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एन सी ई आर टी
NCERT

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About the Journal

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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.

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CONTENTS

Editor's Note

The essentiality of restructuring the curriculum and pedagogy of school education at all stages has been the most vital and significant futuristic recommendation of National Education Policy 2020. The policy firmly recommended the adoption of experiential learning such as hands-on learning, arts-integrated and sports-integrated education, storytelling-based pedagogy, etc., at all stages and within each subject. The efforts have been initiated at different levels to experiment and research on various pedagogies which work on the principles of experiential learning. The present issue of *Journal of Indian Education* also brings out a few such initiatives done by the educators and researchers. Apart from these themes, there are articles and research papers based on themes such as sustainability, teacher education, tool development, inclusive education and gender.

Sustainability Consciousness is a desideratum for enacting the vision of sustainable development among the future generation. Kalyani Akalamkam did a correlation analysis between the various constructs of sustainable consciousness in the three dimensions of sustainable development (SD), namely, environment, social and economic dimensions to delineate the sustainability consciousness of school leaving students. The findings indicated that sustainability behaviour of students is positively associated with their sustainability attitude but was found to be exceptionally low in the areas of environment and economy implying towards the perusal of a more focused and scrutinised school curriculum providing elbow room for experiential learning. In the next article, 'Emergent Literacy: A Developmental Perspective of Literacy', Pooja Bahuguna has analysed and reviews of the Vygotskian theory of literacy and development while also mulling over Marie Clay's contribution and other authors' viewpoints to bring forth the significance of developmental and holistic nature of literacy in the Indian context. The review of the researches was on two contrasting views: Reading Readiness Perspective and Emergent Literacy Perspective. The inferences of the review supported the conviction of emergent literacy where there is a definite need of a complete shift from the traditional way of looking at reading and writing to emergent literacy perspective in the country.

Women education and progress has been a sensitive discourse since ages where a major advancement can be seen with the advent of National Policy for the Empowerment of Women (2001). The paper presented by Preeti and Abhinav Mishra talks on the edifying topic of colonisation of female minds and space through colonial pedagogy in the country. The article describes the status and purposive reason of women education taking into account the

political and socio-economic spheres. It examines the gendered dynamics in pedagogical spaces focusing on 'power' and 'authority' in teaching approaches. The author also did a deep scrutiny of various policy documents to share the official pronouncement on the subject of women's education.

There are two papers related to innovative pedagogies based on our indigenous knowledge and tradition, which have been highlighted in the National Education Policy 2020 also. An innovative yogic chess game was designed and developed conjointly by Manish Kukreja, Paran Gowda and Poonam Panwar, to hone the children's intellectual skills and cognitive abilities and imbibing them with value education based on eight folds of *Ashtanga* Yoga assisting them to achieve the goal of liberation at tender age. Another vibrant and empirical case study was presented by Sumanta Halder and Elizabeth Gangmei in the light of discipline of Ethnomathematics, aiming to probe fundamentals of the mathematical ideas and practices that prevailed within different cultural groups. The findings of the study revealed that culture specific methods, artefacts and games like *Kathi Khela* and *Sholo Guti* (Sixteen Soldiers) have been the predominantly pervading techniques of learning elementary arithmetic operations like addition, subtraction and basic geometrical concepts amongst the local students.

Mathematics is unequivocally a demanding subject and to achieve expertise in the subject, it needs arduous and exacting efforts all through the learning. In order to ameliorate the pursuit, it requires to pin down those specific mathematics competencies which a child should own to apply the knowledge to real-life situations while to get a fix on the issues and challenges in mastering these competencies. The significant discourse is well scrutinised in the collaborative study by Dori Lal, Rakesh Batra and Neeta Rani in their article on 'Facets of Mathematics Education towards Achieving Mathematics Competence in Children'.

Where NCF 2005 emphasises on experiential learning, in parallel, the NEP 2020 highly recommends providing optimal learning environments and support for students, both conducive to stimulate the real time learning experiences of the students. Chemistry is one such subject which lies on the pillars of empirical research studies and concrete attestations. R.K. Sharma and R.B. Pareek elaborated on the teacher's cognizance and discernment on this crucial discourse through their analytical study titled 'Quality Enabling Conditions and Teaching-Learning Process in Chemistry at Senior Secondary Level: Teachers' Perspective'.

Language immersion is a prominent and coherent technique for mastering a target language. On the similar note, Faisal K.V. investigates the efficacy of 'Language Immersion Programme' in potential teaching of English language

to science background students. The findings were truly coruscating with exhorting statistics, recommending the programme to be a preferable tool in enhancing the language learning capacity.

Another enlightening study presented by Anita Rastogi and Sandhya Vaid attempts to centralise the attention on boosting the school-university partnership by the virtue of lesson study for an efficient and successful transaction of amalgamated knowledge by both the prospective teachers and in-service teachers during the course of school internship. The collaboration would not only upswing their professional competency building but would also substantially aid them to accomplish the foremost and onerous milestone of students' learning.

Gender equity is one of the chief goals listed under Sustainable Development Goals and the nascence of imparting self-consciousness with knowledge is a significant milepost in the journey of accomplishing the stated goal. Tripti Bassi calls the attention on the subject through the article titled 'Emancipatory Pedagogy: Teaching of Gender in an Elementary Teacher Education Programme'. The paper focuses on the driving force of emancipatory pedagogy that brings in liberating experiences through the process of self-reflective enquiry, thus addressing issues central to the lives of women.

