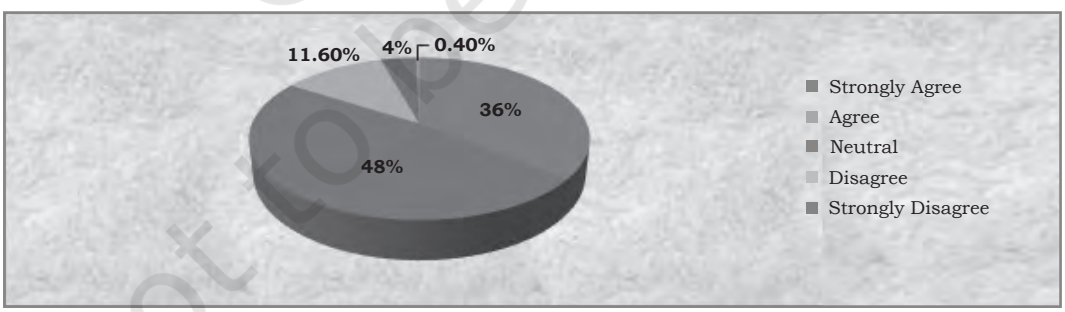


Fig. 15: Graphical Representation for Statement 14

attributed to the highest frequencies of 'Disagree' response. It can also be seen from Figure 16 that 44.40 per cent of participants disagreed with the statement.

Thus, it can be inferred from the results given in Table 16 and Figure 16 that majority of the vocational education teachers do not believe that students' dropping out from vocational courses is due to the lack of interest and scope in the working world.

Table 17 displays the Chi-square test results for Statement 16— 'There is a lack of coordination among government agencies and regulatory bodies regarding vocational education'. The calculated value of Chi-square with df 4 was 200.28, which is greater than the critical value (13.28). This value is significant at 0.01 level of significance. The difference that occurs can be attributed to the highest frequencies of 'Agree' response. The same is displayed

Table 16
Chi-Square for Statement 15

Statement 15	N	Opinions	f_o	f_e	$(f_o-f_e)^2/ f_e$	X^2
Students' dropping out from vocational courses is due to the working world's lack of interest and scope	250	SA	15	50	24.50	126.48
		A	65	50	4.50	
		N	42	50	1.28	
		D	111	50	74.42	
		SD	17	50	21.78	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86						

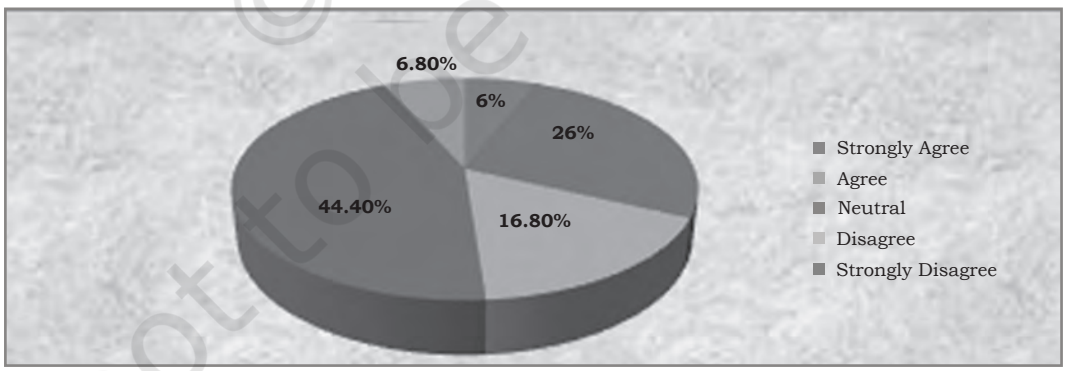


Fig. 16: Graphical Representation for Statement 15

Table 17
Chi Square for Statement 16

Statement 16	Opinions	f_o	f_e	$(f_o-f_e)^2/f_e$	X^2
There is a lack of coordination among government agencies and regulatory bodies regarding vocational education	S.A.	61	50	2.42	200.28
	A	130	50	128	
	N	40	50	2.00	
	D	17	50	21.78	
	SD	2	50	46.08	
Critical value at 0.01 level of significance—13.28 Critical value at 0.05 level of significance—14.86					

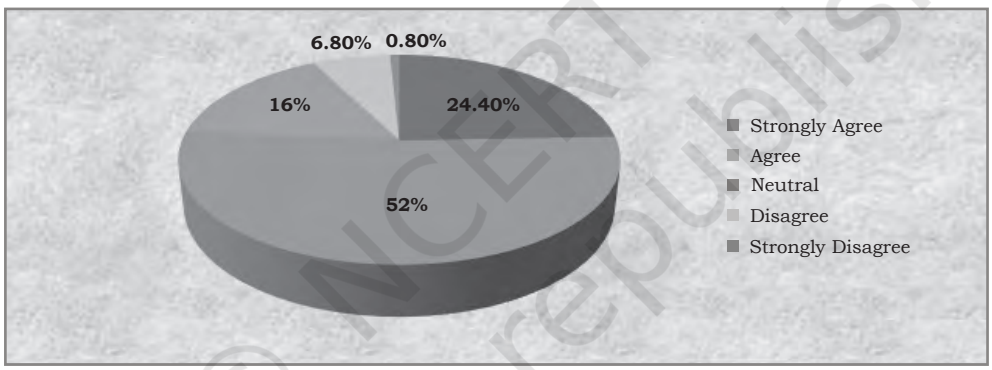


Fig. 17: Graphical Representation for Statement 16

by Figure 17, which depicts that 52 per cent of participants agreed with the statement.

Thus, it can be inferred that the majority of vocational education teachers perceive that there is a lack of coordination among government agencies and regulatory bodies regarding vocational education.

Discussion and Conclusion

The present study was designed to assess the perception of vocational education teachers. Findings of the study reveal that most vocational teachers are satisfied with the current status of vocational education and perceive that teachers and institutions are well equipped and trained to impart vocational education to the students. However, NEP 2020 mentions that only a few percentage of young people are getting vocational education. Results further disclose that teachers believe that there is a gap in theory and practical in relation to vocational

education. The existing curriculum is not updated according to the current needs of the world of work. These findings are in line and consistent with many studies. Kaushik (2014) highlighted the skill gap among the passouts. These findings also got support from the NEP 2020, where it is underlined that passout students of vocational education subjects lack a well-defined way of continuing their vocation to higher education in the same subject.

In addition, it was also found that teachers perceive that students prefer vocational education over traditional education. This finding is not consistent with the work conducted by Aarkrog (2020). He reported that over several years, fewer students have enrolled in vocational education. The need is, therefore, to strengthen vocational education to bring it into mainstream education. NEP 2020 has set the target that by 2025, at least 50 per cent of school and higher education students shall have exposure to vocational education.

Further, it was found that vocational education teachers are not satisfied with their salaries. Findings also disclose that funding from the government is sufficient, but there is a lack of coordination among the government and other regulatory bodies. Vocational Education teachers also feel the need to increase the number of pre-service and in-service training programmes to improve the quality of vocational education.

To conclude the present study, it can be said that vocational or career education is one of the most important areas that need immediate attention. It helps an individual become skilled and secure good working opportunities. It also helps the nation have better-skilled individuals who perform their job with perfection, leading to the development of a nation (Kaushik, 2014, Smith, 2010). Schools are often negligent in providing students with career-related activities (Lim, 2009). Findings of the present study highlight various challenges faced by Vocational Education such as lack of coordination among different agencies, less payment to teachers and gap in theory and practical, etc.

Hence, Vocational Education is an issue of immediate concern as suggested by various policies, including *Nai Taleem* (1937), NEP 1986 and NEP 2020, etc. Vocational Education teachers should be paid better to feel motivated about their work. If an individual is motivated, they perform their duties better. A better communication link needs to be established among government and regulatory bodies to gain indepth understanding of the issues. The curriculum needs to be modified to match the demands of the working world. It is also required to increase the number of pre-service and in-service training programmes to improve vocational education quality. This will also help teachers in their continuous professional growth. According to the current needs, the curriculum should be updated to provide first-hand experience to the students about the working world.

References

Aarkrog, V. 2020. The Standing and Status of Vocational Education and Training in Denmark. *Journal of Vocational Education and Training*. Vol. 72, No. 2. pp. 170–188.

Achtenhagen, F., and E. Winther. 2014. Workplace-based Competence Measurement: Developing Innovative Assessment Systems for Tomorrow's V.E.T. Programmes. *Journal of Vocational Education and Training*. Vol. 66, No. 3. pp. 281–295.

Biemans, H., L. Nieuwenhuis, R. Poell, M. Mulder and R. Wesselink. 2004. Competence-Based V.E.T. in the Netherlands: Background and Pitfalls. *Journal of Vocational Education and Training*. Vol. 56, No. 4. pp. 523–538.

Brockmann, M., L. Clarke, P. Méhaut and C. Winch. 2008. Competence-based Vocational Education and Training (V.E.T.): The Cases of England and France in a European Perspective. *Vocations and Learning*. Vol. 1, No. 3. pp. 227–244.

Chitra, N. and C. Sugra. 2009. Technology and Vocational Education in India. *International Handbook of Research and Development in Technology Education*, pp.105–116. doi. org/10.1163/9789087908799_011

Kaushik, K. 2014. Vocational Education in India. *International Journal of Education and Information Studies*. Vol. 4, No. 1. pp. 55–58.

Lim, David. 2009. Testing the Effectiveness of a Quality Assurance System: The Example of Hong Kong. *Journal of Vocational Education and Training*. Vol. 61, No. 2. pp. 183–202.

Ministry of Human Resource Development. 2020. *National Education Policy 2020*. Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf ***

Natarajan, C., and S. Chunawala. 2009. Technology and Vocational Education in India. *International Handbook of Research and Development in Technology Education.* Brill Sense. pp. 105–116.

Smith, E. 2010. A Review of Twenty Years of Competency–Based Training in the Australian Vocational Education and Training System. *International Journal of Training and Development*. Vol. 14, No. 1. pp. 54–64.

United Nations General Assembly. 117th Session. 2030. Agenda for Sustainable Development. A/RES/70/1.https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Gender Differences in Vocational Interest of Elementary School Children in India

Suniti Sanwal*

Abstract

An interest inventory was developed to identify the vocational interests of elementary stage students. The inventory was developed across 14 vocational areas, which were identified as high growth sectors for employment and on which vocational courses were being offered from Class IX onwards under National Skills Qualification Framework (NSQF). The inventory was administered to 1700 students of Classes VII and VIII in the states of West Bengal, Telangana, Goa and Delhi. All types of schools— rural, urban, tribal, private, aided and government schools were selected for data collection. Results indicated that girls have a significantly higher interest in agriculture and food processing, hospitality, travel and tourism, creative and performing arts, textiles and fashion, education and training, beauty and wellness and security, defence and police, as compared to boys. Boys, on the other hand, showed higher preference for areas like ICT, science and technology and sports and athletics as compared to girls. The study suggests different strategies to orient students about various vocational opportunities which would develop decision-making skills.

Introduction

Students at elementary stage are required to make critical decisions about their educational and career choices as these choices will have an impact on their life satisfaction and livelihood during adult life. Career selection is an important step in determining the future plans of an individual. With the

* *Professor,* Department of Elementary Education, NCERT, Sri Aurobindo Marg, Hauz Khas, New Delhi.

advent of information technology, post-industrial revolution and job competition, career decision making has become a complex scenario. Today, due to changing socio-economic conditions, one has to undertake exhaustive career research in order to make career plans. Multiple factors like personality (including vocational interests); individual perception about themselves and the world (self-concept, racial or cultural identity, world view); socialisation; resources (financial, information, role models, social supports); experiences of sexism, racism, and classism; and the salience of various life roles and identity influence career choice and development (Kerka, 1998).

The process of career selection for each individual is influenced by several factors like the context in which they live in, their personal aptitudes, social contacts and educational attainment (Bandura et al., 2001). Hewitt (2010) stated that factors influencing career choice can either be intrinsic or extrinsic or both. Various factors influence the career decisions of an individual like careers favoured by their parents, careers that their educational choices have opened for them or some choose to follow their passion. Studies such as Super's Theory of Development (Super, 1953), Holland's Theory of Vocational Choice (Holland, 1959), Hoppock's Theory and Anne Roe's Theory (Roe, 1957) attached considerable importance to individual's self-concept, values, and past experiences.

The importance of elementary years has been highlighted by various career development theorists in an individual's career development. According to Gottfredson's (1981, 2005), theory of circumscription and compromise, individuals compromise and eliminate their career aspirations based on gender, academic ability, social prestige, personal interest, and their beliefs in four overlapping stages which coincide approximately with the preschool, elementary, middle, and high school years — orientation to size and power, orientation to sex roles, orientation to social valuation, and orientation to one's internal, unique self. According to Gottfredson, a host of career options based on their gender and social prestige are eliminated by the students by the end of their elementary school.

Donald Super (1980) stated that career development process unfolds over five stages— growth, exploration, establishment, maintenance, and decline. Students in elementary school are in the growth phase, which is categorised by students' development across various career dimensions such as desire for information, and exploration of information about the self and the world, acquiring and accessing career information and awareness of ones' likes and dislikes. Successful development across these dimensions of career exploration leads to the development of positive self-concept and a strong foundation for their further career development.

As per the study conducted by Blackhurst and colleagues (2003), it was observed that by the fifth grade, elementary students could develop a conceptual framework for understanding general educational requirements for career preparation; however, they were unable to apply this knowledge to specific careers. These findings suggest that career development interventions geared towards career exploration must be paired with information about career attainment processes and planning skills.

It is important to keep in mind that the goal of career development at the elementary level should not focus on encouraging children to make career decisions (Akos et al., 2011), but it should be structured around age-related matters of child development and learning (Harkins, 2001). At elementary level, students should be exposed to a variety of careers and build self-awareness (Akos et al., 2011). It should be ensured that career development interventions should be developmentally appropriate, so that they have personal meaning for children, (Alexandria, 2012; Harkins, 2001).

According to Betz (2002) and Gates (2001), many females have been socialised to adopt nurturing roles rather than career or achieving roles. They stated that traditionally, they have not seriously planned for their careers, and have not explored the career options extensively, but have restricted their career choices to careers that are gender stereotyped. The duo maintained that the motivation for work is the same for both sexes. However, both the genders make different choices because of their socialisation experiences and the ways in which social forces structure the opportunities available to them. Lippa (2005) found that there were large differences in women's and men's preferences for realistic occupations (for example, mechanic or carpenters) and moderate differences in their preferences for social and artistic occupations. His results also found that women tend to be more people-oriented and men tend to be more things-oriented.

Over the past decades, the careers for both women and men have changed. Today, jobs are more diverse and many jobs have shifted from one area to another. Over time, the culture and the economy have changed. Therefore an interest inventory can help children identify the vocational area of their interest.

The Policy Context

The vocationalisation of education in schools in India at elementary stage has been introduced by different terminologies. At the primary and middle school levels (Classes I–VIII), it is called 'work experience' or 'socially useful and productive work', and 'pre-vocational education' in Classes IX and X. Kothari Commission Report of the Education Commission (1964–66) conceived work experience programme as 'participation in

productive work in the school, in the home, in a workshop, on a farm, in a factory or in any other productive situation'. It recommended that work experience, which includes purposive and meaningful manual work, should be an essential component at all the stages of education. It should inculcate in the learners a respect for manual work, values of self-reliance, cooperativeness, perseverance, helpfulness, work ethics, attitudes and values related to productive work and concern for the community.

In order to provide diversification of educational opportunities to enhance individual employability, to reduce the mismatch between demand and supply of skilled human resource and to provide an alternative for those pursuing higher education, a Centrally Sponsored Scheme of Vocationalisation of Secondary Education was launched in the year 1988. A Programme of Action was brought out in 1986 to translate the policy imperatives into concrete programmes.

The Programme of Action (1992) of National Policy on Education (1986) emphasised that vocationalisation of education programme must ensure that students are prepared at the secondary stage to choose a career. It stressed the development of vocational interests and aptitudes to allow the self-exploration of vocational preferences and to enhance productivity and participation in work.

On 27 December, 2013, the National Skills Qualification Framework (NSQF) was notified by the Government of India to integrate vocational education with general education and to provide seamless pathway to the learners for a smooth transition from school to work or higher education. It is a competency-based framework that organises all qualifications according to a series of levels of knowledge, skills and aptitude. In schools vocational courses are offered from Classes IX to XII along with regular school subjects. In order to help children choose vocational courses in Class IX, an interest inventory was developed.

Materials and Methods

Development of Interest Inventory

An Interest Inventory was developed to find the vocational interests of children studying in Classes VII and VIII. After pilot testing, 14 vocational areas were included in the interest Inventory namely— security, defence and police services; health care; textiles and fashion technology; agriculture and food processing; construction and architecture; banking and finance; beauty and wellness; education and training; sales and marketing; information and communication technology; hospitality, travel and tourism; creative and performing arts; science and technology; and sports and athletics.

Initially 15 items were developed in each vocational area but after item analysis, only 7–8 items were retained. The items were developed by experts from the field of Psychology, Education, and Vocational Experts. Primary school teachers also helped in making the items easily understood by the target group in terms of language and its content. The challenge was to gauge the interest of the child in a particular vocational area by making the topics relevant to their immediate environment. It was not possible to use any technical terms and the language had to be such which would be easily understood by the students of rural and tribal areas also. Four states were selected—one from each region for data collection—Delhi, Goa, West Bengal and Telangana.

The inventory was bilingual—developed in English and Hindi. The inventory was used as it is in Delhi and Goa. For West Bengal and Telengana, it was translated in the state languages— Bangla and Telugu, respectively. It was administered in English and Bangla in West Bengal and in English and Telugu in Telangana. The inventory was pilot tested in government, private and Kendriya Vidyalaya schools.

Selection of Sample

From each district, three types of schools— government, government aided or sponsored, and private schools from urban, rural and tribal areas were selected. Data was collected from 32 Schools— 6 schools from Goa, 9 schools from West Bengal, 7 schools from Delhi and 10 schools from Telangana. In states where aided schools were not present, data was collected from Kendriya Vidyalaya schools.

Data Collection

Data was collected from one section each of Classes VII and VIII and Interest Inventory was administered to all the students. In all, data has been collected from 1700 students. Independent sample t-value test was used to compare the difference between the mean scores in all the 14 vocational sectors.

Reliability and Validity

The pearson's coefficient of correlation using odd even method was found to be r = 0.82. The split half reliability using Spearman-Brown method was found to be 0.90; thus, indicating a high level of reliability. The construct validity of the test was ensured by obtaining expert opinion. The items were shown to the experts and their opinion was sought in determining whether the items were measuring the interests of the child for a particular vocation.

Results and Discussions

The results have been analysed for each State separately and a comparison has been done by merging all the gained data regarding gender, giving an overview. The results have been discussed across 14 vocational areas.

Table 1
Difference Between Boys and Girls' Vocational Interests Across Four States

	Delhi				Goa			Telangana			West Bengal		
	Boys N=277, Girls N=227				***Boys N=123, Girls N=98***			***Boys N=268, Girls N=167***			***Boys N=248, Girls N=292***		
	Gender	**Mean Difference**	**SD**	**t-Value**	**Mean Difference**	**SD**	**t-Value**	**Mean Difference**	**SD**	**t-Value**	**Mean Difference**	**SD**	**t-Value**
Agriculture and Food Processing	Boys Girls	5.98	1.743	2.594**	7.01	1.225	1.709	7.12	1.090	4.166**	5.90	1.771	6.412**
Hospitality, Travel and Tourism	Boys Girls	6.40	1.834	2.889**	7.28	1.063	1.512	7.51	0.693	4.080**	6.77	1.357	3.968**
Creative and Performing Arts	Boys Girls	4.21	1.296	7.209**	4.73	1.215	3.242**	4.96	1.050	5.609**	4.43	1.281	6.511**
Textiles and Fashion	Boys Girls	4.55	1.347	10.406**	4.97	1.088	6.629**	5.36	0.900	8.325**	4.84	1.138	9.036**
Information and Communication Technology	Boys Girls	4.45	1.718	3.945**	4.99	1.591	1.404	5.42	1.602	2.527*	4.55	1.596	2.794*
Science and Technology	Boys Girls	5.47	1.380	7.075**	5.64	1.334	3.748**	6.21	1.080	1.569	5.40	1.455	0.223

Banking and Finance	Boys Girls	2.39	1.812	0.224	3.13	2.119	1.589	4.16	1.846	3.250**	2.63	1.838	0.807
Sales and Marketing	Boys Girls	4.12	1.900	0.186	4.89	1.734	0.789	5.52	1.298	3.697**	4.11	1.938	1.297
Construction and Architecture	Boys Girls	5.80	1.375	2.532**	5.41	1.367	1.623	5.57	1.471	2.491**	5.47	1.639	2.522**
Education and Training	Boys Girls	5.31	1.421	3.849**	5.14	1.506	2.607**	5.20	1.580	4.784**	5.06	1.764	4.844**
Sports and Athletics	Boys Girls	5.66	1.404	6.621**	5.54	1.344	2.878**	6.24	1.004	0.056	5.34	1.633	7.219**
Health Care	Boys Girls	4.66	1.769	0.909	4.82	1.542	0.160	6.08	1.061	2.588**	5.31	1.405	4.220**
Beauty and Wellness	Boys Girls	5.78	1.528	7.515**	5.76	1.420	5.201**	6.19	1.387	5.579**	5.23	1.555	3.493**
Security, Defence and Police	Boys Girls	5.74	1.644	0.310	6.07	1.438	0.949	6.63	1.306	1.597	5.12	1.483	3.613**

* Significant at 0.01 level, ** Significant at 0.05 level, S.D.— Standard Deviation

Table 1 indicated that in Delhi, there is a significant difference between girls and boys in different vocational areas. The girls showed higher interest for vocational areas like agriculture and food processing, hospitality, travel and tourism, creative and performing arts, textiles and fashion, education and training, and beauty and wellness. The boys showed higher interest for vocations like information and communication technology, science and technology, construction and architecture and sports and athletics.

In Goa, girls showed significantly higher preference for creative and performing arts, textiles and fashion, education and training, and beauty and wellness as compared to boys. The boys, on the other hand, showed higher preference for science and technology, and sports and athletics.

In Telangana, results indicated that there is a significant difference in the preference between boys and girls. While girls have a higher preference for agriculture and food processing, hospitality, travel and tourism, textiles and fashion, education and training, banking and finance, sales and marketing and beauty and wellness, the boys showed greater interest in ICT, Construction and Architecture, and Creative and Performing Arts. The preference of boys for ICT was significantly higher than girls at 01 level of significance.

In West Bengal, girls showed a significantly higher interest in Hospitality, Travel and Tourism; Creative and Performing Arts; Education and Training; Health care; Beauty and Wellness; and Security, Defence and Police services, whereas boys showed significantly higher interest in Agriculture and Food Processing, Textile and Fashion, ICT and Sports and Athletics.

The overall comparison between boys and girls where all the states

Table 2
Overall Difference Between Boys and Girls' Vocational Interests

	Gender	Mean	Std. Deviation	t-value
Boys N=917, Girls N=784				
Agriculture and Food Processing	Boys	6.43	1.622	6.028**
	Girls	6.88	1.440	
Hospitality, Travel and Tourism	Boys	4.56	1.250	5.485**
	Girls	4.88	1.186	
Creative and Performing Arts	Boys	4.83	1.684	10.465**
	Girls	5.62	1.379	
Textiles and Fashion	Boys	3.07	2.008	15.163**
	Girls	4.51	1.873	

Information and Communication Technology	Boys	5.59	1.483	5.646**
	Girls	5.17	1.600	
Science and Technology	Boys	5.73	1.406	6.985**
	Girls	5.22	1.563	
Banking and Finance	Boys	5.75	1.523	.076
	Girls	5.74	1.593	
Sales and Marketing	Boys	4.55	1.504	1.252
	Girls	4.64	1.592	
Construction and Architecture	Boys	5.63	1.914	.554
	Girls	5.58	1.883	
Education and Training	Boys	4.56	1.421	6.729**
	Girls	4.98	1.153	
Sports and Athletics	Boys	5.70	1.344	9.967**
	Girls	4.96	1.708	
Health Care	Boys	6.66	1.398	1.518
	Girls	6.76	1.195	
Beauty and Wellness	Boys	4.43	1.532	8.958**
	Girls	5.11	1.607	
Security, Defence and Police	Boys	5.82	1.176	2.147*
	Girls	5.94	1.155	

*Significant at 0.01 level, ** Significant at 0.05 level

(Table 2) revealed that girls have a significantly higher interest in Agriculture and Food Processing; Hospitality, Travel and Tourism; Creative and Performing Arts; Textiles and Fashion; Education and Training; Beauty and Wellness; and Security, Defence and Police. Boys, on the other hand, showed higher preference for areas like ICT, Science and Technology, and Sports and Athletics.

There are certain cultural stereotypes associated with gender. For example, cooking, hospitality, stitching and designing clothes, beauty and wellness, etc., are generally considered a girls' domain, whereas sports, ICT, security, defence, etc., are considered more appropriate for boys. The trends showed that girls have a higher interest in career choices associated with females' vocational interests like agriculture and food processing; hospitality, travel and tourism; creative and performing arts; textiles and fashion; education and training; and beauty

and wellness. During the informal discussions at the time of data collection, it was observed that girls wanted to become SI (Sub Inspector) in the police force as a few girls from their village or neighbourhood had joined the police forces. This explains the reasons which influenced the interest of girls in the security, police and defence sector.

For boys also, traditional stereotypes are reflected in their choice as they showed greater interest in areas like ICT; science and technology; and sports and athletics, as boys making a job-oriented career is considered as very important. Therefore, they are encouraged to take up Science and Computer related subjects which are believed to fetch jobs easily.

Conclusion and Recommendations

A comparison across genders showed that students are still showing a preference for specific careers reflecting traditional stereotypes. Therefore, there is a need to take steps as given here. It is imperative that elementary school children should be provided 'Vocational Orientation' by calling experts from different fields who could talk about opportunities available in different fields (which are not so popular), like Nursing, Paramedical fields like Physiotherapist, Occupational therapist, X-ray technicians, etc., so that students can be made aware about different opportunities in medical field other than the profession of doctor. Parents engaged in different vocations can also participate in such awareness programmes. Students can be taken to an 'Exposure Visit'. For example, a visit to a hotel exposes students to a variety of careers like Front Desk Manager or Receptionist, Housekeeping Attendants, Floor Supervisors, Chefs, Waiters, Steward, Bakers, etc. Emphasis should be placed on discussing the roles and responsibilities of different careers, career ladder and the kind of training required for the same. There is a tremendous pressure against girls learning and doing what are traditionally considered as 'masculine jobs' and boys being involved in doing 'feminine jobs'. Gender neutral opportunities to explore various vocations should be provided in elementary grades so that they are better prepared while choosing a vocation. Schools should appoint or invite career counselors to give career talks and educate students about different occupations— their requirements, duration and prospects, financial requirement and career progression to make informed choices. The skill development programmes at the elementary stage of schooling should also aim to provide skills combined with the understanding of markets, business negotiation and communication skills. Parents also play an important role in the career choices of their wards. During parent teacher meetings, such advocacy

workshops should be taken up where career talks, sharing of experiences of people successful in their fields should be regularly conducted. Greater opportunities to participate in sports and athletics should be provided to girls. Success stories or life journeys of female athletes like Sania Mirza, Sania Nehwal, P.V. Sindhu, Mary Kom, Geeta Phogat can motivate girls to choose sports as a career.

References

Akos, P., S.G. Niles, E.M. Miller, and B.T. Erford. 2011. Developmental Classroom Guidance. *Transforming the School Counseling Profession*. Upper Saddle River, New Jersey. Pearson. pp. 202–221.

Alexandria, VA. 2012. *The ASCA National Model: A Framework for School Counseling Programs*. 3rd ed. American School Counselor Association.

Bandura, A., C. Barbaranelli, G. Caprara and C. Pastorelli. 2001. Self-Efficacy Beliefs as Shapers of Children's Aspirations and Career Trajectories. *Child Development*. Vol. 72, No. 1. pp. 187–206. 10.1111/1467-8624.00273

Betz, N. 2002. Explicating an Ecological Approach to the Career Development of Women. *Career Development Quarterly*. Vol. 50, No. 4. pp. 335–338.

Blackhurst, A.E., R.W. Auger and K.H. Wahl. 2003. Children's Perceptions of Vocational Preparation Requirements. *Professional School Counseling*. Vol. 7, No. 2. pp. 58–67.

Government of India. 1964–66. *Kothari Commission Report of the Education Commission*. Ministry of Human Resource Development. India

———. 1986. *National Education Policy*. Ministry of Human Resource Development. https://www.education.gov.in/sites/upload_files/mhrd/files/upload_document/npe.pdf

———. 1992. *Programme of Action*. Ministry of Human Resource Development. India. https://www.education.gov.in/sites/upload_files/mhrd/files/document-reports/POA_1992.pdf

———. 2013. *National Skills Qualifications Framework (NSQF)*. Ministry of Human Resource Development. https://www.msde.gov.in/nsqf.html

Gates, J.L. 2001. Women's Career Choices in Math and Science-related Fields. Paper presented at the meeting of the society for Research in Child Development, Minneapolis.

Gottfredson, L.S. 1981. Circumscription and Compromise: A Developmental Theory of Occupational Aspirations (Monograph). *Journal of Counseling Psychology*. Vol. 28, No. 6. pp. 545–579.

———. 2005. Applying Gottfredson's Theory of Circumscription and Compromise in Career Guidance and Counseling. In S.D. Brown and R.W. Lent (Eds.), *Career Development and Counseling: Putting Theory and Research to Work*. John Wiley and Sons, Inc. pp. 71–100.

Harkins, M.A. 2001. Using Literature to Establish Career Concepts in Early Childhood September. *The Reading Teacher*. Vol. 55, No. 1. pp. 29–32.

Hewitt, J. 2010. Factors Influencing Career Choice. Cited in Edwards Kochung and Quinter Migunde (2011) Factors Influencing Students Career Choices among Secondary School students in Kisumu Municipality, Kenya. *Journal of Emerging Trends in Educational Research and Policy Studies* (JETERAPS). Vol. 2, No. 2. pp. 81–87.

Kerka, S. 1998. Career Development and Gender, Race, and Class. ERIC Digest No. 199. https://files.eric.ed.gov/fulltext/ED 421641.pdf

Lippa, R. 2005. *Gender, Nature and Nurture.* Mahway, NJ: Lawrence Erlbaum cited in Correlates of Career Choice among Senior Secondary School Student in Tarka LGA of Benue State, Nigeria. *International Journal of Education and Evaluation.* ISSN 2489-0073. Vol. 4, No. 8. www.iiardpub.org

Super, D.E. 1980. A Life-span, Life-space Approach to Career Development. *Journal of Vocational Behaviour.* Vol. 16, Issue 3, pp. 282–298. https://doi.org/10.1016/0001-8791(80)90056-1.

Super, D.E. 1953. Self-Concepts in Vocational Development. *American Psychologist.* Vol. 8, pp. 185–190.

Holland, J.L. 1959. A Theory of Vocational Choice. *Journal of Counselling Psychology.*

Roe, A. 1957. Early Determinants of Vocational Choice. *Journal of Counselling Psychology.* Vol. 4, pp. 212–217.

Yogic Traditions of India and their Educational Implications with Reference to Development of Values

R. K. Roshni Raj Lakshmi*

Abstract

Values are the set of beliefs that an individual or a community believes in. Values help to establish a just society. Value education is the kind of education, which helps to inculcate certain positive values in children. The introduction of value education in Indian education system started with the Radhakrishnan Commission. It is accepted worldwide that value education is the need of the hour. Even UNESCO has advised that education should have value education as a component. Yoga philosophy is one of the six Indian philosophies. It teaches the ideal way of life and purpose of life. It espouses inculcation of constructive values throughout the journey of yoga. Thus, it can be concluded that yoga has a major contribution to make in the cultivation of values in an individual. It implies that including yoga in the curriculum will ensure values to be internalised in children.

Introduction to Value Education

There is much advancement in science and technology today. However, in the name of modernisation, one can see the decline in societal fabric with falling apart of the values system and rise in crime rates. There seems to be no anchor to hold on to for the modern generation in the absence of values. Post-renaissance, religion was discarded as an archaic and outdated entity. With it, ethics, morality, and values also seems to be lost.

Values are the set of beliefs, which act as a guiding light for a person. It helps us to decide and make right choices in life. There are various definitions of value. Hipple (1969) defines it as 'conscious or unconscious motivators and justifiers

Guest Faculty, Department of Yoga, Manipur University, Canchipur 795003

of the actions and judgment'. Kane defines it as, 'the ideals, beliefs or norms which a society or the large majority of a society's members holds' (Kane, 1962). Having values and a strong value system ensures mental well-being. It also influences our actions and attitude to the environment, other fellow beings, and society as a whole.

A strong value system enables one to become a responsible person who is considerate and firm in one's stand. Values are inevitable if one has to ensure a peaceful society, where there is justice, liberty, secularism, and equality. Value education is, therefore, the need of the hour. Sources of inculcation of values in an individual can be from the family, society, culture, religion, peers, and education. The curricular and extra-curricular activities in education can be valuable tools for cultivating values along with informal education imparted by the family. A child spends a considerable amount of time at school. During the formative years, this time is crucial for moulding the child into a good individual. This can only be done by imparting value education.

Sociologist Morris Massey has described three significant periods during which values are developed. These are— the imprint period (up to 7 years of age), modeling period (8–13), and socialisation period (13–21 years) (Soundarajan, 2015). The imprint period is when children are most receptive and absorb almost everything they see and believe to be true. During the modeling period, people tend to copy others and everyone chooses what to believe in. The socialisation period is when one is influenced by one's peers. It is a phase when the child is in a transition period and becoming an individual in one's own right. This phase is more influenced by one's peers as they are at a similar footing as oneself. Thus, we see that the education system has an important role to play in value development. A child starts school at three years of age and spends most of his time at school. Value education thus implies a kind of education aimed at cultivating specific values in the individual. C.V. Good refers to value education as the collective of all the processes by means of which abilities and attitudes are developed in a person for developing constructive values of society (Barik, 2020). Character education enhances students' knowledge, skills and abilities by providing them with discriminative power and good judgment and responsibility. (Ryan, 1999). Indeed, in the strict sense of the term, education cannot be considered complete until and unless it helps make an individual a better version of oneself. It should not be just cramming information and facts by the young minds.

As spoken by the unemotional character of Charles Dickens' novel, *Hard Times*, Mr. Gradgrind— "Now, what I want is Facts. Teach these boys and girls nothing but Facts.

Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the mind of reasoning animals upon Facts: nothing else will ever be of any service to them." Dickens, through this character, criticises the utilitarian aspect of education and extra emphasis on facts. He believes in just the opposite, and the way Gradgrind refers to young children as 'reasoning animals', it reduces a child to a lower stratum. Here Dickens tries to show that education should be more than this (Dickens, 2001). What is generally taught in the education system is what we refer to as *aparavidya*— knowledge of mundane things. *Upanishads* have advised that *paravidya*— knowledge of spirituality and higher self should also be taught (Nikhilananda, 1956). This kind of knowledge draws one inwards and makes an individual peruse upon one's purpose in life. A person who has such questions in mind would necessarily develop positive values. Swami Vivekananda says education should be 'man-building and character making'. M.T. Ramji, in his book, *Value-Oriented School Education*, has listed down 11 values that should be inculcated in school children. Those are cleanliness, courage, courtesy, the dignity of manual work, joy, respect for all religions, peace, purity, service, truth, and universal love (Ramji, 1973).

Indian Education System and Values

The Indian education system in ancient times was based on the Gurukul System and ancient Indian philosophies. The value system was quite strong during those times. The Gurukul System of education believed in bringing about a total transformation in the student by imparting education. Right from the beginning, education during the *vedic* times required strength of character and sound values in the student. *Sadhana Chatushtaya* in *Tattvabodha* (2014), explains the fourfold qualifications of a student. It says that a student should possess four qualities to be able to get education. Those are *viveka* (discrimination), *vairagya* (dispassion), *shatsampatti* (six properties— control over mind, control over senses, observance of duty, forbearance, faith, and single-pointedness of mind), and *mumukshatva* (intense desire for true knowledge) (Tejomayananda, 2014). During the medieval period, education thrived in stellar institutes like Nalanda, Takshashila, Vikramshila, and Ujjain (Pandya, 2014). The custodians of Nalanda University considered education as not just collecting information and facts but the overall development of personality, much like yogic principles.

As perceived by Nalanda University, development encompasses physical, mental, moral, aesthetic,

and spiritual (Chaurpager, 2018). This implies that values were an essential aspect of education there. Similarly, Takshashila University based its education system on the ancient scriptures like *Vedas* and *Upanishads*, which were the basis of yoga philosophy. Value education is inseparable from the teachings of *Vedas*. Practically, Takshashila demonstrates values of equality and secularism in the admission process. There was no discrimination based on status, power, caste, or family background (Siddiqui, 2012). The teacher had the liberty to assess the eligibility of the students based on their aptitude. Self-discipline, freedom from jealousy, self-control, honesty, and modesty were considered the pre-requisites for admission to the university (Apte, 1961). Moreover, the guru imparted education specifically for each student based on their personality and capabilities. The practice ensured that the students were given complete education that entails the development of the whole personality. The brightest minds were the products of this university, among whom the name of Chanakya can be mentioned.

With the advent of the Mughal invasion, the educational system changed. But it also had a different model of value education. Theology and ethics were also taught besides other subjects like history, politics, accounting, mensuration, agriculture, astronomy, and engineering (Anjum, 2018). While the Muslims studied the Islamic model, the Hindus studied *Vedas*, *Upanishads*, yoga, and grammar. It goes without saying that value education was provided by these means.

When the Western model of education was introduced in India, the purpose was to create a class of Indians who were well versed in English and clerical knowledge. Furthermore, it does not come as a surprise that the education system had no components of value education. Indian education has been following the same paradigm even after independence. Only recently, education committees have come up with suggestions to include value education as a component of education. The Radhakrishnan Commission (1948) emphasised the inculcation of ethical values among students in colleges and universities (Charles, 2012). Secondary education commission or Mudaliar Commission (1952–53) advised that teaching method should be such that it helps inculcate desirable values and attitudes in the children (Purohit, 2018). Kothari Commission (1965) advised that values should be inculcated at all stages of education (Charles, 2012). It also stressed that education should help cultivate social, moral, and spiritual values. The UNESCO declaration on higher education has proclaimed the need to promote values through higher education, and suggest students to be involved in social service activities. The National Policy on Education

(1986) emphasised the need to make education a means to cultivate values. It lies down that there should be an interlinking of education and culture.

Introduction to Yogic Tradition of India

Yoga is an ancient science and art of living life the right way. It is one of the six philosophies of ancient India known as *Shad darshanas*. According to Patanjali, it is defined as the cessation of modifications of the mind (Bryant, 2009). Likewise, Vasishtha defines yoga as the skill to calm the mind. According to *Ashtanga yoga*, eight limbs of yoga are listed down as techniques to achieve the ultimate goal of yoga. These are *yama* (codes of conduct), *niyama* (rules of self-discipline), *asana* (postures), *pranayama* (breath regulation), *pratyahara* (withdrawal of sense organs), *dharana* (concentration), *dhyana* (contemplation), and *samadhi* (self-realisation).

The four paths of yoga explained in accordance to *Bhagavad Gita* are: *raja yoga* (yoga of willpower), *jnana* yoga (yoga of knowledge), *karma yoga* (yoga of action), and *bhakti yoga* (yoga of devotion) (Tapasyananda, 2003). These are the different paths that an aspirant of yoga can take to progress in the journey of yoga. Walking on each of these paths, one has to cultivate specific values essentially. The *Gita* espouses that one should have faith, devotion, and compassion to tread in the *bhakti marga*. Also, if one were to adopt *karma yoga* as one's path, selflessness, generosity, and kindness are a part and parcel of such an aspirant. For a *jnanayogi*, an analytical mind and wisdom are the pre-requisites. *Raja yoga* entails willpower and determination to be necessary to progress in the path. If these principles are adopted in our daily life, they can help embellish the individual's character. These principles of selfless action, generosity, wisdom, and willpower are the ingredients of an ideal person. Such a person is an asset to society as his judgment is always proper and has the welfare of all.

Yoga is a system of developing personality in all aspects. If one was to consider the concept of *Panchakosha*, it emphasises different aspects of one's existence (Sharvananda, 1921). The concept brings forth the idea of the different layers of existence and their improvement by yogic practices. The layers are *annamaya* (physical), *pranamaya* (vital energy), *manomaya* (mental), *vijnanamaya* (intellectual), and *anandamaya* (bliss). It is said that yoga helps to achieve total well-being by improving the different layers of existence.

Contribution of Yoga in the Cultivation of Values

Yoga is, all in all, steeped in values. There can be no yoga without values. To be a yogi, one has to follow a set of injunctions. How one eats, sleeps, dresses, talks, and eats is regulated. Yogic concept of *ahara* (dietary rules), *vihara* (way of living), *vichar* (thought

process), and *achar* (mannerisms) set down the rules to be followed. Traditional texts of yoga— *Hatha Yoga Pradipika*, *Patanjali Yoga Sutras*, *Bhagavad Gita*, all without exception, explain how to be a yogi by cultivating specific values.

Yamas (codes of conduct), as explained in *Patanjali Yoga Sutras*, lists down five vows, and those are *ahimsa* (non-violence), *satya* (truthfulness), *asteya* (non-stealing), *brahmacharya* (abstinence), and *aparigraha* (non-possessiveness) (Bryant, 2009). Each one of these vows is significant in itself. Patanjali says that by observing these vows, one can move closer to the ultimate goal of yoga. Yogi Swatmarama also lists down ten *yamas* to be observed. These are *ahimsa* (non-violence), *satya* (truthfulness), *asteya* (non-stealing), *brahmacharya* (abstinence), *kshama* (forgiveness), *dhriti* (endurance), *daya* (compassion), *arjava* (humility), *mitahara* (moderate diet), *saucha* (cleanliness) according to Chapter 1 verse 16 of *Hatha Yoga Pradipika* (Muktibodhananda, 2003).

Ahimsa or non-violence is the principle of not harming any other being or object by thought, word, or deed. Inherent to this principle is the concern for fellow beings. If one has to follow the principle of *ahimsa*, care for the environment and animals are the values that are inevitably cultivated. *Satya* or truthfulness is another principle which talks about being truthful always and not relying on falsehood. This is yet another significant value in itself. *Asteya* (non-stealing) is based on the value of honesty. It means not taking another person's possession without their permission. *Brahmacharya* (abstinence) implies not indulging in sexual activities and connotes control over one's base instincts. Self-control is the value related to this principle. *Aparigraha* (non-possessiveness) is the principle which talks about minimising one's needs. It can be related to the value of simplicity, a sense of sacrifice, or self-abnegation. *Kshama* is the *yama* that talks about forgiveness. It entails that the person should be large-hearted so as to be able to forgive. *Daya* is compassion. It is an essential value in itself. *Arjava* is humility. Being humble implies that the person possesses positive qualities. As is evident from the saying, 'The tree laden with fruits always bends low' (noble and virtuous persons are always humble and are very keen to help others). *Mitahara* is moderate diet. For a yoga aspirant, moderation in diet and several other aspects is a must. It implies that a yogi should not eat too much or too little. This suggests that a yogi does not indulge and does not give in to desire. It shows he is someone who has self-restraint.