Chiter Rekha attempts to explore and establish a gender-based statistical relationship between the home environment and study habits of pre-service teachers of DIETs from Delhi while measuring their routine study habits and state of the contiguous surroundings. Though the findings revealed no pronounced gender biased differences between the study habits and home environment but, needless to say, a positive and influential relationship was definitely observable between the dyads.

Nityananda Pradhan and Ashwani Kumar Garg did a deliberate trend analysis on the promotion of learning outcomes of elementary stage as a part of the block level interventions of NCERT at Ichhawar block of Madhya Pradesh. The analysis was focused on a comparative picture of learning levels of students in the basic school subjects, viz., environmental studies, mathematics, social science, language with respect to the academic sessions 2017–18, 2018–19 and 2019–2020. The analysis revealed a notable and perpetuating increment in their rate of learning across all the nominated subjects.

Achievement test is a highly acclaimed coherent and purposive aid for gauging cognitive skill sets in various school subjects. Dipak Bhattacharya and Gowramma I.P. shared the blueprint of an objective type achievement test constructed to measure learners' accomplishment in the subject of geography. The study revealed that the designed scholastic achievement test was reliable and valid and could be used for further study.

In the digital era, blended learning is an innovative instructional approach which integrates a variety of delivery strategies of online and face-to-face components. In the line of this belief, Shireesh Pal Singh and Sumit Gangwar strive to explore the authentic degree of acceptance towards blended learning while developing and standardising a scale to assess the readiness of various stakeholders of teacher education towards the efficient use of blended learning approach in teacher preparation (pre-internship activities) so as to make the process of teaching-learning advanced, creative and riveting.

Inclusive education is neither about the inclusion of children with special needs in common classroom community nor about preparing competent teachers to teach these exceptional groups but about optimising the learning environment without any discrimination and providing opportunities for effective teaching-learning. Indu Sharma shares a valuable insight in this regard exemplifying the versatility of school leadership in capacity building.

This edition of the journal provides articles and research papers on a variety of issues and themes under school education and teacher education. We hope that our readers will be able to relate their personal experiences with the issues and concerns discussed by the authors of these articles or research papers. We invite our readers from different levels of school education and teacher education to contribute to the journal by sharing their knowledge in the form of articles, action research reports, theoretical papers, book reviews, etc. Your valuable suggestions and comments for improvement of the quality of the journal are welcome.

Academic Editor

Mapping the Sustainability Consciousness of Students

KALYANI AKALAMKAM*

Abstract

Education plays a critical role in empowering individuals to make choices which contribute to sustainable development. The research focus in this area has shifted from environmental consciousness to a broader concept of sustainability consciousness encompassing the multiple dimensions of sustainable development. Sustainability consciousness (SC) as a construct is represented by categories of knowingness, attitude and behaviour in the three dimensions of sustainable development (SD) namely 'environment', 'social' and 'economic' dimensions. This study is undertaken to find out the sustainability consciousness of students (17–18 years) and analyse the relationship between various constructs and sub-constructs based on the 'three-order theorised model of sustainability consciousness constructs. The sample constitutes 330 students who recently passed out of various schools across India. The mapping was undertaken using an empirically validated and test designed tool 'Sustainability Consciousness Questionnaire' (SCQ). The findings reveal that students have high level of sustainability knowingness (in all the three dimensions, but mostly in the environmental dimension) and low level of sustainability behaviour (lowest in the environmental dimension). Correlation analysis between the constructs of SC indicates positive interaction between sustainability knowingness and sustainability attitude. Sustainability behaviour is positively associated with sustainability attitude except in the areas of environment and economy indicating that environmental knowingness has not translated into attitude and further into behaviour. The study has implications for curricular and pedagogical initiatives to promote sustainability consciousness in students.

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Introduction

Sustainable development as a concept and process is not just an academic term but a compelling necessity for the survival of humanity and the planet. The 'climate change' accelerated by human activities is now seen as a wake-up call for us either to take action in terms of sustainability or perish. The Brundtland report (1987) defines sustainable development as '… a development that meets the needs of the present generation without compromising the needs of future generations…' (WCED 1987). The concept of sustainable development (SD) is represented by three interconnected and overlapping dimensions which are referred to as three pillars of sustainable development, namely, 'economy', 'environment' and 'society'. This model referred to as three rings of SD, is endorsed by all the international agencies and became a benchmark for all the SD initiatives across the world including education. According to UNESCO framework, these three dimensions need to be explicitly stated and explained in terms of our knowledge (knowingness), attitude and behaviour. In 2015, the UN General Assembly adopted Agenda 2030 for sustainable development with an aim to redirect humanity towards a sustainable path for the future. Forging ahead on the path of SD will not only require a change in our thinking but also in our actions.

In this context, education plays a critical role in promoting the culture of SD by 'empowering individuals to make choices and actions for environmental integrity, economic viability, and a just society'. (UNESCO, 2015). Education for sustainable development (ESD) is lifelong learning concept and the UN report on SD reiterates the role of educational institutions. 'All educational institutions from early school to tertiary education should consider it their responsibility to deal intensely with the matters of SD and to foster the development of sustainability competencies.' (UNESCO, 2017). ESD has been recognised as a key enabler for SD since 1992 United Nations Conference on Environment and Development (UNCED) and the UN decade for ESD (2004–2015) is now being followed up by Global Action Programme (GAP) to further scale up. ESD is not just about teaching SD related content or revamping curriculum but also to mainstream sustainability with all the aspects of curriculum, organisational culture and community relationships in the educational institutions. In order to bring any changes in the organisational culture, curriculum and pedagogy, it is important to know the students' understanding and perceptions about sustainability related issues. Research has focused on students' understanding of environmental issues at various levels in terms of awareness, attitudes and environmental consciousness, etc. (Sanchez and Lafuente, 2010; Sharma and Bansal, 2013). As we shift

from 'environmental consciousness' to 'sustainable consciousness', there is a need to focus on this aspect at various levels of education. This study focuses on mapping the sustainability consciousness (SC) of students who have just finished the formal schooling (17–18 years) and analyses the relationship between various constructs and dimensions of sustainability.

Theoretical Background

Sustainability consciousness (SC) is a relatively new term. In this context, sustainability consciousness refers to 'the experiences or awareness of sustainability phenomenon which include experiences, perceptions that are commonly associated with us such as beliefs, feelings and actions.' (Gericke, et al., 2019). They have, for the first time, operationalised this word 'Sustainability Consciousness' (SC) as a construct represented by the categories of knowingness, attitude and behaviour in the environmental, economic and social dimensions of sustainable development on the basis of UNESCO framework (see Fig. 1). In this theoretical framework, the 'Knowingness (K) refers to what people acknowledge as the necessary features of Sustainable Development (SD), Attitude (A) refers to the attitudes towards the issues in SD, and Behaviour (B) indicates what people do in relation to the SD issues under consideration.' (Gericke, et al., 2019). The authors have evolved a theorised three-order model of sustainability consciousness constructs (see Fig. 2) and developed an empirically validated instrument 'Sustainability Consciousness Questionnaire, (SCQ). In this model, the three psychological constructs of sustainability consciousness–knowingness (K), attitudes (A)— behaviour (B)— are related to and three dimensions of sustainable development—environment, economy and social resulting—into nine sub constructs (K-ENV, K-S, K-E, A-ENV, A-S, A-E, B-ENV, B-S, B-E) as illustrated in Fig. 2.

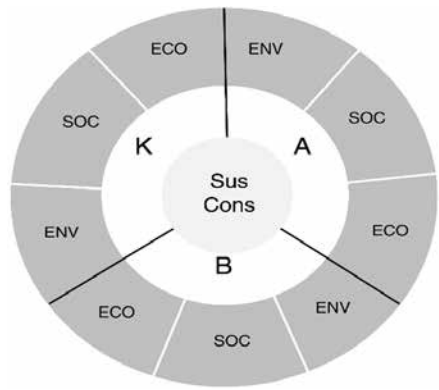

Figure 1: Conceptual representation of sustainability consciousness (Source: Gericke, et al., 2019)

The Sustainability Consciousness Questionnaire (SCQ)' developed and validated on the basis of this model, contains items representing the three constructs and nine sub-constructs and cover the entire spectrum of 15 sub-themes of SD proposed by UNESCO (2015). The study is based on this framework of SC and mapping was done using this SCQ which is discussed in detail in methodology section.

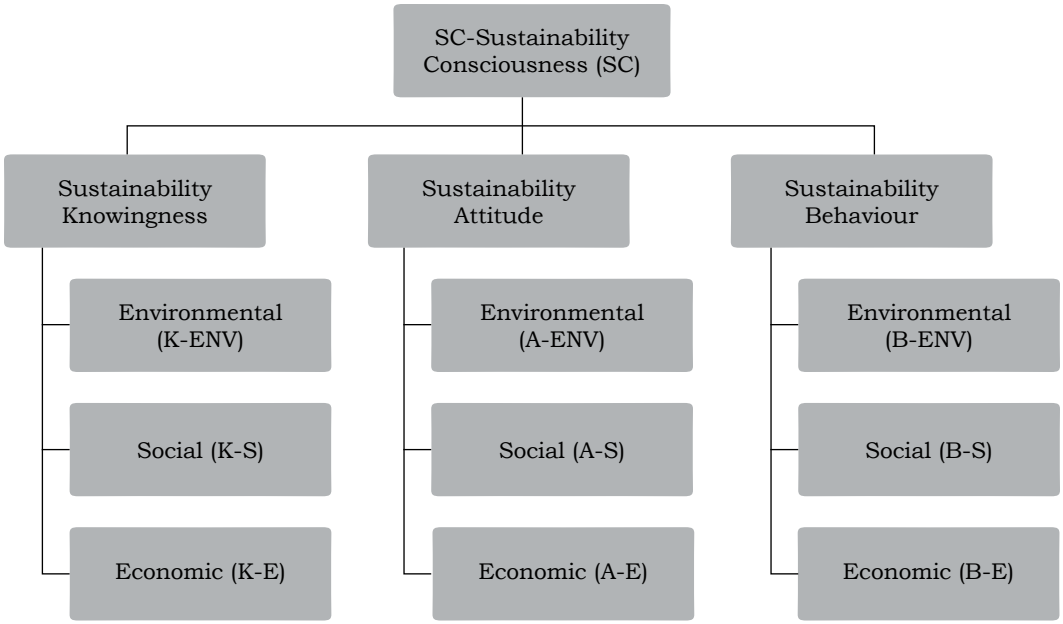

Figure 2: Theorised three orders model of sustainability consciousness constructs