Another important concept in yoga, *niyama*, or rules of self-discipline, is significant when we talk of value education. According to Patanjali, *niyamas* are five in number. They are *saucha* (cleanliness), santosha (contentment), *tapas*

(austerity), *svadhyaya* (self-study), and *ishvarapranidhana* (surrender to God) (Bryant, 2009). *Saucha* (cleanliness) refers to cleanliness, both external and internal. An external aspect relates to the physical body, clothes and environment. The internal aspect denotes the cleanliness of the mind. Herein, the mind has to be made clean by removing negative thoughts and emotions. Also, one has to cultivate positive emotions and thoughts for the same purpose. This can be compared to values like purity. *Santosha* (contentment) refers to the principle of being satisfied with what one has and not crave for other things. This is another important value one needs to inculcate. *Tapas* (austerity) refers to the principle of fulfilling only one's needs. One should follow the principle of simple living and not indulge in a materialistic lifestyle. *Svadhyaya* (self-study) teaches that one should analyse oneself. The progress that one has made in the spiritual path should be gauged time and again. This shines a light on one's moral development as well. Introspection will bring about the development of insight and mental maturity. *Ishvarapranidhana* (surrender to God) refers to a total surrender of one's ego to the divine. Surrender of ego inevitably refines the person and thus leads to the inculcation of values like humility, benevolence and kindness.

According to *Hatha Yoga Pradipika*, *niyamas* are 10 in number. They are *tapas* (penance), *santosha* (contentment), *astikya* (faith), *dana* (charity), *ishvarpujanam* (worship of God), *siddhantavakyashravanam* (listening to sacred scriptures), *hri* (modesty), *mati* (discerning intellect), *japa* (repetition of hymns), *hutam* (sacrifice) (Muktibodhananda, 2003). *Astikya* is faith. There is a saying, 'Faith can move mountains. Faith in the divine gives moral strength and increases endurance in a person'. *Dana* is charity. It arises from values like kindness, compassion and universal love. *Ishvarpujanam* does not only refer to the ritualistic worship of God. It also implies having devotion to God at all times. *Siddhantavakyashravanam* is listening to sacred scriptures. In *Sanatana Dharma*, the sacred scriptures like *Vedas*, *Upanishads* are a treasure trove of spiritual knowledge. Listening to these, one can introspect and develop inner awareness. One realises one's strengths and weaknesses. *Hri* means modesty. Being modest is a beautiful value on its own. *Mati* is discrimination. It tells us what is right and what is wrong. *Japa* means the repetition of hymns. It is again an activity that requires dedication and discipline. *Hutam* is translated as sacrifice. It refers to the oblations offered during a ritualistic sacrifice. It also connotes the sacrifice of one's ego and total surrender to the divine.

Patanjali yoga *sutras* yet again talk about the concept of *chittaprasadanam* (Bryant, 2009). It refers to the attitudinal change

one should have when faced with different situations. It talks about four attitudes that an individual should have— *maitri* (friendliness), *karuna* (compassion), *mudita* (encouragement), and *upeksha* (indifference). The text expounds that one should assume friendliness or share happiness when encountering someone who is in a joyous mood. When faced with someone who is mourning, one should show compassion. If they come across someone who has done good work, one should encourage the person. However, when one is faced with an evil person, a yogi should be indifferent. *Chittaprasadanam* helps to inculcate values like generosity, compassion, maturity, and wisdom.

Bhagavad Gita mentions the concept of *sthitaprajna* as an ideal of mental equipoise (Tapasyananda, 2003). It is described that a *sthitaprajna* is not affected by the dualities of life, nor is it driven by the urges of senses. He is not distracted by desires and passions. His wisdom and judgment are ever balanced. This ideal of the *Bhagavad Gita* can be related to values like self-restraint, wisdom and discrimination.

Yoga Vasishtha is another authoritative text in the field of yoga (Bharati, 2002). It is a dialogue between Lord Rama and sage Vasishtha. Lord Rama was in despair seeing the suffering of humanity. Sage Vasishtha counsels Rama and teaches him the nuances of the path of yoga. Vasishtha explains about the four gatekeepers at the entrance to the realm of *moksha* (liberation). Liberation is the ultimate goal of yoga. The four gatekeepers are the pre-requisites to achieve liberation. Those are self-control, the spirit of inquiry, contentment, and good company. Self-control is a significant value. The spirit of inquiry is another necessity in the path of yoga. It implies the need to introspect and assess one's progress in one's spiritual path. Good company refers to being in the company of people who will have a good influence on self, be it in a spiritual sense or mundane aspect.

The simple concept of *mitahara* (moderate diet), as taught by traditional texts like *Hatha Yoga Pradipika* and *Gheranda Samhita*, advocates that one should not eat too much or too little. One's food intake should be just the right amount to sustain the body. It should not have extremes of taste and substances that are stimulating. The purpose of food is to nourish the body. This principle teaches self-restraint and simplicity (Muktibodhananda, 2003).

Another text, *Tattva Bodha*, explains the qualities of an aspirant of yoga. It lays down four qualities necessary in an aspirant of yoga, known as *sadhana chatushtaya*. They are *viveka* (discrimination), *vairagya* (dispassion), *shatsampatti* (inner wealth), and *mumukshutva* (intense desire for liberation). *Shatsampatti* are *shama* (mind control), *dama* (control of external sense organs), *uparati* (strict observance of one's

duty), *titiksha* (endurance of dualities), *shraddha* (faith), and *samadhana* (single-pointedness of the mind) (Tejomayananda, 2014). *Viveka* (discrimination) is the ability to differentiate between right and wrong. It is an important quality to be able to make a proper judgment in life. *Vairagya* (dispassion) is the attitude of not being attached to any material object. It relates to the value of stoic calmness. *Mumukshutva* (intense desire for liberation) is the burning desire to attain the ultimate goal of life— liberation. It is closely related to the value of perseverance, endurance, and spirituality. Among the *shat sampatti*, *shama* is mind control. It implies values like equanimity and resilience. *Dama* is control of the senses. It refers to self-restraint as a value. *Uparati*, or observance of one's duty, is an important value taught by the *Bhagavad Gita* also. Being dutiful is a value necessary for a good human being. *Titiksha* means endurance. One should be able to endure adversities in life as they are inevitable. *Shraddha* is faith. It is already mentioned earlier how faith is an important value. *Samadhana* is single-pointedness of mind. For achieving success in any endeavour, focusing the mind is essential. Yoga philosophy, as the name suggests, is the union of the individual soul and cosmic soul. It implies the merging of a human entity into the vast infinity of the cosmos. This cannot be perfected without inculcating values that make the individual a perfect being.

Yoga is perceived to be merely physical exercise and practice devoid of the philosophical basis. This is not yoga in totality, but there are benefits of practising it even without understanding the philosophy. As for the inculcation of values, each practice of yoga has some value ingrained in itself. For instance, the practice of asana is done by relaxing the body and concentrating the mind on the infinite soul. As described by Patanjali, the benefit of asana is to overcome the dualities of life (Bryant, 2009). If done correctly, the mere physical practice of an asana can improve willpower and endurance. Thus, it helps to inculcate values even without studying the scriptures. Another illustration would be the practice of *pranayama* (breath regulation). While practicing *pranayama*, one can improve one's mental state and perseverance.

Conclusion

In the 21st century, we can see tremendous growth in science and technology. The impact of this growth is markedly present in the Indian educational system as well. It has had a paradigm shift from the *guru-shishya parampara* of the Gurukula System to online education during the COVID-19 pandemic. The inculcation of values that was an essential aspect of education in the past had taken a backstage. One can see an erosion of moral, ethical, and spiritual values from the number of heinous crimes committed nowadays.

This has resulted from many factors that are intertwined with our current lifestyle and beliefs. High profile jobs of parents, nuclear families, paucity of quality time for family, disregard for age-old customs in the name of scientific temper, and the so-called liberal ideas replacing values mark today's societal scenario. This calls for a means of inculcating positive values in the young children.

The National Education Policy 2020 draws its inspiration from the ancient style of Gurukula education. It is not flawless and lacks a workable paradigm. Nonetheless, in principle, the NEP 2020 tries to weave the principle of ancient education into the fabric of modern education. In the Gurukula System and even later at Nalanda and Takshashila Universities, free education to the deserving was a beautiful precept. The NEP 2020 tries to include this. Being all-inclusive and giving provision for multidisciplinary learning was another aspect of ancient Indian education. The same model is one of the new aspects of NEP 2020, whereby it allows a student to opt for a subject beyond their discipline of study (Choice Based Credit System). Underlying these conditions are the ethics and values of benevolence, equality, and broad-mindedness. NEP 2020 states, "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" (NEP, 2020).

There are many instances where yogic principles espouse the need to inculcate values for progress in the path of yoga. Values and yoga are indeed inseparable. From the above discussion, it can be concluded that yoga is a system that teaches an ideal way of life. Yogic principles entail that one should religiously follow specific rules and regulations. These injunctions help in cultivating values as a part of yogic lifestyle. In the path of yoga, one has to conduct oneself according to the yogic principles. It may be how a person eats, sleeps, talks, thinks, and lives one's life (Yazdani, 2015). According to a study done on hidden curriculum and character education, the researchers have found that it serves an important role in cultivating values in children (Cubukcu, 2012). The same paradigm of investing an individual with values right from the beginning is seen in yoga.

In order to ensure the inculcation of positive values in children, yoga component should be interwoven with the usual curricular activity. A concrete roadmap needs to be designed to make this possible. Yogic

games or *krida* yoga (games with yogic component) should be made a part of their physical routine. It enables children to incorporate positive traits like dexterity, skill, leadership, etc. A yoga module suitable for a specific age-group should be created including *asanas*, *pranayamas*, *shatkriya*, and meditation. Yogic philosophy should be incorporated in the form of stories in the curriculum for young children. Children can be made to enact skits based on yoga philosophy as part of their extra-curricular activities.

The yoga way of life is an essential contribution to developing values and value education. This implies that including yoga as a subject in the curriculum will help inculcate some beautiful values in our children and enable them to be complete individuals.

References

Anjum, F. 2018. Education and learning in Mughal India: A Critical Study of Colonial perceptions. *Journal of Research Society of Pakistan. Vol. 55, No. 1,* pp. 83–93.

Apte, D. G. 1961. *Universities in Ancient India.* 1st ed. M S University.

Barik, P. 2020. Presence of Value education in the curriculum of Government Primary Schools in Assam. *IJESC*, Vol. 10, No. 3, pp. 25094–6.

Bharati, S. J. 2002. *The Essence of Yogavaasishtha.* Chennai: Samata Books.

Bryant, E. F. 2009. *The Yoga Sutras of Patanjali:* A New Edition, Translation, and Commentary With Insights from the Traditional Commentators. New Delhi: Pan Macmillan Publishing India Private Ltd.

Charles, K. 2012. *Value Education.* New Delhi: Neelkamal Publications Pvt. Ltd.

Chaurpager, R. V. 2018. Contribution of Nalanda University in higher education. *International Journal of Current Engineering and Scientific Research.* Vol. 5. No. 5, pp. 54–56.

Cubukcu, Z. 2012. The Effect of Hidden Curriculum on Character Education Process of Primary School Students. *Educational Sciences: Theory and Practice.* Vol. 12 No. 2, pp. 1526–34.

Dickens, C. 2001. Sowing. In: *Hard Times.* p. 3. Delhi: Worldview Publications.

Hipple, T.W. 1969. *The Values in Four Selected American Novels. Dissertation Abstract International.* Vol. 30, No. 2.

Kane, J.J. 1962. *Social Problems: A Situational–Value Approach.* Prentice–Hall, Ist Ed.

Ministry of Human Resource Development. 2020. *National Education Policy 2020.* Government of India. https://www.education.gov.in/sites/upload_files/mhrd/ files/NEP_Final_ English_0.pdf

Muktibodhananda, S. 2003. *Hatha Yoga Pradipika.* Munger: Yoga Publication Trust.

Nikhilananda, S. 1956. *The Upanishads.* Mayavati: Advaita Ashrama.

Pandya, R. N. 2014. Indian Education System— A historical Journey. *International Journal of Research in Education.* Vol. 3, No. 3, p.47.

Purohit, P. 2018. *The History and Evolution of Indian Education System.* pp. 1–16.

Ramji, M. T. 1973. *Value Oriented School Education.*

Ryan, E. K. 1999. Building Character in Schools: Practical Ways to Bring Moral Instruction to Life. ERIC .

Sangma, B. J. 2015. Value Based Education in the Garo Hills (Meghalaya): The Urgent Need. *International Journal of Informative and Futuristic Research.* Vol. 3, No. 4, pp.1199–1204.

Sharvananda, S. 1921. *Taittiriya Upanishad: with Sanskrit Text, Paraphrase with Word for Word Literal Translation, English Rendering and Comments.* Mylapore: Sri Ramakrishna Math.

Siddiqui, K. S. 2012. University of Takshashila: An ancient seat of education. *Journal of Social Sciences and Humanities*, Vol. 51, No. 1, pp. 97–107.

Soundarajan, M. 2015. Value education. In: *Values and Peace Education,* pp. 7–8. Chennai: Tamil Nadu Teachers Education University.

Tapasyananda, S. 2003. *Srimad Bhagavad Gita: The Scripture of Mankind.* Mylapore: Sri Ramakrishna Math.

Tejomayananda, S. 2014. *Tattvabodha. Mumbai*: Chinmaya Prakashan.

Yazdani, S. 2015. Concept analysis: Value based education. *Biosciences Biotechnology Research Asia,* pp. 123–130.

Effect of Computer Animations on Students' Understanding of Neural Conduction via Annotated Drawings and Graphical Representations

PRIYAMVADA* AND DEEPSHIKHA**

Abstract

The purpose of this study is to show how use of computer animations in teaching is an effective way of revealing the misconceptions of students about the basic concepts in Biology. Two sample schools—multipurpose urban model and residential rural school—were selected for the study. Students of Class XI of age group 16–18 years (N = 80) participated in this study. A two-stage experiment in the form of drawing sessions—before and after formal technical teaching was conducted following an open-ended interview to explore students' basic understanding and cause of misconceptions about neural conduction. During each drawing session, the children were asked to draw the annotated diagrams and graphical representations of the processes taught on the basis of their own observation and understanding. The drawings and graphs were analysed and categorised based on five levels of the drawing criteria given by Köse (2008). The connections they draw and explanations they give to their drawings depict that they have several misconceptions regarding the concepts of 'Neural Control and Coordination'.

INTRODUCTION

Biology is a unique science which requires observation, creativity and detailed description. In the last several years, conventional approaches of teaching and learning of Biology have underestimated the role of drawing and graphing. The

* *Former PGT Biology*, DM School Bhubaneswar, Department of Education, Regional Institute of Education (NCERT), Bhubaneswar, Odisha.

** *Former JNV Internship Trainee*, Department of Science and Education, Regional Institute of Education (NCERT), Bhubaneswar, Odisha.

learning or doing of Biology without the use of visual representations limits learners' comprehension and analysis. Visual representations are the only way to make the unseen seen and the complex simple (Katz, Barnetz, and Hershkowitz, 2014; Quillin and Thomas, 2015).

Previous studies have explored the children's understanding of 'Organs and Organ Systems' (Carvalho, et al., 2004; Reiss et al., 2002; Rowlands, 2004) but there were limited efforts being made to determine the knowledge construction with the help of annotated drawings and graphs. Andersson, Löfgren and Tibell (2019) clearly stated that there are considerable gaps in our knowledge on children's understanding of the human body structure and functions which requires due emphasis to address their previous knowledge. Learning of Biology in recent years is mostly examination oriented, teacher-centric and passive, wherein the students are least engaged in the process. Research studies throughout the 1980s focused more on eliciting students' alternative conceptions also called preconceptions, misconceptions and alternative frameworks (Djanettea and Fouadb, 2014). But how to diagnose and challenge the alternative conceptions of learners in a teaching context still remains vague. Annotated drawings and graphical representations are one of the effective tools to address the learner's alternative conceptions in Biology. Learners often relate their drawings with their own experiences and understanding (Dempster and Stears, 2014; Óskarsdóttir et al., 2011).

The use of computer animations having annotated drawings and graphs will scaffold learner's basic understanding of the biological processes and promote active learning. In addition, it will minimise the use of valuable classroom time and requires no extra pedagogical efforts for teachers (Kararo and McCartney, 2019). Annotation in scientific drawings and graphs will help learners to interpret the complex processes with detailed information and develop connecting link among concepts (Nielsen, 2014).

Review of Related Literature

The human physiology is one of the most difficult branches of Biology (Chase, 2014; Sturges and Maurer, 2013). The challenges of understanding many physiological systems, including cardiovascular system, respiratory and digestive systems, have been addressed in many recent studies (Reiss et al., 2002; Pelaez, 2005; Ormanci and Oren, 2011). However, little is known about the learning difficulties, in neural anatomy and physiology at introductory level. Students often face difficulties in interpreting the basic concepts such as difference between myelinated and unmyelinated neuron, action potential generation across axon, variables of membrane potential, voltage-time graphs of

neural signals, the events occurring during the transmission across the synapse, etc. (Guy, 2012; Michael, 2002; Silverthorn, 2002; Montagna et al., 2010). To overcome these difficulties, some approaches have been introduced which include E-learning through MCQ linked animations (Ruiz et al., 2009; Gookin et al., 2010; Merrienboer and Sweller, 2010; Guy, 2011), internet based instructions (Ayres and Paas, 2007; Cook et al., 2008; Cook, 2009) and use of annotated drawings and graphs. Computer animations will help the learner to create systematic annotated drawings and graphs of various physiological processes in Biology.

Importance of Annotated Drawings and Graphical Representations in Learning Biology

Annotation in drawings refers to a drawing accompanied by some written notes and labelling often made with the purpose to provide detailed description about scientific process (Georghiades, 2004). It helps in summarising the large content of information and develops the material useful for revision during examinations. According to Aggarwal (2001), drawing ensures meaningful and deep learning in Biology. It helps learners to look and examine the details of the biological processes. Drawing is an excellent way to present ones' observations in an appropriate format. It acts as a medium for analysis and synthesis and promotes scientific thinking. At the same time it provides a record of students' work to the teachers. Similar to drawings, graphs are also most commonly used to visually illustrate the data (Slutsky, 2014). Graphs may have several parts depending on their format— a figure number, a caption, a head note, axes and scales. Past studies documented that learners face difficulties with graphical interpretations such as in understanding the *x*- and *y*-axis, assigning and illustrating the relationship between the independent and dependent variables, etc. (Picone et al., 2007; Colon-Berlingeri and Burrowes, 2011). However, if graphical representations are frequently practised in the context of classroom situations, it will promote analytical reasoning skills among learners. Graphs can be used to condense and summarise large data sets in less space. It is an effective tool for displaying experimental findings in the field of Biology (Tairab and Al-Naqbi, 2004; Wainer, 2013; Angra and Gardner, 2017).

Role of Computer Animations in Learning Biology

In science education, the use of visual representations helps the learner to see how science works. It contributes to conceptual understanding and knowledge formation (Evagorou et al., 2015). Previously, the use of visual representations started in the form of photographs, diagrams, tables, charts, etc., and over the

years, it has evolved with the new technologies such as advanced digital images, three dimensional models, computer animations, etc. These are effective tools to support cognitive understanding in science (Gilbert, 2010; Wu and Shah, 2004). The use of images in science textbooks (Dimopoulos et al., 2003; Bungum, 2008) and in students' representations or models while studying science (Gilbert et al., 2008; Lehrer and Schauble, 2012) are the initial steps in learning science. But in the current trend, it is not enough to facilitate learning. The complicated processes of life sciences cannot be clearly demonstrated with two-dimensional images. The moving images of the biological processes through computer animations provide sequential information about the events. The use of multimedia tools reduces the efforts of teachers in terms of repetitive drawings of the events of same process. It promotes fast learning in a limited period of time.

Need of Study: Challenges Faced by Students and Teachers

Recent studies have revealed that even after formal teaching and learning of basic concepts of neural conduction, students were found not to be able to explain processes in scientific language, despite having knowledge about them. Before beginning the instruction, students' misconceptions are not taken into account by teachers (Dempsey and Betz, 2001; Aydin, 2012). Simultaneously, the transactional methods used by the teachers are also not relatable at par with the student's misconceptions. The mode of instruction mostly followed was textbook oriented (Figure 1). Various research studies have been conducted to address students' misconceptions by using interviews, open ended questions, two-tiered multiple choice tests, questionnaire based test, etc. However, there were limited studies on how animations including annotated drawings and graphs are used for instructional purpose as well as enhancement of students' basic understanding.

Rationale of the Study

We believe that this approach will facilitate the organisation of knowledge among students in a hierarchical manner. It will help in active construction of knowledge and provide additional resource for learning. We have taken two types of schools intentionally for this study on the basis of location, i.e., rural and urban. It also takes into account the organisational affiliation considering factors that may affect our approach and findings, i.e., previous knowledge of the students, instructional strategies which are being used by the teachers in both types of schools, intelligence level of the students, etc.

Objectives

The objectives of the study are as follows:

- To identify the misconceptions of the students about the topic 'Neural Conduction'.
- To explore whether the use of computer animations enhances

the drawing and graphical skills of the students.

- To compare the drawing and graphical skills of the students of multi-purpose model and residential rural schools.

Research Questions

In this study, we tried to explore the following research questions:

- What are the ways for improving students' annotated drawing and graphical skills on the topic of neural conduction?
- What misconceptions do students perceive before and after instruction about neural conduction?
- Is there any difference in instructional methods which are carried out by subject teachers in both types of schools?
- Is there any difference in the use of teaching aids in both the schools?
- Is the traditional teaching method of schools effective for teaching topics like neural conduction?

Hypotheses

HO1: There will be no significant difference among the students' biological drawings and graphs before instruction and after instruction.

HO2: There will be no significant difference between the students' biological drawings and graphs of Demonstration Multipurpose School (DMS) and Jawahar Navodaya Vidyalaya (JNV) based on the school location.

Methodologies

Research Design

Quasi-experimental research design was followed based on single group pre-test and post-test research model.

Participants

For this study, we have collected the data from 80 students studying in Class XI with subject specialisation—Biology at the Demonstration Multipurpose School, Bhubaneswar, from two sections and Jawahar Navodaya Vidyalaya, Khordha, from one section. The selection of students and sections were done through simple random probability sampling. The sample was composed of 56 female and 24 male students whose mean age was 16–17 years. 40 students were from DMS and 40 were from JNV. All of them had studied about 'Life Processes' and 'Control and Coordination' at the secondary level.

Procedure

We have selected Chapter 21 of Class XI NCERT Biology textbook, that is 'Neural Control and Coordination' for the study. The subtopics which were taught through computer animations were—

- Neuron as structural and functional unit of neural system
- Generation and conduction of nerve impulse

The study was planned in the months of October and November, 2019, when the teachers of both

the schools have finished a few portions of Unit 5: Human Physiology including Chapter 21, that is 'Neural Control and Coordination' for the summative assessment. The dates for the study were fixed with the help of subject teachers in the free periods by taking prior permission from the higher authorities of both schools. The drawings and graphical representations of students, collected from both schools before and after instruction, were analysed and categorised based on five levels of drawings criteria developed by Köse, (2008):

Level 1: No drawing and graphs
Level 2: Incorrect and non-representational drawings and graphs
Level 3: Drawings and graphs with misconceptions
Level 3a: Partially correct drawing and graphs
Level 3b: Partially incorrect drawing and graphs
Level 4: Correct and comprehensive annotated drawings and graphs

Tools used

Computer animations and graphics interchange formats showing annotated drawings and graphical representations of neural conduction developed by Youtube tutorial 'Teacher's Pet and Designmate' that was used for the instructional purpose (Figure 2). Open-ended interview was also conducted to diagnose the cause of misconceptions of the students.

Collection of the data

The concerned schools were visited for data collection and to administer the test.

Pre-instruction Phase

In this phase, students were asked to come prepared with the chapter 'Human Physiology' which had already been taught by their subject teachers and bring a plain paper and drawing items. On the other day, they were asked to draw detailed diagrams of myelinated and unmyelinated neuron, impulse conduction through axon relating it with voltage-time graph. Time assigned to complete the task was 30 minutes.

Instruction Phase

On the second day, students were asked to come to the computer lab of the school. A five minutes video showing computer animations on the structure of neuron, difference between myelinated and unmyelinated neurons, saltatory conduction, generation of action potential along the axon, voltage-time graph of oscilloscope, etc., was shown to the students twice. Each event in the video was described properly to the students relating it with the textbook content. Students were asked to carefully observe each and every event of the process and asked to clarify their doubts whenever they faced difficulty in understanding any concept.

Post-instruction Phase

In this phase, students were asked to again draw the diagrams and graphs of neural conduction by analysing the information that was provided in computer animation video. Time assigned was the same as before. At the same time, the drawings and

graphs that they had drawn before the instruction were distributed to them. After finishing the task, they were asked to relate and compare their drawings and graphs drawn before and after instruction.

Data Analysis

The results were analysed by using percentage distribution. The calculation of frequency and percentage and preparation of graphs were done using Ms Excel, 2007 version.

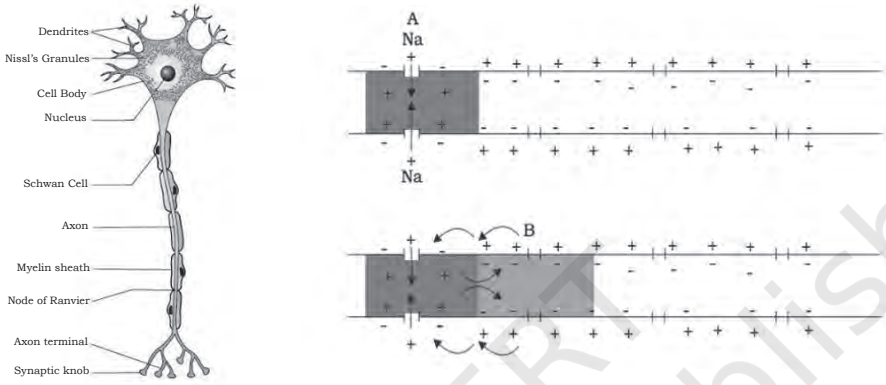


Fig. 1: Diagrams given in Class XI Biology NCERT textbook

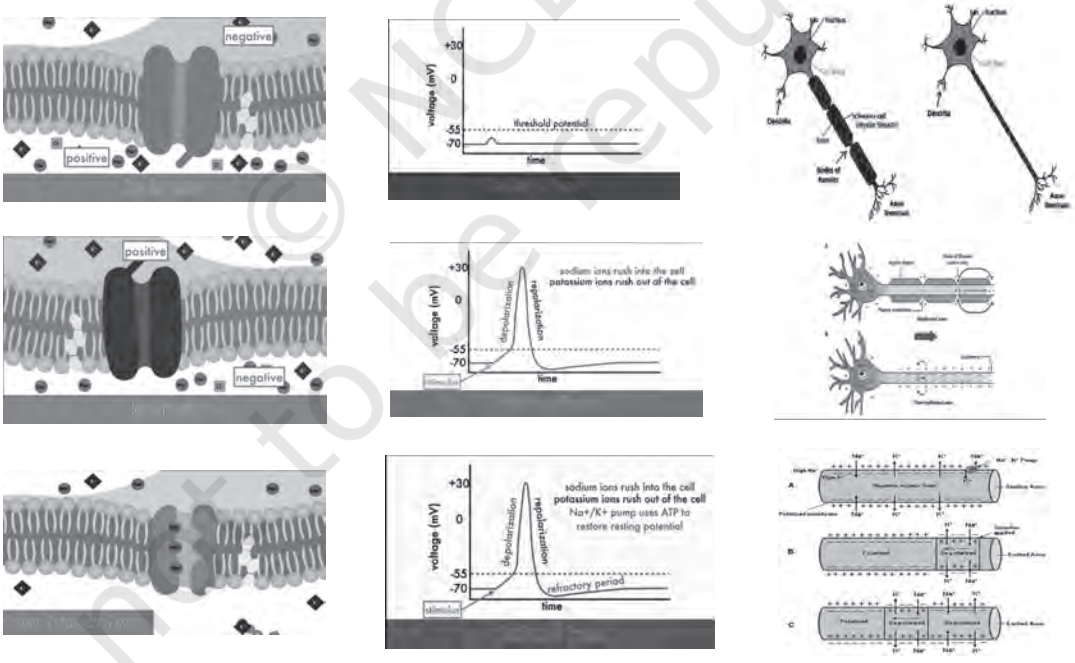


Fig. 2: A series of stills from the computer animations and graphics interchange formats showing annotated drawings and graphical representations used during study

Source: https://www.youtube.com/watch?v=FEHNIELPb0s (Teacher' Pet)
https://www.youtube.com/watch?v=1aSknHTnsYk (Designmate)

Results

The overall results of the pre-instructional study revealed that majority of the students, approximately 68 per cent (more than half) of both schools were having problem in the conceptual understanding of the basic concepts of neural conduction. This percentage was reduced by 13 per cent after instruction. About one-seventh of the students had not drawn any diagrams and graphs prior to the instruction. However, after instruction the percentage of students who had not attempted to make any drawing became negligible. About 13 per cent students had drawn incorrect drawings and graphs before instruction, this percentage decreased to only 4 per cent after instruction. Nearly 55 per cent students were having misconceptions previously, which got reduced to 51 per cent after instruction. The partially correct drawings and graphs were more than partially incorrect drawings before instruction. But the results were reversed after instruction. Only 19 per cent students of both schools had drawn correct and comprehensive annotated drawings and graphs during pre-instructional phase, while the percentage got increased to 42 per cent during post-instructional phase (Figure 3, Plate 1–4). The students of DMS were found to have more misconceptions in comparison to JNV students both at pre-instructional (60 per cent) and post-instructional level (58 per cent) (Figure 6). The most commonly drawn diagrams and frequent misconceptions of students of both schools that were observed in their drawings are listed in Table 1–2. We observed that the students of JNV were having more clear understanding about the neural conduction (pre-instruction: 28 per cent and post-instruction: 53 per cent) in comparison to students of DMS (Figure 4–6, Plate 1–4). There were no significant differences found in the results based on gender. The results of the open-ended interview of students revealed that the lack of ability to draw correct and comprehensive diagrams was due to:

- Lack of interest of learners towards Biology
- Lack of observational and creative skills
- Lack of actual application of drawings and graphs in real classroom situations
- Use of textbook drawings and lab charts for teaching
- Poor monitoring and assessment of students' drawings
- Lack of proper use of available audio-visual aids present in the school
- Lack of ICT-integrated instruction
- Traditional approach of teaching
- Unavailability of skilled teachers

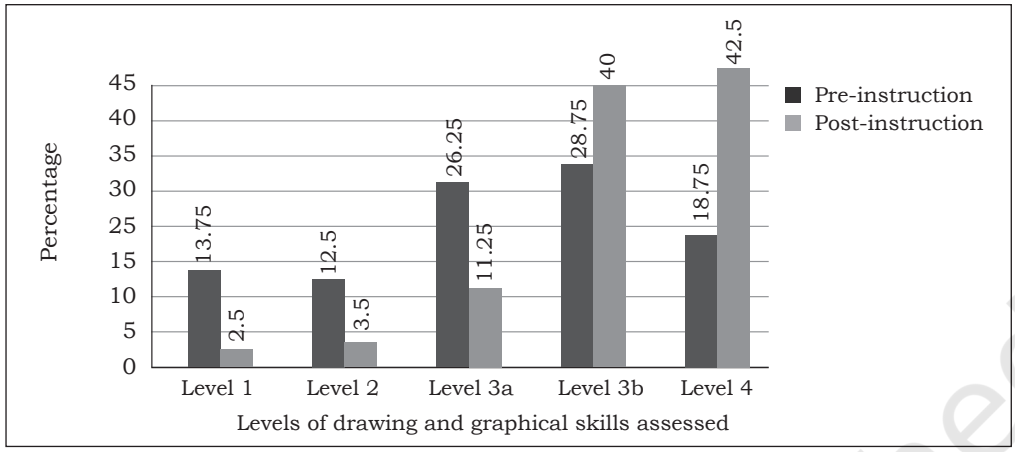


Fig. 3: Overall results of students responses of both schools

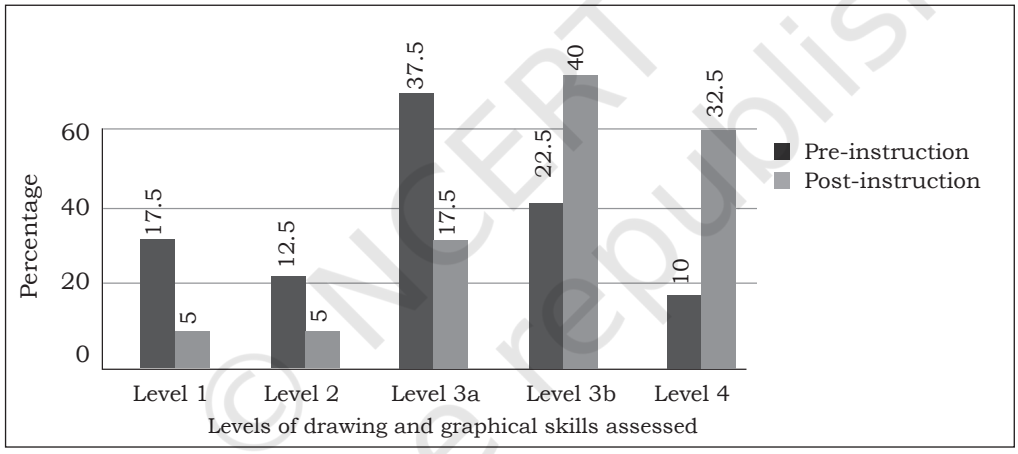


Fig. 4: Comparison between the responses of DMS students (before and after instruction)

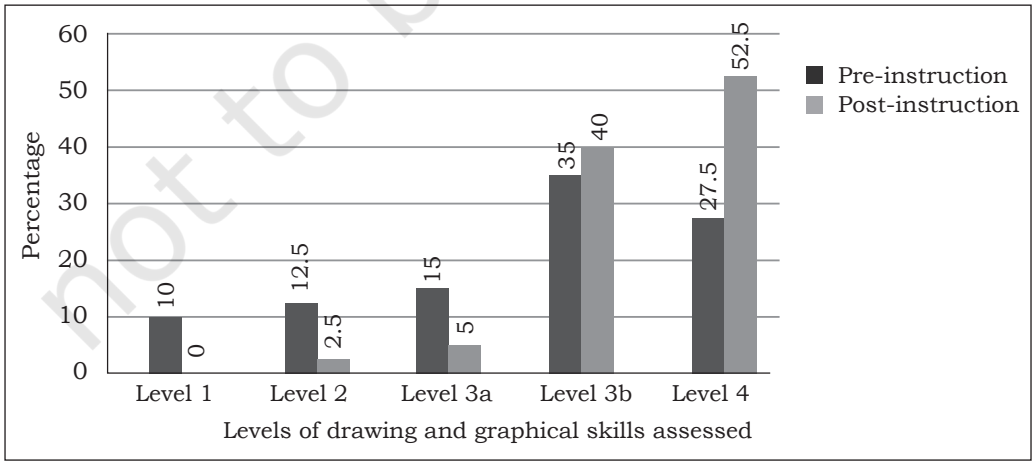


Fig. 5: Comparison between the responses of JNV students (before and after instruction)

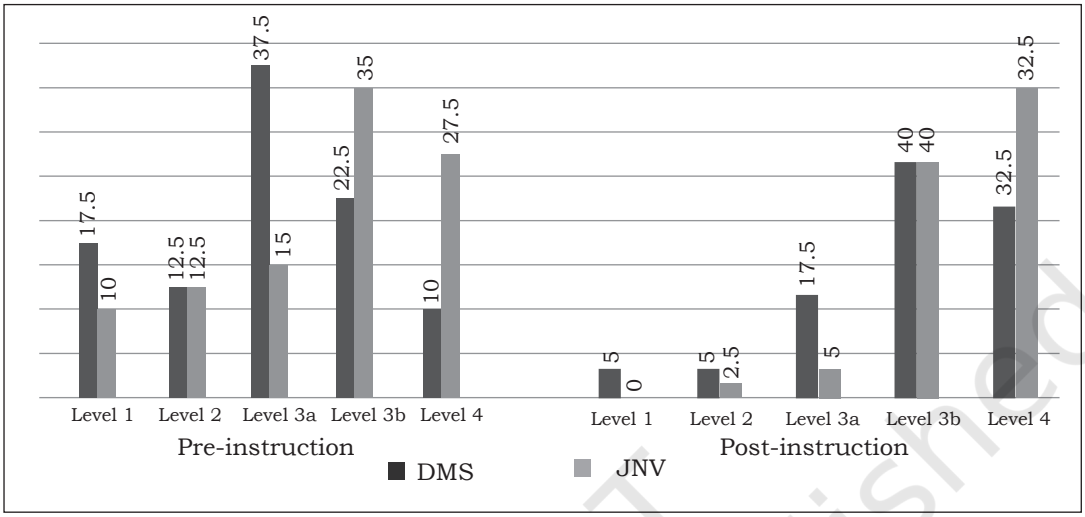


Fig. 6: Comparison between the pre-instruction and post-instructional results of DMS and JNV

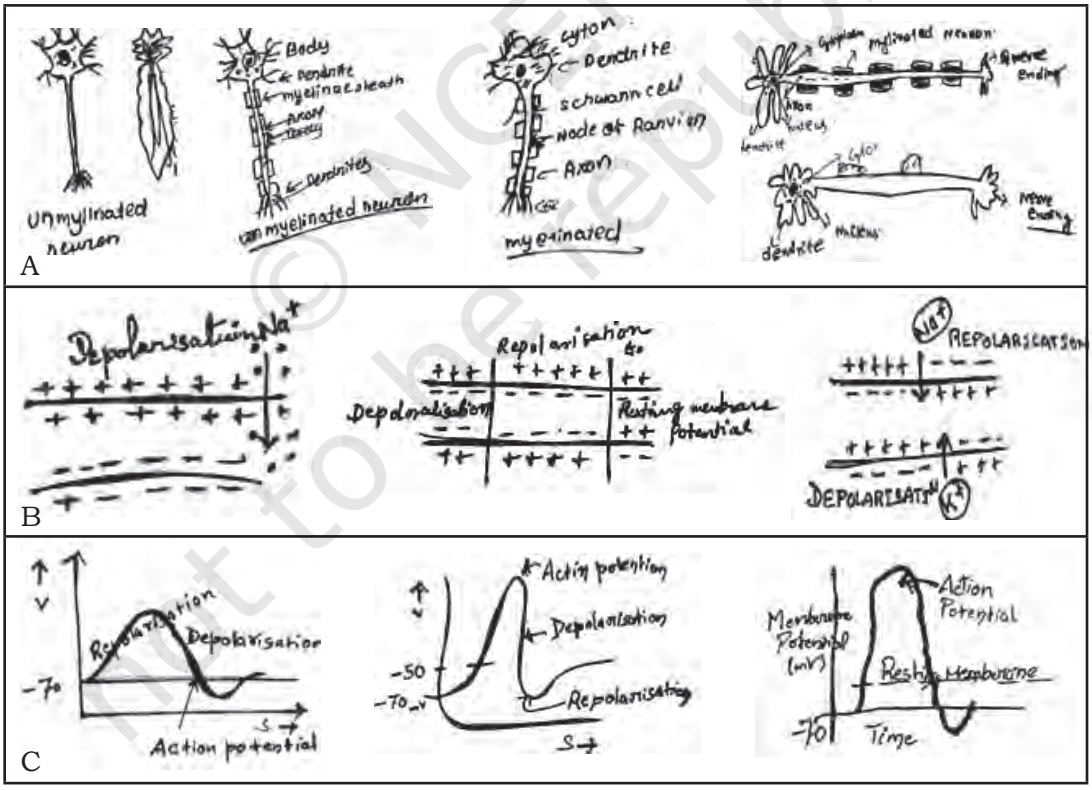


Plate 1: Example of Level 2— Incorrect and non-representational drawings and graphs drawn by students. A. Unmyelinated and Myelinated Neurons B. Diagram of impulse conduction through axon C. Voltage-time graph of action potential

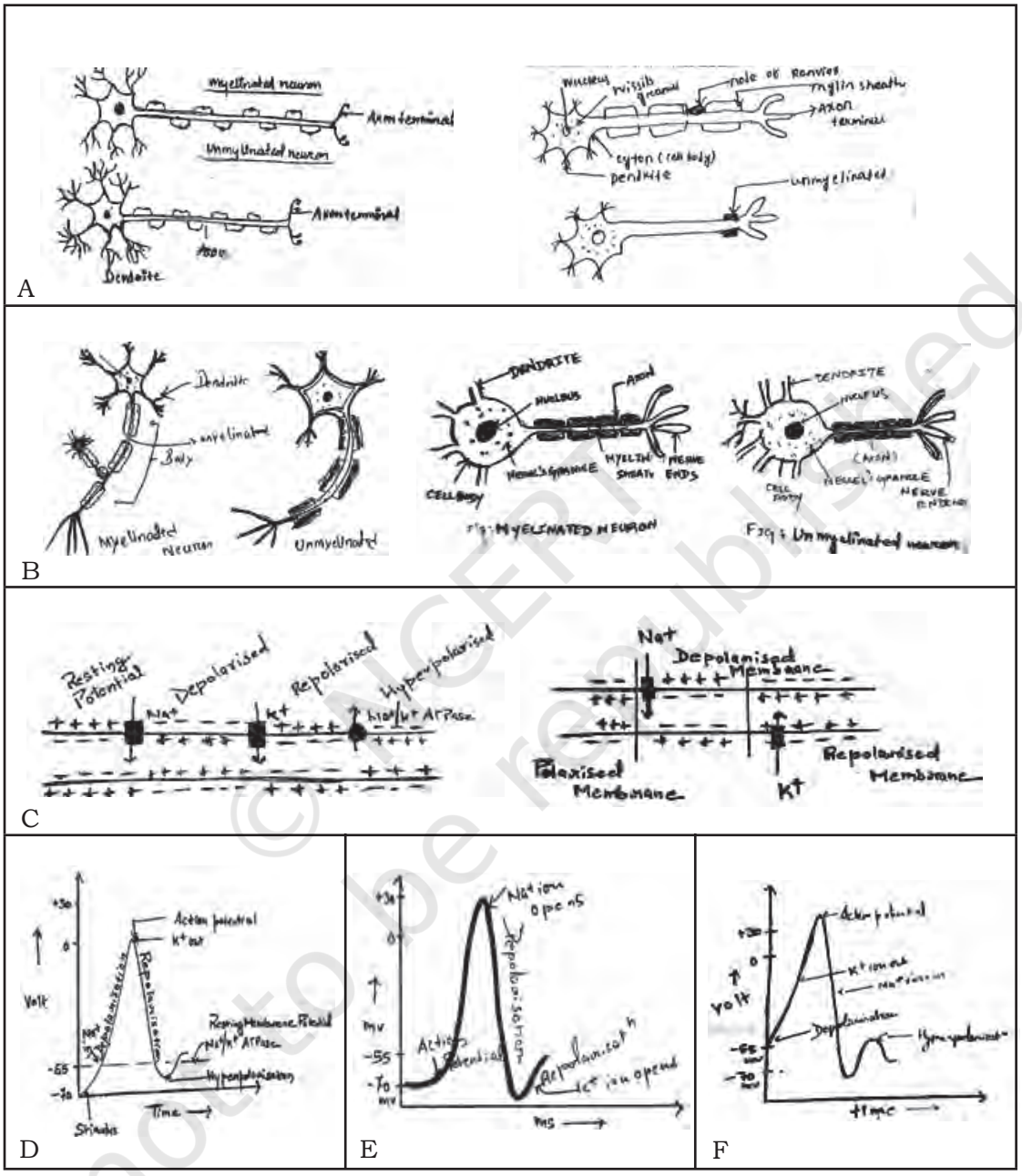


Plate 2: Example of Level 3a and 3b— Drawings and graphs with misconceptions drawn by students. A—B: Unmyelinated and Myelinated Neurons. C: Diagram of impulse conduction through axon. D—F: Voltage-time graph of action potential

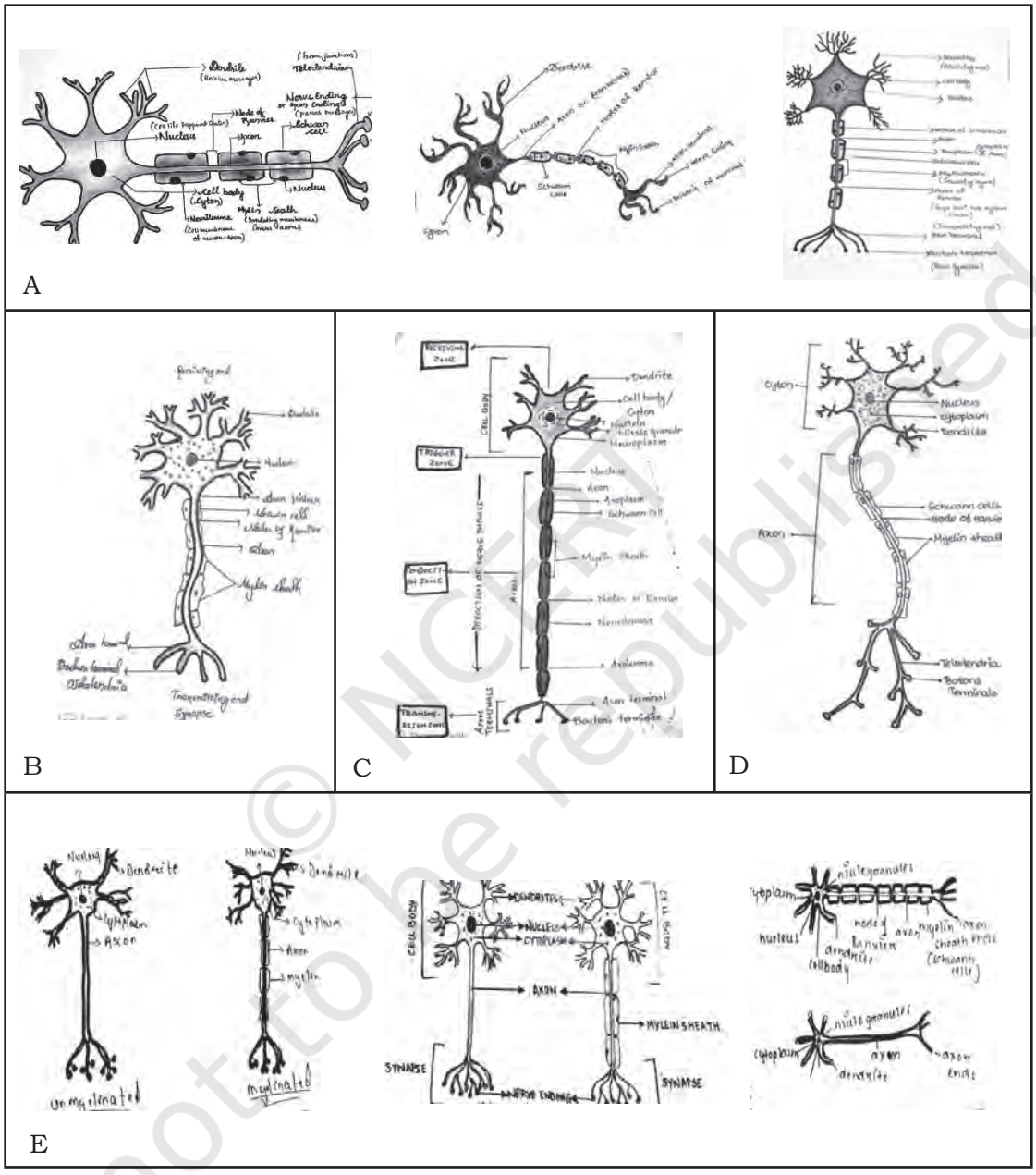


Plate 3: Example of Level 4—Correct and comprehensive annotated drawings drawn by the students. A—D: Myelinated Neuron. E: Unmyelinated and Myelinated Neurons

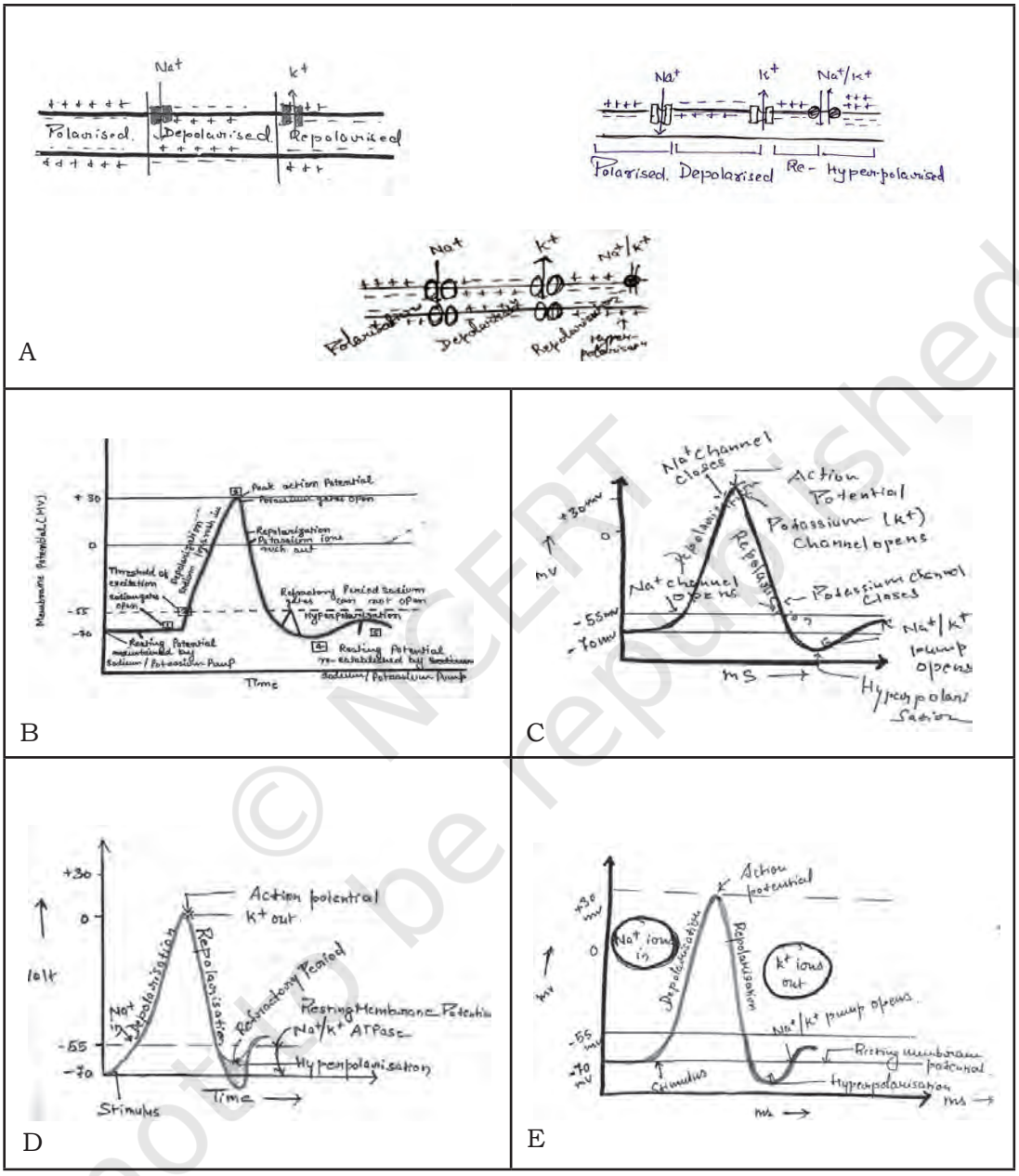


Plate 4: Example of Level 4—Correct and comprehensive annotated graphs drawn by the students. A: Diagram of impulse conduction through axon. B—E: Voltage-time graph of action potential

Table 1
The Most Frequent Components of Neural Conduction Drawn by Students

S.No.	Elements	n	%
1.	Cell body (soma)	69	86
2.	Axon	56	70
3.	Dendrites	51	64
4.	Axon terminals	37	46
5.	Synaptic knobs	29	36
6.	Axon hillock	23	29
7.	Nissl's granules	17	21
8.	Cell organelles in soma	15	19
9.	Schwann cell forming myelin sheath	13	16
10.	Nodes of Ranvier	11	14
11.	Impulse conduction through axon	10	13
12.	Membrane potential difference across different phases of impulse conduction	8	10
13.	Membrane proteins— ion channels	6	8
14.	Different phases of nerve impulse along with voltage time graph	4	5

Table 2
Analysis of Students' Misconceptions about Neural Conduction

	Misconceptions	Pre-instruction		Post-instruction	
		n	%	n	%
1.	Nissle granules are form of ribosomes in the cell body of neuron	33	41	17	21
2.	Schwann cells are found in unmyelinated neuron	29	36	11	14
3.	Saltatory conduction occurs in unmyelinated neuron	24	30	13	16
4.	The action potential generation is faster in unmyelinated neuron than in myelinated neuron	42	53	9	11
5.	Action potential occurs when membrane potential of a specific neuron continuously rises and falls	35	44	3	4
6.	The electrical potential difference between outside and inside of a nerve axon remains uniform throughout the neural conduction	17	21	4	5
7.	The depolarisation of nerve membrane takes place through influx of K^+ ions	8	10	5	6
8.	During repolarisation phase there is rapid influx of K^+ ions	13	16	2	3
9.	In repolarisation phase, the outside of axon will become positive and in hyperpolarisation phase, the outside becomes negative	11	14	6	8
10.	Na^+-K^+ ATPases are responsible for action potential generation	1	1	0	0

Discussion

The current trends in science education focus on giving more emphasis to process rather than content (Eurydice, 2012; Schwartz et al., 2012; Bybee, 2014; Duschl and Bybee, 2014; Osborne, 2014) in order to make science easily accessible to the learners. Unfortunately in practical context, these trends are not followed in real classroom situations. We explored in our study that approximately 68 per cent (more than half) of students from both schools face difficulties in understanding the basic concepts. Although, this was the result of a single pilot study, but findings are almost same everywhere. Drawings in Biology represent one's cognitive thinking which forms a part

of the scientific process (Wasserman, 2013). Katz, P. (2017) described that drawing along with descriptive writing provide clarity and can make learning accessible. Students who draw providing proper annotation with text acquire greater knowledge than those who draw the same drawing without any description. Asking questions, developing and using models, engaging in arguments, and constructing and communicating explanations are the key strategies of effective learning (National Research Council, 2012). The ability to draw, label and annotate biological specimens is one of the important skills in Biology. Hattie (2003) mentioned that teachers contribute 30 per cent of variance in the academic achievement of the students. The reasons for incorrect drawings and graphs along with misconceptions may be attributed to unclear board diagrams drawn by the teachers and lack of appropriate instructions. Most of the teachers in the schools only follow textbook diagrams for teaching (Figure 1). Several times, the textbook diagrams are not updated according to recent trends, so the teachers must use supplementary references of drawings along with the text. The teachers spend least time on monitoring students' drawing skills and are not aware of how to improve or properly assess the students' drawing. The other reasons are well stated in the results of open-ended interview above. The results of multipurpose urban school clearly revealed that majority of the students have several misconceptions in their drawings on the topic of physiology (Table 2). The reasons included the unavailability of teachers, no coverage of the syllabus, lack of any projectors and white boards in the classrooms with non-engagement of computer labs during the periods, etc. On the other hand, inspite of remote rural location, the result of residential school students was better. Gogoi, Dutta and Soni (2016) in their study, revealed the similar results considering the intelligence level and academic achievement of JNV students. The students of JNV from the initial levels are engaged in creative activities and are trained to explore and observe more. This may be one of the reasons that they have more clear understanding about the concepts. Other reasons were attributed to the national entrance examinations which are conducted for the JNV students at elementary level to give learning opportunities to talented children. The remedial classes also help the students to clarify their doubts regarding what was taught in the class. The substantial use of audio-visual aids by the teachers helps students' involvement in projects. Also, individual and specific attention was given to each student by the concerned teacher to speed up their learning by addressing their queries.

Conclusions

We explored that the use of advance technologies to develop drawing and graphical skills improves the pace of learning among the students. Our conclusions suggest that teaching in Biology should shift from theoretical approach to the visual cognitive understanding of the concepts. The results of both multipurpose and residential school showed positive results after integrating computer animations during instruction. However, the result of residential rural school was better considering the previous knowledge of the students, intelligence level, regular advance pedagogic practices used by the teachers, infrastructural facilities, etc. Therefore, the students were aware of many concepts and had fewer misconceptions. The findings of this investigation may help the school teachers and curriculum makers to develop suitable methods of teaching and innovative instructional designs for learners to promote conceptual understanding of various topics in Biology.

References

Aggarwal, D.P. 2001. *Modern Methods of Teaching Biology*. Sarup and Sons Publishers. India, New Delhi.

Andersson, J., R. Löfgren, and L.A.E. Tibell. 2019. What's in the body? Children's annotated drawings. *Journal of Biological Education*. Vol. 54, No. 299. pp. 1–15. doi: 10.1080/00219266.2019.1569082.

Angra, A., and S.M. Gardner. 2017. Reflecting on Graphs: Attributes of Graph Choice and Construction Practices in Biology. *CBE- Life Sci Educ*. Vol. 16, No. 53. pp. 1–15.

Aydin, S. 2012. Establishment for misconceptions that science teacher candidates have about geometric optics. *The Online Journal of New Horizons in Education*. Vol. 2, No. 3. pp. 7–15.

Ayres, P., and F. Paas. 2007. Making Instructional Animations More Effective: A Cognitive Load Approach. *Applied Cognitive Psychology*. Vol. 21, No. 6. pp. 695–700.

Bungum, B. 2008. Images of Physics: An Explorative Study of the Changing Character of Visual Images in Norwegian Physics Textbooks. *Nordic Studies in Science Education*. Vol. 4, No. 2. pp. 132–141.

Bybee, R.W. 2014. NGSS and the Next Generation of Science Teachers. *Journal of Science Teacher Education*. Vol. 25, No. 2. pp. 211–221. doi:10.1007/s10972-014-9381-4.

Carvalho, G.S., R. Silva, N. Lima, E. Coquet and P. Clément. 2004. Portuguese Primary School Children's Conceptions about Digestion: Identification of Learning Obstacles. *International Journal of Science Education*. Vol. 26, No. 9. pp. 1111–1130. doi:10.1080 /0950069042000177235.

Chase, Z. 2014. The Toughest Class in Nursing School is the First One. *All Things Considered. National Public Radio.*

Colon-Berlingeri, M., and P.A. Burrowes. 2011. Teaching Biology Through Statistics: Application of Statistical Methods in Genetics and Zoology Courses. *CBE-Life Sciences Education*. Vol. 10, No. 3. pp. 259–267.

Cook, D.A., A.J. Levinson, S. Garside, D.M. Dupras, P.J. Erwin and V.M. Montori. 2008. Internet-based Learning in the Health Professions: A Meta-analysis. *JAMA (The Journal of the American Medical Association)*. Vol. 300, No. 10. pp. 1181–1196.

Cook, D.A. 2009. The Failure of e-learning Research to Inform Educational Practice, and What we can do About it. *Med Teach*. Vol. 31, No. 2. pp. 158–162.

Dempster, E., and M. Stears. 2014. An Analysis of Children's Drawings of What They Think is inside Their Bodies: A South African Regional Study. *Journal of Biological Education*. Vol. 48, No. 2. pp. 71–79. doi:10.1080/00219266.2013.837401.

Dempsey, B.C., and , B.J. Betz. 2001. Biological Drawing: A Scientific Tool for Learning. *The American Biology Teacher*. Vol. 63, No. 4. pp. 271–276.

Dimopoulos, K., V. Koulaidis, and S. Sklaveniti. 2003. Towards an Analysis of Visual Images in School Science Textbooks and Press Articles about Science and Technology. *Research in Science Education*. Vol. 33, No. 2. pp. 189–216.

Djanettea, B., and S. Fouadb. 2014. Determination of University Students' Misconceptions About Light Using Concept Maps. *Procedia— Social and Behavioural Sciences*. Vol. 152. pp. 582–589.

Duschl, R.A., and R.W. Bybee. 2014. Planning and carrying out investigations: an entry to learning and to teacher professional development around NGSS science and engineering practices. *International Journal of STEM Education*. Vol. 1, No. 1. p. 12. doi:10.1186/s40594-014-0012-6.

Eurydice. 2012. *Developing Key Competencies at School in Europe: Challenges and Opportunities for Policy*. Publication office of the European Union. Vol. 12, No. 11. pp. 1–72.

Evagorou, M., S. Erduran, and T. Mäntylä. 2015. The role of visual representations in scientific practices: from conceptual understanding and knowledge generation to 'seeing' how science works. *International Journal of STEM Education*. Vol. 2, No. 11. pp. 1–13. doi. 10.1186/s40594-015-0024.

Georghiades, P. 2004. Making pupils' conceptions of electricity more durable by means of situated metacognition. *International Journal of Science Education*. Vol. 26, No. 1. pp. 85–99.

Gilbert, J.K., M. Reiner, and M. Nakhleh. 2008. *Visualisation: Theory and Practice in Science Education*. The Netherlands: Springer. 978-1-4020-5266-8.

Gilbert, J.K. 2010. *The Role of Visual Representations in the Learning and Teaching of Science: An Introduction*. pp. 1–19.

Gogoi, N., J. Dutta, and J.C. Soni. 2016. A comparative study on academic achievement and intelligence of Class X students of Jawahar Navodaya Vidyalaya and Kendriya Vidyalaya in Lakhimpur District, Assam. *International Journal of Development Research*. Vol. 6, No. 3. pp. 7191–7198.

Gookin, J.L., D. McWhorter, S. Vaden, and L. Posner. 2010. Outcome assessment of a computer-animated model for learning about the regulation of glomerular filtration rate. *Advances in Physiology Education*. Vol. 34, No. 2. pp. 97–105.

Guy, R. 2011. Increasing Student Engagement in Physiology— The Use of Simple Spinal Reflex Animations. *Proceeding of the Australian Physiological Society*. Vol. 42. pp. 41–46.

———. 2012. Overcoming Misconceptions in Neurophysiology Learning: An Approach using Color-coded Animations. *Advances in Physiology Education*. Vol. 36. pp. 226–228. doi:10.1152/advan.00047.2012.

Hattie, J. 2003. Teachers Make a Difference, What is the research evidence? *Australian Council for Educational Research*. pp. 1–17.

Kararo. M., and M. McCartney. 2019. Annotated Primary Scientific Literature: A Pedagogical Tool for Undergraduate Courses. *PLOS Biology*. Vol. 17, No. 1. pp. 1–9. https://doi.org/10.1371/journal.pbio.3000103.

Katz, C., Z. Barnetz, and I. Hershkowitz. 2014. The Effect of Drawing on Children's Experiences of Investigations following Alleged Child Abuse. *Child Abuse and Neglect*. Vol. 38, No. 5. pp. 858–67.

Katz, P. 2017. *Drawing for Science Education: An International Perspective*. University of Maryland, USA. pp. 1–8.

Kose, S. 2008. Diagnosing Student Misconceptions: Using Drawings as a Research Method. *World Applied Sciences Journal*. Vol. 3, No. 2. pp. 283–293.

Lehrer, R., and L. Schauble. 2012. Seeding evolutionary thinking by engaging children in modeling its foundations. *Science Education*. Vol. 96, No. 4. pp. 701–724. doi:10.1002/sce.20475.

Montagna, E., A.M.S. Azevedo, C. Romano, and R. Ranvaud. 2010. What is transmitted in "synaptic transmission"? *Advance Physical Education*. Vol. 34, No. 2. pp. 115–116.

Michael, J. 2002. Misconceptions— what students think they know. *Advance Physical Education*. Vol. 26. pp. 5–6.

National Research Council. 2012. A Framework for K-12 Science Education. National Academies Press. Washington DC.

Nielsen, B. L. 2014. Students' annotated drawings as a mediating artefact in science teachers' professional development. *Nordic Studies in Science Education*. Vol. 10, No. 2. pp. 162–175.

Ormanci, Ü., and F. S. Ören. 2011. An analysis of pre-service teachers' drawings about the digestive system in terms of their gender, grade levels, and opinions about the method and subject. *International Journal of Biology Education*. Vol. 1, No. 1. pp. 1–22.

Osborne, J. 2014. Teaching scientific practices: meeting the challenge of change. *Journal of Science Teacher Education*. Vol. 25, No. 2. pp. 177–196. doi:10.1007/s10972-014-9384-1.

Óskarsdóttir, G., B. Stougaard, A. Fleischer, E. Jeronen, F. Lützen, and R. Kråkenes. 2011. Children's Ideas about the Human body— A Nordic Case Study. *Nordic Studies in Science Education*. Vol. 7, No. 2. pp. 179–189. doi:10.5617/nordina.240.

Pelaez, N. J. 2005. Prevalence of blood circulation misconceptions among prospective elementary teachers. *Advances in Physiology Education*. Vol. 29, No. 3. pp. 172–181. doi:10.1152/advan.00022.2004.

Picone, C., J. Rhode, L. Hyatt, and T. Parshall. 2007. Assessing gains in undergraduate students' abilities to analyse graphical data. *Teaching Issues and Experiments in Ecology*. Vol. 5, No. 1. pp. 1–54.

Schwartz, R.S., N.G. Lederman, and F. Abd-el-Khalick. 2012. A series of misrepresentations:a response to Allchin's whole approach to assessing nature of science understandings. *Science Education*. Vol. 96, No. 4. pp. 685–692. doi:10.1002/sce.21013.

Silverthorn, D.U. 2002. Uncovering misconceptions about the resting membrane potential. *Advances in Physiology Education*. Vol. 26, No. 1–4. pp. 69–7. doi:10.1152/advan.00012.2002

Slutsky, D.J. 2014. The Effective Use of Graphs. *Journal of Wrist Surgery*. Vol. 3, No. 2. pp. 67–68. doi: 10.1055/s-0034-1375704.

Sturges, D., and Maurer, T. 2013. Allied health students' perceptions of class difficulty: the case of undergraduate human anatomy and physiology. *Internet J Allied Health Sci Practical*. Vol. 11, No. 4. pp. 1–10.

Tairab, H.H., and Al-Naqbi, A.K. 2004. How do secondary school science students interpret and construct scientific graphs? *Journal of Biological Education*. Vol. 38, No. 3. pp. 127–132.

Quillin, K., and Thomas, S. 2015. Drawing-to-Learn: A Framework for Using Drawings to Promote Model-Based Reasoning in Biology. *CBE-Life Sciences Education*. Vol. 14, No. 1. pp. 1–16.

Reiss, M.J., S.D. Tunnicliffe, A.M. Andersen, A. Bartoszeck, G.S., Carvalho, S.Y. Chen, and W. V. Rooy. 2002. An International Study of Young Peoples' Drawings of What Is inside Themselves. *Journal of Biological Education*. Vol. 36, No. 2. pp. 58–64. doi:10.1080/00219266.2002.9655802.

Rowlands, M. 2004. What Do Children Think Happens to the Food They Eat? *Journal of Biological Education*. Vol. 38, No. 4. pp 167–171. doi:10.1080/00219266.2004.9655936.

Ruiz, J.G., D.A. Cook, and A.J. Levinson. 2009. Computer animations in medical education: a critical literature review. *Medical Education*. Vol. 43, No. 9. pp. 838–846. doi: 10.1111/j.13652923.2009.03429.x.

Van Merrienboer, J.J. and J. Sweller. 2010. Cognitive load theory in health professional education: design principles and strategies. *Medical Education*. Vol. 44, No. 1. pp. 85–93.

Wainers, H. 2013. *Medical Illumination: Using Evidence, Visualization and Statistical Thinking to Improve Healthcare*. Oxford, UK: Oxford University Press.

Wasserman. M.L. 2013. Drawing as Thinking: An Enquiry into the Act of Drawing as Embodied Extension of Mind. *Disseration Thesis*. University of KwaZulu-Natal.

Wu, H.K. and P. Shah. 2004. Exploring visuospatial thinking in chemistry learning. *Science Education*. Vol. 88, No. 3. pp. 465–492. doi:10.1002/sce.10126.

Effectiveness of Computer-based Instructional Package in Educational Psychology with Respect to Various Determinants

Sarita Chaudhary* and S.K. Tyagi**

Abstract

This study was related to two broad areas namely— Information and Communication Technology, and Educational Psychology. In the present study, the investigator has attempted to find out the effectiveness of computer-based instructional package on the pupil teachers' achievement in educational psychology, with respect to various psycho-social determinants. This study was an attempt to explore the possibilities of applying computer-based instruction for teachers' training programme. In the present research, the investigator has developed Computer-Based Instructional Package in Educational Psychology and assessed the effectiveness of the package, in terms of achievement in the educational psychology of the pupil teachers. The pre-test-post-test control group design has been used for the experiment.

Introduction

It is crucial to understand the role of ICT in promoting educational changes and creating a new culture of learning. A basic assumption of using ICT in education, is that it changes the distribution, and uses the information and resources in the zone of teaching and learning, resulting in changing the association among educational participants. The core idea of ICT integration in teaching and learning is to always apply pedagogy which is based on technology. Moreover, it refers not only to develop mastery in ICT

* *Former Research Scholar*, School of Education, Devi Ahilya Vishwavidyalaya, Indore.
** *Former Head* and *Dean*, School of Education, Devi Ahilya Vishwavidyalaya, Indore.

skills, but also improve teaching and learning with the use of ICT.

The efficient integration of Information and Communication Technology (ICT), in the teaching-learning process and pedagogy, is becoming a fundamental competency for stakeholders. However, generally they do not allow linear instructional design models for integrating ICT, which is the reason the experts suggest a generic model, which consists of three basic elements—pedagogy, social interaction, and technology. It develops a learner-centred culture with an independent and autonomous learning atmosphere that promotes initiation, creativity, and critical thinking (Wang, 2008). There should be much emphasis on integrating ICT as a tool in pedagogy, and on learning that tends to improve basic cognitive skills, motivate and engage students, as well as foster their enquiry and inquisitive skills.

The teachers are expected to create a new flexible and interactive learning environment with flexible, experiential, and multimedia-based delivery system (Pelgrum and Law, 2003). ICT helps learners and teachers to interact and collaborate beyond the boundaries of classrooms, and enable the learners to collect, select, analyse, organise, extend, transform, and present knowledge in an authentic way, besides permitting the teachers and instructors to bring the whole world into the classrooms.

ICT Based Learning Environment

Authenticity is an important concern which should be undertaken in the planning and development of learning environment. According to Bransford and researchers (1990), learning environments need to reflect the potential uses of knowledge that students are expected to master it. In order to prevent the acquired knowledge from becoming static, ICT provides opportunities to access an affluence of information through multiple information resources, viewing information from multiple perspectives, and also makes complex concepts easier to understand through simulation, to create an authentic learning environment. The use of ICT may foster co-operative learning and promote reflections about the content; it may act as a facilitator of active learning and higher order thinking (Vaezinia and Dehghani, 2016). The ICT environment extends experience in developing web-based and multimedia materials. It has been developed by using different software, in order to maximise the opportunities for open and active learning.

ICT has the capacity to increase the flexibility in the delivery of content that enhances the learners' access to knowledge, anytime and anywhere. It has a huge potential to transform the teaching methodology by creating a learner-driven environment instead of teacher-centred practices (Somekh, 2008). It provides a ground to prepare the learners for lifelong learning, as well as enhances the quality of learning.

ICT Benefitting Teaching-Learning Process

The learners have now initiated to acknowledge the capability of ICT to make education available anywhere and anytime, due to its potential to heighten the availability of just-in-time learning and distance learning. Best content and best practices, which are the shared means of ICT, can foster quality teaching-learning and allow the educational institutions to grasp the disadvantaged groups of the society. The teachers and learners both recognise the capabilities of ICT within the sphere of communication technologies and mobile technologies in a 24×7 envelop. What and how much time will be used within the 24×7 envelop are the challenges that will be encountered by the future educators for the purposeful use of ICT (Young, 2002). Teachers tend to use ICT for making radical changes in their teaching practices (Fabry and Higgs, 1997).

Many of the studies, conducted through the ICT, suggest that an appropriate use of digital technologies in education could have a remarkable positive effect on the students' attitude and their performance in their scholastic subjects, which is the need of the 21st century classrooms. Further, the students who integrate ICT as a means of learning, scored higher than the students not using ICT, despite having an average intelligence level. The learners learned quicker and showed more interest in the classroom interactions (Kulik, 2003). However, creating a positive effect on the learners' performance is based on how effectively the teachers use ICT, and how efficiently they use such technologies (Hammond et al., 2009).

Rationale of the Study

The programme such as B.Ed. is an important course in teachers' training; it prepares future teachers for teaching in secondary and senior secondary classes. In this programme, 'Educational Psychology' is a part of the course structure which prepares pupil teachers to apply psychological principles to make teaching-learning process effective and interesting.

The studies related to ICT are extravagantly conducted on relative effectiveness of computer-based instructions and comparative analysis with traditional and other methods or strategies of teaching. In this area, researchers such as, Amareshwaran and Singh (2011), Singh and Chaudhary (2016), Kant (2016), Vaezinia and Dehghani (2016), conducted research and explored this area of study. But not much research has been conducted on— How ICT and Computer-Based Instructional Package improve our teachers' effectiveness and students' achievement in specific subjects like Educational Psychology and no attempt has been made to develop Computer-Based Instructional Package on Educational Psychology. Further to the best of researcher's

knowledge, no Computer-Based Instructional Package on Educational Psychology has been developed at B.Ed. level, which may help pupil teachers in enhancing the comprehension of the contents. This Computer-Based Instructional (CBI) Package has been developed especially for pupil teachers or future teachers to provide insight into Educational Psychology. It will hopefully be helpful for future teachers to identify, understand and nurture their abilities with the help of study of Educational Psychology.

Objectives of the Study

The present problem endeavours for the realisation of the following objectives:

1. To study the effect of treatment, academic discipline, and their interaction on the achievement in Educational Psychology of B.Ed. students, by considering pre-achievement in Educational Psychology as covariate.
2. To study the effect of treatment, computer proficiency, and their interaction on the achievement in Educational Psychology of B.Ed. students, by considering pre-achievement in Educational Psychology as covariate.
3. To study the effect of treatment, personality, and their interaction on the achievement in Educational Psychology of B.Ed. students, by considering pre-achievement in Educational Psychology as covariate.

Hypotheses

The hypotheses of the present study were as follows:

1. There is no significant effect of treatment, academic discipline, and their interaction on the achievement in Educational Psychology of B.Ed. students, by considering pre-achievement in Educational Psychology as covariate.
2. There is no significant effect of treatment, computer proficiency, and their interaction on the achievement in Educational Psychology of B.Ed. students, by considering pre-achievement in Educational Psychology as covariate.
3. There is no significant effect of treatment, personality and their interaction on the achievement in Educational Psychology of B.Ed. students, by considering pre-achievement in Educational Psychology as covariate.

Methodological Orientation

Sample

The purpose of this study was to find out the relative effect of the CBI Package in enhancing the understanding of student-teachers in Educational Psychology. For this, the researcher selected 75 students as experimental group and 52 students of B.Ed. for control group, in which the traditional method of teaching has been applied.

Table 1
Variable-wise Distribution of Sample

S.No.	Variable	Groups	N
1.	Treatment	Experimental Group	75
		Control Group	52
2.	Personality	Introvert	50
		Extrovert	47
		Ambivert	30
3.	Computer Proficiency	Proficient	60
		Not Proficient	67
4.	Academic Discipline	Humanities/Social Science	97
		Science	30

Tools

To assess the performance of the pupil teachers before and after the experiment, an achievement test in Educational Psychology was constructed by the researchers on the topics— learning, intelligence, personality and creativity. The items included in the test were of objective type consisting of only objective type questions (04 options— multiple choice). The test was designed to assess the achievement in the knowledge, understanding and application domains; the same achievement test was used for pre-test and post-test.

Personality traits were assessed by using *The Personality Inventory* (PI-SS). PI-SS is a standard and easy method to administer and provides a scored inventory which is designed for assessing the degree of *Introversion – Extraversion* dimensions of personality. The computer proficiency of B.Ed. students was assessed with the help of a computer proficiency test which was developed and standardised by the researchers. The test comprised of 30 questions which are objective in nature. The students were given 40 minutes to complete the test. The total weightage of the test was of 30 marks. The grouping was done on the basis of academic discipline, i.e., graduation subject.

Research Design

The present research was quasi-experimental in nature. In this study, the researchers followed non-equivalent pre-test post-test control group design. This quasi-experimental method was designed by Campbell and Stanley. The layout of the design is as follows:

O X O
.....
O O

Where X denotes the treatment, O before X denotes the pre-test, and O after X denotes the post-test. The dotted line means that the groups

were not made the equivalent before the experiment. There were two groups— one group was designated as the experimental group and the other as the control group. The experimental group was taught by Computer-Based Instructional Package in Educational Psychology and the control group was taught by the traditional method. In traditional method, only lectures and discussion method were used to explain the content. ANCOVA is used to eliminate the effect of pre-achievement in Educational Psychology.

Computer-based Instructional Package

The computer-based instructional package was developed by researchers which contains graphics, text pictures, animations and e-assessment. It consists more material than an ordinary class room lecture or notes. In this mode of instruction, computers are used as primary means of knowledge exposition. Thus, computer-based instructional packages may present any topic in a lively and interactive mode. This CBI Package has followed behaviouristic approach of learning. It is based on Skinner's Operant Conditioning Principles stating that learning is best accomplished in small incremental steps with immediate reinforcement, or reward for the learners.

Analysis of Data

The data was analysed objective wise with the help of statistical techniques as listed hereby.

1. For studying the effect of treatment, academic discipline and their interaction on achievement in Educational Psychology of B.Ed. students by considering pre-achievement in educational psychology as covariate, 2×2 factorial design ANCOVA was used.
2. For studying the effect of treatment, computer proficiency and their interaction on achievement in Educational Psychology of B.Ed. students by considering pre-achievement in educational psychology as covariate, 2×2 factorial design ANCOVA was used.
3. For studying the effect of treatment, personality and their interaction on achievement in Educational Psychology of B.Ed. students by considering pre-achievement in educational psychology as covariate, 3×2 factorial design ANCOVA was used.

Results and Interpretation

The analysis and interpretation of results has been done according to the objectives of the study, which are given as follows.

1. Effect of treatment, academic discipline, and their interaction on the achievement in Educational Psychology of B.Ed. Students: The first objective of

this investigation was to study the effect of treatment, academic discipline, and their interaction on the achievement in Educational Psychology of B.Ed. students by considering pre-achievement in Educational Psychology as covariate. There were two levels of each— the treatment and academic discipline. Thus, the data, with respect to this objective, was analysed with the help of 2×2 factorial design ANCOVA. The results are given in Table 2.

Table 2 shows that the adjusted F-value for Treatment is 14.474, whose probability of significance with df = (1,122) is 0.000, which is less than 0.01. Hence, it is significant at 0.01 level of significance. It indicates that the adjusted mean scores of achievements in Educational Psychology of experimental group and control group, by considering pre-achievement in Educational psychology as covariate, differ significantly. Hence, the null hypothesis, 'There is no significant difference in the adjusted means score of achievement in educational psychology of experimental group and control group, by considering pre-achievement in educational psychology as covariate', is rejected.

Table 2 further shows that the adjusted F-value for Academic Discipline is 0.022, whose probability of significance with df = (1,122) is 0.882, which is greater than 0.05. Hence, it is not significant at 0.05 level of significance. It indicates that the adjusted mean scores of achievement in Educational Psychology of Science and Social Science or Humanities groups do not differ significantly by taking pre-achievement in Educational Psychology as covariate. Hence, the null hypothesis is not rejected. It may, therefore, be concluded that the achievement in Educational Psychology of Science and Social Science or Humanities group was found to be equally enhanced, when

Table 2

Summary of 2 × 2 Factorial Design ANCOVA of Treatment, Academic Discipline and their Interaction on Achievement in Educational Psychology by Considering Pre-Achievement in Educational Psychology as Covariate

Source of Variance	Df	SSy.x	MSSy.x	Fy.x	Sig (p)	Remark
Treatment	1	464.661	464.661	14.474	0.000	P < 0.01
Academic Discipline	1	0.704	0.704	0.022	0.882	P > 0.01
Treatment × Academic Discipline	1	5.055	5.055	0.157	0.692	P > 0.05
Error	122	3916.562	32.103			
Total	**125**					

both the groups were matched with respect to pre-achievement in Educational Psychology.

Again from Table 2, it can be seen that the adjusted F-value for interaction between Treatment and Academic Discipline is 0.15, whose probability of significance with df = (1,122) is 0.692, which is greater than 0.05. Hence, it is not significant at 0.05 level of significance. It indicates that there is no significant effect of interaction between Treatment and Academic Discipline on the Achievement in Educational Psychology, by considering Pre-achievement in Educational Psychology as covariate. Hence, the null hypothesis is not rejected. It may, therefore, be concluded that the achievement in Educational Psychology of Science and Social Science/Humanities groups was found to be equally enhanced when taught through Computer-Based Instructional Package, by considering Pre-achievement in Educational Psychology as covariate.

2. Effect of Treatment, Computer Proficiency and Their Interaction on Achievement in Educational Psychology of B.Ed. Students: The second objective of the investigation was to study the effect of Treatment, Computer Proficiency, and their interaction on achievement in Educational Psychology of B.Ed. students, by considering Pre-achievement in Educational Psychology as covariate. There were two levels each of the Treatment and Computer Proficiency. Thus, with respect to this objective, the data was analysed with the help of 2×2 Factorial Design ANCOVA. The results are given in Table 3.

Table 3 further shows that the adjusted F-value for Treatment is 23.858, whose probability of significance with df = (1,120) is 0.000, which is less than 0.01. Hence, it is significant at 0.01 level of significance. It indicates that the adjusted mean scores of the achievement in Educational Psychology of Experimental Group

Table 3

Summary of 2 × 3 Factorial Design ANCOVA of Treatment, Computer Proficiency, and Their Interaction on Achievement in Educational Psychology by Considering Pre-Achievement in Educational Psychology as Covariate

Source of Variance	Df	SSy.x	MSSy.x	Fy.x	Sig (p)	Remark
Treatment	1	733.047	733.047	23.858	0.000	P < 0.01
Computer Proficiency	1	172.197	172.197	5.604	0.019	P < 0.05
Treatment × Computer Proficiency	1	16.103	16.103	0.524	0.524	P > 0.05
Error	122	3748.486	30.725			
Total	**125**					

and Control Group, by considering Pre-achievement in Educational Psychology as covariate, differ significantly. Hence, the null hypothesis is rejected.

Again from Table 3, it can be seen that the adjusted F-value for Computer Proficiency is 5.604, whose probability of significance with df = (1,122) is 0.019, which is less than 0.05. Hence, it is significant at 0.05 level of significance. It indicates that the adjusted mean scores of achievement in Educational Psychology of the two groups namely, Computer Proficient and Computer Non-proficient, by considering Pre-achievement in Educational Psychology as covariate, differ significantly. Hence, the null hypothesis is rejected.

In order to find out which group of students have performed significantly better, the adjusted mean scores of the achievement in Educational Psychology, Computer Proficient and Computer Non-proficient are given in Table 4.

From Table 4, it is evident that the adjusted mean scores of the achievement in Educational Psychology of the Computer Proficient group is 33.25, which is significantly higher than that of Computer Non-proficient group, whose adjusted mean scores of achievement is 30.87. It may, therefore, be concluded that the adjusted mean scores of the achievement of Computer Proficient students are found to be significantly higher than that of Computer Non-proficient, when the groups were matched with respect to Pre-achievement.

Further from Table 3, it can be seen that the adjusted F-value for the interaction between Treatment and Computer Proficiency is 0.524, whose probability of significance with df = (1,122) is 0.470, which is greater than 0.05. Hence, it is not significant at 0.05 level of significance. It indicates that there is no significant effect of interaction between Treatment and Computer Proficiency on achievement in Educational Psychology by considering Pre-achievement in Educational Psychology as covariate. Hence, the null hypothesis, is not rejected. It may, therefore, be concluded that the achievement in Educational Psychology was found to be independent of the interaction between Treatment and Computer Proficiency by considering the Pre-achievement in Educational Psychology as covariate, and it may be concluded that irrespective of the level of Computer Proficiency,

Table 4

Group-wise Adjusted Mean Scores of Achievements in Educational Psychology

Group	Adjusted Means
Computer Proficient	33.25
Computer Non-proficient	30.87

Educational Psychology can be taught equally well through Computer-Based Instructional Package and traditional method of teaching.

3. Effect of Treatment, Personality and Their Interaction on Achievement in Educational Psychology of B.Ed. Students: The third objective of the investigation was to study the effect of Treatment, Personality, and their interaction on the Achievement in Educational Psychology of B.Ed. students, by considering Pre-achievement in Educational Psychology as covariate. There were two levels of treatment and three levels of personality. Thus, the data, with respect to this objective, was analysed with the help of 2 × 3 Factorial Design ANCOVA. The results are given in Table 5.

Table 5 shows that adjusted F-value for Treatment is 23.374, whose probability of significance with df = (1,120) is 0.000, which is less than 0.01. Hence, it is significant at 0.01 level of significance. It indicates that the adjusted mean scores of achievement in Educational Psychology of Experimental Group and Control Group, by considering Pre-achievement in Educational Psychology as covariate, differ significantly. Hence, the null hypothesis is rejected.

Table 5 further shows that the adjusted F-value for Personality is 1.474, whose probability of significance with df = (2,120) is 0.233, which is greater than 0.05. Hence, it is not significant at 0.05 level of significance. It indicates that the adjusted mean scores of achievement in Educational Psychology of extrovert, ambivert, and introvert groups do not differ significantly, by taking Pre-achievement in Educational Psychology as covariate. Hence, the null hypothesis is not rejected. It may, therefore, be concluded that the achievement in Educational Psychology of extrovert, ambivert, and introvert group was found to be equally enhanced, when both the groups were matched with respect

Table 5

Summary of 2 × 3 Factorial Design ANCOVA of Treatment, Personality, and Their Interaction on Achievement in Educational Psychology by Considering Pre-Achievement in Educational Psychology as Covariate

Source of Variance	Df	SSy.x	MSSy.x	Fy.x	Sig (p)	Remark
Treatment	1	737.850	737.850	23.374	0.000	P < 0.01
Personality	2	93.192	46.596	1.474	0.233	P > 0.05
Treatment × Personality	2	49.492	24.746	0.784	0.784	P > 0.05
Error	120	2787.978	31.566			
Total	**125**					

to Pre-achievement in Educational Psychology.

Again from Table 5, it can be seen that the adjusted F-value for interaction between Treatment and Personality is 0.784, whose probability of significance with df = (2,120) is 0.459, which is greater than 0.05. Hence, it is not significant at 0.05 level of significance. It indicates that there is no significant effect of interaction between Treatment and Personality on achievement in Educational Psychology, by considering Pre-achievement in Educational Psychology as covariate. Hence, the null hypothesis is not rejected. It may, therefore, be concluded that achievement in Educational Psychology of extrovert, ambivert, and introvert groups are found to be equally enhanced, when taught through computer-based instructional package, by considering pre-achievement as covariate.