Research Focus

In present times, the environmental issues need to be understood in a complex manner and need multiple perspectives to resolve. Research in the area of sustainability and sustainability consciousness is only a decade old. The studies focused on developing a scale to measure the educational competencies to live together sustainably (Biasutti and Surian, 2012), attitude towards SD based on three-pillar model of SD (Biasutti and Frate, 2017), knowledge, attitude and behaviour with regard to SD (Michalos, et al., 2012), and sustainability consciousness (Gericke, and et al., 2018). The review of literature indicates that not much work has been done in the area of sustainability consciousness and the author has not come across any study done in the Indian context either at school level or undergraduate level. Thus, establishing the validity of this SCQ in the Indian context and mapping the SC of students can serve two-fold benefits. One is that mapping would help the academicians and educators to know the SC of the students with whom they are dealing. This will help to evolve pedagogical and institutional initiatives. It will cater the process of policymaking and curriculum designing for many trans-disciplinary and interdisciplinary initiatives in school and higher education to meet the 21st century skills. The second benefit of this mapping would

help to understand how the formal schooling has prepared young adults towards issues related to SD and henceforth, can help to suggest for school education curricular reforms. Keeping this two fold benefit in mind, this study is undertaken to map the SC amongst students who have just finished 12 years of formal schooling. The study is based broadly in the following research questions:

(i) To map the sustainability consciousness (SC) of students.

(ii) To analyse the relationships between various constructs and sub-constructs of sustainability consciousness.

(iii) To examine the relationship between the academic streams (sciences, humanities and commerce) and the various constructs of SC.

Materials and Methods

Tool: The Sustainability Consciousness Questionnaire (SCQ)

The instrument used in this study for analysing SC of students is SCQ (long version) which is a test designed and empirically validated tool with 638 students (age 18–19) by Gericke, et al., in 2017–18. Due permission is taken from the authors to use the tool. The SCQ items are formulated on the basis of 15 sub-themes of SD as formulated by UNESCO (2015). The SCQ (long version) consists of 50 'Likert-scale type' items to measure knowingness, attitude, and behaviour with regard to sustainable development in all the three dimensions, i.e., environmental, social and economic aspects. The SCQ has three sections: Sustainability knowingness, attitude and behaviour and the number of items within each section are denoted in Table 1. Thus, the SCQ is structured in three sections and further structured into nine sub-sections representing items to all nine sub-constructs, i.e., K-Env, K-S, K-E, A-Env, A-S, A-E, B-Env, B-S and B-E. The items are randomly arranged within each section and the Likert scale uses scale ranging from (1) Strongly disagree to (5) Strongly agree.

Sample

The sample consists of 330 students who have just passed out of school and enrolled in an institution of higher education in Delhi studying various courses. Though the sample belongs to one particular institution (convenient sampling), it represents regional and cultural diversity of India as the students from various states of India (almost all regions of India) take admission in this institution. The limitation of the sample is that it only comprises female students as it is a women's institution and high achievers. However, this study is first of the series of studies undertaken, its scope in terms of gender and other variables can be expanded in other papers. As the students come from various academic streams of their school education, the study explores the relation between their academic stream at school level and SC.

Table 1
Number of Items in Various Constructs and Dimensions of SD

	Knowingness	Attitudes	Behaviour	Total
Environmental	6	4	7	17
Economic	5	4	4	13
Social	8	6	6	20
Total	19	14	17	50

The quantitative analysis was done using parametric statistical tests and SPSS software. Descriptive statistics were used to compare the mean scores within each construct and sub-construct. Tests to compare groups (t-test) and correlation analysis (Pearson correlation) were performed using SPSS software. The reliability of the tool is established by calculating Cronbach's alpha and its value came to be 0.795. Since it is more than 0.7, the tool is found to be reliable in the Indian context.

Results and Discussion

1. Analysis of Sustainability Consciousness of Students

Descriptive statistical analysis of SCQ items revealed that students had higher scores in items related to sustainability knowingness (knowledge domain) followed by sustainability attitude and least scores in items related to sustainability behaviour (Table 2).

The dimension in which students scored highest within the three analysed areas (knowingness, attitude and behaviour) is economical dimension (Mean of 4.05) closely followed by social dimension. The dimension in which students' SC is lowest is environmental dimension. However, within sustainability knowingness, environment dimension is the highest whereas in sustainability attitude and behaviour, the environment dimension of SC of students is least (see Fig. 3). Overall, the sustainability behaviour scores in all dimensions in the SCQ is least indicating that knowingness has not translated effectively into behaviour.

Table 2
Mean scores of constructs and sub-constructs of SC

Domain	Dimension/ Sub-construct	Mean	SD
Sustainability Knowingness	Environmental	4.32	0.58
	Social	4.23	0.50
	Economic	4.08	0.41
		4.21	
Sustainability attitude	Environmental	3.27	0.52
	Social	4.43	0.44
	Economic	4.44	0.48
		4.05	

Sustainability behaviour	Environmental	3.61	0.51
	Social	3.96	0.46
	Economic	3.64	0.64
		3.73	