Findings and Discussion of Study

The following were the findings and discussion of the present research:

- Achievement in Educational Psychology of Science and Social Science/Humanities group do not differ significantly by taking Pre-achievement in Educational Psychology as covariate. There was no significant influence of Academic Discipline on the achievement in Educational Psychology. There was no significant effect of interaction between Treatment and Academic Discipline on the achievement in Educational Psychology. Achievement of Science and Social Science/Humanities groups was found to be equally enhanced when taught through Computer-based Instructional Package.
- This finding was supported by Sultan (2013), who found that Academic Discipline has no significant effect on Achievement. However, this finding was not supported by Shinde (2002), who, in turn, found that students from the science discipline were significantly superior to those from other disciplines, in terms of the Achievement, when taught through Video Instructional Material. The reason for the present finding might be that the subject of Educational Psychology is new for students of all the disciplines, and previous knowledge of all the students was almost same in this subject. Further, Educational Psychology is an interesting subject, and it is also liked by students of all the disciplines. There is no significant effect of interaction between Treatment and Academic Discipline on Achievement in Educational Psychology by considering Pre-achievement as covariate. Thus, computer-based instructional package can be used to teach educational psychology, irrespective of the Academic Discipline of students when Pre-achievement in Educational Psychology was taken as covariate.

The reason for the present finding might be that proper care was taken by the investigator in developing computer-based instructional package, based on the academic disciplines of the students to maximise their learning through this medium. The subject matter was easily grasped by students from all the academic disciplines, and it can be said that it would not be relatively easier or more difficult for students of any particular academic discipline.

- Achievement in Educational Psychology of two groups namely, Computer Proficient and Computer Non-proficient, by considering Pre-achievement as covariate, differ significantly. There was a significant effect of Computer Proficiency on Achievement. The Achievement of Computer Proficient group was found to be significantly higher than that of Non-proficient group, by considering Pre-achievement as covariate. There was no significant effect of interaction of Treatment and Computer Proficiency on the Achievement in Educational Psychology of B.Ed. students, by considering Pre-achievement in Educational Psychology as covariate. The Achievement in Educational Psychology was found to be independent of the interaction between Treatment and Computer Proficiency, by considering Pre-achievement in Educational Psychology, and it may be concluded that irrespective of the level of computer proficiency, the computer-based instructional package in Educational Psychology was found to be equally effective in terms of the achievement for both the groups namely— computer proficient and computer non-proficient.
- This finding is in support to the study done by Sultan (2013), who found that more computer proficient students significantly enhanced their achievement as compared to less computer proficient students. The reason for the present finding might be that computer proficient students might be more actively engaged in studying through computer-based instructional package. They might have shown more interest and attentiveness, as compared to less proficient students.
- Achievement in Educational Psychology of extrovert, ambivert, and introvert groups do not differ significantly by taking Pre-achievement as covariate. The achievement of extrovert, ambivert, and introvert groups was found to be equally enhanced when taught through computer-based instructional package. There was no significant effect of interaction of Treatment and Personality on the Achievement in Educational Psychology of B.Ed. students, by considering pre-achievement as covariate.

- This finding is supported by Patel (2011) and Shinde (2002), who reported no significant difference between the achievement of extrovert and introvert students. The reason for this finding might be that personality has a little contribution in understanding the subject matter, as it belongs to the affective domain, while understanding comes under cognitive domain abilities. Thus, the three groups of extrovert, ambivert, and introvert students could be fully indulged in the studying process through CBI package.
- Further, the achievement of extrovert, ambivert, and introvert group were found to be equally enhanced when taught through CBI package by considering Pre-achievement as covariate. It indicates that personality may not be taken into consideration, while developing CBI Package in educational psychology. This finding is supported by Shinde (2003), Patel (2011), Sharma and Sharma (2013), Sharma (2017) and Shinde, (2003), who found that extrovert, ambivert, and introvert students can be benefitted equally, when taught through video instructional material and other ICT-based teaching. The reason for the present finding might be that there was no extra activity to be done in the class while studying through CBI package in Educational Psychology, which might have been helpful for a specific kind of personality. Thus, irrespective of having different kind of personalities, the students paid equal attention while studying through the CBI package.

Conclusion

On the basis of the above discussion, we can conclude that computer-based instructional package is effective in terms of achievement in Educational Psychology, this achievement does not differ significantly on the ground on academic discipline and personality, though computer proficiency affect achievement significantly. Achievement of Computer Proficient group was found to be significantly higher than that of Non-proficient group.

References

Amereshwaran, N., and S. Singh. 2011. Teacher education through open and distance learning-information and communication technology-based pedagogy integration. *Techno learn.* Vol. 1, No. 1. pp. 53–63.

Bransford, J.D., N. Vye, C. Kinzer and V. Risko. 1990. Teaching thinking and content knowledge: Toward an integrated approach. In: B.F. Jones and L. Idol (Eds.). *Dimensions of Thinking and Cognitive Instruction.* pp. 381–413. Lawrence Erlbaum Associates. Hillsdale, NJ.

Fabry, D., and J. Higgs. 1997. Barriers to the effective use of technology in education. *Journal of Educational Computing*. Vol. 17, No. 4. pp. 385–395.

Hammond, M., S. Crosson, E. Fragkouli, J. Ingram, P. Johnston-Wilder, Johnston-Wilder, and D. Wray. 2009. Why do some student teachers make very good use of ICT? An exploratory case study. *Technology, Pedagogy and Education*. Vol. 18, No. 1. pp. 59–73.

Kant, R. 2016. Relationship between attitude towards using new technologies and teaching effectiveness. *International Journal of Research Studies in Educational Technology*. Vol. 5, No. 2. pp. 61–69.

Kulik, J. 2003. Effects of using instructional technology in elementary and secondary schools: What controlled evaluation studies say (Final Report No. P10446.001). SRI International. Arlington, VA. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.207.3105&rep=rep1&type=pdf

Patel, S. 2011. Effectiveness of video instructional material on counselling in terms of achievement and reaction of B.Ed. students. M.Ed. Dissertation, D.A.V.V., Indore.

Pelgrum, W.J., and N. Law. 2003. ICT in education around the world: Trends, problems and prospects. *UNESCO-International Institute for Educational Planning*. Available: www.worldcatlibraries.org/wcpa/ow/02d077080fcf3210a19afeb4da09e526.html

Sharma, A. and R. Sharma. 2013. A Study of Effectivenes of Computer Assisted Programme Instruction and Interactive Instruction on Students' Performance. *Journal of Educational Planning and Administration.* Vol. 27, No. 2. pp. 157–168.

Sharma R. 2017. Computer Assisted Learning — A Study. *International Journal of Advanced Research in Education and Technology*. Vol. 4, No. 2. pp. 102–105.

Shinde, J. 2003. Effectiveness of multimedia CAI package with reference to levels of interactivity and learning style. Unpublished Ph.D. Thesis (Edu), SNDT Women's University.

Somekh, B. 2008. Factors Affecting Teachers' Pedagogical Adoption of ICT. In: Voogt J., Knezek G. (Eds) *International Handbook of Information Technology in Primary and Secondary Education*. Vol. 20. Springer, Boston, MA. pp. 449–460 https://doi.org/10.1007/978-0-387-73315-9_27

Singh, S. P. and S. Chaudhary. 2016. Technologies in Facilitating Professional Growth and Capacity Building. *World Scientific News*. 26, 39. (worldscientificnews.com)

Sultan, N. 2013. Knowledge management in the age of cloud computing and Web 2.0: Experiencing the power of disruptive innovations. *International Journal of Information Management*. Vol. 33, No. 1. pp. 160–165.

Vaezinia, S., and F. Dehghani. 2016. Investigating the relationship between teachers' attitudes towards the use of educational technologies in teaching and the academic motivations in the students. *Journal of Administrative Management, Education and Training*. Vol. 12, No. 5. pp. 62–71.

Wang, Q. 2008. A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International*. Vol. 45, No. 4. pp. 411–419. DOI: 10.1080/14703290802377307

Young, J. 2002. The 24-hour Professor. *The Chronicle of Higher Education*. Vol. 48, No. 38. pp. 31–33.

Nature and Occurrence of Lexical Bundles in Mathematical Lesson Plans as Indicators of Authority Relationships

Haneet Gandhi* and Ruchi Mittal**

Abstract

This study draws on authority structures that were observed in mathematics lesson plans developed by pre-service teachers during their internship period. Language clues, in the form of lexical bundles, were identified and categorised as an indication of authority structures. Four categories of authority structures were found to be present in the mathematics lesson plans, viz., personal authority, discourse as authority, discursive inevitability and personal latitude; among these, personal authority and discourse as authority appeared most pervasive. It was also found that pre-service teachers' beliefs evolved during their internship period. Towards the end of their school experience programme, their beliefs towards authority structures changed as by then they had started sharing authority with their students.

Introduction

Authority is a two-way relationship between two or more people where one acts as an 'In charge' and the other is subjected to following the commands of the former. Amit and Fried (2005) opine, 'A relation of authority exists when a person (or group of people) tends to obey, act on or accept without questioning the statements or commands of another person (or group of people) capable of producing statements or commands'.

This thought also echoes with Weber's (1947) notions which explicate authority or imperative control as, 'the probability that a command with a given specific content will be obeyed by a given group of persons'. Thus, authority holds only when there is someone to obey or accept the commands set in by some other.

*Assistant Professor, Department of Education, University of Delhi, Delhi, India.
**Assistant Professor, Institute of Home Economics, University of Delhi, Delhi, India.

In educational settings, authority serves as one of the many resources that teachers employ to maintain a 'control' over their learners. Pace and Hemmings (2007) consider authority as a social relationship wherein some people, usually more knowledgeable ones, are granted the role to lead; and others, usually the students, agree to follow. Most often, by virtue of an unexpressed common consensus in educational settings, teacher's knowledge is considered superior and they enjoy the position of a leader to which the students tend to abide, thus become the recipients. It is expected to agree to these 'social classroom norms', which are mutually agreed norms for deciding the behavioural and functional expectations between teacher and students (Cobb and Yackel,1996; Cobb and McClain, 2001; Homans,1951).

Authority in classrooms can be centred on an individual or can also be a shared responsibility. Different researchers while analysing the classroom behaviours have documented the ways authority functions in classroom situations. Some researchers connected authority with classroom management techniques while others have looked at authority in knowledge generation spaces (Waller, 1932; Levin and Shanken-Kaye,1996; Amit and Fried, 2005; Bochenski, 1974; Oyler, 1996; Skemp, 1979; Wagner and Eisenmann, 2014). These researchers have claimed that when more knowledgeable persons take control of the classroom, they take control at two levels— (i) control of the content domain, and (ii) control of the domain of discourse. Control of the content domain encapsulates controlling the domain of knowledge. It is mainly about regulating the information considered legitimate, true and relevant. On the other hand, 'Control of the Domain of Discourse' is about managing the flow of talk and ideas, acknowledging some questions as important while dismissing others. At both levels, teachers become an authority due to their having more content knowledge and position.

Till now, most of the studies related to authority have looked at how authority functions in classroom settings. The studies, have, by far, only looked at the notion of authority *in-situ*, but a lot needs to be seen outside the classroom settings. What happens before going to the classroom is still unrepresented. A lot of what happens in a classroom can be attributed to the planning phase, of which the teacher is In charge. If teachers hold a mindset towards authority which they enjoy owing to their position or knowledge, it is bound to be reflected in their classes. Therefore, before we analyse how authority functions in the classroom situations, it is a good idea to see how these are reflected at the planning stage of a teacher.

One of the planned aspects for teachers is their lesson plans. These are teachers' plan of action developed by them before they enter their

classrooms. While writing a plan, a teacher deliberates upon the content to be delivered and the kind of involvement they would expect from the learners. While planning, the teacher knowingly or unknowingly plans authority relations amongst themselves and their learners. For illustration, when they mention in the lesson plan that they will 'explain' the concept, they have self-assigned an authority to themselves of imparting the knowledge. If, on the other hand, a teacher mentions in the lesson plan about the active role of students in building a concept collaboratively, they can be seen sharing the authority with their learners in the classroom situation. Thus, how the teacher positions themselves in classroom and the amount of authority they pass on to their learners does get reflected through the plans. The plans hold the potential of indicating the structure of authority relations and hierarchy that one can expect in the class. In other words, the control that is given to the students during the classroom transactions does get reflected from the planning stage of teachers. Since, lesson plans offer a lot of information about the mindset of teachers, studying them can give a lot of information about how a teacher perceives authority structures in the classrooms. It is hypothesised that analysing lesson plans in terms of authority structures will provide evidences of teachers' beliefs, pedagogy and intended classroom discourse.

There are many ways of analysing lesson plans. One of them is studying 'Lexical Bundles' that occur in the lesson plans. The premise lies on the assumption that identifying lexical bundles in the written material would aid in recognising the beliefs related to authority held by the teachers.

This study analyses the perceptions of authority held by pre-service mathematics teachers as reflected in the lesson plans developed by them. The nature and frequency of lexical bundles were analysed to study the most occurring bundles and thereby know the authority relations that are prevalent in the plans and beliefs. Further, changes in teachers' beliefs as they progressed through their internship were looked at. It was questioned if the authority relations changed over a period of time for these pre-service teachers as they engaged more and more with their students.

Understanding Lexical Bundles

Lexical bundles refer to a sequence of two or more words that recur in a written or oral script. The recurrences of group of words indicate to the beliefs that are held by the speaker. One can find such recurring group of words in a person's verbal as well as written language.

Although, the choices of words that people use arise from the current positioning of the speaker in an unintentional, unconscious manner;

they tend to reflect the values, dispositions and ideologies of the speaker (Lemke,1990; Morgan,1996). This group of words communicates personal feelings, attitudes and value-judgments which people may hold. Keeping this in mind, Bochenski (1965) and Morgan (1996) recommended analysing sentences, statements or groups of words that people write or speak as one of the domains to understand how people perceive their position with respect to others. These groups of words help in exploring interpersonal relationships and social structures.

Biber (1999, 2006) took the first significant step in investigating the frequency of word combinations as they appear in the text as indicators of a speaker's belief. Since the language used in a classroom can convey various aspects of the interactions and social structures that exist in the class, lexical bundles can act as hidden curriculum in understanding the authority relationships that prevail between the actors of a classroom, viz., teachers and students.

Wagner and Eisenmann (2014) and Eisenmann et al., (2010), in particular, related these lexical bundles to authority structures that exist in the discourse of Mathematics classrooms. On the basis of the classroom discourses, they concluded four categories of authority relationships that can be seen in the discourses of the mathematics classroom namely—personal authority, discourse as authority, discursive inevitability and personal latitude.

The Study

The objective of this study is to bring out the authority related beliefs of pre-service mathematics teachers as they get reflected through the lexical bundles used in their lesson plans. This study is an endeavour to understand teacher-student authority relationship by studying the nature and occurrence of lexical bundles (recurring group of words) in the Mathematics lesson plans made by pre-service Mathematics teachers. Mathematics lesson plans developed by pre-service teachers were considered to understand how the perception about authority in the Mathematics classroom develops from the training period itself.

Pre-service teachers are required to make countless decisions while planning for their lessons, which at times, reflect their beliefs related to subject discourse or on the strategies they would adopt for teaching-learning process. The recurrence of the words used while making plans for classroom discourse provides relevant data that displays authority structures. To understand the authority relationships among teacher and students, lexical bundles that appeared in the lesson plans were studied. General indicators of each authority relationship as given by Wagner and Eisenmann (2014) framework was used to place

the identified lexical bundles. The study explored if the language used in plans suggested a predominant interest in authority by the teacher. It further looked into the most pervasive authority structure as reflected in the Mathematics lesson plans.

Further, from the study of Tatsis and Tatsis (2018), one realise that pre-service teachers become more authoritative towards the end of their teaching training than their initial phase. Consequently, while looking at the presence of authority structures in pre-service Mathematics lesson plans, one of the objectives was also to see if the intended authority structures changed with the passage of time.

Hence, in this study lexical bundles that occurred in the lesson plans of pre-service Mathematics teachers, have been studied to fulfil a two-fold objective—

- To know the perception of Mathematics pre-service teachers towards authority structures.
- To analyse if these perceptions change over the period of internship.

Methodology

As a part of teacher-training course, every pre-service teacher is taught to make lesson plans keeping in mind the grade and content specifications. The pre-service teachers develop these lesson plans as a part of their School Experience Programme, also known as School Internship Programme (Arora et al., 2020). Since, in this study, the authority relationships specific to the Mathematics teachers were studied, lesson plans developed by pre-service Mathematics teachers enrolled in B.Ed. programme run by two renowned universities in Delhi region were considered. Twenty lesson plan diaries of Mathematics pre-service teachers were analysed.

It was found that on an average, each intern makes approximately 40–42 lesson plans over their entire internship. The diary of each intern was divided into triads—initial, middle and last triad. Tags were used to distinguish these triads. From each triad, the median plan was picked. For example, if an intern had made a total of 42 lesson plans, the three triads consisted of plans numbered 1–14 in the first triad, 15–28 in the second triad and 29–42 in the third triad. The median lesson plans under each of the triad consisted of lesson plans numbered 7, 21 and 35. These three lesson plans finally made to the analysis phase.

In this manner, approximately 60 lesson plans from 20 Mathematics lesson plan diaries were studied for the occurrence of lexical bundles as an indicator of the authority structures. This spread in the selection of plans was done to see if the beliefs related to authority relationships changed over the period of internship.

Prelude to Analysis

Typically, a lesson plan comprises of sections such as— teaching-learning objectives, previous

knowledge, classroom presentations or teacher-student activity, tasks for assessment, etc. The section titled 'Teacher-students activity' or 'Classroom Presentation' is the part where intended classroom discourses are mentioned by the teachers. The pre-service teachers in this part explicate the processes which would be adopted for the development of concepts, role of students, activities to be performed and anticipated responses of the students. For the purpose of understanding the beliefs of teachers, analysis of lexical bundles found in the classroom presentation section was deemed sufficient, hence only this section was analysed.

Content analysis of 'Classroom Presentation' section of all 60 lesson plans was conducted to identify the recurring groups of words (called lexical bundles). A group of words that often occurred were identified for each plan. These lexical bundles were then studied for their intent. The intent of the pre-service teachers regarding who will take the lead in class, who is expected to follow, and whether the work will be done in collaboration, as reflected through the lexical bundles, were kept in mind. As these lexical bundles accounted for the authority structures, they were studied in depth to be categorised under the four categories listed by Wagner and Eisenmann (2014) and Eisenmann et al., (2010) Colour coding was done for easy identification.

Findings with Discussions

This section shares the analysis of lesson plans for the two stated objectives of the study. The first sub-section elaborates the identification of lexical bundles as indicators of authority structures, and the second sub-section compares the changes in perception of authority relationships of pre-service teachers in course of their internship period.

Identification of Lexical Bundles as Indicators of Authority Relationships

Lexical bundles, like 'I will ask, you may do', were identified. These were then divided into four categories. Frequencies of occurrence of lexical bundles belonging to a category were also taken into account to trace changes in the beliefs of authority relationships over time. Lesson plans were studied in depth and sentences that hinted towards any instruction, laid down by the teacher for the student, were identified.

Personal Authority

Lexical bundles wherein we see the use of personal imperatives, such as 'I' and 'you' in the same sentence, sentences which reflected command (exclusive imperative) and questions wherein single correct responses (closed questions) are expected, were considered to reflect personal authority.

With respect to the lesson plan, lexical bundles, such as— 'I will ask…, I will explain…, I will discuss…,

Pupil teacher will ask..., Pupil teacher selects..., Pupil teacher commands..., Teacher will tell them..., Teacher will brief..., Teacher will make them..., Students will be asked..., Consider you have..., Teacher will instruct..., Teacher will discuss..., Teacher will demonstrate..., Which shape is this..., What is the name of this figure...,' were placed under this category.

On analysing the Mathematics lesson plans of the prospective teachers, usage of the following lexical bundles emphasised the personal authority relationship:

(i) Usage of exclusive imperative such as, 'Teacher will ask students to open their textbook exercises, Teacher will demonstrate the procedure, Teacher will ask them to arrange packets, Teacher will explain the concept of lattice algorithm, Teacher will ask them to turn clockwise to east, PIT commands them to start solving those questions'. The usage of such lexical bundles indicated that instruction process was teacher-centric, where teachers believed their role as decision makers, who were supposed to give commands to their students.

(ii) Usage of closed questions such as, 'Pupil teacher will draw a rectangle on the board and will ask— What is this? Now tell me the sum of angles of a quadrilateral. Now count every blood group and write their frequency along with tally. Pupil teacher will ask the students about the characteristics of angle, pupil teacher will ask which of the two line segments is larger, what do we call the boundary of rectangle, what is the vertically opposite angle of angle AOD?'. Usage of such lexical bundles indicated that a single response was considered as correct and expected from the students.

(iii) Use of 'I' and 'you' (children) in the same sentence such as, 'I will ask children to look around them, I will discuss some situations, and the students will act on these situations, I will read the section 'TUNTUN missed the train'. Lexical Bundles exemplified above indicated that students were expected to listen carefully and follow the commands of the teacher.

(iv) Use of words such as, 'student teacher or pupil teacher' instead of 'I' suggested that pre-service teachers considered themselves as authority positions due to their role as a teacher.

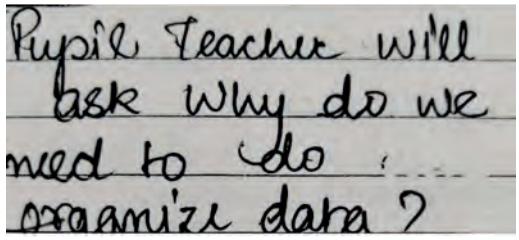


Fig. 1: Sample from a plan showing lexical bundles belonging to personal authority

On further tabulation of the frequency of usage of lexical bundles, it was found that among the large corpus of lexical bundles (1185) identified under each authority structure, nearly 45 per cent (533) belonged to personal authority. This suggested that personal authority was most pervasive in the lesson plans of Mathematics pre-service teachers. The teachers believed to have a major part of authority in teaching the subject of Mathematics.

In fact, amongst all the lexical bundles that were identified demonstrating personal authority relations, the lexical bundles that appeared maximum were— 'I will ask..., Teacher will ask..., Pupil-teacher will..., I will explain..., I will demonstrate..., I will discuss...'. Use of lexical bundles such as 'Student teacher will..., Pupil-teacher will...' suggested that the pre-service teachers considered themselves as authority by virtue of their position as a teacher.

The results shared here throw light on the way we perceive the teaching and learning of Mathematics. From the study of lexical bundles in the lesson plans, it was obvious that teachers believed that in Mathematics classes, teachers are supposed to 'explain' the concepts to their students. Since a majority of lexical bundles reflect personal authority structures, it can be said that Mathematics' teachers believe that while doing Mathematics, students would need a lot of hand-holding from a more experienced person. They believe it is a discipline of rules, procedures and skills that need to be taught. Repeated use of exclusive imperatives, such as 'I' and 'you', reflected that the teachers held that it was their responsibility to transmit these rules, procedures and skills being the more knowledgeable ones. They considered themselves as knowledge generators, keeping the authority to teach on to themselves giving low or no autonomy to the students. Thus, they believe in giving direct instructions considering students as passive receivers. To some extent, it can be said that the pre-service teachers believed themselves as leaders of the group. Summarising, one can say that pre-service teachers held a traditional mindset on orchestrating their Mathematics classrooms.

Discourse as Authority

Discourse as authority relationship is associated to reestablishing the rules that are already a part of the discipline of Mathematics during classroom discussions. It means that the teachers create situations such that their students can deduce the mathematical principles. Evidences that edified certain things have to be done as per the demand of discipline such as making rules, algorithms, facts and definitions.

Lexical bundles wherein definitions, rules, algorithms were being discussed or stated, qualified under this category of authority relationship. The categorisation also included modal verbs which

suggested the necessity of doing an action, for example, 'We have to do..., You have to choose..., You need to..., You don't have to...' were identified as indicators of discourse as authority relation.

The following lexical bundles were enlisted from the lesson plans that reflected on discourse as authority:

- 'The method in which first we find the value of one unit and then the value of required units in the unitary method. If we have to write integers greater than negative integers, then we will write its opposite, we will have to add 7–8 times; we have to change denominator as a multiple of 10 and accordingly the numerator will also change; we do not have to do it one by one (standard way) and the answer will be same in both the cases; a triangle should satisfy the Pythagoras property to be a right angled triangle; the line which equally divides circle into two parts is diameter'.

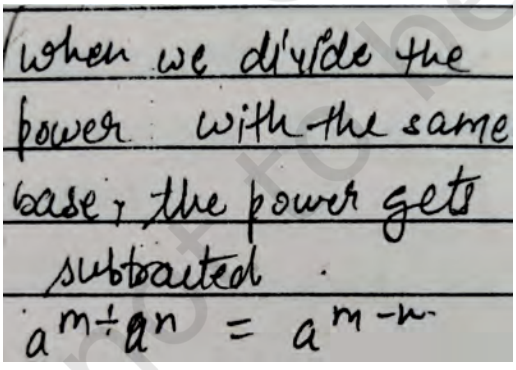


Fig. 2: Sample from a plan showing lexical bundles belonging to Discourse as Authority

In all, nearly 25 per cent (293 out of 1185) lexical bundles belonged to discourse as authority. It was evident from the frequency that lexical bundles which were most frequently used within discourse as authority were: 'We have to..., We do not have to..., We will have to...'.

From the findings quoted above, one can conclude that in all the above lexical bundles, students were expected to accept something as a protocol of the discipline of mathematics which cannot be questioned. This observation suggests that for pre-service Mathematics teachers, following discipline protocols was the second most important thing.

Mathematics as a discipline is well known for its deductive nature. School level Mathematics is determined by rules specified by a group of people who made decisions about mathematical content and pedagogy. This ideology also got reflected in the lesson plans made by teachers. Planning of pre-service teachers reflected that they also believed these rules as absolute and have to be followed mandatorily. It also reflected that they considered these rules as structures on which Mathematics is built and so one cannot make any changes in it. They held that procedures and methods given by the disciplinary structures ensure correct answers and hence must be accepted as stated. Discourse was seen as authority wherein the rules and procedures had to be accepted

without any questioning. Further, the presence of discourse as authority in the lesson plans of the pre-service teachers confirms the assertion that teachers believe that Mathematics is abstract in nature.

Discursive Inevitability

Authority structure related to discursive inevitability refers to actions or events that are verbally presented as unavoidable. There is no explicit reference to compulsion, rather a sense of decision prevailed. Cases where students are expected to do something but the source of expectation is not clear, are termed as establishing authority relationship in a discursive inevitability format.

On studying the lesson plans, all lexical bundles that echoed a feeling whereby students had to perform a task without knowing the reason, were included in this category. Lexical bundles for this category included— 'You are going to..., We are going to..., Students will find..., Students will cut..., Students will be given...'.

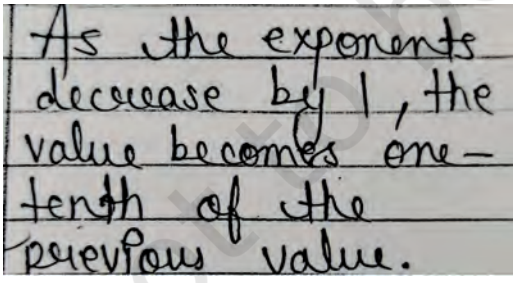


Fig. 3: Sample from a plan showing lexical bundles belonging to Discursive Inevitability

Some of the evidences of presence of authority structures belonging to Discursive Inevitability in the plans were— 'You are going to learn about perpendicular lines today; Students will cut quadrilaterals from a sheet of paper; Students will find the median weight; You have to arrange collected data in ascending order; Learners are going to count the total number of matchsticks'. These suggested that students were expected to perform a task without knowing the reason why, hence the source of authority was unclear.

Out of a total of 1185 lexical bundles identified in all lesson plans, 213 (18 per cent) were found to fall under the category of discursive inevitability authority relationship. Further, among these 213 lexical bundles, the most occurring ones included— 'Student will cut..., Students will find..., You are going to...'.

This implies that although the share of discursive inevitability was quite small as compared to other authority relationships, a notion related to pre-determined authority with unclear source existed in the lesson plans of the prospective teachers. Although there is no obligation to act by any specific authority, the actions in the tasks were considered conceivable. This authority was most indirect as the commanding authority remains unknown yet the students have to abide by certain norms while doing Mathematics.

This implied that pre-service teachers believed in giving up their own authority but continued to hold a hidden authority figure that generally offers a feeling of security in getting correct solutions. An implicit obligation for students to follow the instructions and accept what was said was visible in the lesson plans made by Mathematics teachers. Pre-service teachers, by using such models, reflected that they believed mathematical conventions are passed through people even if the source is unknown. It even suggested that pre-service teachers agreed that there is only one way of carrying out a mathematical task.

Personal Latitude

Authority relations in terms of personal latitude relates to students making their own decisions during the interactions, thus exercising their own authority. Evidences of lexical bundles that show students have a scope to make choices and that the teachers include students' voices while building a concept, are general indicators of this category.

Lexical bundles that were found in the lesson plans of the pre-service mathematics teachers, which contributed to the authority relationship of personal latitude, were of the following types:

(i) Usage of open questions such as— 'Tell me how will you get a circle; Try to look at objects through different views'. Usage of these groups of words reflected an initiation of discussion in the classes thereby creating space for developing students' thoughts.

(ii) Usage of inclusive imperative such as, 'Let us perform an activity to show that vertically opposite angles are equal, Let us take an example of mathematical expression, Let us represent 0.6 on a number line, Let us find out how fractions can be converted to per cent'. These suggested that the pre-service teachers tend to include themselves in the completion of the task instead of merely giving commands.

(iii) Scope of making choices such as— 'Students can make 2–3 different shapes like this, Students may push along length and breadth to obtain a quadrilateral, You may multiply both the numerator and the denominator of fraction by the same number

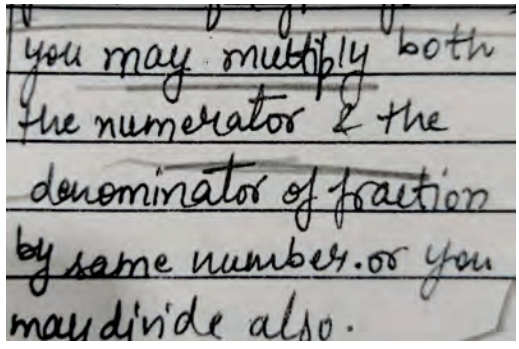


Fig. 4: Sample from a plan showing lexical bundles belonging to Personal Latitude

or you may divide also'. The presence of lexical bundles like these echoed that authority was passed to students with a scope for them to make their choices.

Further, it was found that nearly 12 per cent of word groups identified among 1185 lexical bundles belonged to personal latitude authority relationship. The low frequency of this structure suggested that pre-service teachers intended to give least authority to the students while doing Mathematics.

Findings also suggested that very few pre-service teachers intended to open opportunities for students to explore mathematical ideas and take decisions regarding the same. However, the control to take decision was thought for simpler mathematical tasks such as doing trivial multiplication or construction. This reflected the low confidence that teachers hold on the abilities of their students of doing mathematics. They believe that simpler tasks can be initiated by the students but when it comes to doing complex tasks, the authority must rest with the teacher. They can perform complex tasks only with the support of instructions. There were no instances in the plans where students were involved in developing formula, which confirms the pre-service teachers' beliefs of Mathematics being an accumulation of facts, skills and rules which can be imparted to students by direct instruction.

Change in Perception of Authority

As mentioned earlier, the second objective of the study was to find if the authority structures changed towards the end of planning. This section discusses the findings related to the changes in pre-service mathematics teachers' beliefs related to authority relationships as reflected through the analysis of the lexical bundles present in the lesson plans.

To do this, the nature of lexical bundles present in the first triad cluster of a lesson plan was compared to the nature of lexical bundles that appeared in the third triad cluster of the respective lesson plan diary.

It was found that the lexical bundles related to personal authority and discourse as authority were evident in the first triad cluster of most of the lesson plans. Presence of lexical bundles like, 'Teacher will tell..., Teacher will explain..., Teacher will show..., We have to change..., We need to add..., You need to choose...', were found in the first triad. There were hardly any lexical bundles that reflected personal latitude authority structure in the plans developed during the initial stages of internship. However, in the lesson plan selected from third triad cluster of the same intern developed during the final stages of internship included lexical bundles like, 'Students may..., You may do...'. This indicated that the pre-service teachers had started delegating authority to their students by the end of their internship period.

In the lesson plan diaries where personal latitude was completely missing in the initial plans, evidences of their appearance could be seen in the latter plans. This indicated that by the end of their internship, the pre-service teachers had started to build a belief on giving more authority to the students for building mathematical concepts. They believed that mathematics can be built in a dialogical way.

There could be many factors that led to the shift in the authority relationship between the interns and the students. One of them can be attributed to the rapport that pre-service teachers built during the course of internship. It takes time for a teacher to build a shared relationship with the students. At the beginning stages, the pre-service teachers are testing their own skills of being a teacher, therefore, resorting to personal authority relationships which would help them in managing the class. Delegation of authority towards the end of internship suggests that by the end of the internship period, the pre-service teachers start gaining more confidence in handling content as well as class management. They become more comfortable in sharing their position with their students.

Although lexical bundles to all the four authority structures were found in the lesson plans of the interns, authority relationships related to personal authority and discourse as authority were most pervasive. Evidence of authority relationships belonging to personal latitude and discursive inevitability were hardly present in the plans. This observation suggests that even while planning, pre-service teachers give most of the authority share to themselves and to the way Mathematics functions as a discipline.

Conclusions

The presence of authority structures reflected through Mathematics lesson plans suggested that varied authority relationships exist among teachers and learners, personal authority being the most dominant. This reflected that pre-service teachers believed in direct instruction and expected the students to follow what was instructed in the class. Another structure that emerged as important was 'discourse as authority', suggesting that mathematics as a discipline has immense authority due to its nature and being governed by rules and formulae. Pre-service teachers accepted this authority of mathematics, which was reflected through their plans. They further believed that the rules and procedures of Mathematics are fixed, which lead to certainty and hence should be followed as laid down. Evidences of discursive inevitability proposed the obligation of performing task with an obscure authority source. This implied that pre-service teachers believed in unknown sources of authority that was external yet important in

mathematics classrooms. Evidences of personal latitude suggested sharing of authority with the students. Low frequency of this authority structure and students' autonomy in taking decisions for simpler mathematical tasks implied that pre-service teachers lacked confidence in students. Change in the perception of authority leading to appearance of personal latitude relationship towards the end of internship reflects that teachers tend to share authority with students once they feel confident about them handling the given task well.

References

Amit, M., and M. Fried. 2005. Authority and authority relations in mathematics education: A view from an Class VIII classroom. *Educational Studies in Mathematics*. Vol. 58. pp. 145–168.

Arora, P., Y. Sharma, H. Gandhi, and S. Sunita. 2020. *Re-envisioning School Internship for Teacher Education*. University of Delhi, Delhi.

Biber, D. 2006. *University language: A corpus based study of spoken and written registers*. John Benjamins, Philadelphia.

Biber, D., and S. Conrad. 1999. Lexical bundles in conversation and academic prose. In: H. Hasselgard, and Oksefjell, S. (Eds.), *Out of Corpora*. pp. 181–190. Rodopi, Amsterdam.

Bochenski, J. M. 1965. Analysis of authority. *The Logic of Religion*. pp. 162–173. New York University Press, New York.

———. 1974. An analysis of authority. In F.J. Adelman (Ed.), *Authority*. pp. 56–85. Martinus Nijhoff, Hague, Netherlands.

Cobb, P., and K. Mcclain. 2001. An approach for supporting teachers' learning in a social context. In F. L. Li & T. Cooney (Eds.), *Making Sense of Mathematics Teacher Education*. pp. 207–231. Kluwer Academic Publishers, Dordrecth, Netherlands.

Cobb, P., and E. Yackel. 1996. Sociomathematical norms, argumentation, and autonomy in mathematics. *Journal for Research in Mathematics Education*. Vol. 27, No. 4. pp. 458–477.

Herbel-Eisenmann, B., D. Wagner, and V. Cortes. 2010. Lexical bundle analysis in mathematics classroom discourse: The significance of stance. *Educational Studies in Mathematics*. Vol. 75, No. 1. pp. 23–42.

Homans, G.C. 1951. *The Human Group*. Routledge and Kegan, London, UK.

Lemke, J. 1990. *Talking-science: Language, Learning, and Values*. Ablex, Norwood.

Levin, J. and J.M. Shanken-Kaye. 1996. *The Self-Control Classroom*. Dubuque, Kendall/Hunt Publishing Company, Iowa.

Morgan, C. 1996. The language of mathematics: Towards a critical analysis of mathematics texts. *For the Learning of Mathematics*. Vol. 16, No. 3. pp. 2–10.

Oyler, C. 1996. *Making room for students: Sharing teacher authority in room 104*. Teachers College Press, New York.

Pace, J.L., and A. Hemmings. 2007. Understanding authority in classrooms: A review of theory, ideology, and research. *Review of Educational Research*. Vol. 77, No. 1. p. 4.

Skemp, R. 1979. *Intelligence, Learning, and Action*. New York: Wiley.

Tatsis, K. and B.M. Tatsis. 2018. *Authority Structures in Preservice Teachers' Talk*. Cerme, Dublin, Ireland.

Wagner, D., and B. Herbel-Eisenmann. 2014. Identifying authority structures in mathematics classroom discourse — a case of a teacher's early experience in a new context. *ZDM*: *The International Journal of Mathematics Education*. Vol. 46, No. 6. pp. 871–882.

Waller, W. 1932. Wiley social science series. *The Sociology of Teaching*. John Wiley & Sons Inc.

Weber, M. 1947. *The theory of social and economic organisation*. William Hodge, London.

Primary School Children's Ideas about 'Plants' and Use of Constructivist Approach

Mamta Singhal*

Abstract

Children come to the class with their own ideas about the natural phenomenon. Even before getting a formal exposure of learning scientific concepts, they have experienced them in their daily life. Their experiences and interactions about natural phenomenon are often unplanned and transcend into the domains of science, social science, psychology and culture. They form their own understanding about the world which interferes with their learning of scientific concepts in the school. Children's prior ideas are given different names such as pre-conceptions, misconceptions, alternative frameworks, etc., in different researches. Irrespective of the nature of these ideas, the most important step is to explore and acknowledge these ideas. This paper is based on the research conducted with primary school children studying in government schools of Delhi. The study explored children's ideas about plants using qualitative research tools and addressed them using constructivist approach.

Introduction

Research in cognitive psychology and science education in last several decades have shown that children and adults construct an intuitive understanding of the world which is based on their everyday experiences. Although different terms such as preconceptions, misconceptions, alternative frameworks, mental models, prior ideas, etc., have been used to describe these experiences and knowledge, there is a broad consensus that we may have a different understanding of natural phenomenon than the one that is provided in textbooks or is accepted by the scientific community. The learners come to the classroom with

* *Assistant Professor*, Institute of Home Economics, University of Delhi.

these experiences and knowledge and their first few years of schooling become very crucial in deciding whether they would hold on to their intuitive and unscientific ideas or would be ready for a conceptual change as they encounter scientific concepts in the classrooms. While it is agreed that some of their beliefs and ideas are often stable and may not change, it is the responsibility of the teachers to help the learners at least acknowledge the inconsistencies in their knowledge viz. scientific ideas.

The awareness would be important to bring a conceptual change in case they feel the need to do so. While it is important that learners modify their ideas and develop concepts that are aligned with the scientific worldview, the change however cannot be forced. It would demand changes in their cognitive structures. The teacher must therefore, provide the opportunities to the learners to evaluate their ideas and modify them on their own.

The review of literature suggests that children have naive ideas about the various phenomenon they observe around them. These ideas interfere with the ideas that are given in the textbooks or the ideas that the teacher is trying to teach in the class. Sometimes these ideas change through their confrontation with newer situations but sometimes they resist change. We often call them misconceptions and alternative conceptions. There is ample evidence of children's and even teachers' misconceptions and alternative conceptions about various socio-scientific concepts in the context of Environmental Studies (EVS). Therefore, it is important not only to address children's misconceptions but also to equip teachers to examine their own notions.

Bell (1981), in his research with children, found that there are misconceptions on the idea of trees. Some children do not think that trees are plants. Children believe that only those living organisms are plants which have specific features like flowers or stems.

K. Pine et al., (2001) conducted a survey of children's misconceptions in primary science. Children were reported to have naive ideas about many concepts including plants. They believed that bigger plants are healthier, seeds come into packets and not from the adult plants. These seeds contain a baby plant inside them. The plants need only water for their growth and light is not essential. These views were reported by the teachers who taught them science. The teachers who participated in the study also believed that it is important to acknowledge these ideas and a wide range of constructivist approaches could be used to bring a conceptual change. The study also found alternative conceptions related to other concepts of science.

Barrow, H. Lloyd (2002) investigated elementary children's conceptions about insects across grades. He found that older children

(K-6) exhibited broader understanding about insects' characteristics than (K-2), children but overall lacked understanding about the life cycle of insects. Also, children had prior knowledge about the harmful aspects of insects more than their useful aspects. The study suggested using students' personal questions and experiences for teaching.

Barman et al., (2006) conducted research around children's and adults' notions and concepts about physical and natural world, which are quite different than those presented by the scientific community. They argue that children come to school with knowledge about plants, which may be prior knowledge or resulting from their everyday experiences with the concepts they learn at school. It has also been argued that 'misconceptions are also introduced and reinforced at early ages. Understanding these misconceptions can help us to better address them in the classroom'. They interviewed different school age children on two questions— whether a specific living organism was a plant or not; and what do plants need to grow. Their findings suggested that older children (Classes VII–VIII) have more misconceptions than younger children in Classes (IV–V). They suggest ways in which misconceptions can be confronted through teaching.

Palmeri (2007) followed Barman et al., (2006) work to find out children's ideas and misconceptions around the theme 'animals'. She found that children's concepts of animals were fuzzy, as they use biological functions to categorise animals. She also found that children have a potential bias in recognising and categorising animals. Further, she found that children's knowledge about animals is skewed in favour of vertebrates. Palmeri's study has clear implications for confronting these misconceptions by working with teachers, and helping them organise their teaching frames.

Several other researches— Pringle (2006); Henriques (2002); Tao and Gunstone (1999) and Driver et al. (1985), have documented children's alternative conceptions across grades and discussed their role in teaching-learning and conceptual change.

The present study focussed on finding primary school children's prior ideas about 'Plants'. These ideas may be pre-conceptions (knowledge that exists before any formal learning) or misconceptions (incorrect conceptual understanding despite being taught) or alternative conceptions (ideas or beliefs that exists along with formal conceptual knowledge), but for the present study no such classification was made. The idea was to explore their ideas and concepts, which may be different from the acceptable scientific knowledge, and hence may require attention. For convenience and for a broader meaning these ideas have been referred as 'alternative conceptions' in this study. Alternative conceptions essentially refer to all those notions of children which are different from the currently acceptable scientific view.

The researcher attempted to address these conceptions using constructivist approach. According to the constructivist perspective, learning is a process by which knowledge is constructed. This involves the active participation of learners who construct their own knowledge by developing connections or bridges between their existing ideas and the new ideas that are presented to them in the form of external stimuli. For instance, a learner might have an initial idea of the transport system based on the experience of travelling by road (bullock cart, cycle, bus, train, etc.). When presented with suitable activities (experiences) related to water and air transport systems, the learner will be able to construct mental representations (images) of the external reality (transport system) and thus reconstruct the initial idea of the transport system by incorporating new ideas. This structuring and restructuring of ideas will facilitate progress in the learning process.