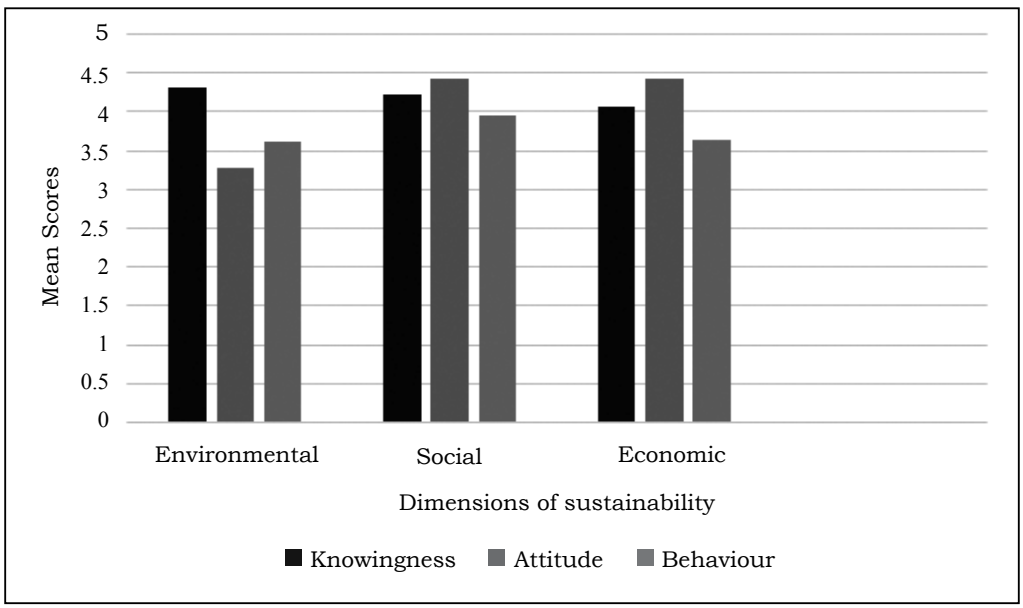

Figure. 3: Mean scores of knowingness, attitude and behaviour in the three dimensions of SD

Sustainability Knowingness

The three dimensions (sub-constructs) of sustainability knowingness, i.e., environmental, economic and social dimensions, were analysed item wises. Table 1 corresponds to the number of items related to the environmental dimension of knowingness. Majority of students agreed that reducing water consumption (72%) and wastes (81%) is necessary for sustainable development (SD). 93 per cent expressed that preserving nature and natural species is necessary for SD and 77 per cent felt that people need to be educated about natural disasters. Few items (Table 1) were asked in the economic dimension of sustainability knowingness. Analysis of responses revealed that above 70 per cent agree that economic development is necessary for SD but only 67 per cent agreed with the view that SD requires people's understanding of the working of economy whereas 25 per cent were of neutral opinion in this aspect. Majority of students (73%) agreed that companies should treat their employees in a fair way to achieve SD. The analysis of social dimension of sustainability knowingness revealed that majority

(above 80%) agreed with the view that improving people's health and life is necessary for SD. Majority of students agreed that peaceful resolution of conflicts (84%) and participation in democratic process like elections (70%) is necessary for SD. 25 per cent of students could not associate between SD with democratic processes. A good number of students are of the view that reinforcing girls' rights (82%) and respecting human rights (87%) and access to education (89%) are necessary for SD. 84 per cent of students agreed that respect for other cultures is necessary for SD, whereas 15 per cent in this regard were neutral.

Sustainability attitude

Environmental, social and economic dimensions of sustainability attitude was analysed through 14 items. An overwhelming majority of students agreed that more strict laws are needed to protect environment (95%), and it is important to do something with the problem of climate change (98%). Regarding economic dimension, majority of students (90%) agreed that companies have a responsibility to reduce the use of packaging and disposable articles and people who pollute should pay for the damage (95%). 70 per cent of students are of the opinion that companies in rich countries should give their employees in poor nations the same conditions whereas 26 per cent neither agreed nor disagreed. Regarding social dimension of sustainability attitude, 95 per cent of students agreed that everyone needs to be educated to live sustainably and 81 per cent students are of the view that people in the present generation need to take care of future. Majority of students (83%) agreed with the view that government should give financial aid to people for shifting to green vehicles. However, only 63 per cent felt that government should make decisions on the basis of SD and 25 per cent of students neither agreed nor disagreed with this view. An overwhelming percentage of students (97%) agreed that men and women need to give same education and employment opportunities and 93 per cent agreed on the importance of voting in elections and express views.

Sustainability behaviour

The items probing the environmental, social and economic dimensions of sustainability behaviour were analysed and this part gives an insight of students' behaviour in certain situations. Seven items were asked on the environmental dimension of sustainability behaviour (see Table 1) which refer to their behaviour in a personal context. Though majority of students (74%) stated that they choose to cycle or walk whenever possible, 19 per cent were neutral. Regarding wasting water and recycling things only 57 per cent stated that they do not waste water and 59 per cent stated recycling things. Only 56 per cent said that they would pick up rubbish from public places and 30 per cent neither agreed nor disagreed. Only 66 per cent said that they separate food from other wastes and 15 per cent do not follow this practice whereas 91

per cent said that they do things to reduce waste. Regarding economic dimension, 72 per cent expressed that they do things to help poor. Regarding purchase behaviour, only 42 per cent said that they purchase second hand goods and 35 per cent said that they do not prefer it. Only 51 per cent agreed with the view that they prefer not to buy goods companies with a poor reputation for treating their employees. Few items were asked regarding social behaviour. An overwhelming 90 per cent of students are of view that they treat others respectfully while using internet or mobile communications like messages and chats. Surprisingly only 32 per cent agreed that they do things which are not good for their health. A large number of students (67%) are keen on working with committees and support an aid or environmental organisation (62%) and treat people with respect irrespective of the cultural background (98.5%).

The overall analysis shows that there are certain gaps between knowingness and behaviour and the sustainability knowingness has not effectively translated into sustainability behaviour.

2. Associations between Constructs of Sustainability Consciousness

In order to find out the associations between various constructs and sub–constructs, correlation analysis was done by calculating Pearson's correlation coefficients which are depicted in Table 3.