Objectives of the Study

- To find out primary students' alternative conceptions about plants
- To use constructivist approach to address students' alternative conceptions about plants

Operational Definitions

Let us define and explain the terms 'alternative conceptions' and 'constructivist approach' in the context of the present study.

Alternative Conceptions

The use of terms such as alternative conceptions, misconceptions, intuitive theories, naive ideas, etc., became popular with the recognition of children's experience and knowledge in their learning. The rise of constructivist perspective of learning and research into children's ideas have been simultaneous. Misconceptions have been referred to as incorrect explanations of scientific concepts, whereas the term alternative conception is used by researchers who do not wish to call children's, ideas as incorrect, rather they refer to them as 'alternative conceptions', which do not match with the acceptable scientific knowledge. These ideas may be partially correct, incorrect or may be their cultural beliefs, which need to be acknowledged and challenged at times so that learners can themselves change them.

In the context of the present study, the term 'alternative conceptions' has been used to represent children's ideas and knowledge that may be partially scientific or non-scientific as per the currently acceptable scientific explanations of the concept.

Constructivist Approach

The constructivist approach to teaching-learning has its roots in the epistemology of 'constructivism'. Constructivism is an epistemological stance or theory that emphasises that knowledge is not out there, rather it is constructed by the subjects with

their physical and social interactions with the world. Glaserfeld (1989) believes that constructivism is a way of knowing that recognises the real world as a source of knowledge. The students and scientists try to explore the real world which is made of objects and events but one can never fully know it. They form approximations of reality but connot form a true picture of it. With regard to learning, Piaget (1971) and Vygotsky (1978) have emphasised different dimensions of constructivism. Piaget has highlighted the role of personal experiences and physical interactions with the world and Vygotsky has highlighted the role of social and cultural interactions in the construction of knowledge.

Based on the study of different meanings of constructivism, a suitable definition of constructivism in the present study can be given as follows.

Constructivism

It is a view of learning that believes that learners are active and construct their own knowledge based on their physical and social interactions with the world.

Research Methodology

The study followed the broad guidelines of action research within a qualitative framework. The qualitative tools— concept maps and interviews were used for data collection about children's alternative conceptions. Based on the analysis of data, children's alternative conceptions about 'Plants' were identified and suitable teaching-learning interventions were planned to address these. The details about sample, tools and interventions are provided further.

Sample

The data was collected in four government schools of Delhi with more than 50 students. The sample was convenient in nature and involved four MCD schools of South Zone of Delhi as the researcher had easy access to these schools due to the ongoing internship of B.El.Ed. (Bachelor of Elementary Education) pre-service teachers. Class IV students from each of the selected schools were selected for data collection and intervention. Each class had a strength of 30–40 students but not all of them were regular in coming to the schools.

Data Collection and Analysis

The data on children's ideas about 'Plants', which is a theme in the EVS (Environmental Studies) curriculum, was collected by using concept maps and personal interviews.

Concept Maps

Concepts mapping by children was used as a strategy to explore children's ideas on various themes. Children were divided in group of 5–6 and were asked to write, draw and illustrate their knowledge about the theme. The researcher divided the class into small groups of 5–6 students making sure that one student in each group

could write and clearly map out the concepts and present coherent ideas. Each group was provided with an A-3 size sheet. No content knowledge was given to the students, only an brief introduction was given. Groups were asked to map out the theme, i.e., their understanding about plants. This phase of the study was explorative. These ideas could either be vague or well fleshed out. To elicit ideas from children, they were asked questions related to the theme and also encouraged to connect their ideas to form a clear concept map.

With a group of 50 students, 8 concept maps of the theme 'Plants' were collected finally. These concept maps represented similar notions but were put in different ways. Given hereby are three concept maps made by children, wherein they represented most of their ideas similarly in other concept maps also.

Interviews

The concept maps helped the researcher to understand the basic ideas of children about plants, but in order to gain an in-depth understanding of their notions, personal interviews were conducted. The researcher asked children to elaborate, give examples and give reasons for their ideas represented in the concept maps. For example, children were asked to explain how plants clean the air?; why do they think tribal people cut trees?; have they seen ghost on trees?; why do they think plants eat soil?; etc.

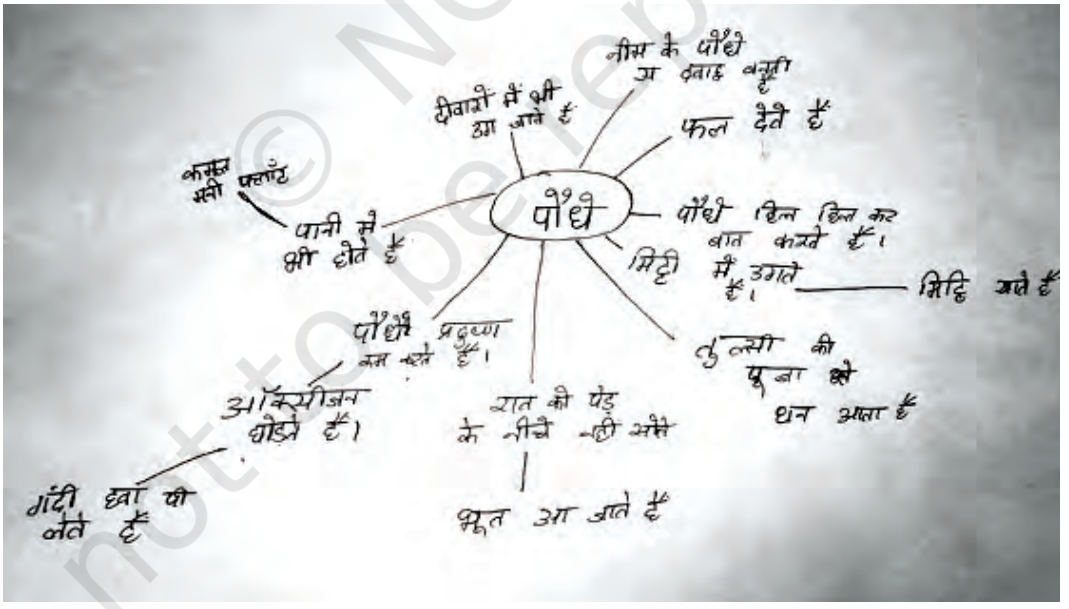


Fig. 1: Concept Map 1 (By Group 1)

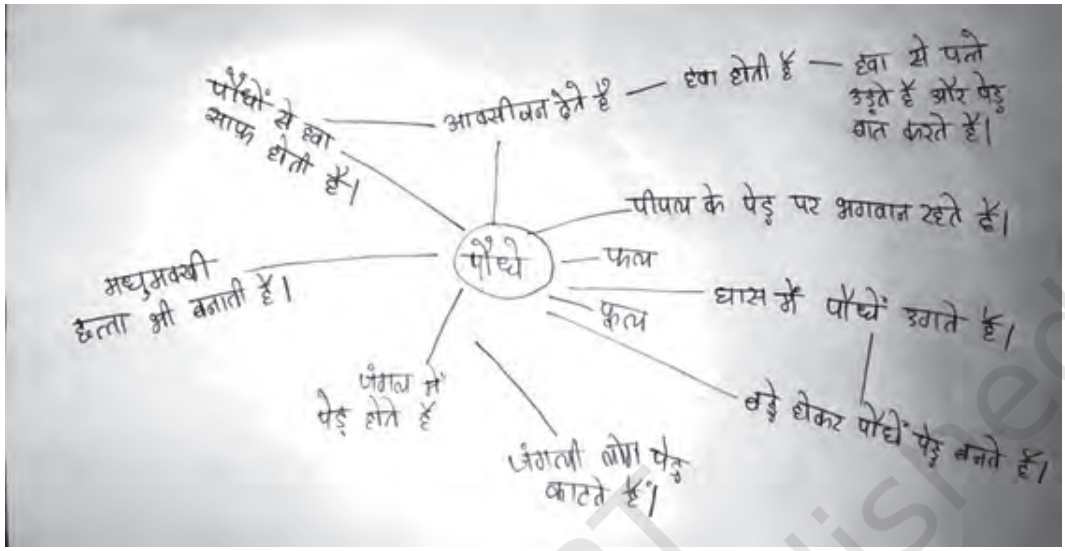


Fig. 2: Concept Map 2 (By Group 2)

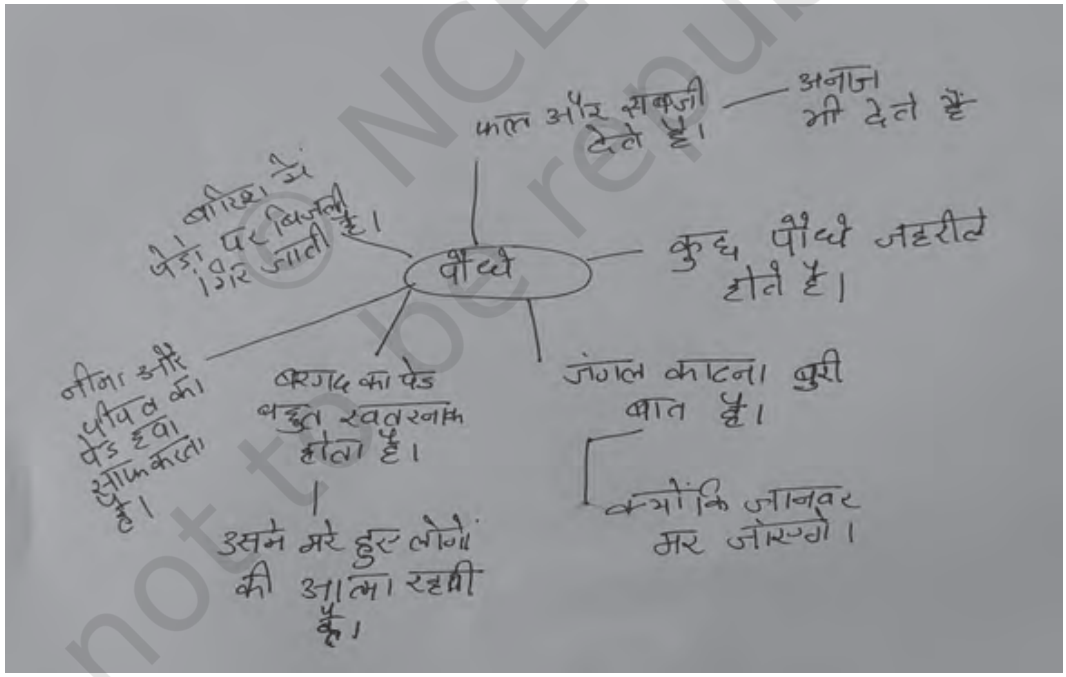


Fig. 3: Concept Map 3 (By Group 3)

Children's Ideas About Plants

Based on the analysis of their concept maps and their responses during the interviews, the following notions about plants were identified and some of them were addressed using various teaching-learning strategies based on constructivist approach.

- Oxygen is air.
- Plants eat soil.
- Plants become trees as they grow.
- Plants talk to each other by moving their branches and leaves.
- We should not sleep under trees as ghosts live on them at night.
- Tribal people cut trees.

Interventions to Address Children's Alternative Conceptions

The constructivist approach advocates that children's prior ideas, which may be their beliefs or alternative conceptions, should be explored and then appropriate teaching-learning strategies can be used to address them. However, it may be possible that children hold on to their notions even after teaching. The traditional teaching approaches do not take into account children's ideas and often ignore them. Research has shown that children as well as adults maintain these ideas despite being taught. However, constructivist approaches to teaching help the teachers to take into consideration children's prior or alternative ideas and attempt to bring a conceptual change by challenging them. Below is an account of some alternative conceptions and activities that were used in the present study to address children's conceptions.

Oxygen is Air

Children in primary classes often use the terms: gas, air, oxygen and carbon dioxide, without understanding the difference between them. To address children's notions about air, they were asked to explain what is air, how do they know that there is air around them and in what ways air is useful for them. Children gave varied responses such as air is felt only when it is blowing. We take air in our body when we breathe. Carbon dioxide is bad air and so on. Although the topic of 'components of air' is not a part of primary classes, it seemed important to discuss it with children. The teacher took them for a visit to the school garden and open spaces. She asked them to take a few deep breaths. After that they returned to the class. The teacher asked them to wait for a while outside the class and created a bit of smoke by burning some papers in one corner of the class. She closed all the windows and asked children to enter the class and take a deep breath as they enter. The children experienced discomfort and went outside again. The students and teacher now sat comfortably outside the class and discussed the difference in the two cases.

Teacher: How was your experience of taking deep breaths in the garden?

Did you face any difficulty in breathing there?

Students expressed that they felt good. They had no difficulty in breathing. Some of them also mentioned that, "There were trees around. So, we breathed oxygen".

Teacher: How did you feel when you entered the class with smoke inside?

The students expressed their discomfort in various ways such as:

"I was coughing".

"It was suffocating".

"One could die, if you breathe such air for long".

The students also shared their previous experiences and knowledge during the discussion. One of them shared an instance that had come in the newspaper some time back. He said, "My father told me that we should never use *angeethee* in closed rooms as it leads to suffocation.

In another class, children were asked to observe the sunlight coming through a small window opening. All the doors and windows were closed and the room was made fairly dark by covering the windows with newspaper. The children could observe dust particles in the beam of light coming from the small opening. The activity showed the presence of dust particles in air.

Another simple activity was conducted with children to show breathing in plants. The teacher took a bowl filled with water and submerged a freshly plucked leaf into the water. A small stone was used to keep the leaf submerged and not float on the surface. The bowl was kept in sun for few hours (almost 3 hours) and it was observed that small bubbles were formed over the leaf. The teacher could explain that exchange of gases is happening over the surface of leaf.

It was also discussed that air around them consists of various gases like oxygen, carbon dioxide, nitrogen and water vapours. When we breathe in, we take air inside the body but the oxygen present in air gets mixed with haemoglobin present in the blood. For the other gases like nitrogen and carbon dioxide, there are no carriers in our body and they are exhaled out. Carbon dioxide is used by them in the process of making their food. Children were not burdened with terms like 'respiration' and 'photosynthesis' but it was explained that these two processes are separate and plants have a special pigment (chlorophyll) that makes them unique in terms of using the carbon dioxide present in air. The children actively participated in the discussion and activities. The discussions helped students to bring their previous knowledge in the class and also understand that 'air'— the commonly used term, has different components such as oxygen and carbon dioxide. Considering that children belonged to Class IV, complex activities such as fractional distillation, experiments to show the presence of oxygen and carbon dioxide were not suitable for them. However, the activities and

discussion held made it evident to understand that air has different components and these components have different properties.

Plants Eat Soil

Children seemed to have different notions about plants' food. But the most common notion that came across was that plants eat soil. The soil travels to the different parts of plant after getting mixed in water.

These ideas were challenged through the following activity.

The teacher took few pots and filled them with soil up to the top. Some plants like tomato and brinjal were planted in these pots. It was ensured that the plants get adequate water and sunlight. After few weeks, children observed new leaves and fruits on these plants. The teacher pointed out that the soil in the pots has not reduced. She pointed out how plants produce kilos of fruits in one season without reducing the quantity of soil in which they are grown.

The teacher also showed them a stem and cut it from the middle. She discussed if soil had dissolved in water and travelled to various parts, then there could have been soil in the stem cutting. Although the concept of photosynthesis would be taught in middle school, it is important to explore their ideas and also address them as much as possible right from the beginning.

Plants Become Trees as They Grow

Although only few children had this notion that young plants will eventually grow to become big trees, it was important to teach them about the diversity of plants in their surroundings. The teacher took them for a visit in garden and helped them to notice the variation in their size. Children observed the difference in their height and width and concluded on their own that all small plants would not grow as tall as others. They would learn to classify plants on the basis of their height, type of stem, type of leaves and roots in appropriate grades.

Ghosts Live on Trees at Night

The children's beliefs about ghosts living on trees were evident in the concept maps made by them. The Concept Map 1 and Concept Map 3 given hereby have statements like, "*Raat ko ped ke neeche nahi sote. Bhoot aa jaate hai" (Concept Map 1)* and *"Bargad ka ped sabse khatarnak hota hai. Usme mare hue logon ki aatma rehti hai."* (Concept Map 3). The statements are indicative of children's beliefs about ghosts residing on trees. They have expressed fear and danger associated in going near them. The interviews tried to explore reasons behind these statements.

The teachers (researchers) asked them questions like, 'Who told them about ghosts living on trees? Have they seen them?'

The students shared several narratives and experiences in the class. One of the students mentioned that he has seen movies where people have committed suicide by hanging themselves on trees. Such trees are bound to become haunted. Several students agreed with him.

Another student said, trees make scary noises at night and he has heard these noises often when they go to their village. When he asked his mother about the noises, she told him that ghosts come on trees at night and chat. Some other student claimed that his grandfather was attacked by ghosts while he was sleeping at his farm (in his village) under a tree.

The discussion with children revealed that their idea of ghost living on trees came from certain stories and narratives told to them by their parents or other known people who told them to stay away from plants at night. It may be possible that the elders who told them such narratives themselves were not aware that plants stop photosynthesis at night and hence there may be excess of carbon dioxide under trees at night, which is not good for health. The other reason could be that at night, some animals that take shelter on trees should not be disturbed and hence it is better to avoid sleeping under the trees.

Not all students agreed with the idea of ghosts during the conversation and challenged their friends by saying things like, 'Ghosts do not exist'; 'Movies that show ghosts are baseless'; 'I will sleep under the tree and show you that nothing happens'.

Although the teachers encouraged children to observe the plants at night and discussed scientific reasons for not sleeping under the tree at night, it can not be ensured that their beliefs have changed. The constructivist approach advocates the children to bring their experiences and prior notions in the class and the teacher tries to challenge or deconstruct them if possible. They also listen to the diverse views from their peer group and may be willing to change their notions. However, the conceptual change is a slow process and not all the ideas could be changed.

Also, cultural notions and beliefs are very deep rooted and more difficult to change as compared to unscientific notions that arise due to lack to discussion and teaching-learning support at the right time.

Tribal People Cut Trees

The discussion with children revealed the biases and prejudices held by them about educated and uneducated people. They believed that tribal people (they called them *Junglee*) are uneducated. They cut trees for their living as they do not have employment. Some children mentioned that government is rehabilitating the *junglee* people away from forests as they will destroy the forests.

The teacher took out some articles from internet and discussed that tribal people live in harmony with

nature. One of the articles mentioned the tradition of 'Halma' performed by Bheel tribe of Madhya Pradesh, where people of the community get together to discuss their problems and make strategies to save the forests. These people had planted thousands of trees in nearby villages and dug canals for conserving rainwater. Similarly, Saara tribe of Odisha decided to protect their forest from intruders who came from nearby villages to cut trees and formed their organisation to guard the forests day and night from intrusion.

Children were very surprised to read these articles and seemed open to change their beliefs about tribal people. They were also interested in gathering more information and discussing the role of government policies for tribal people.

Conclusion

Children do not come to class as empty vessels. They bring their experiences and beliefs about natural phenomenon and things around them. The teachers should give importance to these experiences and should make conscious attempt to build their understanding of these phenomenon. Concept mapping is one of the ways through which children can be encouraged to express themselves freely about any scientific concept before the teachers begin to teach it through the textbooks. Children's drawings, personal interviews and their classroom questions could be other ways of exploring their ideas. The constructivist approach is based upon taking these ideas into cognizance, while planning classroom experiences. The teacher may use activities, field visits, peer group discussions or any other strategy to challenge these notions so that children experience the contradictions themselves and are better prepared for a conceptual change. It may be possible that some of the concepts in primary classes may not be addressed fully as their scope is beyond the primary classes curriculum. However, an awareness of these concepts would help children to be open for learning and exploration in further classes. If their ideas are ignored or suppressed in early years, they would co-exist in their mind along with the acceptable scientific knowledge and would often create conflict when applying them in daily life.

The present study has attempted to use constructivist approach for teaching about plants in primary classes and advocates using this approach for teaching other concepts also.

References

Barman, C., M. Stein, S. McNair and N. Barman. 2006. Students' Ideas about Plants and Plant Growth. *The American Biology Teacher*. Vol. 68, No. 2. pp. 73–79.

Barrow, H.L. 2002. What do Elementary Students know about Insects? *Journal of Elementary Science Education*. Vol. 14, No. 2. pp. 51–56.

Bell, B.F. 1981. What is a plant: Some children's ideas. *New Zealand Science Teacher*. Vol. 31. pp. 10–14.

Driver, R., E. Guesne, and A. Tiberghien (Eds.) 1985. *Children's Ideas in Science*. Milton Keynes. Open University Press.

Henriques, L. 2002. Children's ideas about weather: A review of the literature. *School Science and Mathematics*. Vol. 102, No. 5. pp. 202–215.

Glaserfeld, E.V. 1989. Constructivism in Education. In T. Husen and T. N. Postlethwaite, (Eds.) (1989). *The International Encyclopaedia of Education*. Supplement. Vol. 1. pp. 162–163. Pergamon Press, Oxford/New York.

Piaget, J. 1971. *Science of Education and the Psychology of the Child*. Viking Press, New York.

Palmeri, A. 2007. Methods and Strategies: Teaching about Animals. *Science and Children*. Vol. 45, No. 1. pp. 52–55.

Pine, K., D. Messer and St. K. John. 2001. Children's Misconceptions in Primary Science: A Survey of Teachers' Views. *Research in Science and Technological Education*. Vol. 19, No. 1. pp. 79–96.

Pringle, M. Ross. 2006. Preservice teachers' exploration of children's alternative conceptions: cornerstone for planning to teach science. *Journal of Science Teacher Education*. Vol. 17, No. 3. pp. 291–307.

Roth, W.M. 1994. Student views of collaborative concept mapping: An emancipatory research project. *Science Education*. Vol. 78, No. 1. pp. 1–34.

Tao and Gunstone. 1999. The Process of Conceptual Change in Force and Motion during Computer-Supported Physics Instruction. *Journal of Research in Science Teaching*. Vol. 36, No. 7. pp. 859–882.

Vygotsky, L. 1978. *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press, Cambridge, MA.

Storytelling and Listening to Stories
A Critical Skill for Early Reading

ROMILA SONI*

Abstract

National Education Policy (NEP) 2020 has put an unprecedented emphasis on developing critical foundational literacy and numeracy (FLN) skills across the foundational stage. In order to improve the foundational literacy competencies and skills of all children at the foundational stage of learning, i.e., from preschool to Class II, various pedagogical practices need to be designed and used in the classrooms and at home. Storytelling is considered as one of the best methods to develop basic literacy skills in young children. Through storytelling, one (teacher or parent) can establish connections easily with other domains or subjects as it motivates children and arouse their interest towards learning. This also enhances children's competencies in other developmental areas. Use of appropriate pedagogy to promote foundational literacy is an important issue because the success in later years of school education depends on the FLN skills developed during foundational or early years of learning. This article discusses various dimensions of storytelling as a pedagogy and how it develops and boosts the foundational literacy skills in young children.

INTRODUCTION

A 4 year old, Ria carefully leaf through the pages of **'मेरा एक दिन' (My day's routine), a wordless picture book; she tells the following story:

I wake up in the morning; my Mumma wakes me up every day. I looked in the mirror and saw my teeth so dirty. I said, "Ria let's brush your teeth – make them shine." Ria has to take

* *Associate Professor*, Department of Elementary Education, NCERT.

** One of the unpriced Publications of National Council of Educational Research and Training (NCERT), New Delhi, India

bath also but here in this book – there is no picture of a toilet! Oh! This is wrong. Ria will go to the toilet first and then take her bath. Ria will also shampoo her hair. She has to look pretty. Let me close the door to take the bath. Then after bath, Ria wore a smart frock with lots of flowers on it. My Mumma bought this for me. Then my Mumma helped me in combing my hair. I have got long hair. Then I said my prayer. I ate my breakfast and drank milk. I took my school bag and said bye to my doll and pet. I said bye to my Mumma, papa and dadi. Why doesn't this book have any pet and any doll? Even my dadi is not here.' The story ends.

What does Ria know about stories and their construction? She is a competent storyteller and very creative at this age who can relate her experiences and language to the pictures in a simple, wordless storybook. But she also knows something about the form and language of stories. For example, she includes characters, obstacles or conflict in the story sequence. Story awareness is one of the important aspects of early literacy development that includes young children's growing knowledge about print, sound, and writing (Jensen and Hanson, 1982). As the practitioners of young children, we all need to understand how to assess young children's story awareness. We as practitioners need to incorporate storytelling experiences into a balanced quality early years' education curriculum that encourages literacy development in early years.

Research has shown that once the children show poor outcomes in foundational literacy in their first eight years, they are unable to catch up later in the primary grades and the result is inevitable, i.e., drop out. This happens because children do not get the appropriate stimulating and enabling environment where the focus is on the literacy skills and thus, they do not enjoy reading. They keep passing the classes without actually learning to read. National Policy of Education (NEP 2020) emphasises on foundational literacy and numeracy so that the basic necessary learning gets accomplished in all the schools by all the children. In order to make early reading joyful and meaningful, at the same time attract reluctant readers and inculcate in them the desire to learn to read, storytelling is one of the best approaches and activity through which many of the skills can be targeted. The observation and assessment of children's foundational literacy become easier for the teacher as 'read aloud' and other storytelling techniques offer amazing strategies which motivate the young learner towards early reading. Let's see how story awareness can play an important role in improving the foundational literacy skills.

Why Read Stories to Young Children?

Young children become familiar with story language (age and developmentally appropriate) and increase their ability to talk about stories when parents and teachers read and re-read children's favourite picture storybooks to them. Whole group story reading has been an integral part of quality Early Childhood Education (ECE) programme in many preschools and early primary classes. Reading aloud is recognised as a valuable and appropriate action in the development of language and emergent literacy in young children. The above practices certainly build the foundation for children's literacy development and are highly recommended to be followed by the parents of young children.

Young children's story and print awareness seems to be enhanced at home when—

- Several people (caregivers, parents and teachers) read to the child.
- The child requests or demands for numerous books for re-reading.
- The child discusses storybooks read by others.
- The child pretends to read.
- The child shares a variety of books with their younger sibling.

Practitioners in high-quality ECE programmes are encouraged to read appropriate stories to children during the primary years as an appropriate way to encourage emergent and early literacy development. Recent research indicates that reading simple stories that are age and developmentally appropriate to young children is important for the initial acquisition of early knowledge about reading.

There are several other activities that include labeling pictures, naming and spelling words or printing letters and words which are enhanced through story awareness.

Researchers also indicate that children who were read to in their early years scored higher on early reading skills than those who participated in other types of early literacy activities.

How Does Story Awareness Develop?

Young children's schemas for stories might include broad concepts such as:

- Types of events and elements found in a story.
- Patterns for sequencing story events.
- Language patterns in a story.
- Patterns in a dialogue or role-taking.

Some of the story elements that might be included in young children's story construction are: setting, initiating an event, planning the characters, attempts to reach a goal, hurdles to the goal and consequences of the character's actions.

According to Piaget, during the pre-operational period, young children's thinking expands beyond sensory-motor and perceptual impressions. During this period, i.e., between 2–6 years of age, children are able to use symbolic mental imagery and recall. For example, children move from simply labeling pictures to role-taking through dialogues as they retell the story. Young children's stories are filled with action as they focus on what is being portrayed in illustrations. As children's symbolic imagery develops, their story content also gets widened. At pre-operational stage, children just develop skills to reason out logically and thus they create highly imaginative stories. This broadens their concept of what constitutes a story compared to the children in older age.

Ways to Assess Story Awareness Through Storytelling

It is difficult to assess children's abilities to tell or retell stories from picture books. Young children's language tends to be especially sensitive to situations. For example, children who are usually relaxed and talkative may sit stiffly and give perfunctory responses when they are in an uncomfortable situation. An emotionally supportive, familiar setting is essential when teachers try to assess children's language. Teachers need to use informal encounters where familiar interactions are possible and in order to increase the potential for active participation. But many teachers often worry that even if the setting is comfortable and people are familiar, young children do not respond in a way that indicates their true ability when they are asked to tell or create a story by themselves. In such case, a teacher can try using additional cues such as an appealing theme-based story with familiar pictures. She can then encourage young children to retell a story using the same book or sequential story cards. While assessing young children's abilities to tell stories, preschool teachers should use several concentrated encounters, where each encounter will rely on different cues. Children's responses to these different cues could provide thorough insights into their story awareness than just a single encounter. Before teachers try to assess children's story awareness, they need to decide which story processing abilities they wish to elicit. Teachers need to select the story materials very carefully. If the teachers want to determine whether children can sequence the story cards in chronological order, they should use the materials in which the story topic, the character traits, and depicted behaviors are familiar to the children. These structural cues can enhance children's abilities to understand the stories and recall them. The connections in the story should be clearly presented to the children. During the storytelling, questions should be focused on the relationship between story events,

else children can get distracted. Story picture cards should be focused only on the event or the story content, otherwise it can distract children from telling stories. For instance, one child sequenced a set of story cards based on the shade of the pictures rather than on the story content. Therefore, teachers need to conduct an assessment of story awareness in an informal setting with age appropriate story materials conducive to eliciting appropriate responses. In such a setting, children will be much more motivated to respond in a way that indicates their storytelling abilities.

Let's see a few examples of what we mean by informal encounters during storytelling. There are generally five types of story activities that represent the range of encounters that can provide insights into young children's story awareness. These informal encounters should take place in an area that is familiar to the children, and at the same time, the area should have privacy with no distractions. A good storytelling session is where there is a freedom for children to make remarks. This is a good indicator where the children feel a sense of purpose and motivated towards listening to a story.

1. Retell a favourite picture book story— Young children often enjoy selecting and sharing the same story which they have already read. These retellings indicate that children retain lots of information and details from a familiar story.
2. Wordless picture book— Preschool teachers can create a simple picture book to assess children's abilities to talk about a story. This wordless picture book contains familiar content, a strong storyline, appropriate details, and a limited number of pictures in order to elicit children's story language. The purpose of creating a wordless picture book is to determine whether children can identify the main idea, elaborate it, predict what comes next and associate events in the story with their own experiences. It has been seen in early classrooms that children show greater interest when stories and characters are associated with their own experiences. This will help them to anticipate what will happen next.
3. Create a story for a wordless picture book or story cards— Preschool teachers can gain insights of children's story knowledge by analysing how they construct a story by looking at or reading a wordless picture book. Teachers need to encourage children to look through the book especially when it is an unfamiliar book so that they have some sense of direction that the story will take. The pace of this activity should be adjusted according to the needs and interest of an individual child.
4. Retell and recall a short oral story— This story activity does

Signs for Development of Sense of Story

- Recall specific information while discussing a story that has been read
- Role-taking when retelling stories
- Arrange and tell sequence story cards logically
- Use simple and common language when retelling stories

not have any pictures of cues to reconstruct the story, therefore the story needs to be simple, short and focus on specific information. When children are asked to repeat after hearing the story, they recall the specific information in a better way.

5. Story sequencing cards—Preschool teachers can easily prepare a set of four or five story picture cards that form a sequence. After demonstrating, teachers can ask children to arrange the story cards in sequence and tell a story. Initially, the teachers should use familiar pictures and then she can use new pictures to see how well the child can sequence those. Teachers can also add or eliminate some of the pictures to provide variation. This variation will help to see whether children can use the meaning of the story as a guide to picture selection and sequence. Young children's abilities to sequence the story picture cards and to recognise the direction of print both emerge during the early years.

The given examples of informal encounters for assessing children's story awareness are not intended to be used to compare children with one another. Neither is it an objective form of diagnosis. However, this will help the preschool teachers to identify how the young children are developing a sense of story.

How to Select Storybooks and Materials Related to Stories?

- Consider the following when reading stories to a group of children:
  - Child development and appropriate practices
  - Children's background knowledge
  - Language ability of children
  - Children's interest in the subject
  - Accept the books that children bring from home
  - Use props while reading stories to children
  - Extend the story and provide related experience such as a visit to zoo, field trip, play with a doll, etc.
  - Invite visitors to bring something (such as a pet) or do something relevant such as cook porridge.

Always remember that young children love the repetition of their favourite stories. They love to listen to stories over and over again. It enhances comprehension and helps children to explore print.

What Adults Need to do to Enrich Story Awareness?

First of all, parents must tell stories to their little ones at home; a teacher must make it a part of their quality developmentally appropriate programme in preschools.

Both parents and preschool teachers need to work together and share their observations to develop children's story awareness. This will help the preschool teachers to plan age and developmentally appropriate learning experiences and pedagogies to lead towards story awareness for young children. Story awareness is a very important component in early childhood education that contributes to children's literacy development.

For emergent and early literacy development, children need to be given one-to-one reading experiences at home, opportunities for looking at picture storybooks (both individual and group), and meaningful and relevant print rich display be planned. An interesting area for such story reading activities needs to be formed which is easily visible to children.

To conclude, reading age appropriate and interesting stories to young children can substantially contribute to their story knowledge and their awareness of reading. The 'Story-based Lesson Plans' can be designed to suit different age groups of children across the foundational stage, and pre-storytelling and post-storytelling activities can be planned to connect with the different domains of child development as such pedagogical strategies will help in boosting the literacy skills among young children.

References

Black, S. 2008. Literature based storytelling: Read one, tell one. Retrieved March 23, 2008, from www.ala.org/booklinks

Brand, S.T. and J.M. Donato. 2001. *Storytelling in Emergent Literacy: Fostering Multiple Intelligences*. pp 1–12, Delmar Thomson Learning, Australia.

Cliatt, M. and J. Shaw. 1988. The story time exchange: Ways to enhance it. *Childhood Education.* Vol. 64. No. 5. pp. 293–298. ERIC Document Reproduction Service No.: EJ373896.

Jensen, M.A. and B.A. Hanson. 1982. Helping Young Children Learn to Read: What Research Says to Teachers. In J.F. Brown (Ed.). Curriculum planning for young children. pp. 58–68. Washington, D.C.: National Association for the Education of Young Children.

Mello, R. 2001. Building bridges: How storytelling influences teacher and student relationships. In Proceedings, storytelling in the Americas conference. St. Catherine, ON: Brooks University Press ERIC Document Reproduction Service No. ED457088.

National Council of Teachers of English. 1992. Position Statement from the Committee on Storytelling. Teaching Storytelling. Retrieved June 25, 2006, from http://www.ncte.org/about/over/positions/categ ory/curr/107637

Wright, A. 2008. *Storytelling with Children*. Oxford University Press, Oxford.

Achievement of Higher Secondary School Students in Biology in Relation to their Conjunctive Concepts, Scientific Attitudes and Self-efficacy

MANOJ KUMAR YADAV* AND VINOD KUMAR SINGH**

Abstract

The present study aimed to investigate the achievement of Class XI students in Biology in relation to the independent variables, i.e., Conjunctive Concepts, Scientific Attitudes and Self-efficacy. A sample of 300 students, studying in Class XI was pulled out from six higher secondary schools of Varanasi city affiliated to CBSE Board under the administration of either CBSE Board or Banaras Hindu University. Total of four tools were used for data collection; of which three were constructed and standardised by the researcher himself and one was a readymade tool. The constructed tools were— (i) Achievement Test in Biology (ATB) (ii) Conjunctive Concept Test in Biology (CCTB) (iii) A Students' Self-Efficacy Scale in Biology (SSESB). The readymade tool was Action Affection Thinking Style Questionnaire (AATSQ) (Singh, 1988). Statistical analysis was made by calculating mean, standard deviation and regression analysis. The findings of the study indicate that only conjunctive concepts as an independent variable play a significant role in the achievement of higher secondary school students in Biology at formal operational stage. The other independent variables like Scientific Attitudes and Self-efficacy seem to be less effective for predicting the achievement scores in Biology.

* *Ex. Research Scholar,* Faculty of Education, B.H.U.
** *Assistant Professor,* Faculty of Education, B.H.U.

Introduction

The present era is of science and technology. In different branches of science, Biology is an important subject as it is directly related to the survival needs of human life. Biology has become the most active, the most relevant, and the most personal science, one characterised by extraordinary rigor and predictive power (Moore, 1993). Biology has changed much more with the development of electron microscopy. Knowledge in Biology consists not only the collection of facts, but more importantly the ways these facts are associated with and interpreted in general theories applied to human life.

Achievement in academic subjects is important as it helps the students to understand the hierarchy based on it, i.e., higher the achievement, more are the openings for the students and they can choose the stream of their choice and get better jobs in all fields like science and technology, medicine, management, literature, education, etc. So, the need for measuring academic achievement is due to differences within an individual from time to time known as behaviour oscillation, i.e., academic achievement of the same individual differs from time to time, from one class to another and from one educational level to another. Although, there are individual differences, individuals of the same age group and of the same grade, usually differ in their potential abilities and academic proficiency.

The world is becoming more and more competitive, and the quality of performance has become the key factor for school. This desire for a high level of achievement shapes their attitude towards the educational system. In the present system, the concept of providing education is changed from only enhancing the achievement in subjects to harmonious development of learner. Now parents want that their kids get admission in the school having facilities like smart classrooms, smart boards, computer based learning and hi-tech language laboratories. Dougle and Odell (1989) pointed that academic achievement is the unique responsibility of educational institutions established by the society to promote the development of learners. The development of the learners is possible only if proper individual attention is given to them for enhancing the knowledge attained or skills developed in school subjects. Importance of academic achievement can also be judged when we realise that the happy life that we wish for every child, would be impossible, unless they have some skills in the intellectual and scholastic arts (Pandey and Ahmed, 2008). For the achievement in Biology, students have to develop their cognitive abilities with the help of learning experiences provided by the teachers. For this, the development of scientific temper is necessary (Mahanti, 2013). Today, science is not only conceived as a systematised body of knowledge, but scientific method and scientific attitudes are also supposed to be its

important components. It is assumed that self-efficacy constitutes a critical force in students' academic achievements that enhance the quality of teaching and learning. It influences human functioning through cognitive, affective and motivational process (Bandura 1997b; Pajares, 2003).

Review of Literature

A review of the related literature reveals that various studies have been conducted on the achievement of higher secondary school students in Biology against several variables. For example, intelligence and scientific attitude (Kaushik, 1988), scientific attitude, scientific aptitude (Rao, 1990), scientific attitude and interest (Nellaiappan, 1992), scientific attitude, attitude to science and science achievement (Kayode and Ademola, 2014), concept attainment model (Sushama, 1987; Ayishabi, 1996; Jayakumari, 1997; Lekha, 2000; Kaur and Kaur, 2011), understanding of selected Biological concept (Taylor and Francis, 1980; Judson and Nishimori, 2005; Mehrotra and Baniwal, 2006), home environment, biological self-efficacy (Baldwin et al., 1999), intelligence, self-efficacy and academic achievement (Panda, 2005), emotional intelligence and self-efficacy (Sevda and Fatma, 2011), etc.

The perusal of these studies revealed that the choices of these variables were neither justified properly nor the data were analysed by choosing appropriate statistical methods. What portions of dependent variables were being accounted for by these independent variables was also not considered and so on. Therefore, the investigator decided that there is a need to study the achievement of higher secondary school students in Biology and factors affecting it with the help of a set of suitable independent variables and statistical techniques.

Rationale of the Study

Most of the students are far from being blank slates, they come to school with their own ideas and explanations about Biology principles. Many Biology lessons are highly conceptual and students cannot visualise what is taking place on a microscopic level. Since Biology is a conceptual based subject having a lot of discrete facts and memorisation based topics and students face difficulty while memorising this bulk of knowledge in short term memory. Traditionally, students struggle to learn some of the basic ideas of Biology at higher secondary school classes. To understand this problem, we have to analyse not only the content itself but also the classroom conditions and learning environment. Because of the bulk amount of information taught in the class in relevance to a single topic, even good students find it difficult to retain what they learn. Also, as the subject emphasis is on a fact-based curriculum, the mode of instruction is often direct to cover

all the material. As a result, students have limited experiences with the ideas and rarely retain what they learned in the past.

At the higher secondary level, Biology has many concepts which differ from one another either in number or extent or values. If the differences are presented in terms of conjunctive concepts (De Cecco and Crawford, 1988), the subjects become clearer to the students. Under this impression, the researcher considered 'Conjunctive Concept' in Biology as one of the determinants of achievement and also tried to find out its contribution with the achievement of higher secondary school students in Biology together with other determinants. Introducing conjunctive concepts may help to reduce the vast curriculum, minimise the learning gap and misconceptions and promote meaningful, purposeful and conceptual based teaching-learning process of Biology. It may throw light on the relationship of the achievement of students in Biology with conjunctive concepts, scientific attitudes and self-efficacy.

The revolution of science and technology has glorified the modern world in various ways. The advancement of technology depends upon the emergence of the scientific knowledge, methods and attitudes. It provides opportunities to develop all the intellectual abilities like sense of meaningful observation, facts, reasoning and purposeful thinking among students. Inculcating the scientific attitudes and developing problem solving abilities are the major objectives of science teaching. But our young boys and girls are being alienated from science subjects on a large scale for which they continue to be deprived of the acquisition of scientific attitudes (Johnson, 2006). Research on science education shows a declining trend in the number of students pursuing education in science and science related fields. But an individual's interest in science education is very important for learning sciences. The scientific attitudes have an effect upon students' selection of different subjects and also on their interest and achievement in the scientific knowledge (George, 2000). So based on the above assumption, the researchers opted 'Scientific Attitudes' as another determinant of achievement and also tried to find out its correlation with the achievement of higher secondary students in Biology.

In an attempt to know the reason behind low academic outcomes of learners, it has been seen that self-efficacy is the central component of teaching-learning process and improved academic achievement of the students. So, how self-efficacy influences the achievements of higher secondary school students in Biology is a matter of concern. Therefore, the researchers also included self-efficacy as one of the determinants of achievement of higher secondary students in Biology.

On the basis of the aforesaid grounds, the following research questions arose in the mind of the investigator.

Research Question of the Study

Is there a relationship among achievement of higher secondary school students in Biology with Conjunctive Concepts, Scientific Attitudes and Self-efficacy?

Limitations of the Study

The present study was delimited in terms of content, area and sample to be completed successfully in time.

(i) Only higher secondary school students of Class XI affiliated to CBSE Board of Varanasi city were taken as a sample of the study.

(ii) The content area for the Conjunctive Concepts Test, Achievement Test and Self-efficacy test have been selected from each unit of the syllabus of Biology, Class XI.

(iii) From the educational variables, only Class XI was selected due to the realisation that the study should be done precisely in depth. Due to the paucity of time and other situational compulsions, other educational variables could not be included in the study.

Statement of the Problem

Considering the above arguments, the following problem was chosen for extensive and detailed study—

'Achievement of higher secondary school students in Biology in relation to their Conjunctive Concepts, Scientific Attitudes and Self-Efficacy.'

Operational Definition of Important Terms Used

Conjunctive Concepts

It refers to the joint presence of appropriate value of several independent attributes or characteristics. In conjunctive concepts, different unrelated characteristics or attributes are grouped together to give a resultant impression of the scientific concepts. More simply, attributes and values are added together to form conjunctive concepts.

In this study, the term 'Conjunctive Concepts' in Biology have been conceptualised in terms of five areas of Biology, viz;

- Diversity in the Living World
- Structural Organisation in Plants and Animals
- Cell: Structure and Functions
- Plant Physiology
- Human Physiology

Scientific Attitude

In the present study, 'Scientific Attitude' has been defined in terms of the following six components:

- Rationality
- Curiosity
- Open-mindedness
- Aversion to Superstitions
- Objectivity
- Suspended Judgment

Self-efficacy

Self-efficacy refers to beliefs in one's capabilities to do some task in future (Ravikumar and Manimozhi, 2011). In this study, the term 'Self-efficacy' in Biology has been conceptualised in terms of seven areas of Biology:

- Zoology
- Botany
- Physiology
- Cognitive strategies in Biology
- Emotional strategies in Biology
- Selection strategies in Biology
- Motivational strategies in Biology

Biology

Biology is a branch of natural science that comprises the several fields of science (Botany, Zoology, Physiology, Microbiology and Biochemistry, etc.) and involves in dealing with the structure, function, characteristics and behaviour of living organisms like plants, animals and microorganisms.

Achievement

In this study, achievement in Biology refers to the scores obtained by an individual in 'Achievement Test' in Biology.

Higher Secondary School Students

In this study, higher secondary school students refer to those studying in Class XI of higher secondary schools affiliated to CBSE board of Varanasi city.

Objective of the Study

The main objective of the study is to find out achievement in Biology with the help of subset of variables—conjunctive concepts, scientific attitudes and self-efficacy.

Research Hypotheses of the Study

The following were the research hypotheses of the present study:

H_R1: There is a relative contribution of conjunctive concepts, scientific attitudes and self-efficacy on achievement in Biology of Class XI students.

H_R2: There is a contribution of conjunctive concepts on achievement in Biology of Class XI students.

H_R3: There is a contribution of scientific attitudes on achievement in Biology of Class XI students.

H_R4: There is a contribution of self-efficacy on achievement in Biology of Class XI students.

Method of the Study

The descriptive survey method was used in this research study.

Tools of the Study

Relevant data were gathered with the help of following tools:

Achievement Test in Biology (ATB)

Achievement of Class XI of higher secondary school students in Biology was measured by self-constructed and standardised tool entitled as 'Achievement Test in Biology'. ATB consisted of 48 items and each item consisted of four multiple choice type options. Forty-five minutes time was allotted to the respondent. The scoring was done strictly in accordance with

the developed scoring procedure, a score of zero for a wrong answer and score of 1 for a correct one. Two types of validity were established viz; content validity and intrinsic validity. Intrinsic validity of ATB test was found to be 0.95.

Reliability of the ATB test was established by several methods. By split-half method and by Rulon and Flanagan formulas, in both cases reliability coefficient was found to be 0.95. The Kuder-Richardson formulas (K-R_{20} and K-R_{21}) and Cronbach alpha were also calculated to establish internal consistency and homogeneity of the test. Reliability coefficients by these methods were found to be 0.77, 0.74 and 0.77 respectively.

Conjunctive Concept Test in Biology (CCTB)

For measuring the Conjunctive concepts of Class XI of higher secondary school students in Biology, self constructed and standardised tool entitled as Conjunctive Concept Test in Biology was used. CCTB consisted of 46 items and each item consisted of five statement type options. Sixty minutes were allotted to the respondents. The scoring was done strictly in accordance with the developed scoring procedure. In each of the test items, five features of some scientific concepts were furnished. Answers were given in preferences of appropriateness to different options of each item. A score of 4 is provided for most appropriate answer, a score of 3 is provided for appropriate answer, a score of 2 is provided for less appropriate answer, a score of 1 is provided for least appropriate answer and a score of 0 is provided for inappropriate answer. Two types of validity of CCTB were established in this study viz; content validity and intrinsic validity. Intrinsic validity of CCTB test was found to be 0.96.

Reliability of the CCTB test was established by several methods. By split-half method, reliability coefficient was found to be 0.96 and by Rulon and Flanagan Formula it was found to be 0.94.

Students' Self-Efficacy Scale in Biology (SSESB)

For measuring the Self-efficacy of Class XI of higher secondary school students in Biology, Students' Self-Efficacy Scale in Biology was used. SSESB consisted of 62 items of statement type. Fifty-five minutes were allotted to the respondents. The scoring was done strictly in accordance with the developed scoring procedure, a score of '0' was allotted for 'Highly certain cannot do', a score of '1' was allotted for 'Moderately can do' and a score of '2' was allotted for 'Highly certain can do'. Two types of validity were established viz; content validity and intrinsic validity. Intrinsic validity of SSESB test was found to be 0.96.

Reliability coefficient of the SSESB test was established by split-half method and by Rulon and Flanagan Formula. The reliability coefficients by both methods were found to be 0.96.

Standardisation of the test was done on a sample of 300 students of Class XI. Some demographic and educational correlates provided the basis for selecting the sample for standardisation. Raw scores and group norms were found out in terms of mean and standard deviation for all the groups which were supposed to be homogenous. Derived score norms like T-score, Z-score and percentile ranks were also calculated.

Action Affection Thinking Style Questionnaire (AATSQ)

For measuring the Scientific attitude of Class XI of higher secondary school students in Biology, Action Affection Thinking Style Questionnaire (Singh, 1988) was used.

This test consists of 54 questions in three parts. It assesses scientific attitude in terms of six components viz., (i) Rationality, (ii) Curiosity, (iii) Open-Mindedness, (iv) Aversion to superstition, (v) Objectivity and (vi) Suspended judgment. The first part of the test includes items related with assessing the conative aspect of scientific attitude, the second part of the test includes items related with the affective aspect of the scientific attitude and third part of the test includes items related with the cognitive aspect of scientific attitude. Each question has three alternative items. The arrangements of the questions are from simple to difficult. In each question, there are some items who were measuring scientific, semi-scientific and anti-scientific attitudes.

This test is properly validated and standardised on a large sample of students from different classes and stages. The standardisation sample consisted of 1035 students of the age group 12–20 from Classes VI to XI. Score 2 is provided for highly scientific items, score 1 for semi-scientific items and score 0 for anti-scientific items. Validity of the test was established by several evidences. Reliability coefficient between two parts of the test was 0.73. Split-half reliability of the test was 0.85. Test-retest reliability of the test was 0.54.

Rationale for Selection of the Tools

Various studies have been conducted on measuring students' achievement in Biology at different levels. Different investigators have used different tools in combination of several variables to measure the students' achievement in Biology only at secondary level. Kaur and Lekhi (1995) studied the academic achievement of secondary students' as correlates of intelligence, achievement motivation and study habits. Spall et al., (2004) studied the achievement of school students in Biology and Physics in relation to motivation, interest, and students' grade level. Jiboku (2008) conducted a study on gender, intelligence and self-concept as predictors of academic achievement of students. Only a few studies have been conducted in the area of measuring

students' achievement in Biology at formal operational stage. The investigator could not trace out a single tool developed for measuring achievement in Biology of Class XI students at formal operational stage in combination of these variables, i.e., conjunctive concepts, scientific attitudes and self-efficacy. Therefore, valid and reliable tools were needed and the researcher decided to construct such tools.

Population of the Study

Students from Class XI of Biology group of different higher secondary schools affiliated to CBSE Board and under the administration of either CBSE Board or Banaras Hindu University of Varanasi city constituted the population of the study.

Sample of the Study

A sample of 300 students studying in Class XI, was pulled out by random sampling technique from six higher secondary schools of Varanasi city affiliated to CBSE Board and under the administration of either CBSE Board or Banaras Hindu University. The boys and girls both were included in the sample.

Results

Analysis and Interpretation of Data

Mean and S.D. of total sample and each group of students for dependent variables are presented with the help of the following tables:

Table 1, naming Mean and S.D. of total sample for data variables reflects a brief summary of all the variables, their Mean, S.D. and sample size. Here achievement is a dependent variable as well as conjunctive concepts, scientific attitudes and self-efficacy are independent variables. Mean for each variables are 28.54, 252.63, 68.61 and 84.50 respectively, whereas S.D. are 7.44, 36.71, 11.34 and 13.87 respectively, for sample size 300.

Multiple Regression Analysis of Achievement on Subsets of Conjunctive Concepts, Scientific Attitudes and Self-efficacy

Multiple regression analysis of the total sample was performed for predicting the dependent variable, i.e., achievement with the help of a subset of independent variables

Table 1
Mean and S.D. of Total Sample for Data Variables

S.No.	Variables	Mean	S.D.	N
1.	Achievement	28.54	7.44	300
2.	Conjunctive concepts	252.63	36.71	300
3.	Scientific attitudes	68.61	11.34	300
4.	Self-efficacy	84.50	13.87	300

Table 2
Inter-correlation Matrix among variables for total students (N=300)

Variables	Achievement	Conjunctive concepts	Scientific attitudes	Self-efficacy
Achievement	1.000			
Conjunctive concepts	0.868	1.000		
Scientific attitudes	0.468	0.602	1.000	
Self-efficacy	0.417	0.548	0.505	1.000

viz., conjunctive concept, scientific attitudes and self- efficacy. Summary of the findings is described as follows:

Table 2 indicates the inter-correlations among the variables of Class XI students. The correlation coefficient between achievement and conjunctive concepts, achievement and scientific attitude and achievement and self-efficacy are 0.868, 0.468 and 0.417 respectively. The correlation coefficient between conjunctive concepts and scientific attitude, and conjunctive concepts and self-efficacy are 0.602 and 0.548 respectively. The correlation coefficient between scientific attitude and self-efficacy is 0.505. All the correlation coefficients are significant at 0.05 level of significance.

From Table 3, it is evident that about 76 per cent variance in achievement in Biology for Class XI students were accounted for by conjunctive concepts, scientific attitudes and self-efficacy. From the analysis of regression, F-ratio is found to be 31.032 with 3 and 296 degree of freedom. The F-ratio is significant at 0.05 level. The analysis of regression suggests that the three independent variables— conjunctive concepts, scientific attitudes and self-efficacy, combine in least square

Table 3
Multiple Regression Analysis for the Prediction of Achievement Scores in Biology (N=300)

Dependent Variable	R	R^2	Constant	Degree of freedom K	N-K-1	F-ratio	p-value	Significance
Achievement	0.872	0.760	-13.797	3	296	31.032	p<0.05	S*
Independent Variables	**r**	**Beta Co-efficient (β)**	**Regression Co-efficient**	**Degree of freedom K**	**N-K-1**	**F-ratio**	**p-value**	**Significance**
Conjunctive Concepts	0.868	0.945	0.191	2	296	2479.35	p<0.05	S*
Scientific Attitudes	0.468	-0.0671	-0.0440	2	296	1.343	p>0.05	NS**
Self-efficacy	0.417	-0.0670	-0.0359	2	296	1.339	p>0.05	NS**

**Significant, **Not Significant*

regression equation, which in fact account for a portion of dependent variable achievement in Biology.

By an extension of this analysis, test of significance of the regression coefficients may be done. After fitting a regression of achievement in Biology on conjunctive concepts alone, the regression coefficient is 0.191. In other words, the unique contribution of conjunctive concepts to the regression, the null hypothesis is tested by computing F-ratio = 2479.35 with 2 and 296 df. The F-ratio is significant at 0.05 level.

Similarly, the other two null hypotheses are tested by finding additional reduction in the sum of squares due to the inclusion of scientific attitudes and self-efficacy in the regression after conjunctive concepts has already been included. In this case, F-ratio = 1.343 (for scientific attitudes) and F-ratio = 1.339 (for self-efficacy) is not significant at 0.05 level.

The regression equation to predict achievement in Biology is given by:

$$\hat{Y} = -13.797 + 0.191\ X_1 - 0.0440\ X_2 - 0.0359\ X_3$$

Where, $\hat{Y}$ = predicted value for Achievement score

X_1 = Conjunctive concepts score

X_2 = Scientific attitudes score

X_3= Self-efficacy score

This equation can be used to predict the scores on achievement in Biology on the basis of scores of conjunctive concepts, scientific attitudes and self-efficacy.

Finding 1: (with reference to objective 1 and $H_0$1)

$H_0$1: There is no significant relative contribution of conjunctive concepts, scientific attitudes and self-efficacy on achievement in Biology of Class XI students.

About 76 per cent variance in achievement in Biology for Class XI students was accounted for by conjunctive concepts, scientific attitudes and self-efficacy. The F-ratio 31.032 (with 3 and 296 df) is significant at 0.05 level.

Therefore, the null hypothesis that there is no significant contribution of conjunctive concepts, scientific attitudes and self-efficacy on achievement in Biology of Class XI students is rejected at 0.05 level of significance.

Finding 2: (with reference to objective 1 and $H_0$2)

$H_0$2: There is no significant contribution of conjunctive concepts on achievement in Biology of Class XI students.

However, by an extension of this analysis, test of significance of the regression coefficients may be done. After fitting a regression of achievement in Biology on conjunctive concepts alone, the null hypothesis is tested by computing F-ratio = 2479.35 (with 2 and 296) df. The F-ratio is significant at 0.05 level of significance.

Therefore, the null hypothesis that there is no significant contribution of conjunctive concepts on achievement

in Biology of Class XI students is rejected.

Finding 3: (with reference to objective 1 and $H_0$3 and $H_0$4)

$H_0$3: There is no significant contribution of scientific attitudes on achievement in Biology of Class XI students.

$H_0$4: There is no significant contribution of self-efficacy on achievement in Biology of Class XI students.

The other two null hypotheses are tested and it has been found that in these cases, F-ratio = 1.343 (for scientific attitudes) and F-ratio = 1.339 (for self-efficacy) is not significant at 0.05 level of significance.

Therefore, the null hypothesis that there is no significant contribution of scientific attitudes and self-efficacy on achievement in Biology of Class XI students is not rejected.

Thus, only one variable i.e., conjunctive concepts, has contributed significantly in the prediction of achievement of Class XI students in Biology.

Discussion of the Findings

Analysis of the data was conducted by re-arranging the data and keeping in view the objectives and hypotheses of the study. It essentially involved the application of the statistical methods. It may be stated that though a number of analysis may be performed with the data, yet only those, which were essential to meet the objectives of the study, were included.

However, conjunctive concepts seem to be an important factor influencing the achievement of higher secondary school students in Biology at formal operational stage. Hence, it was assumed that teaching of students in terms of conjunctive concepts may yield a better academic achievement. These findings are also supported by various studies conducted by Koballa, (1988), and Judson and Nishimori, (2005), on problem solving abilities of mathematical calculus, algebraic problem based on conjunctive concepts. In all these studies, it was founded that students' performance was better who adopted conjunctive concepts in their teaching-learning process.

On the basis of the above analysis, one may conclude that achievement as dependent variable seems to be related with conjunctive concepts, scientific attitudes and self-efficacy. A major portion of the total variance may be accounted by these independent variables. Remaining portion of the variance may or may not be accounted for by other variables.

Scientific attitudes and self-efficacy were another important variables chosen by the researchers in predicting achievement of higher secondary school students in Biology. From the review of related studies, it was also found that the above mentioned variables were significant contributors of students' achievement in Biology. Studies conducted by John and Rafiu (2014) on scientific attitude and by Baldwin

et al. (1999); De Broux and Margie, (2007); Ravikumar and Manimozhi (2011), on self-efficacy supported this argument. But, the above findings were neither significant nor supported this study. Hence, there is no contribution of these variables in predicting students' achievement in Biology at formal operational stage.

So, from the above discussion, it may be concluded that only conjunctive concepts as an independent variable play a significant role in achievement of higher secondary school students in Biology at formal operational stage. The other independent variables like scientific attitudes and self-efficacy seem to be less important for predicting the achievement scores in Biology.

Conclusions of the Study

On the basis of the above findings, following conclusions may be derived:

- In the formal operational stage, a large portion of achievement of students in Biology may be accounted for by conjunctive concepts only.
- Conjunctive concept is related with the cognitive aspects of the psyche. Therefore, for better achievement in Biology at formal operational stage, development of cognitive aspect of the psyche should be given importance through teaching-learning process.

Hence, the achievement in Biology only depends on appropriate educational objectives and selecting suitable teaching-learning strategies and teaching aids for developing cognitive aspect of the psyche. Thus, conjunctive concepts should occupy a central stage in teaching-learning process for better achievement in Biology.

Educational Implications of the Study

A few educational implications of the study are described below:

It is a fundamental type of research and aims at studying the relationship between achievement in Biology in relation to conjunctive concepts, scientific attitudes and self-efficacy. This may help in improving the teaching-learning strategies in Biology in a better way. This study is very much effective for teachers, teacher-educators and policymakers. The relevant variables so chosen in this study are directly related with students. So, it may help in identifying and classifying the better students in Biology.

This study may also be helpful in improving the achievement of higher secondary school students in Biology. Since, higher secondary education provides a platform for higher studies, so, this kind of study may also help in improving the quality of higher education.

Recommendations

Since the problem of the present study is an area which needs thorough investigation and careful probing. Hence, further researches may be carried out to throw light on the

unsolved problems of this study and also to confirm and modify its results. These unsolved problems may be listed as follows:

(i) Standardisation of the tool used in this study on a larger sample.

(ii) Major portion of the variance should be accounted for by these independent variables. Remaining portion of the variance may be accounted for by other variables. Therefore, remaining percentage of variance may be explained by some other variables. Hence, further researches can be carried out based on these findings.

(iii) Researches can be carried out to find out other factors which may affect the achievement of the students besides demographic variables.

(iv) Schools run by the state government may be included in the study. Further, a comparative study of both may also be conducted.

References

Ayishabi, T.C. 1996. Teaching Zoology through Concept Attainment Model at +2 level: An Experimental Study. *Journal of Indian Education*. Vol. 22, No. 3. pp. 65–70.

Baldwin, J.A., D. Ebert-May and D.J. Burns. 1999. The Development of a College Biology Self-Efficacy Instrument for Nonmajors. John Wiley and Sons, Inc., *Science Education*. Vol. 83, No. 4. pp. 397–408.

Bandura, A. 1997b. Cognitive Functioning. In *Self-Efficacy*: *The Exercise of Control*. pp. 212–258. Freeman, New York.

De Broux and L. Margie. 2007. The Effect of Guided Questioning on Student Achievement, Self-Regulatory Behaviour, and Self-Efficacy in Biology for Non-Majors Class. Electronic Theses, Treatises and Dissertations. Retrieved from http://purl.flvc.org/fsu/fd/FSU_migr_etd-0065.

De Cecco, J.P. and W. Crawford. 1988. *The Psychology of Learning and Instruction*. PHI, New Delhi.

Dougle, M., and K. Odell. 1989. Predicting Academic Achievement from Study Skills Habits among Upward Bound Students. Denton, Texas. p. 85. (https://digital.library.unt.edu/ark:/67531/metadc330930/m1/92/: accessed October 30, 2021), University of North Texas Libraries, UNT Digital Library, https://digital.library.unt.edu

George, R. 2000. Measuring Change in Students Attitude towards Science Overtime. *Journal of Science Education and Technology*. Vol. 9, No. 3. pp. 213–225.

Jayakumari, A.D. 1997. Effect of concept attainment model on achievement in Physics of secondary school students. Published M.W., Thesis, M.G., University.

Jiboku, A.O. 2008. Gender, Intelligence and Self-Concept as predictors of Academic achievement of Students. *Ogun Journal of Counselling Studies*. Vol. 2, No. 2. pp. 89–94.

John, K. and O. Rafiu Ademola. 2014. Scientific Attitude, Attitude to Science and Science Achievement of Senior Secondary School Students in Katsina State, Nigeria, *Journal of Educational and Social Research.* MCSER Publishing, Rome-Italy. Vol. 4, No. 1. pp. 445–452. 2239-978X, 2240–0524

Johnson, D. 2006. Are 21st Century Skills Right Brain Skills? Education World. Retrieved June 11, 2010 from: http://www.educationworld.com/a_tech/columnists/johnson/johnson006.shtml(2)138.

Judson, W. and T. Nishimori. 2005. Concept and skills in high school calculus: An examination of a special case in Japan and the United States. *Journal of Research in Mathematics Education.* Vol. 36, No. 1. p. 24. http://www.my.nctm.org/eresources.

Kaur, G.P. and V. Lekhi. 1995. Intelligence, achievement motivation and study habits as correlates of academic achievement of secondary students. Ph.D., (Edu.), In Buch, M.B., *Fifth Survey of Research in Education*, NCERT, New Delhi.

Kaur, J., and S. Kaur. 2011. Effect of Concept Attainment Model of Teaching on Mathematical Achievement of Secondary School Students. *Journal of Educational Research and Extension.* Vol. 48, No. 3, pp. 37–46.

Kaushik, N.K. 1988. The long term effect of advance organiser upon achievements in Biology in relation to reading ability, intelligence and scientific attitudes. Ph.D., (Edu.) Devi Ahilya Viswavidyalaya, In Buch, M.B., (Edu), *Fifth Survey of Research in Education.* NCERT, New Delhi.

Koballa, T. R. 1988. Attitude and Related Concepts in Science Education. *Science Education.* Vol. 72, No. 2. pp. 115–126, ERIC No-EJ371101.

Lekha, G. 2000. Effectiveness and concept attainment model on achievement in mathematics at secondary level. Published M.Ed. Thesis, Mahatma Gandhi University, Kottayam.

Mahanti, S. 2013. A Perspective on Scientific Temper in India. *Journal of Scientific Temper.* Vol. 1. pp. 46–62.

Mehrotra, I. and V. Baniwal. 2006. Understanding Children's Construction of Biological Concepts and its educational implications. *Journal of School Science.* Vol. 44, No. 3. pp. 39–54.

Moore, A. 1993. *Hard to Teach Biology Concepts— A framework to deepen students understanding.* Susan Koba and AnneTweed, NSTA Press, Arlington, Virginia, USA. 978-1-933531-41-0.

Nellaiappan, N.O. 1992. A Study of Scientific Attitude and Interests among Higher Secondary Biology students in Relation to their Learning Environment. Ph.D., Edu., Annamali University. In Buch, M.B., (Edu), *Fifth Survey of Research in Education.* NCERT, New Delhi. p. 1195.

Pajares, F. 2003. Self-efficacy beliefs, motivation and achievement in writing: A review of the literature. *Reading and Writing Quarterly.* Vol. 19, No. 2. pp. 139–158.

Panda, M. 2005. Correlation among Academic Achievement, Self-efficacy and Intelligence of Class IX students. *Edutracks.* Vol. 5, No. 1. pp. 36–38.

Pandey S.N. and F. Ahmed. 2008. Significance of difference between male and female adolescents on academic performance, achievement motivation, intelligence and socio economic status. *Journal of Community Guidance and Research.* Vol. 25, No. 1. pp. 40–45.

Rao, Digumarti Bhaskara. 1990. A comparative study of scientific attitude, scientific aptitude and achievement in Biology at secondary school level. Ph.D. (Edu), Osmania University. In Buch, M.B., *Fifth Survey of Research in Education*. NCERT, New Delhi.

Ravikumar, S. and T. K. Manimozhi. 2011. Self-efficacy among the students of Biological sciences at Cuddalore district, TN, India. *Indian Journal of Science and Technology*. Vol. 4, No. 1. pp. 68–71. 0974-6846

Sevda, S. and A. Fatma. 2011. Emotional intelligence and self-efficacy beliefs as predictors of academic achievement among high school students. Karadeniz Technical University, KTU Fatih. Faculty of Education, Trabzon, 61335, Turkey.

Singh, P.N. 1988. Construction and Standardisation of a Test of Scientific Attitude. Ph.D. Thesis in Education, B.H.U., Varanasi, India.

Spall, K., M. Stanisstreet, D. Dickson and E. Boyes. 2004. Development of School Students' Constructions of Biology and Physics. *International Journal of Science Education*. Vol. 26, No. 7. pp. 787–803.

Sushama. 1987. Effectiveness of concept attainment model on Biological science to Class VIII students. In Buch, M.B., (Edu.), *Fourth Survey of Research in Education.* (1983–88). Vol. 1. NCERT, New Delhi.

Taylor and Francis. 1980. A study of Nigerian pupils' understanding of selected Biological concepts. *Journal of Biological Education*. Vol. 14, No. 4. p. 277.

Towards Inclusive Education in Tribal Areas of Odisha
An Empirical Analysis

Soubhagya Ranjan Padhi*, Deepthi Shanker** and Manash Pratim Goswami***

Abstract

This paper re-examines the linkages between tribal literacy, constraints for inclusive education, and socio-economic and cultural development of the tribal society in India. Using an analytical survey of 640 households, the study empirically evaluates the factors responsible for the low literacy rates and analyses various constraints and opportunities for accessing primary education among the tribal population of Koraput district in the state of Odisha in India. The paper argues that the lack of essential infrastructure and inadequate educational incentives has significantly impacted the quality of teaching and education in the tribal schools of Koraput district. The study concludes that the successful implementation of 'inclusive education' in India involves revamping and restructuring the existing educational system in tribal areas, which calls for framing educational policies that are context-specific, fostering the principles of expansion, inclusion and excellence in the field of education.

Introduction

Tribal development in India can be understood from three key perspectives namely, 'isolation model', 'assimilation model' and 'integration model'. Isolation model was initially propagated by British anthropologists and administrators in India.

The British government's policy was solely directed and dominated by the colonial interests based on

* *Professor* and *Head*, Department of Sociology and Social Anthropology, Indira Gandhi National Tribal University, Amarkantak, Madhya Pradesh.
** *Independent Researcher*, Bangalore.
*** *Associate Professor*, Department of Media and Communication, Central University of Tamil Nadu, Thiruvarur, Tamil Nadu.

isolation and exploitation of the tribal communities. Hence, acquiring formal education became a difficult task for these tribes. Ghurye (1980) challenged the isolation model and advocated the assimilation model. He argued that the tribes will continue to remain poor socially, economically, educationally and politically if they are not in contact with other people in the society. But, Ghurye's assimilation model was not considered appropriate for the development of tribes because of the tendency of the dominant culture to absorb the marginalised tribal culture and its age-old traditional institutions in the assimilation process. Accepting a new dominant culture would be detrimental to the tribe's indigenous culture. As a result, many contemporary scholars advocated the integration of indigenous tribal culture with modern culture. 'Integration model' allows for only positive intervention of the dominant modern culture, thus protecting the core culture and institutions of the tribes.

The formal education system in India has unfortunately not factored the 'inclusive' elements while designing the course curriculum for tribal education. Even after many years of independence, the builders of modern India have not been able to provide tribal population an appropriate inclusive educational pattern conducive to tribal development. Although the constitutional provisions are designed and aimed to safeguard the interest and welfare of the tribal communities, tribal marginalisation continues as the measures are either underutilised or inefficiently implemented (Xaxa, 2014). Rupavath (2016) suggests that tribal education in India must be viewed as a 'perspective from below', which allows critical enquiry and initiatives for greater participation by tribal communities. He emphasises that the local people should be considered as the key stakeholders and consulted for planning educational provisions (Rupavath, 2016).

Educational Situation of Scheduled Tribes in Odisha

Census data (2011) reveal that Odisha is one of the low ranking states (25th) of India; portraying more than two-fifths of the population as illiterate. The census indicates that literacy rate is only 73.45 per cent in Odisha. Majority of Odisha's poor and marginalised communities are categorised as Scheduled Tribes. These groups are lagging behind in their educational attainment when compared to the general population in terms of enrolment in school, completing their secondary and/or higher education, etc. Table 1 shows the literacy rates of tribal population in Odisha in comparison to the general population.

The overall literacy rate of the STs has increased from 22.3 per cent in

Table 1
Literacy Rate (in per cent) of General Population and ST Population in Odisha during 1991–2011

Year	General			ST		
	Male	***Female***	***Total***	***Male***	***Female***	***Total***
1	2	3	4	5	6	7
1991	63.09	34.68	49.09	34.4	10.2	22.3
2001	75.95	50.97	63.61	51.48	23.37	37.37
2011	82.40	64.36	73.45	63.7	41.2	52.2
*Shows the gap between the total literacy rates of STs and of the general population						

Source: Government of India, Census of India, Odisha, 1991, 2001 and 2011

1991 to 37.4 per cent in 2001, and to 52.2 per cent in 2011. Major tribes such as Gond, Saora, Santal, Munda, Kondh, Shabar, Kolha, Bhottada, Gadaba and Paroja have low literacy rates, reflecting the exclusion of tribal communities in the field of education in Odisha. The gap between the general literacy rate and ST literacy rate in 1991 is 26.8 per cent. However, it has decreased in 2011 to 21.25 per cent. This partly indicates that the efforts of the government to provide education to all have not reached the tribal areas. Among ST males, literacy rate has increased from 34.4 per cent in 1991 to 51.48 per cent in 2001 and to 63.7 per cent in 2011. ST female literacy rate has increased from 10.2 per cent in 1991 to 23.37 per cent in 2001 and to 41.2 per cent in 2011. The ST female literacy was low by approximately 28 percentage points as compared to the overall female literacy of the general population in 2001. It has not reduced significantly and the gap persists as it was only 23.16 per cent in 2011. This reveals the exclusion of tribal women in the field of education in Odisha. The Malkangiri district (undivided Koraput) has the lowest tribal literacy, i.e., only 35.2 per cent and Koraput district has the next lowest ST literacy, i.e., 35.4 per cent. According to the 2011 census, Koraput district ranks 28th among the 30 districts in Odisha with only 49.21 per cent tribal literacy. The tribes of Koraput have relatively low literacy rates when compared to other districts, states or general population. Considering the low educational status and exclusion of tribal communities from the formal educational structure, this paper attempts to make a critical analysis of the challenges of providing inclusive education to the tribes of Koraput district in Odisha.

Inclusive education system can be viewed as a solution to tackle the learning obstacles of the marginalised tribal children. The Salamanca World Conference on Special Needs Education (UNESCO, 1994) adopted the principle of

inclusive education and the Dakar World Education Forum (2000) was initiated to reinforce it. Inclusive education system according to them should accommodate all children, irrespective of their physical, intellectual, social, emotional, linguistic and other conditions. Inclusive education points to the diversity of needs of all learners, particularly the vulnerable learners of any society. It allows for increased participation of the members in the entire learning process and also in the every day activities. Inclusive education as a point of departure from the normal education, requires a gamut of strategies and actions to nurture solidarity and a sense of belongingness among children from diverse backgrounds (Tiwari and Tian, 2017).

Objectives and Hypotheses

The main objective of this study is to analyse various constraints and opportunities for accessing primary education among the tribal population in Koraput district of Odisha. The sub-objectives include: (i) Studying the factors responsible for the exclusion and concomitant marginalisation of tribal communities in the domain of education; (ii) Studying the factors of low attendance and dropouts in the tribal area of Koraput district in Odisha; and (iii) Assessing the quality of primary education system, and providing suggestions and recommendations to strengthen inclusive education among the tribal population. The study hypothesises that the infrastructure facilities and educational incentives received in the schools of tribal areas are poor which can significantly impact the quality of education in the tribal areas.

Methodology

Koraput district was selected as the study area because of its high concentration of tribal population and low tribal literacy rate. Data was collected from both primary and secondary sources. The secondary sources included census reports, survey documents, government records, Gram Panchayat files, local newspapers, etc. Primary data was collected from the village population, which included household members. Multistage sampling technique was used for the selection of households. Koraput district is divided into 14 blocks which fall under two main sub-divisions, namely 'Koraput' and 'Jeypore'. In the first stage, eight blocks out of the total 14 were selected from Koraput district on the basis of stratified random sampling (four each from two sub-divisions viz. Koraput and Jeypore, respectively). The selected blocks included Koraput, Semiliguda, Nandapur, Pottangi, Jeypore, Kundura, Kotpad and Boriguma. In the second stage, the unit of sampling was 'Gram Panchayat'; and hence two Gram Panchayats from each of the eight blocks were selected ($2 \times 8 = 16$), using stratified random sampling

technique, resulting in 16 Gram Panchayats. In the third stage, 'village' was considered as the unit of sampling. From each of the 16 Gram Panchayats, 2 villages were identified ($16 \times 2 = 32$), which resulted in 32 villages. In the fourth and final stage, 'household' was considered as the unit of sampling. From these 32 villages, 20 households ($32 \times 20 = 640$) were selected based on random sampling technique, which resulted in the total of 640 households for the study. The primary sampling unit was the household. Using the survey method, data was collected from one person from each household. It was either the head or any active adult member in the household.

Considering the objectives of the study, an analytical survey was designed to understand the various constraints for providing inclusive education to the tribal children of Koraput district. In the context of this study, 'inclusive education' is defined as that which accommodates the educational and learning needs of all individuals from diverse cultural, social, linguistic, economic backgrounds and conditions. The study was designed to test the association of different variables like association between the contextual syllabus, language of instruction and attendance rate or drop-out rate of tribal students. It also tries to establish the relationship between the available infrastructure and method of teaching with the quality of education. The independent variables namely available infrastructure, medium of instruction and course curriculum were examined in association with the drop-out or attendance rate in class and the concomitant quality of education in tribal areas. The operational definitions of the variables are as follows.

- ***Infrastructure Accessibility***

  We define this variable as access to physical infrastructure namely school building, classroom, playground, library facilities, sanitation facilities, study chairs and tables, study hall, assembly area, sports facilities, etc.

- ***Quality of Teaching***

  It refers to the kind of teaching, which facilitates proper understanding of the subject; and ensures effective application of the theoretical knowledge in the practical world and real life situations. It also refers to the development of communication skills in multiple languages namely tribal dialect, Oriya, Hindi, etc.

- ***Educational Incentives Received***

  It refers to the availability of sufficient number of teachers skilled to teach in tribal languages and availability of teachers with tribal dialect. It also includes conducive-learning environment; healthy snacks; financial rewards for teachers; living quarters for teachers; pedagogy that includes music, plays, skits, dance, puzzles, games, etc.

Scaling methods such as nominal, ordinal and interval scales were used to measure and analyse the responses of respondents besides t-test, co-relation and regression methods. One of the purposes of the study was to understand the gender differences of variables namely—(i) infrastructure accessibility, (ii) quality of teaching, and (iii) educational incentives. So t-test was used for this purpose. Pearson moment correlation has been used to examine the relationship between variables (Table 6) and to check the significant contributions of variables like infrastructure accessibility, and educational incentives received towards the outcome variable, i.e., quality of teaching.

Major Findings and Discussions

Out of the total 640 respondents, 538 (84.1 per cent) were male and remaining 102 (15.8 per cent) were female. They belonged to eight different communities namely, Gadaba (123 respondents), Paraja (218), Bhatra (63), Amanetya (56), Penthia (42), Bhumia (12), Durua (20) and Kondh (106). Data highlighted that the main occupation of the tribals was agriculture (439 respondents). Other key occupations included wage labour (174 respondents), service holders (14 respondents) and business (13 respondents).

Table 2 shows gender-wise distribution of respondents based on their education level in different villages. Data reveals that 512

Table 2
Respondent's Level of Education

Sex	*Number of Respondents*	Education				*Total*
		No Formal Education	*Primary*	*Secondary*	*Higher Education*	
Male	Respondents	423	89	19	7	538
	Percentage within gender	78.6	16.5	3.5	1.3	100.0
	Percentage within education	82.6	88.1	95.0	100.0	84.1
Female	Respondents	89	12	1	0	102
	Percentage within gender	87.3	11.8	1.0	0.0	100.0
	Percentage within education	17.4	11.9	5.0	0.0	15.9
Total	Respondents	512	101	20	7	640
	Percentage within gender	80.0	15.8	3.1	1.1	100.0
	Percentage within education	100.0	100.0	100.0	100.0	100.0

Source: Fieldwork

respondents (80 per cent) have not completed their formal education, 101 respondents (15.8 per cent) have completed their primary education, 20 respondents (3.1 per cent) have completed their secondary education and only 7 respondents (1.1 per cent) have managed to complete their higher education. Only 12 of 102 female respondents had completed primary education, while only 01 respondent had completed secondary education. Multiple factors are responsible for this low educational status of respondents.

The key constraints in accessing and utilising primary education for the tribes of Koraput district include: lack of motivated teachers, disguised dropouts and low attendance in class besides language issues. About 196 respondents (30.63 per cent) state that there is a lack of efficient teachers, who can teach or instruct using tribal language in combination with the dominant regional or alien languages as a medium of instruction at elementary level (Table 3). This is the primary cause for the lack of motivation among tribal students in the class. Findings reveal that language constraint is one of the major factors resulting in high drop-out rate in school at both primary and secondary levels among the tribal children. About 27.8 per cent of the respondents mentioned that the syllabus is unfamiliar for tribal children and their learning process as it does not reflect the tribal folk tales, hunting stories, tribal leaders, agriculture, tribal craft or any of the tribal religious practices, festivals, political organisations, etc. Besides, the data revealed the pre-dominance of disguised dropout, which was rampant in tribal areas at the primary level. Disguised dropout refers to the situation wherein the system conceals the fact that the students are missing from the schools, by manipulating the actual attendance sheet and other formal records. Lack of motivated teachers was also responsible for the poor situation of tribal education in the region. About 155 respondents (24.2 per cent) conveyed that teachers were casual in their approach towards the students.

To overcome the constraints discussed, the use of multiple languages in a single classroom along with the relevant course materials that align with the tribal culture of the area has been proposed. This is believed to reduce the drop-out rate of tribal school children and also aid in increasing their motivation to complete their education. Draft National Education Policy (DNEP) 2019 has prescribed a provision that the mother tongue or regional language should be mandatorily treated as the medium of instruction up to Class V. However, implementing this provision and achieving this in a time-bound period is not clear. There is a need to chalk out an appropriate and practical roadmap to address the issue on an urgent basis. For this to materialise, primarily we must focus on the preparation of course materials up to Class V in

Table 3
Constraints for Learning in Primary Education

Gender		Constraints for Education						Total
		Teachers' inefficiency at teaching in tribal language	***Unfamiliar language as medium of instruction***	***Course curriculum***	***Lack of motivation in teachers***	***Improper teaching method***	***Lack of infrastructure***	
Male	Respondents	86	71	154	130	64	33	538
	Percentage within gender	16.0	13.2	28.6	24.2	11.9	6.1	100.0
	Percentage within 'constraints for learning'	87.8	76.3	86.5	83.9	84.2	82.5	84.1
Female	Respondents	12	22	24	25	12	7	102
	Percentage within gender	11.8	21.6	23.5	24.5	11.8	6.9	100.0
	Percentage within 'constraints for learning'	12.2	23.7	13.5	16.1	15.8	17.5	15.9
Total	Respondents	98	93	178	155	76	40	640
	Percentage	15.3	14.5	27.8	24.2	11.9	6.2	100.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Fieldwork

different diversified languages. DNEP must start the programme at grass root level and implement it as early as possible.

Table 4 depicts the mean value and SD of study variables in a sample of 640 respondents. All items were answered using a five point scale (1, 2, 3, 4 and 5), ranging from poor to very good. It is clearly indicated that all the variables do not go over the neutral value, i.e., 3 of the five-point scale. By analysing the means, it is found that the respondents sense a gap in the availability of sufficient infrastructure and educational incentives. Due to lack of educational incentives and infrastructure accessibility, the quality of teaching is also poor. This quantitative information is represented in Figure 1 in the Appendices.

From Table 5, the researchers have derived the following hypotheses:

(H_1) : "The infrastructure facility in the schools of tribal area is poor"— is supported.

(H_2) : "The educational incentives received in the schools of tribal area is poor" — is supported.

Further, an independent sample t-test was conducted to evaluate the mean scores of infrastructure availability, quality of teaching and educational incentives received by the school children according

Table 4
Mean Value and Standard Deviation Analysis

Measures	Number of items	Scale's Neutral Value	Mean	SD
Infrastructure Accessibility	11	33	16.44	3.89
Quality of Teaching	13	39	20.66	3.32
Educational Incentives Received	06	18	9.47	1.28

Source: Fieldwork

Table 5
Descriptive Statistics and t-test between Study Variables

Measures	Gender				t-test for Equality of Means with Degrees of Freedom (DF) 638	
	Male (N–538)		*Female (N–102)*			
	Mean	*SD*	*Mean*	*SD*	t-value	Sig.
Infrastructure Accessibility	16.43	3.92	16.45	3.74	–0.04	0.97
Quality of Teaching	20.62	3.36	20.86	3.08	–0.69	0.49
Educational Incentives Received	9.46	1.27	9.49	1.28	–0.19	0.85

Source: Fieldwork

to the opinion of male and female respondents (N = 640). It was found that there are no significant differences between the opinions of male and female respondents. Table 5 depicts the mean score, standard deviation and t-value. The mean scores of 'infrastructure accesibility' for males and female participants are 16.43 and 16.45, which indicate that there is no significant difference between males and females regarding infrastructure accesibility in the schools. Table 5 depicts the significant value for this as 0.97, which is quite above the requisite cut-off of 0.05. Insignificant differences are observed in the mean score of quality of teaching and educational incentives received by school children according to the male and female respondents. The t-value for both factors has not reached the significance level of 0.05.

Table 6 demonstrates the correlation among study variables including infrastructure accessibility, quality of teaching and educational incentives received. There is a positive and significant relationship between infrastructure accessibility and quality of teaching ($r = 0.50$, $p = 0.01$), which suggests that higher values of infrastructure accesibility are associated with the higher values of quality of teaching. There was a positive relationship between infrastructure accesibility and educational incentives received ($r = 0.17$, $p = 0.01$), which indicates higher values of infrastructure accesibility are associated with the higher values of educational incentives received. Similar trend has also been reflected in the relationship between quality of teaching and educational incentives received. The relationship of these measures is positive and significant ($r = 0.28$, $p = 0.01$). This means higher values of quality of teaching are associated with the higher values of educational incentives received. Figure 1 depicts the relationship between the three variables.

From the multiple regression analysis (Table 7), the investigators wanted to determine which predictor has significantly contributed to the prediction of quality of teaching. It was found that the 'availability of infrastructure' is a predictor that reports the largest beta coefficient towards quality of teaching ($\beta = 0.47$,

Table 6
Correlation among study variables

S.No.	Measures	1	2	3
1.	Infrastructure Accessibility	0.79		
2.	Quality of Teaching	0.50**	0.73	
3.	Educational Incentives Received	0.17**	0.28**	0.62

** Correlation is significant at 0.01 level
Values represented in the diagonals are reliability coefficients (Chronbach alpha)

Table 7
Multiple Regression Analysis

Predictors	Quality of Teaching	
	R^2	*B*
Availability Infrastructure	0.29	0.47**
Educational Incentives Received		0.20**

** Prediction is significant at 0.01 level

p≤0.01). The β value for educational incentives received on quality of teaching suggests that there is a significant correlation between them. It is observed that there is a significant impact of 'availability of infrastructure' on 'quality of teaching'. Similarly, there is a significant impact of 'educational incentives' received on 'quality of teaching'. In the analysis, R^2 value is 29, indicative of the 29 per cent of variability in the quality of teaching, which shows that it is low due to poor availability of infrastructure and poor educational incentives received in the schools of tribal areas. In other words, the hypothesis (H3), 'poor infrastructure and poor educational incentives will have a significant impact on the poor quality of education in the schools of tribal areas' is supported.

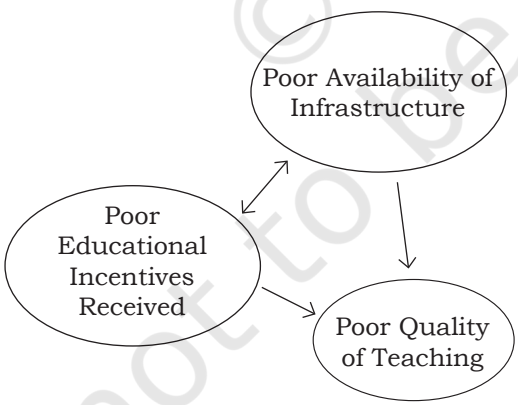


Fig. 1: Model Analysis

Source: Author's Fieldwork

Suggestions and Conclusions

The future roadmap of tribal education in India depends upon three issues—'access' (expansion), 'equality' (inclusion) and 'quality' (excellence) of delivering education. The dimension of inclusiveness is important because even today many ST students are excluded from education at all levels due to economic, social and cultural disparities and barriers. The blueprint to reach the final goal of creating an educated community in India depends upon inclusive education that involves revamping and restructuring education in tribal areas particularly. This calls for educational policies that are context-specific and foster the principles of expansion, inclusion and excellence in the field of education. Our study corresponds to Mohanty's (2017) emphasis upon the need to develop a sense of pride in the tribal languages, both among the tribals and other

stakeholders as a development strategy to enhance tribal education. The findings of this study also resonate with Singh's (2016) observation that the involvement of educators, parents, community leaders and the civil society is essential to meet the challenges for creating better and more inclusive schools in India.