Table 3

Correlations between constructs and sub-constructs of SC

		KE_M	KS_M	KEN_M	AE_M	AS_M	AEN_M	BE_M	BS_M	BEN_M
KE_M	Pearson Corr.	1	.727**	.462**	.560**	.364**	.152	.414**	.300**	.255**
	Sig. (2-tailed)		.000	.000	.000	.000	.057	.000	.000	.001
KS_M	Pearson Corr.	.727**	1	.451**	.522**	.434**	.067	.331**	.291**	.091
	Sig. (2-tailed)	.000		.000	.000	.000	.405	.000	.000	.265
KEN_M	Pearson Corr.	.462**	.451**	1	.423**	.416**	–.092	.290**	.340**	.298**
	Sig. (2-tailed)	.000	.000		.000	.000	.247	.000	.000	.000
AE_M	Pearson Corr.	.560**	.522**	.423**	1	.560**	.070	.355**	.380**	.197*
	Sig. (2-tailed)	.000	.000	.000		.000	.388	.000	.000	.016
AS_M	Pearson Corr.	.364**	.434**	.416**	.560**	1	–.034	.369**	.361**	.220**
	Sig. (2-tailed)	.000	.000	.000	.000		.664	.000	.000	.006
AEN_M	Pearson Corr.	.152	.067	–.092	.070	–.034	1	.008	.067	.001
	Sig. (2-tailed)	.057	.405	.247	.388	.664		.922	.411	.988
BE_M	Pearson Corr.	.414**	.331**	.290**	.355**	.369**	.008	1	.492**	.506**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.922		.000	.000
BS_M	Pearson Corr.	.300**	.291**	.340**	.380**	.361**	.067	.492**	1	.366**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.411	.000		.000
BEN_M	Pearson Corr.	.255**	.091	.298**	.197*	.220**	.001	.506**	.366**	1
	Sig. (2-tailed)	.001	.265	.000	.016	.006	.988	.000	.000	

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Correlation analysis revealed that sustainability knowingness and sustainability attitude are positively associated except in the environment dimension indicating that environmental knowingness has not translated into environmental attitude. Regarding sustainability behaviour, results reveal positive association with sustainability knowingness in all the three dimensions. Sustainability behaviour is positively associated with sustainability attitude in all the dimensions but it is not significant in the aspects of environmental and economic behaviour, indicating that attitude has not translated enough into behaviour in the environment and economy dimension. Within the sub-constructs, the analysis of data reveals that there is a substantial correlation between environmental, economic and social dimensions of sustainability knowingness. There is negative association between social and environmental attitude, though not significant. There is no significant interaction between environmental attitude and economic attitude beyond positive interaction between them. Similarly, association between environmental attitudes is not significant with social behaviour except positive correlation between them.

3. Relation Between Sustainability Consciousness and Academic Stream

In order to know the differences in the sustainability consciousness of students from various academic streams in their senior secondary stage, i.e., sciences, humanities and commerce, data was subjected to t-test analysis in SPSS.

Table 4
Mean Scores of Sub-constructs across the Three Academic Streams at School Level

	Stream					
	Commerce		***Humanities***		***Science***	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
KE_M	4.13	0.56	4.04	0.55	4.14	.67
KS_M	4.24	0.52	4.20	0.51	4.26	.51
KEN_M	3.81	0.48	3.80	0.42	3.92	.32
AE_M	4.63*	0.44	4.40*	0.49	4.35*	.47
AS_M	4.55	0.35	4.46	0.44	4.34	.50
AEN_M	3.32	0.52	3.23	0.47	3.35	.63
BE_M	3.64	0.63	3.62	0.68	3.71	.57
BS_M	4.12	0.45	4.10	0.46	4.17	.47
BEN_M	3.61	0.46	3.53*	0.53	3.78*	.46

* Results are based on two-sided tests assuming equal variances with significance level 0.05

On the basis of two-sided tests assuming equal variance with significance 0.05, it is found that there is no significant difference in the responses of students from humanities, commerce and science streams except in the area of environmental behaviour between science and humanities groups. Environmental dimension in sustainability behaviour is more in students with science background than humanities students and SC in economic dimension in sustainability attitude is more in commerce students than rest of the students.

Conclusions and Implications

The sustainability consciousness of school leaving students (17–18 years) was mapped in this study with the purpose to analyse the sustainability consciousness in terms of knowingness, attitude and behaviour. For this, SCQ tool developed by Gericke, et al. (2019) was used with due permission. This is one of the most extensively used as well as the first tool developed to measure SCQ and was empirically validated with the sample of 16–17 years' age group students in Sweden. Since then, researchers in other countries like Taiwan, Turkey, etc., have used this tool to analyse SC of students across various age groups. The author has not come across any study done using this tool in the Indian context. Hence this study also helped in empirical validation of the tool in the Indian context. The SC of the young students who had finished formal schooling was analysed in different domains (environmental, social and economic) of sustainability knowingness, attitude and behaviour, which are also referred as constructs and sub-constructs of sustainability consciousness. The results reveal that students hold high levels of sustainability knowingness (in all the three dimensions, but most in environmental dimension). Students reported a low level of sustainability behaviour (lowest in the environmental dimension), which is contrary to the results of sustainability knowingness as the environment dimension was highest in knowingness. This indicates that sustainability knowingness is not effectively translated into behaviour. The sustainability knowingness of students may be reported as high due to the influence of textbooks and other curricular knowledge sources but not translated into personal contexts. This has strong implications for schooling and ESD initiatives at institutional level. This implicates that school curriculum needs to focus more on the experiential aspects and provide more opportunities for student-led environmental activities like projects, case studies, community interface, etc. There is no significant difference in the responses of students from humanities, sciences and commerce academic stream except in the area of environmental behaviour.