Based on our field work, some of the suggestions to enhance the quality of education in tribal areas include:

(i) Appropriate steps should be taken to reduce drop-out rates of schools in the tribal-dominated regions. Due to poverty, tribal families prefer to engage their children as wage labourers to earn for their daily bread rather than sending them to school to gain knowledge. To address this vicious cycle of poverty and illiteracy, viable employment opportunities must be created for the tribal population. Also, the government and NGOs must adopt initiatives to provide the required study materials to the tribal students free of cost for primary and secondary education at the right time.

(ii) There is need to create a healthy and enjoyable learning environment in the schools in the tribal areas. This is possible if the course curriculum reflects tribal life and culture, besides focusing on the dissemination of knowledge and skill development. Teaching pedagogy can be made innovative and interesting with the inclusion of plays, music, songs, skits, dance, puzzles, games, etc. Sports and library facilities should also be provided adequately.

(iii) Skill development programmes should be judiciously combined with the formal education that sustains motivation in learning. Formal education can be attractive and also meaningful for the tribal communities if it addresses the problem of unemployment. Hence, vocational education and skill-based learning, which also includes primitive tribal skills, should be linked with the formal classroom training and activities.

(iv) There should be a rigorous implementation of the capacity-development programmes for all the stakeholders namely, teachers, parents, students, local administrators, etc. The professional skills of teachers and students should be enhanced periodically according to the requirements. The education department can organise various motivational and leadership training programmes for teachers, parents and administrators. It may include training programmes to learn and instruct in tribal language or

dialect; updating knowledge regarding the contextual situation of a particular tribal area for proper implementation of the educational policies, etc. Proper implementation of educational programmes in tribal areas requires greater professionalism, responsibility and accountability. Full involvement and wholehearted participation of all the stakeholders become essential to reap effective and positive results.

(v) Teachers who are the key stakeholders in the process of imparting quality education should be provided with specialised training. Teachers serving in remote tribal areas should have a mandatory exposure to vocational education and local indigenous knowledge system of tribal communities. Incentives such as proper residential facilities within the tribal area, transport facilities, stimulating pay packages, etc., are essential to attract and retain the talented workforce in the tribal-dominated remote regions. There is also a need to address the issue of teachers, absenteeism, especially in the tribal areas. Higher authorities of the education department must seriously monitor the teachers in remote tribal areas by regular inspection. Teachers neglecting their duties must be punished and made accountable.

(vi) There is a greater need to create a growing consciousness among the stakeholders of the society at large regarding tribal education. The government should work in partnership with NGOs, civil societies, educators, social activists, youth of the country, bureaucrats, etc., to provide access to formal education of good quality to all the tribal children of the country. Educational programmes can be implemented effectively through interventions by the civil society at a macro level. Civil societies, teaching community, youth, politicians, etc., in the mainstream societies must be empathetic towards the tribal population in their struggle to access formal education. Right guidance, timely assistance and moral support by the society at large, at every step, shall build confidence in the tribal youth and make them self-sufficient. This shall eventually help the tribal population to integrate, fully participate and contribute to the nation's developmental process.

References

DNEP. 2019. Draft National Education Policy. https://mhrd.gov.in/sites/upload_files/mhrd/files/Draft_NEP_2019_EN_Revised.pdf

Ghurye, G.S. 1980. *The Scheduled Tribes of India*. 2nd Edition. New Brunswick: Transaction Books.

Government of India. 2011. Census. Office of the Registrar General, New Delhi. India. https://www.census2011.co.in/literacy.php

Mohanty. 2017. Education in Mother Tongue: Impact of Multilingual Education in Odisha. *Economic and Political Weekly*. Vol. 52, No. 7. pp. 31–38.

Rupavath, R. 2016. Tribal education: A perspective from below. *South Asia Research*. Vol. 36, No. 2. pp. 206–228.

Singh, J.D. 2016. Inclusive Education in India – Concept, Need and Challenges. *Scholarly Research Journal for Humanity Science and English Language*. Vol. 3, Vo. 13. pp. 3222–3232.

Tiwari, A. and F. Tian. 2017. Institutional Barrier to Educational Participation: Examples from China and India. *International Journal of Educational Reform*. Vol. 26, No. 1. pp. 70–84.

UNESCO. 1994. The Salamanca World Conference on Special Needs Education: Access and Quality, UNESCO and the Ministry of Education, Paris: UNESCO. https://www.right-to-education.org/resource/salamanca-statement-and-framework-action-special-needs-education. http://www.csie.org.uk/inclusion/unesco-salamanca.shtml

Xaxa, V. 2014. Constitutional Provisions, Laws and Tribes. *Yojana— A Development Monthly*. Vol. 58, No. 1. pp. 4–7.

An Analysis of Factors Contributing to the Choice of School

'Informed Choice' Vs 'Grapevine Decision Making'

Anshul Saluja*

Abstract

Provision of elementary education is one of the major responsibilities of the State. And with alignment to this responsibility and role, the State should endeavour to provide education to all, irrespective of any discrimination. The basic assumption behind this is that free education and incentives will attract the audience and will help achieve the objectives of Universal Elementary Education (UEE). Over the years, the access to schooling provisions has been increased by increasing the resource base and number of government-run schools. Several studies have shown that despite free provision of education, the households increasingly prefer private unaided schools by utilising their limited resources to fulfil 'that' need which the government is already legally bound to provide. While exercising their choices explicitly, they are seeking the options that relate to their own needs and interests. This paper is based on a survey of randomly selected 7 villages of Faridabad district of Haryana and tried to develop insights as to why parents choose a particular school and determinants for making these choices to develop an understanding of the process and whether they form an informed opinion or are merely perception based, twenty-one schools were taken under the framework of investigation.

Introduction

Education is a universal and publicly provided good which should be accessible to all. Ratifying to the UN Convention on the Rights of the Child, primary education is made

**Assistant Professor*, School of Education, K.R. Mangalam University, Sohna, Gurugram.

free and compulsory for all children. Nearly 70 years ago, India also made a constitutional commitment to provide free and compulsory education to all the children of age group 6–14 years and further adopted a rights-based approach towards the universalisation of education. Before independence, the rates of literacy were too low, with only 27 per cent male and 9 per cent female population as literates (Census of India, 1951). This was because of the educational system followed by Britishers which favoured the education of few (elites), who could help them administer the country (Kingdon, 2005) and the poor were deprived of the education.

This reinforced broadening up the gap of inequality among the people based on their social and economic positions. To reduce this gap, the Constitution of India adopted the goal of 'Education for All' after the adoption of Universal Declaration of Human Rights in 1968, which stated that everyone has the right to education and it should be provided free at least at the fundamental stages and the parents have the prior right to choose the kind of education that shall be given to their children.

Kothari Commission (1964–66) perceived the objective of education to be the attainment of equality. Based on this recommendation, the National Policy on Education (1968) aimed for equalisation of educational opportunity and adopted a common school system. In 1976, education was changed from a State responsibility to the joint responsibility of the Centre and the State and with this, the agenda of UEE started taking shape. National Policy on Education (1986) with a focus on educational development of SC and ST, attempted to equalise the educational opportunities among different social groups. World Conference on EFA (1990) produced a broad consensus on universal access and equity in education while emphasising on strengthening the partnerships in education to meet the unmet goals of education. The first Human Development Report by UNDP in 1990 included 'to be educated' as a necessary aspect for maintaining a decent standard of life.

With the onset of liberalisation in 1991, India witnessed the growth of private schools and that of education at a large scale. To meet this increasing demand, District Primary Education Programme (DPEP) was launched in 1994, which targeted universalisation of primary education in around 600 regions. Dakar Framework (2000) set time-bound targets and said that the governments should ensure that all children, principally the girls, children living in different circumstances, those belonging to minorities, must have access to free education and also, to achieve the goal of gender equality in education by 2015. Sarva Shiksha Abhiyan (SSA), a flagship programme launched in 2001, aimed towards bridging the gender and social category gap in elementary education and improve the quality

of education thereof. This included increasing the resource base (opening new schools, additional classrooms, toilets, teachers, textbooks, uniforms, etc.). Insertion of Article 21A provided free and compulsory education to all children in the age group 6–14 years and made education a fundamental right. With the enactment and implementation of RTE Act 2009, India moved to the rights-based framework to education.

In India, there were around 81.5 lakh children who were out of school and out of these, the estimated numbers were 7.67 per cent for Muslims, 5.60 per cent for ST, 5.96 per cent for SC and 2.67 per cent for OBC and others (MHRD, 2010). Moreover, the girls, low caste children, and other underprivileged children were still over-presented in government schools (Mehta, 2005; Aggarwal, 2001; PROBE, 1999). By continuing the agenda, World Education Forum (2015) emphasised that the central role of education should be sustainable development paving the way for the Sustainable Development Goals (SDG 2015), one of which is to ensure equitable and inclusive quality education, and promote lifelong learning opportunities for all' (under the 2030 Agenda for Sustainable Development). This sets an ambitious agenda for the period from 2015 to 2030 and the process finally culminated in the Incheon Declaration.

Despite these efforts, educational levels improved very slowly and gaps were seen among social, religious, regional and gender groups. Further, by granting parents the right to choose the type of education that will be provided to their children, the education system aims to increase participation from the various groups of community. The execution of choice systems has resulted in huge gush of schools established by both the private as well as public providers. Increased availability of options has increased the accessibility of schools, but the opinions of parents regarding different schools are also diverse. People from a particular class share common interest, based on which they acquire a collective identity and develop a similar pattern of behaviour and identity through collective action. The decision to participate in schooling rests with the households and for this, the households compute the social and economic returns and the opportunities that education will generate for the child in future. In the light of this argument, the present study attempts to develop insights as to why parents choose a particular kind of school for their children and what are the factors that support their choices. The study also develops an understanding of whether the factors cited are merely perception based or the households make informed choices.

Review of Literature

Since the entry of the private sector in education, there has been a debate about why and which schools

parents should send their children to. The commodification of education and the prevalent market forces have affected the mindsets of the people regarding which school is best for their children. This entire debate was looked at critically by Coons and Sugarman (1978), who pointed out that parents choose that school for their children where children can be educated as per their own value system (Greene, 2001). Researches have shown that when parents are expected to assume functioning of the school as a part of their responsibility by paying a higher fee when they are educated and informed (Knowles, 1999) and are capable of securing the best placements for their children, they are more likely to seek out 'successful' comprehensive schools than the parents who are disengaged from education themselves. In this process, the poorest of the poor are excluded from participation or are left behind (Chubb and Moe, 1990).

Harma (2010) distinguished between school preference and the actual school choice made by the parents. School preference denoted the type of school that parents would like to provide for their children in the absence of any constraint and it may differ from the actual choice made by the parents. However, she found that there is a universal preference for private schools, yet the majority of children are enrolled in government schools and the primary reason for this is poverty. Further, due to moving up of wealthy families to the private sector, the government sector has become the option of last resort for the poor and marginalised. Ramachandran (2004) also highlighted the 'hierarchies of access', where she focussed that on going down the social and economic pyramid, the access and quality issues become much more pronounced. She further observed that a vast number of poor in rural and urban parts of India rely on government schools of different types and their quality may vary. The relatively better-off people in rural and urban India either access better government schools or opt for private aided and unaided schools. This is because parents from higher social and economic backgrounds are more likely to be able to afford school fees. On the other hand, the poor, who cannot afford the fees, but aspire to enrol their children in private schools, fail to do so (Majumdar et al., 2002).

Lampl (1999) said that with greater resources, and for having greater access to education and jobs (Desai et al., 2008; Baird, 2009); private schools are chosen. Exploring the factors which influence the selection of any school, Beavis (2004) found that the economic factors, occupational status and the perceptions of schools play a role in shaping their selection. While analysing the private enrolment throughout India, Baird (2009) highlighted that the supply-side factors have a little statistical relationship to private schools; they do exist because the parents demand these schools. Government funding

is inversely proportional to private enrolment and private enrolment is linked to teacher absenteeism in government schools and students travelling more to reach school increases the likelihood of children dropping out of schools (Mike et al., 2008). Analysing the trends of children moving between and within government and private schools during the first grades of primary school, James and Woodhead (2014) observed that the majority of school shifts occur within private schools as the parents attempt to secure the best private school for their children. The school-related factors that the parents consider are— better accountability and right to question in private schools which usually lacks in government schools. Private schools are 'English medium' and offer a better prospect of the service sector. Among other factors are the facilities offered, teachers' qualifications and their English speaking and teaching abilities.

- Besides, the factors such as academic attainment of students, socio-economic composition of the school and travelling distance from home to school also play an important role (Burgess et al., 2015). Dreze and Kingdon (1999) found that school participation, especially among girls, is determined by a wide range of variables including parental education and motivation, social background and non-teaching duties. Even pupil-teacher ratio was discovered to be important for families with the inclusion of mid-day meals. The participation of female children was found to be 15 per cent higher when the mid-day meal was provided in school than when it was not. Among the other factors responsible for low enrolment and retention of students in schools is lack of school infrastructure, absence of schools, the distance of schools, lack of facilities in schools, lack of teachers, teachers' accountability, curriculum, teaching methodology and lack of motivation (Mukherjee, 2011). Based on the 'Young Lives Study on Quality of Schooling in Andhra Pradesh', Singh and Bangay (2014) discovered that before making choice, parents seek a range of advice about schools and consult their neighbours about the quality of schools before sending their children to school. They also make financial sacrifices in the hope that their children will have a better life.

Thus, the factors determining the educational participation of children in a particular kind of school relate to the availability of teachers and resources, infrastructure, school performance and school accessibility. Since school participation responds to a wide variety of variables, thus in the light of the review, the present study attempts to ascertain the congenial as well as the enabling factors that determine the participation of children in the education system.

Objective

The major objective of this paper is to find out the factors which influence the households' decision for the choice of school for their children. By studying these factors, an attempt is also made to see if the choices they have made are informed choices or are the perceived ones.

Methodology

The study adopted a mixed-method design and is primarily based on a survey done by the researcher to collect the data about households' pattern of school choice and the factors behind that choice by using semi-structured questionnaires.

Study Design

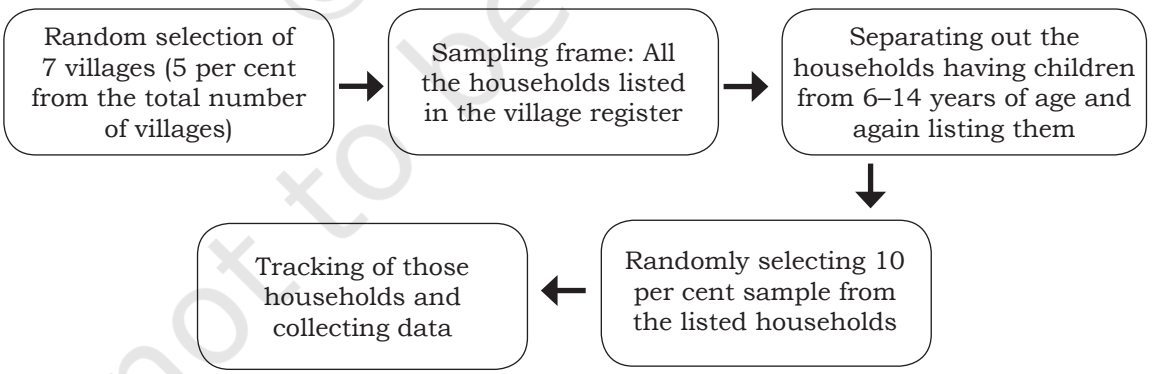
The study makes use of the field survey method wherein two semi-structured questionnaires were used to collect the data from the households and the schools.

Sampling Process

The sampling process involved the selection of villages followed by the selection of households from those selected villages. As per Haryana Statistical Abstract (2011–12), Faridabad has a total of 144 inhabited villages and those villages which had the availability of both private and government elementary schools were identified and listed. From among the listed villages, a sample of 5 per cent of villages was selected randomly, to constitute a total sample of 7 villages.

As the present study targets the elementary stage of education, the households possessing at least one child from the age group 6–14 years constituted the target group. The list containing the details regarding the head of the household, details of the number of members, their sex and age was obtained from aanganwadi workers of the village.

Graph 1: Stages of Sample Selection



Source: Researcher's compilation

From the list, firstly, those households were segregated in which there was at least one child from the age group 6–14 years. A sample of 10 per cent of households was then selected as the final sample using a random table method. The selected 190 households were then approached and were interviewed.

Selection of schools was also made after the interview from the households was done. One private unaided school and one government elementary school were selected from among the schools which were preferred by the households for their children. The total number of sampled schools was 21, out of which 13 schools were government schools and 8 schools were private unaided schools.

Findings of the Study

The study was conducted in seven villages of Faridabad and 190 households were selected and surveyed. 19 households were from village Karnera, 25 households were from village Samaipur, 48 from village Pali, 48 from village Seekri, 15 from village Kailgaon, 19 from Madalpur and 16 from village Kureshipur.

Educational Status of Children

The questionnaire used to collect data from the households had two parts, first part dealt with the collection of general information about the households and the second part consisted of questions about the schooling of the children in the households. The respondents were asked questions about the present educational status of their children, the kind of schools they are studying in and the factors they considered while making choice and who all were involved in this process. Taking an elaborated view of the schooling of a child from each selected household, 184 choice patterns were obtained. Of the total children, 36.8 per cent were boys while 62.6 per cent of children were female children. Of all the children attending schools, 40.5 per cent of children were going to the government school while 57.9 per cent were studying in private unaided schools; 1.1 per cent were found to be obtaining *madarsa* education and 0.5 per cent had never attended any school.

While choosing any school, parents often rely on certain types of network systems, usually the informal ones. This may include information gathered from people in their neighborhood, their own friends, friends of the child, etc. The parents also rely on the information made available by the schools formally in the form of brochures, pamphlets, advertisements and websites, etc. Although 55.8 per cent of the households said that they randomly enrolled their child in the school because someone recommended it as 'good', while 43.2 per cent of the respondents said that they chose the school by personally visiting it, surfing the internet, talking to

the parents of the children already studying in that school and talking to the teachers. Around 44.7 per cent of the households selected the school after consulting their neighbours or the friends of the child. 34.8 per cent of households choose the school based on its location; as that was the closest school to their households, so they preferred it. However, households also used formal means of gathering information about the school and relied on advertisements shown on TV or newspaper, pamphlets, school prospectus and internet searches. But it was also observed that the parents typically held very little information about their children's school or the choices available to them and very few households appeared willing to acquire the relevant information and made informed decisions. In other words, very few households knew how to find the information about the school, from where to find and how to use it.

The factors mentioned as most important by the households were school discipline, school's ability to impart moral values to their children, the medium of the school, quality of education and expenditures associated with schooling. While the religion of the teachers and other students of the school, timings of the school, resources, infrastructure and building of the school were least considered by the households while choosing the school. Besides, most of the households were unaware of the qualifications of teachers of the schools, the pupil to teacher ratio, the approaches used by the teachers to teach children and the performance of the school during the previous years.

Issue of Quality of Education

As perceived by the opinion of the households, quality was the major factor that influenced their shift of preference from the government to private schooling. English medium schools are often equated with 'good quality schools' by households as evidenced by higher percentage of participation of sampled households in different kinds of schools. The purpose of taking the schools was to see whether the households make informed choices about the schools or they merely make opinion based decisions. For assessing the quality of teaching and learning processes, various factors have been considered like the admission criteria of the school, maintenance of security and sanitation of children in school, training status and educational qualifications and appointment process of teachers, and evaluation system of teachers and students.

Infrastructural Facilities

All schools had good infrastructural facilities from having their own building, availability of blackboards, chalks, seating arrangements, drinking water, separate toilets for girls and boys, to playground and electricity. The government schools had good quality and fairly well-maintained buildings, a covered

verandah, a store-room and a large outdoor area. The selected private unaided schools varied considerably on account of the poor-quality building, improper rooms, and less outdoor area. The private schools had guards allotted at the gates and thus there was almost no scope for any child to escape from the school. Besides, the teachers of the schools were also quite attentive towards the security of the children. On the other hand, the government schools had no guards at the gates and it was very easy for the students to escape. This was cited as the main reason by the households that in government schools, children wander without any restrictions while in private schools, the children were made to sit in the classes which facilitate their learning.

In private schools, the parents pay the fee which includes tuition fee, examination fee, admission fee and transportation fee (if applicable). Whereas in government schools, no fee, in any form, was being charged by the school, students were given mid-day meals, provided textbooks, uniforms and the girls or children belonging to ST, SC or other minorities were given stipends. Discipline was also given utmost importance in private schools and rules were followed to maintain the same while the government schools lacked this aspect and hence households get a chance to opt for other schools than government schools.

Teachers' Training and Evaluation

Although none of the government schools had any untrained teacher, three private schools had a few untrained teachers at the elementary level. The private schools appointed teachers based on availability, while a proper procedure is followed in the government schools to appoint a teacher. Secondly, no proper evaluation system of the teachers was found in private schools. The evaluation of teachers was merely restricted to the surprise visits by Head Teacher or Principal in the classrooms and the teachers were given verbal feedback. While in the government schools, frequent visits were made by the higher-level officers like DEO, DDO, cluster head, etc. The teachers of the government schools were found to be evaluated annually using APAR (Annual Performance and Appraisal Report) and ACR (Annual Confidential Report), issued by the Education Department of Haryana. The government school teachers are evaluated at two levels, one by Head Teacher of the school and then by Elementary Education Head of the area. The teachers are assessed on the factors like punctuality, students' performance, behaviour with students and other teachers in the class and outside the class in school, use of teaching and learning material, their language and way of delivering the lecture, etc.

Student Evaluation

The structure of student evaluation was also found to be weak in private

schools. The government schools were provided with pre-designed evaluation sheets/booklet (as per the policy) separately for each child. These were so designed that each aspect of the child (scholastic or co-scholastic) was covered and gave detailed and timely progress of each child, while the private schools were following CCE pattern without any proper understanding, and evaluation of students was restricted only to the scholastic aspect. Most of the households were found to be ignorant of the evaluation system followed in the schools of their children.

The households with children in private schools were completely dependent on the tuitions for their academic performance. Households with children in private schools were completely dependent on tuitions for their academic performance whereas the households with children in public schools did not put much emphasis on their children's academic attainment.

Conclusion

The present paper has tried to pin down the factors that influence the role of households in choosing different kinds of schools. The rural households of the selected villages of Faridabad had the option to access the government schools managed by the Department of Education, the private unaided schools managed and run by the private authorities or *madarsas* (for muslims). The study found that the decision to choose any school lies with the father while the mother of the child was hardly involved in the process. But even after the fathers are educated, they fail to make informed choices about the schools that they are choosing. The participation percentage of households in the kinds of schools reveals that households choose private schools more than the government schools and are ready to pay even the meagre resources as tuition fee of their children. Government schools are preferred by the households which did not possess any resources or do not value education much. Private schools opted by the parents are the low fee-charging schools where the amount of fee to be paid by the households is decided based on their economic status. Such schools have emerged as alternatives to government schools which promise the parents a better-quality education for their children than the government schools.

Households who opted the government schools reasoned that they find government schools to be a representative of the local community. Also as the school's composition in terms of caste and economic status resembles a lot to the general structure of the community, it is more likely that the children value inclusiveness and thus support each other, including the minorities and the disadvantaged groups. Other people choose private schools as they provide a better academic environment, a sense of safety, better teachers without frequent absenteeism and the accountability

of schools for students' performance. It was also evident that parents give importance to the schools having traditional values as well as wearing a clean and tidy school uniform and studying in a more hygienic environment.

Further, these small and low fee private schools have copied the educational pattern and practices of some elite private schools and then advertise accordingly despite the fact that that they lag in almost all the aspects. They have weak students' and teachers' evaluation systems and fail to provide the basic facilities to them. Although the households consider a lot of factors while enrolling their children in a school, they somehow fail to make informed choices. This is because most of the households rely on the opinion of their neighbours and friends or the information made available from the schools in terms of advertisements or pamphlets for making a choice and give least importance to check the validity of that information. This demonstrates that interpersonal networks serve as an efficient means of gathering information. However, formal networks in terms of internet searches and advertisements were seen to be less preferred methods of gathering information about the schools. Very few people visit the schools to enquire about the general working and specific aspects regarding teachers, methods of teaching, activities carried on, examination, etc. In the absence of the willingness to enquire for the same and due to the lack of awareness of the educational policies and rights of parents and children, the households end up making uninformed choices. Thus, the households should understand that having the right to choose the type of education for their children gives them the power to demand quality education for their children and to effect changes through their own efforts. But all this is possible only if they are willingly involved in the education of their children.

References

Aggarwal, Y. 2001. Progress Towards Universal Access and Retention, Analytical Report. National Institute of Educational Planning and Administration. New Delhi.

Baird, R. 2009. Private schools for the Poor: Development, Provision, and Choice in India. Doctoral dissertation. University of Oxford.

Beavis, A. 2004. Why Parents Choose Public or Private Schools. *Research Developments*. Vol. 12, No. 12. p. 3.

Burgess, S., E. Greaves, A. Vignoles and D. Wilson. 2015. What Parents Want: School Preferences and School Choice. *The Economic Journal.* Retrieved October 15, 2020 from https://onlinelibrary.wiley.com/doi/full/10.1111/ecoj.12153. 125 (587), 1262–1289.

Chubb, J.E. and T.M. Moe. 1990. America's Public Schools: Choice is a Panacea. *The Brookings Review*. Vol. 8, No. 3. pp. 4–12.

Coons, J. and S. Sugarman. 1978. Education by Choice. *The Case for Family Control*. Berkeley: University of California Press. Berkeley. pp. 133–212. Doi: https://doi.org/10.1525/9780520317390.

Desai, S., A. Dubey, R. Vanneman and R. Banerji. 2008. Private Schooling in India: A New Educational Landscape. *India Policy Forum*. Global Economy and Development Program, The Brookings Institution. Vol. 5, No. 1. pp. 1–58.

Dreze, J. and G.G. Kingdon. 1999. School Participation in Rural India. The Development Economics Discussion Paper. Series, No. 18. London School of Economics. London.

Government of Haryana. 2013. Department of Economic and Statistical Analysis, Haryana. Statistical Abstracts Haryana. 2011–12. Retrieved 9 December, 2020 from http://14.139.60.153/handle/123456789/8997.

Government of India. 1986. *National Policy on Education*. New Delhi, India. Retrieved June 12, 2020 from https://www.education.gov.in/sites/upload_files/mhrd/files/upload_document/npe.pdf.

Government of India. 2011. *Census*. Directorate of Census Operations, Haryana. Retreived December 10, 2020 from https://censusindia.gov.in/2011-prov-results/prov_data_products_haryana.html.

Government of India. 1951. *Census of India*. New Delhi. Retrieved October 20, 2020 from https://censusindia.gov.in/DigitalLibrary/data/Census_1951/Publication/India/23685-1951-REP.pdf.

Government of India. 2010. Selected Educational Statistics, Ministry of Human Resource Development (MHRD). Retrieved November 17, 2020 from https://www.education.gov.in/sites/upload_files/mhrd/files/document-reports/AR2010-11.pdf.

Government of India. 1968. *National Policy on Education.* Ministry of Human Resource Development. New Delhi, India. Retrieved October 29, 2020 from https://www.education.gov.in/sites/upload_files/mhrd/files/document-reports/NPE-1968.pdf.

Greene, J.P. 2001. *An Evaluation of the Florida A-Plus Accountability and School Choice Program*. Center for Civic Innovation at the Manhattan Institute. pp. 15–18.

Harma, J. 2010. *School Choice for the Poor? The Limits of Marketisation of Primary Education in Rural India. CREATE Pathways to Access. Research Monograph.* No. 23, pp. 38–48

James, Z. and M. Woodhead. 2014. Choosing and Changing Schools in India's Private and Government Sectors: Young Lives Evidence from Andhra Pradesh. *Oxford Review of Education*. Vol. 40, No. 1. pp. 73–90.

Kingdon, G.G. 2005. Private and Public Schooling: The Indian Experience. Paper presented at the conference: "Mobilizing the Private Sector for Public Education" Co-sponsored by the World Bank Kennedy School of Government, Harvard University (pp. 5–6). Retrieved on January 22, 2020 from https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.168.5082&rep=rep1&type=pdf.

Knowles, K. T. 1999. The Effect of Teacher Engagement on Student Achievement and Motivation. NELS: 88, eighth grade, tenth-grade. Doctoral dissertation, University of Maryland, College Park, 1990. Dissertation Abstracts International, 60, 1010, pp. 133–148.

Kothari Commission. 1964. Kothari Commission Report on Education. Retrieved November 12, 2020 from http://14.139.60.153/handle/123456789/2448.

Lampl, P. 1999. Opening up Elite Education. *Prospects*. January.

Majumdar De, A., M., Samson, M., and C. Noronha. 2002. Private Schools and Universal Elementary Education, in Govinda, R. (Ed.). *India Education Report: A Profile of Basic Education*. Oxford University Press. New Delhi. pp. 131–150.

Mehta, A.C. 2005. Elementary Education in Unrecognised Schools in India. National Institute of Educational Planning and Administration. Retrieved on 10 October 2019.

Mike, I.O., A. Nakajjo and D. Isoke. 2008. Socioeconomic Determinants of Primary School Dropout: The Logistic Model Analysis (No. Research Series No. 54). *Kampala, Uganda: Economic Policy Research Centre (EPRC)*.

Mukherjee, D. 2011. Reducing Out-of-School Children in India. *Journal of Educational Planning and Administration*. Vol. 25, No. 2. pp. 171–183.

PROBE Team. 1999. Public report on basic education in India, Oxford University Press, Delhi. Retreived January 30, 2020 from https://www.undp.org/content/dam/india/docs/public_report_basic_education_india.pdf.

Ramachandran, V. (Ed.). (2004). *Gender and social equity in primary education: Hierarchies of access*. SAGE Publications India, p. 79.

Singh, R., and C. Bangay. 2014. Low Fee Private Schooling in India— More Questions than Answers? Observations from the Young Lives longitudinal research in Andhra Pradesh. *International Journal of Educational Development*. 39, pp. 132–140.

UNDP. 1990. Human Development Report. Oxford University Press. New York. Retrieved October 15, 2020 from http://hdr.undp.org/sites/default/files/reports/219/hdr_1990_en_complete_nostats.pdf.

UNESCO. 2015. World Education Forum. Equitable and Inclusive Quality Education and Lifelong Learning for all by 2030. Transforming lives through education. Retrieved August 1, 2020 from https://sustainabledevelopment.un.org/index.php?page=view&type=13&nr=1360&menu=35.

United Nations. 2015. Transforming Our World: The 2030 Agenda for Sustainable Development. UN, New York. Retrieved October 17, 2020 from https://sdgs.un.org/2030agenda.

World Conference on Education for All, and Meeting Basic Learning Needs. 1990. *World Declaration on Education for All and Framework for Action to Meet Basic Learning Needs*. Retrieved October 26, 2020 from https://www.right-to-education.org/sites/right-to-education.org/files/resource-attachments/UNESCO_World_Declaration_For_All_1990_En.pdf.

A Review of Motivational Influences of Emotions on Academic Goal Pursuit

Deepmala*

Abstract

Academic performance has long been assumed as the baseline to measure the progress of the child both in schools as well as in life. It can be both, a source of stress and a source of relief and motivation for further actions. Yet, the educators are still inquisitive to explore the factors responsible to promote the academic achievement. This paper looks upon educational goals as the central objective of study and emphasises the role of emotions as the motivational factors to propel the academic goal pursuit of the students in the right direction. It tries to revisit the question why certain students are so motivated to pursue their goals despite challenges and difficulties whereas others find excuses and shut themselves from further growth.

Introduction

As educational goals are a decisive factor for determining the academic performance and classroom behaviour of a student, the educators are always curious to unfold that why some students are motivated to achieve their academic goals while others are not. As our classrooms are always in a state of flux, it is quite difficult to locate one fixed cause for performance of the students in classroom tasks. Yet in an attempt to explore the same, the centrality of this review is to explore the role of emotions as the impetus to further direct the actions of the learner in classroom tasks such as planning and preparing for the classroom activities in advance, or completing home assignments on time, seeking help, etc. The paper further draws the inferences about the motivational role of emotions in light of the Achievement

**Assistant Professor*, DEPFE, NCERT, Hauz Khas, New Delhi

Goal Theory, the Attribution Theory and the Prospect Theory, analysing the causality of the students' behaviour towards their academic goals. Furthermore, this review paper contrasts the prevalent traditional view of emotions as an outcome with contradictory interpretations of emotions as a facilitating/inhibitory factor for academic achievement of the students.

The aim is to provide implications for future studies for developing classroom interventions in this area by exploring if the emotions can be manipulated to help a learner achieve the academic goals.

This paper is based upon the review of various research papers and articles published in international and national education. The analysis also included psychology journals as well as online available literature in addition to some relevant books (both print and digital). The review also covers the research studies conducted over the last four decades on the role of emotions in education, emotions and motivation and the motivational theories individually.

Studies on Educational Goals

The present study acknowledged the goals as described by Schutz, et al. (2001), as the determinants of achievement based on the efforts and persistence. Several scholars have also defined goals as specific to the individuals pertaining to their choice about future results on the basis of which they decide whether to continue the task or not. Also, goals are stated as cognitive representation of an end state by Fishbach and Ferguson (2007), which governs daily choices of a person including goal selection, plan and the actions taken to achieve them.

Different types of goals including prehedonic goals, performance goals, eudaimonic goals, epistemic goals, and social goals, are also explored to understand the influence of emotional experiences on task performance. It was seen by Webb et al. (2012) that prehedonic goals are includes positively associated with active coping, distraction, and cognitive reappraisal, as those are effective in changing the current emotional experience. Similarly, social goals are a crucial part of academic life. Through education, the children not only learn the concepts of various subjects but also prepare themselves as active and productive social individuals through the daily processes of scaffolding, analysing and further directing the various social skills such as peer interaction, conflict resolution, perspective taking, self-awareness, etc., to define their daily behaviour. Similarly, eudaimonia goals are important for the happiness and well-being of the person and epistemic goals define the knowledge and justification part. Teachers, parents, educators and learners consider success to be the achievement of epistemic goals as the sole criterion of academic achievement. However, if one denies or ignores the importance

of eudaimonic and social goals, not only chasing other goals become difficult but also the joy of sustaining on the existing goals will be missing. This will further lead an individual to select another goal.

Motivation for Learning Goals

Motivation is an important construct which governs the goal-appropriate action of the learner. It has been studied as an important predictor of learning in the past (Ryan and Connel, 1989; Pintrich, 2003).

Deci and Ryan (1989) assert that motivation encopasses all the aspects of activation and intention that have energy, direction, persistence and equifinality at its core. Exploring the work of Deci and Ryan (1989, 2000), one can identify that the motivational influences towards the goal depend upon the perceived reason of goal regulation by the individual. When the person views the selected goal as impersonal, it eliminates the motivation from within and the goal regulation is external. It can be said that if the predicted reason is in the environment, the goal regulation is external, which is dependent on the presence of rewards and punishment. However, if the perceived control of the achievement is within, the individual is internally motivated and the goal regulation is also intrinsic.

The paper further investigates the determining factors for achieving those goals from the perspective of 'The Attribution Theory' an proposed by Weiner (1986). The attribution theory is an important goal theory which gives an underlying explanation of events as per their locus of causality. On the basis of this theory, the interpretation can be drawn that the ability, effort, task difficulty and luck are the main attributing factors for achievement. The internal attribution can be explained when the individual's ability and efforts are predicted as the reasons for achievement whereas the task difficulty and luck are considered as the external attributors as the cause of an outcome is beyond an individual's control. These attributed factors result in making a person to experience positive and negative emotions depending on the outcome. For example, when failure occurs while pursuing goals, it appears that the internal attribution often results in unpleasant emotions such as guilt and shame. On the other hand, their association with achievement and goal directed action elicits positive emotions like pride and joy.

This theory gave an important insight to the researchers looking for causal ascriptions of the behaviour or action of the learner on the task. As studied by Weiner and Graham (1989), the taxonomy of emotions is considered as a link between past outcomes and future behaviour, in a manner that past outcome results in emotions which is helpful in predicting future behaviour. The perceived cause of an outcome based on the attributional theoretical model includes lack of ability, perceived difficulty of the task, efforts and

luck governs how an individual establishes ones goals. This explains both the likes and dislikes of the learner towards the educational tasks. When investigated from the attributional analysis, the importance of various emotions experienced by the students in their academic life becomes more meaningful to be understood as the motivational feature shaping goal regulatory behaviour of the learner.

Another important theory explored here is 'The Achievement Goal Theory' put forward by Pintrich (2000), to explain students' academic motivation. The theory basically differentiates the inherent capacity lying within the individual when targeting goals. It identifies two types of goals— mastery goals and performance goals. Individuals with mastery goal orientation emphasises more on understanding and learning, whereas those with performance goal orientation are motivated on demonstrating one's ability or competence, often in relation to others.

School Climate as the Determinant of Goal Achievement

The classrooms offer countless occasions where the students experience different emotions including pleasant and non-pleasant ones, and the simple and complex sets. Hence, it would be unjust to discuss the regulation of academic goals without the mention of those. Although theory gives more prominence to individual differences while considering their goal orientations and asserts that people vary in preferences to make choices. However, it has been demonstrated through recent studies that classroom context also plays a major role to decide the students' goal orientation. For example, Anderman and Patrick (2012), in an attempt to understand achievement goal theory, ability and classroom climate, have claimed that social context has an influential role on goals. Urdan et al. (1998) have also suggested that teaching practices in addition to the overall school climate, are important factors which decide whether the students select mastery or performance goals. Yet, it was agreed in a study by Bartlett, et al. (2006), while working on different matters in sports like self-confidence, anxiety, etc., that it is the presence of positive emotions such as enjoyment, satisfaction and interest experienced by a task-orientated performer during participation in the activity which keep them motivated to work. So, it can be discerned based on the past evidences from the studies that though the school environment and instructional practices are the determining factors for academic goal selection and goal pursuit, the stout existence of various emotions and their impact in daily life cannot be undermined.

Relationships between Emotions and Goal Regulation

Academic researchers, while trying to comprehend the various parameters to understand the engagement of students with school and learning, have found emotions as a crucial component for generating interest of the learner within learning. It is also a critical factor in deciding the persistence in a task and achievement of classroom goals; along with behavioural and cognitive components. Further to unfold the relationship between goal regulation and emotion utilising the motivational principles, first the review elaborated upon the function of emotions in education. Bagozzi et al. (1998) determine the informational and motivational function of emotions during goal pursuit. Emotions provide feedbadk for goal attainment through their informational role, and their motivational function is to energise goal-oriented action, leading to an individual's goal-focused behaviour. The individuals design or choose particular strategies to alter the emotional experiences associated with that goal which further strengthen or minimise the goal achievement. In the study by Milgram et al. (1992), it was seen that individuals choose distraction, instead of rumination, to reduce the negative emotional experience. Further to understand the motivational role of these emotions while studying the academic goals, a good number of evidences are produced from the literature which suggest that goals are pursued with greater vigour when they are linked with positive effects as opposed to negative effects (Aarts, et. al, 2007; Aarts, et. al, 2008).

Numerous studies were conducted in the past highlighting the characteristics of emotions (Izard, 2009), role of emotions in education (Schutz and Lanehart, 2002), emotions and motivation separately, but the inquiry of the motivational influences of these emotions produced within the classroom processes on academic goal regulation has been very limited. Studies by Higgins (1997), Carver and Scheier (1990) suggest the presence of two different motivational systems which further produce positive and negative affects. One is the approach incentive systems and another is driven by the avoidance of threat. In the same line of enquiry, Carver and Jones (2009) suggest that when one performs well on the task with the intention to approach it and succeeds on it, it produces positive activating emotions such as joy and delight; whereas failure in the same causes negative emotions. Similarly, when one takes action in order to avoid the task would also produce positive emotions such as relief. This may explain the avoidance behaviour of the students in case of difficult tasks.

The above analysis of approach and avoidance behaviour of the learner can be understood based on their classification given by Pekrun (2011). He has distinguished the academic emotions with reference

to their performance properties and have classified them as:

(a) Positive activating emotions, e.g., hope, pride, joy of learning and positive deactivating emotions like relief, contentment;

(b) Negative activating emotions such as anger, anxiety, shame; and negative deactivating emotions, e.g., boredom, hopelessness.

The positive activating emotions provide the energy to motivate towards goal-oriented tasks, whereas positive deactivating emotions obstruct the motivation to persist on goal related tasks. Contrarily, negative activating emotions provide an internal push for an individual to pursue the goal-oriented tasks; and negative deactivating emotions demotivate the learner to obstruct the task behaviour. It further disengages the learner from the academic activities. It also explains that an individual devotes ones energy, time and efforts on a task, only if they believe that the outcome is achievable. Contrarily, an individual is withdrawn from the task if the outcome is unachievable or uninteresting. These predictions are in line with the analysis of attribution theory done in this review as mentioned in the previous section.

Another important theory studied here is 'The Prospect Theory', postulated by Heath et al. (1999). This theory well explains the motivation of an individual to chase a goal. It mentions that the success and failures are identified on the basis of the reference points. These points are the goals. If an individual fails to achieve the selected reference point, the negative affects are evoked, which further develop diminished sensitivity to work towards achieving that goal. Based on his work, Heath et al. (1999) suggested setting proximal goals or subbing goals so that an individual stay motivated on that line. The same finding has been contradicted by Amir and Ariely (2008), who asserted that sub-goals result in contentment and distract attention from the main goal. Goal progress is important not only as an early indicator of goal achievement but its success also develops positive emotional experiences, which influence the further task performance. The same has been studied by Fox and Hoffman (2011), who emphasise that throughout the process of goal pursuit, the associated experiences of an individual may decide their future preferences for the task. If the experiences are positive, the individual is motivated to engage in associated or similar activities and vice-versa. As evident through the diversity of researches in education, sports and clinical disorders, our emotional experiences impact our motivation towards the goal regulation in different fields, the motivational role of emotions during goal regulation in education has been an understudied area.

Evidences from Neuroscience Studies on Task Approach and Motivation

In an attempt to frame the neural pathways found to be involved in task approach and motivation system, it was found that high intensity positive affects are associated with brain regions involved in motivational processes and the behavioural approach system, such as nucleus acumbens, anterior cingulated cortex, insula and prefrontal cortex (Berridge, 2012; Harmon-Jones and Gable, 2008). Also, high intensity positive affects induce attentional narrowing, reduce cognitive flexibility, and shorten time perception to help people focus on a desired object or goal (Gable and Harmon- Jones, 2008; Price and Harmon-Jones, 2010). As discussed by Hart and Gable (2013), the cognitive narrowing caused by high intensity positive affect likely facilitate goal pursuit by excluding irrelevant perceptions and cognitions and allowing the individual to zero-in on the primed goal. Simultaneously, a high intensity positive state may provide information about the value of primed goal.

Studies have indicated that in order to follow their goals, regulation of emotions is required within a person. Illies and Judge (2005), presented a model highlighting the influences of feedback on consequent goals through an affective mechanism associated with the two behavioural motivation systems— performance feedback signalling success or failure (in reaching the initial goal) influencing individuals' positive and negative affect, which in turn activates the behavioural approach or avoidance system. Illies and Judge (2005) also provided evidence that motivational state varies within individuals as a function of performance feedback.