Correlation analysis between the constructs of SC indicates positive interaction between sustainability knowingness and sustainability attitude. Sustainability behaviour is positively associated with sustainability attitude except in the areas of environment and economy indicating that environmental knowingness has not translated into attitude and further into behaviour.

It is very challenging to change behaviour regarding SD (Guler and Afacan 2013) and in order to modify these complex and contextual behavioural aspects, it is important to address and change beliefs related to sustainability (Ferreira, et al., 2009; Wals, 2011; Kinoshita, et al., 2019). To teach sustainability effectively, and improve SQ, we need holistic and pluralistic approaches (Pauw, et al., 2015). Some effective strategies for improving SQ and orienting students for SD are project-based inquiry learning (Kalsoom and Khanam, 2017; Tsai, 2018; Wals, 2011; Kinoshita, et al., 2019), green experimental approach (Mageswary, et al., 2012), university-school partnerships (Kruger, et al., 2009) and service-learning approach at both senior school and university level (Hernandez-Barco, et al., 2020; Lasen, et al. 2015) as these involve students in direct experiences with complex problems related to sustainability. The school curriculum needs to integrate sustainability issues across all the subjects in an interdisciplinary approach.NEP 2020 is aligned with the ESD framework and Agenda 2030 as the vision of the policy states to promote the development of knowledge, skills, values and dispositions to support human rights, SD and global values. The policy recommends holistic and multidisciplinary educational environment and include areas such as climate change, waste management, organic and sustainable living, global citizenship education, etc., to sensitise students for SD. Engaging students in the SD issues and establishing a culture of sustainability in institutions is the key for transformation. Mapping the SC of students help not only in curricular reforms but also in planning for various institutional initiatives and creating organisational culture to promote sustainability as way of living.

Scope for Future Research

The impact of gender on sustainability consciousness is not explored in this study. The relationship between gender and SC can be examined in future studies. Similarly longitudinal and cross-sectional studies can be undertaken to understand how SC develops or changes with age and other experiences. In-depth content analysis and evaluation of curriculum in various subjects can be undertaken to examine the relationship between SC and curriculum. The impact of interventional strategies in the institutions can be analysed by measuring the change in SC

in certain aspects by using this tool or modifying this tool as per the requirement. Sustainability consciousness initiatives in schools and higher education institutions can be undertaken after mapping the students and identifying the gaps. Knowing the SC of students through this kind of mapping also helps to plan macro and micro level interventions at various stages of education.

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Emergent Literacy
A Developmental Perspective of Literacy

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Abstract

Seeing literacy (including early reading) from a developmental perspective is a great achievement. It has not only contributed in the formulation of reading-writing instructions from a child-centred perspective but also has given the world a perspective which believes that preschool literacy experiences are equally valuable. The purpose of this paper is to bring forth the significance of developmental and holistic nature of literacy by reviewing the researches on two contrasting views: Reading Readiness Perspective and Emergent Literacy Perspective. The paper also interprets developmental perspective of literacy in the light of Vygotskian theory of literacy and development and Marie Clay's contribution in early literacy. Early literacy in Indian context is also reviewed in the light of emergent literacy framework in the later section of this paper.

Introduction

Looking at literacy learning before young children receive formal reading and writing instructions is a recent interest adopted by reading researchers since 1960. This understanding is popularly known as 'Emergent Literacy'. The study of emergent literacy represents a new perspective which stresses that legitimate, developmental literacy learning occurs during the initial years of a child's life (Teale and Sulzby, 1986). It entails the idea that social and linguistic context for literacy acquisition plays a significant role in the course of literacy development. Children begin to explore the language in varied forms before their encounter with literacy in a formal school setting. It legitimises the earliest literacy concepts and behaviours of children and acknowledges the multiplicity

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of social contexts in which children are becoming literate (Teale and Sulzby, 1986). Such literacy related behaviours are unlike the behaviours of conventional readers and writers, but they are covered with various assumptions about literacy. The emergent literacy also presents social interactive view of literacy. Chomsky (1956) in his language acquisition research stated that young children are active constructors of language rules. They hypothesize and generate rules on their own while actively engaging in communication with others. Thus, the communication patterns and practices, parent-child interactions and parent-child literacy activities act as critical support for the acquisition of reading and writing concepts. Early reading research with this shift in perspective characterises young children's early reading behaviours in a new manner.

Education is a major concern for a developing country like India. The interest in early reading and a shift in perspective on early reading are also relatively recent in India.

According to Sinha (2010), in India, literacy pedagogy (including early literacy instructions) is still primarily traditional, where the focus is overwhelmingly on sounds rather than meaning. Such practices have led to a high dropout rate in Indian schools (Kumar, 2004). Socio-cultural background of the child is the reason often quoted for it. This paper questions the other less mentioned reasons like inadequacy of the literacy experiences provided in the school, which just end up being meaningless for the child and having no relation with the real world. It is the need of the hour to reflect upon education in primary years of schooling from the lens of emergent literacy paradigm which holds the belief that literacy learning is developmental in nature. However, before presenting this new perspective, it is equally essential to understand the various notions about early reading and writing attempts, that arise from the reading readiness perspective and its implications to reading.