Challenges in the Study of Emotions Towards Goal Regulation

Also, an important concern in the study of emotions being raised here is about the possibility of studying emotions in isolation excluding the cognitive and behavioural aspects of classroom processes. In a cognitive motivational model proposed by Pekrun (1992), it is assumed that the effects of emotions on learning and achievement are mediated by a number of cognitive and motivational mechanisms. Many scholars have contributed to the cognitive evaluation model of emotions whereas a number of scholars, using the frameworks of both socio-cognitive theory (e.g., Bandura, 1991; Bandura and Cervone, 1983) and control theory (e.g., Carver and Scheier, 1990,), have suggested that positive and negative affective reactions have important motivational implications during the process of goal regulation. Hence, the role of affects to stimulate the motivational systems cannot be ignored, however, when these characteristics of the affects act as facilitators or the inhibitors is an aspect yet to be explored.

Who Determines the Goals in Classrooms?

How different individuals distinguish a situation determines their action which can be a coping behaviour, a distraction from the task, or performance on the task. A student who faces severe criticism or harsh remarks from the teacher, would try to escape the task and make excuses. In contrast, the one who is being praised by others would choose to make efforts towards the completion of the task. This can be explained by Higgin's work (1997). It suggests emotional experiences by the way one regulates pleasure and pain marks the promotion focus and prevention focus approach adopted by one to achieve the desired end state. In both cases, the person is motivated to attain the desired end state, however, a promotion focused individual is highly motivated towards accomplishments, aspirations, hopes, and tries to regulate the behaviour to achieve positive outcomes. As the emphasis here is upon hopes, ideals and the individual aims for rank and position in the class or grades in the tests, it is called the promotion focus approach. Contrarily, one chooses the prevention focus approach when the motivation is upon accomplishing one's responsibilities or ensuring safety as the prominence is to reduce negative results. The implications of the insight gained by Higgin's works (1997, 1998) may help the teacher to accordingly plan the learning tasks. If regular instructions such as stay in your queue, wake up early, as well as setting clear goals and feedback charts would motivate the prevention-focused students to pursue their tasks. The role models and inspirational stories can work better with promotion-focused students. So, an insight about the approach selected by a student can help the teacher to accordingly design the incentives and appropriate classroom strategies, it would also be helpful in managing the problem behaviour of students.

The present review tried to examine the motivational influences of emotions on academic goal pursuit. Although the clinical implications of emotion and goal regulation have been thoroughly studied specifically in case of clinical depression and anxiety, still a dearth of work exploring an association of emotional and motivational principals of educational goals is seen. The analysis of goal regulatory behaviour by considering motivational dimension of emotions suggests that the feelings one encounter during various actions of goal pursuit further influences the goal persistence or change in goal. It does not simply mean that dichotomous emotions, i.e., positive and negative ones result in approach and avoidance behaviour respectively rather the emotional regulatory behaviour can help an individual trigger goal selection or sustain on the present one or may cause choosing different goals.

Conclusion

In this paper, we have discussed how the classroom processes generate different emotions and the key role of those in goal pursuit. We propose a link between emotions, motivations and goal-regulation, explaining motivation as the energy which regulates the behaviour or action of an individual and emotions as the feedback mechanism operating this energy. One may say that emotions serve to provide the facilitatory or inhibitory impetus towards goal pursuit. Further, this adaptive function of emotions is explored clarifying the activating and deactivating role of both positive and negative emotions as proposed by Pekrun (2011), determining future action of the learner. Rightly said, positive activating emotions are correlated positively with intrinsic motivation generating interest of the learner to chase the selected goal. Similarly, one can find suitable evidences to prove the validity of correlation between negative deactivating emotions with loss of motivation.

As demonstrated through the literature, the learners are motivated to select the academic goals and choose to sustain on it, if the emotions they experience are of the activating nature regardless of the immediate classroom demands. For instance, a student loses motivation on continuously been rewarded for the achievement as she or he is overwhelmed with the contentment whereas on being challenged on some complex task, they are motivated to pursue it further as the emotion brings pride to them. An important implication of this finding is to help the educators and researchers find gaps in their interventions and design personally initiated strategies of learning.

Simultaneously, the paper also examines the role of emotions during various stages of goal regulation including goal setting, goal striving and goal progress highlighting the perspectives of future research to provide classroom implications. It can be stated that the fragmented work done till date still requires multilevel analysis considering the cognitive, emotional, motivational, and meta-cognitive processes together. As one component influences the existence of another, bringing out change at one level would also serve as the feedback for others.

References

Aarts, H., R. Custers and , R.W. Holland. 2007. The Nonconscious Cessation of Goal Pursuit: When Goals and Negative Affect are Coactivated. *Journal of Personality and Social Psychology*. Vol. 92, No. 2. pp. 165–178.

Aarts, H., R. Custers and H. Marien. 2008. Preparing and Motivating Behaviour Outside of Awareness. *Science*. 319 (5870): 1639

Anderman, E.M. and H. Patrick. 2012. Achievement Goal Theory, Conceptualisation of Ability/Intelligence, and Classroom Cimate. In S.L. Christenson, A. L. Reschly, and C. Wylie (Eds.). *Handbook of Research on Student Engagement*. pp. 173–191.

Amir, On and Dan Ariely. 2008. Resting on Laurels: The Effects of Discrete Progress Markers on Task Performance and Preferences. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. Vol. 34, No. 5. pp. 1158–71

Bagozzi, R.P., H. Baumgartner and R. Pieters. 1998. Goal-Directed Emotions: Cognition and Emotion. Vol. 12, No. 1. pp. 1–26.

Bandura, A., and D. Cervone. 1983. Self-Evaluative and Self-Efficacy Mechanisms Governing the Motivational Effects of Goal Systems. *Journal of Personality and Social Psychology*. Vol. 45, No. 5. pp. 1017–1028.

Bandura, A. 1991. Social Cognitive Theory of Self-regulation. *Organisational Behaviour and Human Decision Processes.* Vol. 50, No. 2. pp. 248–287.

Bartlett, R., C. Gratton and C. Rolfe. 2006. *Encyclopedia of International Sports Studies*. Routledge, London. Vol 1, A-E.

Berridge KC. 2012. From Prediction Error to Incentive Salience: Mesolimbic Computation of Reward Motivation. *European Journal of Neuroscience*. Vol. 35, No. 7. pp. 1124–1143.

Carver, C.S. and E. H. Jones. 2009. Anger is an Approach-Related Affect: Evidence and Implications. *Psychological Bulletin.* Vol. 135, No. 2. pp. 183–204

Carver, C.S., and M.F. Scheier. 1990. Origins and Functions of Positive and Negative Children. *Journal of Experimental Child Psychology*. Vol. 109, No. 3. pp. 294–310.

Fishbach, A., and M.F. Ferguson. 2007. The goal construct in social psychology. In A. W. Kruglanski and E. T. Higgins (Eds.). *Social Psychology: Handbook of Basic Principles*. (pp. 490–515). Guilford Press, New York.

Fox, J. and W. Hoffman. 2011. The Differentiated Instruction Book of Lists. Jossey-Bass, San Francisco.

Gable P.A., E. Harmon-Jones. 2008. Approach-motivated positive affect reduces breadth of attention. *Psychological Science*. Vol. 19, No. 5. pp. 476–482

Hart W. and P.A. Gable. 2013. Motivating goal pursuit: The role of affect motivational intensity and activated goals. *Journal of Experimental Social Psychology*. Vol. 49, No. 5. pp. 922–926.

Heath C., R.P. Larrick and G. Wu. 1999. Goals as Reference Points. *Cognitive Psychology*. Vol. 38, No. 1. pp. 79–109.

Higgins, E.T. 1997. Beyond Pleasure and Pain. *American Psychologist*. Vol. 52, No. 12. pp. 1280–1300.

Higgins, E.T. 1998. Promotion and Prevention: Regulatory Focus as a Motivational Principle. *Advances in Experimental Social Psychology*. 30, pp. 1–46.

Illies R., and T.A. Judge 2005. Goal Regulation Across Time: The Effects of Feedback and Affect. *Journal of Applied Psychology*. Vol. 90, No. 3. pp. 453–467.

Izard C.E. 2009. Emotion Theory and Research: Highlights, Unanswered Questions, and Emerging Issues. *Annual Review of Psychology*. Vol. 60. pp. 1–25.

Milgram, N.A., T. Gehrman and G. Keinan. 1992. Procrastination and Emotional Upset: A Typological Model. *Personality and Individual Difference.* Vol. 13, No. 2. pp. 1307–1313.

Pekrun, R. 1992. The Impact of Emotions on Learning and Achievement: Towards a Theory of Cognitive/Motivational Mediators. *Applied Psychology: An International Review.* Vol. 41, No. 4. pp. 359–376.

Pekrun R. 2011. Emotions as Drivers of Learning and Cognitive Development. *New Perspectives on Affect and Learning Technologies.* pp. 23–39.

Pintrich, P.R. 2000. Multiple Goals, Multiple Pathways: The Role of Goal Orientation in Learning and Achievement. *Journal of Educational Psychology.* Vol. 92, No. 3. pp. 544–555.

———. 2003. A Motivational Science Perspective on the Role of Student Motivation in Learning and Teaching Contexts. *Journal of Educational Psychology.* Vol. 95, No. 4. pp. 667–686.

Price T.F., E. Harmon-Jones. 2010. The Effect of Embodied Emotive States on Cognitive Categorisation. *Emotion.* Vol. 10, No. 6. pp. 934–938.

Ryan, R.M. and E.L. Deci. 1989. Bridging the research traditions of task/ego involvement and intrinsic/extrinsic motivation: Comment on Butter (987). *Journal of Educational Psychology,* Vol. 81, No.2. pp 265–268. http://doi.org/10.1037/0022-0663.81.2.265.

Ryan, R.M., and J.P. Connell. 1989. Perceived Locus of Causality and Internalisation: Examining Reasons for Acting in two Domains. *Journal of Personality and Social Psychology.* Vol. 57, No. 5. pp. 749–761.

Ryan, R.M. and E.L. Deci. 2000. Self-determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-being. *American Psychologist.* Vol. 55, No. 1. pp. 68–78.

Schutz, P.A., E. Crowder, and V. E. White. 2001. Development of a Goal to Become a Teacher. *Journal of Educational Psychology.* Vol. 93, No. 2. pp. 299–308.

Schutz, P. A., and S.L. Lanehart. 2002. Introduction: Emotions in Education. *Educational Psychologist.* Vol. 37, No. 2. pp. 67–68.

Urdan, T., C. Midgley and E.M. Anderman. 1998. The Role of Classroom Goal Structure in Students' Use of Self-handicapping Strategies. *American Educational Research Journal.* Vol. 35, No. 1, pp. 101–122.

Webb. T. L., E. Miles and P. Sheeran. 2012. Dealing with Feeling: A Meta-analysis of the Effectiveness of Strategies Derived from the Process Model of Emotion Regulation. *Psychological Bulletin.* Vol. 138, No. 4. pp. 775–808.

Weiner, B. 1986. *An attibutional theory of motivation and emotion.* Springer-Verlag, New York. pp. 159–190.

Weiner, B. and S. Graham. 1989. An Attributional Approach to Emotional Development. In C. Izard, J. Kagan, and R. Zazonc (Eds). *Emotions, Cognition and Behaviour.* Cambridge University Press. pp. 167–191.

Changing Face of Science Education in India During the COVID-19 Pandemic

Sunita Singh* and Kajal Verma**

Abstract

COVID-19 pandemic has led educational institutions to be shut down to contain the infection. Still, it was carried out online, which resulted in the students' isolation from physical interaction in contrast to the exploratory nature of Science. As a result, it compelled researchers to investigate the nature of science education during COVID-19. This paper critically analyses the nature of science education in Indian classrooms in a complete virtual mode. The exploratory method was adopted where teachers, students, and parents were interviewed through zoom meetings, and for further information, semi-structured questionnaires in the form of Google forms were shared. The study has been conducted from August to October 2020. The findings reveal that online mode was not favourable for many learners, due to lack of resources and facilities. Responses confirm that it was inadequate to facilitate science teaching and learning in a complete virtual mode as it limits the basic premise of nature of science, i.e., exploration. Students weren't able to perform experiments at home and teachers were not techno-savvy. However, they still managed to teach science at the elementary level, subsequently, a daunting task at secondary and senior secondary level.

The COVID-19 pandemic has tremendously affected the entire world. It has changed the global perspective towards the value of life. It has been observed that the geopolitical aspects, like global economy, social life, environment, and health in terms of physical and

* *Assistant Professor*, Department of Education, University of Delhi, India.
** *Research Scholar*, Department of Education, University of Delhi, India.

mental health, have been affected severely. Education has also not been untouched by these circumstances, especially the developing countries, where access to education is not feasible in a formal setup. Governments around the world have temporarily closed educational institutions to contain the spread of pandemic.

UNESCO's report (UNESCO, 2020, *Global Monitoring on School Closure*) revealed that 1,198,969,357 learners were affected among 68.5 per cent of the total enrolled. However, the number of affected learners has decreased, but a huge fall in the number of enrolled students due to COVID-19 has also been noted. The learners are still struggling with long academic breaks. In India, most of the schools remained shut till now (2021). The pandemic has squandered the education system, and still, it is growing rapidly.

The present study laid emphasis on teaching and learning of science education in India up to senior secondary level and the major purpose is to understand how it is affected due to COVID-19 pandemic. It has changed most of the curricular practices such as synchronised and asynchronised pedagogical interventions related to the transaction of course content in virtual classroom setting, 30 per cent deduction of syllabus from CBSE, virtual assessment and e-evaluation strategies are used by most of the secondary schools in various states. It is observed that education is digitalised as the teacher and the students are meeting virtually for the process of learning in developing countries too.

The issue arises here, whether it is affordable for the Indian Students. The reasons for the reconsideration of access to digital education are— First, in India, approximately 6.8 per cent of people are below the poverty line, i.e., less than ₹27000 per annum as family income. Second, India is the second largest populated country in the world. It is hard to imagine, a family including two-three children with less than ₹27000 per annum, can support online mode of education, which demands smartphones, strong internet connection, and electricity. Also in India, remote and inaccessible villages have always proved to be a major challenge in the country's electrification drive (BBC News, 2018).

In addition, data shows that only 54 per cent of the Indian population have an internet facility and that too, it is limited to the urban population with men using the internet roughly twice as requently as women, it is (Hindustan Times, 2020). Consequently, many children are struggling to access education during COVID-19 pandemic, and that too specifically in science education. However, the digital divide in terms of equity and access to online mode of education becomes a prominent query for researchers:

- Why are inequalities occurring in India in terms of access to electricity, internet and devices?
- What are the issues of 'affordability and accessibility' in rural India in terms of education?

The accessibility issues pertaining to science education lie both on the physical and content level. These issues are more prevalent in the realm of science education as the existing discourse concludes on disadvantaged groups (for instance girls, learners with disabilities, those who belong to remote/rural/tribal areas) in science. In addition, the position paper of 'Teaching of Science', NCERT (2006) also acknowledges 'equity' as a significant issue in science education. Therefore, this study presents a critical perspective on virtual education with reference to 'school science education'.

Literature Review

A study by KMPG in India and Google (KMPG in India and Google, 2016), reveals that India witnessed a significant increase in the total internet users population by 31 per cent till 2016, where maximum use of online learning mode has been adopted by primary and secondary school learners and expected to grow from 409 million internet users to approximately 735 million by 2021. Besides, studies have shown some negative impacts of online mode of education such as reduced employment opportunities, unpreparedness to online platforms for students and teachers, loss of nutrition due to school closure (provision of mid-day meal), lack of resources hindering access to education, less parental support (for first-generation learners 2020;) (Jena, 2020 and Shin, 2020). This school closure not only causes serious damage of quality education for children but also increases the issues in society such as child labour, child marriage, exploitation, early pregnancy and loss of nutrition (absence of mid-day meal) (UN, 2020). It is recommended that distribution of digital devices and support access to online platforms expand the reach of learners through television programmes, and encouragement of learning outside the prescribed syllabus must be there (Shin, 2020). As India has been seen as a country developing online mode of education, blended or flipped education can help to achieve an optimal balance between e-education and traditional education (Say and Ildirim, 2020; Palvia et al., 2018). Studies suggest that science education should be based on a constructivist approach but how the practical part would be handled in such a situation was still doubtful (Deshmukh et al., 2012); in this situation, the role of a parent is crucial when a child learns science at home. Parents' own affective experiences, organisation of the experiments and finding time to do experiments are important factors to consider (Vartiainen and Aksela, 2019). Therefore, it is emphasised

that the interdisciplinary approach be adopted to teach science during the COVID-19 pandemic through philosophical, sociological, and historical dimensions of science (Reiss, 2020). However, how students, teachers, and the administration will adapt to complete online mode of education and how efficient it would be in reference to science education, is still questionable.

Initiatives taken by the Government of India

To facilitate online mode of education, the Government of India has taken some initiatives as discussed below (Fig. 1).

Along with digital platforms, the Government of India has also issued PRAGYATA guidelines for online mode of education for students, teachers and parents.

Resources	Description
SHAGUN	An online junction under which the Department of School Education in the Government of India have launched several e-learning platforms
National Repository of Open Educational Resources	Facilitates e-books, e-libraries, online discussion, e-courses, webinars, etc., it is available with 5923 documents, 141 interactives, 2777 audios, 2583 images and 6391 videos
DIKSHA	Equips teachers and students from Classes I to XII into the world of e-learning
SWAYAM and SWAYAM Prabha	A programme initiated for students from Classes IX to XII and those pursuing undergraduate or postgraduate degrees, all can access learning materials here and Swayam Prabha is a collection of 32 DTH channels which run 24×7 for the multiplication sign
PMeVIDYA	A multi-model digital online learning education platform
e-Pathshala	A web portal where students can access learning material from Classes I to XII
National Academic Depository (NAD)	24×7 online storage of all academic awards, run by UGC
Virtual Labs	Another key initiative of MHRD and the Government of India under the mentorship of NMEICT
National Digital Library of India	To provide content to not just school students but also students pursuing higher education and Ph.D. level education

Fig. 1: Initiatives taken by the Government of India to facilitate Online Education

Research questions

1. How do online platforms influence the nature of science education?
2. How do students and teachers adapt to a complete online mode of learning and teaching of science and what are the distinct science pedagogical strategies adopted by teachers?
3. How school administration is intervening and facilitating online Science education accessible to all the students?
4. How does the perception of parents towards online teaching influence students' learning?

Methodology

The nature of this research is qualitative. The objective is to understand the nature of science and to know the challenges and issues that emerged in science teaching-learning in online mode of education. Further, triangulation was done to understand the teachers', students', and parents' perceptions about online science education. It also analyses the input of stakeholders on facilitation of resources during pandemic.

A purposive sampling criterion is opted and the sample of the study is— students at secondary and senior secondary level (who opted science stream), TGT and PGT Teachers of science stream, and Parents (of selected students) of the Government Schools.

The semi-structured questionnaires were distributed among parents, teachers, and students through Google forms. A focus group discussion of teachers of secondary and senior secondary schools was conducted. The responses were analysed through thematic analysis under different themes. The data was collected from the month of August to October (2020).

Data Analysis

Perception on Online Mode of Learning

This section includes perception of students, teachers and parents towards online mode of education. Data reveal that students spend a minimum of 2 hours to maximum 4 hours on screen, which is similar to

Sample	Tools	
	Questionnaire	***Focus Group Discussion***
Parents	7	–
Teachers	8 (5-TGT*, 3-PGT**)	3 (1-TGT*, 2-PGT**)
Students	62 (Class IX—12, Class X—48, Class XI—2)	–

** Trained Graduate Teachers ** Post Graduate Teachers*

Fig. 2: Sample of the study

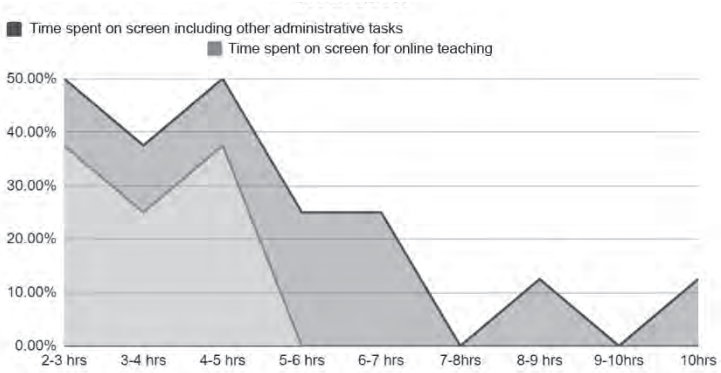


Fig. 3: Time Spent by Teachers on Screen in Online Mode of Education

the guidelines of PRAGYATA (2020) as proposed by the HRD ministry of Government of India. Their science classes are scheduled for a minimum 30 minutes to maximum 1 hour. Teachers who responded were TGT and PGT; therefore, their responses differed with respect to their experiences and academic achievement.

It was found that teachers spend 3 to 5 hours in online classes per day, and 10 hours with other administrative work per week (Fig. 3).

Teachers' perception on teaching science in online mode reveals that most of the teachers consider online mode as an opportunity, whereas others see it as an imposed decision which is beneficial only to those who have access to resources. Teachers don't consider online mode efficient to develop scientific attitudes. Their reactions are given hereby.

Teacher 1: "I found that being practical using their nearby things makes it easier to teach about the topic and for them to understand, but without face-to-face interaction,

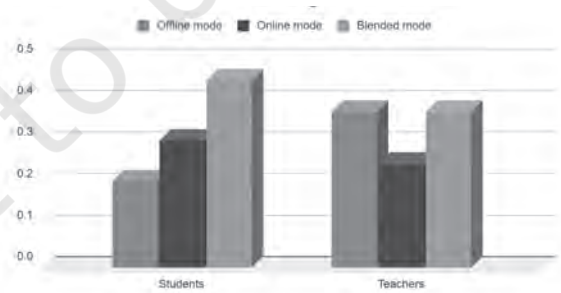


Fig. 4: Perception of students and teachers on different modes of learning

it is difficult for them to understand completely."

Teacher 7: "It is not favorable for economically weaker students."

Figure 4 reveals that around 45.2 per cent of students agreed on a blended mode of learning. On the other hand, 30.6 per cent students favoured online mode and 21 per cent students are in favour of offline mode of learning. Among them, 37.5 per cent teachers were in favour of offline mode, whereas 37.5 per cent favoured blended mode and 25 per cent agreed on online mode. Teachers faced challenges during teaching online, for instance, unavailability of resources, lack of physical presence for teaching science, lack of teaching environment at home, a completely online mode of teaching and teachers miss the physical presence of the students. Few teachers responded they didn't get any support from the school or administration, whereas some schools are providing adequate support to their teachers for the facilitation of online mode of education by providing resources (including internet, laptop, learning material, etc.), organising workshops with timely motivation, and providing suggestions in reference to online teaching.

Due to a change in the mode of learning, 50 per cent of parents believed that the child is active, whereas 50 per cent said that they are becoming passive learners. Interestingly, most parents agreed that during pandemic, online mode is favourable for continuing education, as well as for health and safety, but some of them also argued that it caused headache, eyesight weakness, ear related disease. According to parents, their children spend at least four hours per day in a virtual classroom. Parents were inquired if they have observed their children's online classes, some responses are given hereby.

"Online classes are good because it provides new normality in education now students can achieve knowledge beyond syllabus. This approach is accessible anywhere any time by any person so it creates a sense of endless learning where the sky is limitless. Online mode of education is the education which facilitates learners for self-learning approach".

"Online mode of education is helpful but not appropriate for interaction between teachers and students."

It is noted that online classes were happening in the presence of parents and hence, online classes had a surveillance of parents. Moreover, a majority of teachers do feel the pressure of being observed during classes.

Accessing Resources

Managing resources and learning material was the major challenge in online mode of education, as around three-fourth of students in India did not have access to the internet at home (*The Hindu*, 2020). Likewise, the data shows that most of the students

access online mode of education through smartphones. Students mentioned various mediums such as textbooks, YouTube, SWAYAM and material given by teachers, among which textbooks and YouTube were the major means of accessing learning material. As parents have to manage the resources, hence, in many homes, children are able to attend classes from a single smartphone because of different schedules. However, many parents had to buy smartphones, tablets and laptops while others face challenges like space, unavailability of mobile phones, laptop, printer, etc., in relation to online classes.

Teaching and Learning Science Through Online Mode

Learning science without exploring the physical world is an enormous challenge. However, considering the pandemic, online mode is the only option. While conversing with teachers, teaching science to Classes IX–XII, the common ideas are—teachers were not techno-savvy, never have they ever used online platforms to this extent in their offline classes. However, with time they learned things and now have become used to it. Initially, they faced many challenges such as lack of resources (laptop, mobile phone, printer, Wi-Fi, etc.), teaching ethos, practice, etc. They learned things from their children, colleagues and school administration. Besides, the major issue was internet accessibility. Teachers adapted pedagogies like inquiry method, activity method, lecture method, experimentation, demonstration, and the resources they have used were mainly videos, virtual laboratory, textbooks, online mode of education portal SWAYAM, online learning material, etc. Among them, YouTube videos and textbooks were the frequently used mediums for transaction. Notably, teachers introduce scientific concepts via inquiry method or by informing them earlier in the class or by relating it with the surroundings. And when it comes to the experimental portion; teachers tend to send the link of related videos to the students. Teachers mentioned that they engage students in online classes by discussing their problems and taking their names while teaching.

It is necessary to understand how students cope with the issues related to online mode of learning; the data revealed that around 80 per cent students believed that online mode is not as good as offline mode. When students were asked about their opinions on learning science via online mode, some responses are—

- Student 1: "Many of my scientific concepts are still not clear. Learning online is a bit complicated for me. For a proper understanding, I need someone who is teaching me face-to-face. Online classes are helpful but offline classes are better."
- Student 29: "Being a class 11 science student, I feel that the reduction in syllabus and

commencing the new session with online mode of education, I felt a little disappointed. There was a lot of curiosity and excitement I possessed earlier for learning science, but in online teaching the fun just got away, it feels like a formality now. My science education has changed drastically according to me, it has become a matter of facts and not understanding. Yet there are plus points like the extra efforts made by teachers to ensure that we grasp things well."

The above responses indicate that students are struggling with issues while learning science at home. Experiments are an essential part of learning science and enable students to develop process skills. However, few reports claim that students with science streams are using virtual labs without compromising the quality of education (*India Today*, 2020), whereas the data shows that 53.2 per cent students were not able to perform experiments at home even through virtual labs, and those who were able to perform, found it challenging to manage material. Some responses in support are—

- Student 3: "At school, there are teachers who take care of ourselves as well as they tell us how to do experiments with precautions. It feels safe with teachers because they tell us our mistakes too and they have more knowledge than us."
- Student 4: "Laboratory has all the things which are required but it is difficult to arrange the things at home."

Another reason is that parents consider scientific experiments as 'dangerous' and hence do not allow their child to perform it at home, because their education is not in the science background. According to them—

"Science can be taught online but when it comes to experimental explanation there would be difficulty

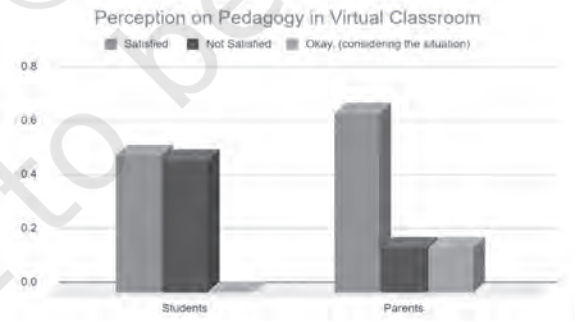


Fig. 5: Parents' and Students' perception on Pedagogy in Virtual Classroom

in understanding, lack of space, and lack of a learning environment at home is not supportive to understand scientific concepts."

So, students were taught through various means. When parents and students were asked if they are satisfied with the pedagogy practiced in their child's online classes, the results show that most of them were satisfied while the remaining were okay, considering the current scenario.

Responses show that 50.8 per cent of students were satisfied with the teachers' effort whereas 49.2 per cent of students were not satisfied, because in some classes, teachers teach them through PPT or video which makes it boring as they desire some interaction with their teachers during the classes as it happens frequently in an online classroom that they are instructed to mute their mic and camera and the classroom lacks any interaction. Ironically, parents consider it most convenient contemplating the current scenario and 66 per cent parents were satisfied with teachers' efforts for making education successful even in the era of COVID-19. Some responses are—

- "No. Showing PowerPoint presentations and explaining them is not enough in order to get a proper understanding of the concept."
- "I am satisfied because they are doing all that they could. Each of us needs to understand that it's impossible to create an engaging environment in online mode, so we just need to emotionally connect and try our best in the class."

Figure 6 affirms that 58 per cent of students were accessing science education through private tuitions, among which 62 per cent students are taking it through online mode. 61 per cent of students responded that there are remedial classes from their school teachers, but it is limited to

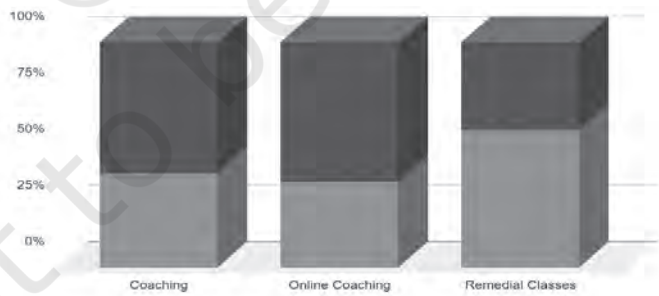


Fig. 6: Students Accessing Alternatives for Learning

the students, who score less. Some students understand the pandemic situation as a temporary phase, so their expectation from teachers was not much regarding engaging the classroom or understanding concepts. One obvious reason for their dissatisfaction was that learners were habituated to face-to-face teaching, thus, due to sudden shift they were struggling to adapt to the new approach.

Parents admitted playing an important role in their child's learning, especially if it is from home. In response to how they support their children's learning, they answered—by providing resources and assistance during class, observing classroom, solving their doubts while studying, helping them in activities such as drawing, coding preparation for Olympiad, etc. Due to change in the mode of learning, students' learning style has also been affected; the researchers got mixed responses from parents, such as—

- "They have started using technology more than referring to books."
- "Before pandemic children went to school, it helped them in physical and mental activities while in pandemic only mental activities are involved."
- "I think now she is more aware and searches for some new AppSource for learning on daily basis so her capacity for self-searching and self-learning is raised."

Online Assessment

The data reveals that maximum teachers assess their students through MCQ tests, weekly assignments, and on the basis of their activeness or engagement in virtual classroom, online quiz, etc. They mentioned various means to solve students' queries, for instance, addressing queries in a virtual class, through WhatsApp, by organising remedial classes, taking doubt sessions, etc.

Suggestions

Students' suggestions indicate that they require extra efforts from teachers. Therefore, teachers need to be sensitive to the present scenario and they should adapt their pedagogical strategies according to the mode.

- "Teachers should be more interactive with students."
- "Being a senior secondary student, I think, teachers in our system are very capable of good teaching, I would just want them to be a little more understanding and less insecure, because we as students tend to read that in their voice. We understand and we too sometimes deserve a good lesson, but being angry and agitated throughout the week is not a good idea for anyone. If this would be read by teachers actually, I would like to thank them for their efforts and promise my obedience during online classes. With respect."

Some parents considered the attitude of teachers towards students

as important as their pedagogical approach. Thus, they suggested that teachers should be more empathetic to the students in such times. They verbalised:

- "Teachers need to have good communication skills and empathy towards students".
- "The only suggestion is to make the students interact with their surrounding things while they are learning so they can enjoy and learn at the same time."

It is imperative to know that parents are conscious about their children's education.

Findings

1. Due to a sudden shift in education from traditional classroom teaching to online mode of education, students including teachers have faced difficulty while managing resources such as internet, laptop, smart phone, electricity, etc.
2. Teachers and students weren't techno-savvy.
3. Teachers believed that it is difficult to teach science through a complete online mode because of its exploratory nature.
4. Students were not able to perform experiments at home especially at secondary and senior secondary level, due to lack of necessary material and apparatus.
5. YouTube videos and textbooks were the popular source of content.
6. Teachers also struggled as they had to teach while doing other administrative works through online platform from home in a non-conducive environment.
7. The responsibility of parents increased for their children's education at home during pandemic and they had to continuously indulge there. Therefore, parents with low educational qualification were helpless to support online education.

Discussion

Even in pandemic situation, education was imparted via online mode, but it was not successful to fulfill the objectives of science education, i.e., exploration, investigation, experimentation, developing process skills, etc. It has also led to a digital divide among learners; knowledge was limited to those who can afford e-resources even after many initiatives were taken by the Government of India. Accessing education in tribal or remote areas was always a challenge in India and due to pandemic; they were not able to avail many educational opportunities (*The Hindu*, 2020). Except the national capital, Delhi (with 55 per cent households having internet facility), there are ten other states with less than 20 per cent internet penetration including States with software hubs such as Karnataka and Tamil Nadu. On the other hand, those who were attending online classes were

struggling with many issues, mostly while managing resources, and for girls, it was difficult to study from home (Center for Global Development, 2020). Despite the lack of resources, some had issues with the approach too, like the technical issues (e.g., unstable internet connection) mostly ending up in an incomprehensible transaction. Further, students complained about teachers' insensitivity and less interactivity.

The teachers were struggling with their own personal and professional life issues, for instance, spending 10 hours on screen including administrative work and working from home was not an easy task for them, not receiving any support from their school administration and involving themselves in their own children's learning process too, led to burnout. It is concluded that teaching at elementary level was manageable for them including both theoretical and experimental componented whereas teaching at secondary or senior secondary level became challenging because: (i) concepts become more abstract and technical, (ii) the objective of science education shifted to practical aspect with an emphasis on experiments or technology and problem solving, and (iii) acquiring process skills. Thus, it requires the collaboration of peers, teachers, and a conducive learning environment to comprehend scientific concepts.

Besides teaching, assessment is considered as another defying task for teachers. Since education continued through virtual classrooms, they were unaware about the effectiveness of their pedagogy and achievement of teaching. Moreover, teachers felt that they were losing control over their own classroom and how will they ensure justice, while assessing the students was still a question.

In the pandemic, science is considered as a way to overcome the crisis. Still, its practices were limited to explaining scientific concepts rather than conducting scientific inquiry; the Indian science classrooms were limited to learning definitions. Some teachers argued that science is only possible in a physical environment where students can see each other. On the flip side, parents view online mode as an opportunity. According to them, the horizon of their child's learning has been increased and now, they can access various domains of knowledge other than the prescribed syllabus.

Conclusion

On the basis of the above discussion, the researchers concluded that virtual science classrooms lack experiential learning, where learners are bound to learn science through virtual mode rather than the real world. The epistemic understanding of science needs empirical investigation where the involvement of sense plays a vital role to develop schemes. Due to lack of physical interaction, peer interaction and teacher facilitation have been compromised. As a result, the epistemic understanding of

learners suffers in a virtual science classroom. On the other hand, teachers were unable to get feedback of their pedagogical strategies, rather than interacting with students, they were seeking different means such as PPTs, YouTube, and textbooks and ignored the dialogical space. Apart from that, teachers were unaware of the various learning platforms and virtual labs, for instance, virtual labs by Government of India, nextsciencelab.in, edutechindia.com, etc. Hence, it can be concluded that virtual classrooms were inefficient to ensure a democratic classroom. Instead of using digitalisation as an opportunity, both teachers and students had struggled only due to lack of ICT skills.

Another aspect is the sudden shift to complete digital education teaches our existing education system that the government and other stakeholders should be prepared for any crisis. Also, digital education can be considered as an alternative measure for various other causes of school closure, for instance, pollution, natural disasters, social movements, etc. The government should ensure to be prepared well in advance with the requirements for the facilitation of digital education such as training and programmes, and timely arrange workshops to acquaint the teachers with ICT skills.

References

BBC News. 2018. India says all villages have electricity. Retrieved from https://www.bbc.com/news/world-asia-india-43946049.

Center for Global Development. 2020. COVID-19 and Girls' Education: What We Know So Far and What We Expect from. Retrieved from https://www.cgdev.org/blog/covid-19.

Department of School Education and Literacy. 2020. PRAGYATA Guidelines for Digital Education. Government of India. Ministry of Human Resource Dev*elopment.*

Deshmukh, V., S. Forawi, A. Jaiswal. 2012. The Role of E-learning in Science Education vis-a-vis Teacher Training Institutes in the Middle East. US-China Education Review. Vol. 2, pp. 142–148.

Government of India. 2017–18. National Statistics Office (NSO) Report. Ministry of Statistics and Programme Implementation. http://mospi.nic.in/_Annual_Report_2017-18.pdf

Hindustan Times. 2020. Connectivity gets better but parts of India still logged out. Retrieved from https://www.hindustantimes.com/india-news.

India Today. 2020. *Education in India in the times of* Covid-19: Planning Ahead. Retrieved from https://www.indiatoday.

Jena P. Kumar. 2020. Impact of Pandemic COVID-19 on Education in India. International Journal of Current Research (IJCR). Retrieved DOI- http://journalcra.com/article/impact-pandemic-covid-19-education-india, Available at SSRN:https://ssrn.com/abstract=3691506. Vol. 12, No. 7. pp. 12582–12586.

KMPG in India and Google Report. 2016. Digital classifieds in India 2020. https://assets.kpmg/content/dam/kpmg/in/pdf/2016/09/Digital-Classifieds-India-2020.pdf

National Council of Educational Research and Training. 2006. National Focus Group on Teaching of Science (NCF-2005). *Position Paper*. NCERT, New Delhi.

Palvia, S., P. Aeron, P. Gupta, D. Mahapatra, R. Parida, R. Rosner and S. Sindhi. 2018. Online Education: Worldwide Status, Challenges, Trends, and Implications. *Journal of Global Information Technology Management*. Vol. 21, No. 4. pp. 233–241. https://doi.org/10.1080/1097198X.2018.1542262

Reiss, M.J. 2020. Science Education in the Light of COVID-19. *Science and Education*. https://doi.org/10.1007/s11191-020-00143-5. Vol 29, pp.1079–1092

Say, F.S. and F.S. Ildirim. 2020. Flipped Classroom Implementation in Science Teaching. *International Online Journal of Education and Teaching (IOJET)*. http://iojet.org/index.php/IOJET/article/view/759. Vol. 7, No. 2. pp. 606–620.

Shin, W.Y. 2020. Education during COVID-19. Retrieved from https://www.researchgate.net/publication/340860261 Retrieved on April 30, 2021.

The Hindu. 2020. NSO report shows stark digital divide affects education. Retrieved from https://www.thehindu.com/news/national.

UNESCO. 2020a. Global Monitoring on School Closure. Retrieved from https://en.unesco.org/covid19/educationresponse

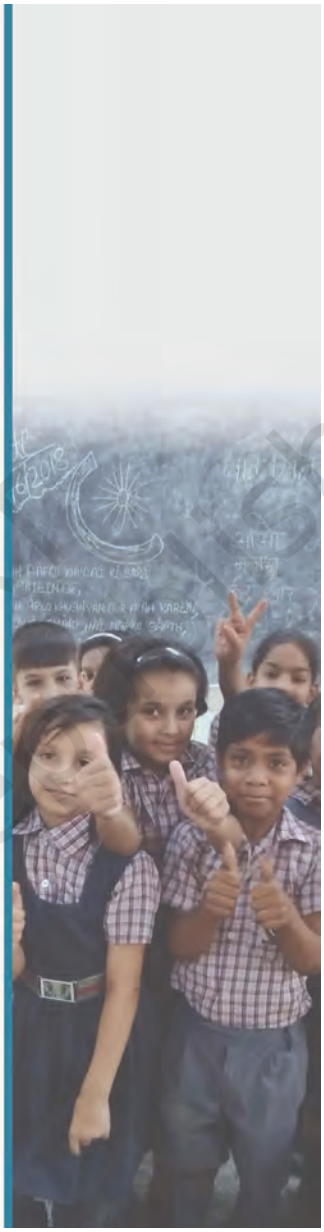
UNESCO. 2020b. Policy Brief: Education during COVID-19 and beyond. https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg Retrieved on January 30, 2021.

United Nations. 2020. Policy Brief: The Impact of COVID-19 on Children. Retrieved from https://unsdg.un.org/Covid_Children_Policy_Brief.pdf.

Vartiainen, J. and M. Aksela. 2019. Science at Home: Parents' Need Support to Implement Video-Based Online Science Club with Young Children. *International Journal on Math, Science and Technology Education*. Vol. 7. doi.org/. 10.31129/LUMAT.7.1.349.

REFLECTIVE TEACHING

A handbook towards
preparing a Reflective Teacher



₹100/pp186
Book Code: 13221
ISBN: 978-93-91444-25-9

Guidelines for Contributors

Soft copy of the articles, research papers, book reviews, case studies, etc., not exceeding the word limit of 5000 words typed in English with Times New Roman - 12 pt. font, double spaced, including sufficient margins, must be sent along with an undertaking of originality and plagiarism report (optional) on:

jiedtencert@gmail.com
dtee1999@rediffmail.com

An abstract of the paper in not more than 200 words must be sent with each paper.

Diagram or line drawings must be supplied separately, numbered neatly for identification and their position in the text clearly indicated. Tables may be given as part of the text.

References need to be listed at the end of the article, in alphabetical order, as follows:

Lannier, J. and J. Little. 1986. Research on Teacher Education. In M. Wittrock (Ed.), *Handbook of Research on Teaching.* 3rd ed. Macmillan, New York.

Narayan, Jayanthi and M. Ajit. 1991. Development of Skills in a Mentally Retarded Child: The Effect of Home Training. *Indian Educational Review.* Vol. 28, No. 3. pp. 29–41.

Journal of Indian Education accepts papers based on relevant themes under School Education or Teacher Education. The journal uses double-blind peer review for review process.

R.N. 26915/75

Revised Rates of NCERT Educational Journals
(w.e.f. 1.1.2009)

Title	Single Copy	Annual Subscription
School Science A Quarterly Journal for Secondary Schools	₹ 55.00	₹ 220.00
Indian Educational Review A Half-Yearly Research Journal	₹ 50.00	₹ 100.00
Journal of Indian Education A Quarterly Journal of Education	₹ 45.00	₹ 180.00
भारतीय आधुनिक शिक्षा (त्रैमासिक) (Bharatiya Aadhunik Shiksha) A Quarterly Journal in Hindi	₹ 50.00	₹ 200.00
Primary Teacher A Quarterly Journal for Primary Teachers	₹ 65.00	₹ 260.00
प्राथमिक शिक्षक (त्रैमासिक) (Prathmik Shikshak) A Quarterly Journal in Hindi for Primary Teachers	₹ 65.00	₹ 260.00
फिरकी बच्चों की (अर्द्ध वार्षिक पत्रिका) Firkee Bachchon Ki (Half-yearly)	₹ 35.00	₹ 70.00

Subscriptions are invited from educationists, institutions, research scholars, teachers and students for the journals published by the NCERT.

For further enquiries, please write to :

Chief Business Manager, Publication Division
National Council of Educational Research and Training
Sri Aurobindo Marg, New Delhi 110016

E-mail: gg_cbm@rediffmail.com, Phone: 011-26562708, Fax: 011-26851070

Published by the Head, Publication Division, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110016 and printed at Chandra Prabhu Offset Printing Works (P.) Ltd., C-40, Sector 8, Noida -201 301 (U.P.)