Two Perspectives of Literacy Development in Young Learners

'How people respond to children in their initial stages of literacy learning depends upon what they believe about literacy development.' (Raban, 1997, p. 20). In the field of education, there are two predominant, conflicting views about how learning, particularly learning to read, takes place. The two views are reading readiness perspective and emergent literacy perspective.

Reading Readiness Perspective

Reading readiness theory has undergone several transformations in its application over the past 100 years (Mason, 1984). It had its emphasis on a maturational viewpoint in the early stages of the movement, but reading readiness theorists eventually adopted a behaviouristic model of instruction asserting that children's

readiness could be influenced through direct instruction.

The dominant theory from the 1920s–1950s was that reading readiness was the result of biological maturation. From this perspective, it was believed that the mental processes necessary for reading would unfold automatically at a certain period of time in development. The view held by reading readiness theorists was that development is controlled by maturation which results from neural ripening. Therefore, all kinds of children's thinking were seen as resulting from motor development, largely being unaffected by the environment. As a result of this view, 'waiting' until child is mature was considered essential for any kind of learning.

The reading readiness perspective was influenced by this maturational view (giving instructions only to the most mature). It was believed that readiness to read was the result of neural ripening. Therefore, if the child is not yet ready to read, wait. Instructions should be postponed until readiness was established.

During the late 1950s and 1960s, the dominant theory shifted from reading readiness as maturation, toward readiness as the product of experience (Teale and Sulzby, 1986). Proponents of this viewpoint argued that if children had the appropriate experiences, their reading readiness could be accelerated. In response to this shift in thinking, educators and parents were encouraged to use more direct instructions and structured curriculum in early childhood in order to prepare children for reading. In the 1970s, researchers began to challenge traditional reading readiness attitudes and practices. As a result, educational world took an interventionist posture, taking into account the role of environmental factors. However, the influence environmental factors can have on a child learning to read has been taken in a narrow sense. For instance, activities to develop auditory and visual discrimination and auditory and visual memory were given importance. The curriculum believed in providing such a set of basic sequenced prerequisite skills which could help mastering reading later on. Writing was expected to be delayed until the child learns to read. Here, literacy was used in a formal way; the functional use of literacy was not given any attention. The task of learning to write waited until enough training was given on reading. Children were considered literate only after their reading and writing began to approximate adult models. (Mason, 1984; Teale and Sulzby, 1986; Mason and Sinha, 1993).

This way, the reading readiness perspective affected people's thinking about literacy development in two ways. Firstly, it conceptualises early childhood period as precursor to real reading. It implies that 'only after the child has mastered the various sub-skills of reading readiness does the real part begins.' (Teale

and Sulzby, 1986, p.177). Second implication is that learning to read and write begins only in a school-like setting as readiness skills can only be taught in schools.

Debatable Issues in the Perspective

Many issues were raised and debated by scholars regarding this perspective. Like Mason and Sinha (1993) pointed out various issues. First issue with this perspective is the assumption about the nature of reading, which has been viewed in a dichotomous manner by reading readiness theorists. Reading is taken as 'all' or 'none' phenomena. Secondly, the very nature of reading is also misunderstood. Reading has been considered as a decoding process, which is finding the oral equivalent of written language. Thus, a child who knows other aspects of literacy but still not able to decode, is viewed as a non-reader. Third issue is the suggestion that maturation in sensory motor skills is assumed transported reading skills. Skills, like spotting differences, visual discrimination, listening discrimination and fine motor skills, were supposed to indicate readiness in reading. It was also believed that children develop reading skills from general cognitive and motor skills, whereas researchers state that children, who experience reading even informally, do develop reading skills (Mason, 1984). Lastly, it is questionable to wait and delay the exposure to reading until children reach a certain developmental level.

Emergent Literacy: An Alternative Perspective

Shortcomings in the reading readiness perspective mostly come from a new perspective, popularly known as emergent literacy perspective. Most of the literacy acquisition researchers have accepted the paradigm of 'emergent literacy'. One of such researchers is Marie Clay, who coined the term emergent literacy for this perspective. Emergent literacy gives legitimacy to children's early, non-conventional reading and writing behaviours. The term 'emergent' connotes development rather than stasis; it signifies something in the process of becoming (Teale and Sulzby, 1986). Similarly, 'literacy' denotes the interrelatedness of reading and writing in young children's development.

According to this perspective, the process of becoming readers is facilitated by children's active involvement in language and print activities rather than providing mechanical drill and practice. Emergent literacy perspective views literacy as a process of discovery and exploration of print. Thus, this view is in contrast with reading readiness perspective, which puts emphasis on perceptual motor skills and abstract isolated aspects of print. The other shifting perspectives provided by emergent literacy theory are as follows:

- Literacy emerges before children are taught to read in formal settings like schools.
- Literacy is defined in a holistic manner. Hence, reading is not merely decoding rather other major aspects are also involved in the act of reading. For instance, knowledge about directionality, reading print in context, meaning making and so on.
- The notion of reading preceding writing or vice-versa is a misconception. Oral and written aspects of language develop concurrently and are interrelated.
- Literacy develops in real life settings. Thus, functional aspects of literacy are as important as mechanical aspects.
- Children learn reading and writing through active engagement with their world. They profit from modelling of literacy by significant adults. Active agency of child as well as social setting is considered significant.
- Language is learned through use rather than through practice exercises (Harste and Woodward, 1989).

Emergent literacy perspective views children's attempts to read and write in informal settings (before formal schooling begins) as significant as their engagements with formal literacy instructions in school. Such early reading-writing behaviours of children predictive not pre of anything, but are considered as integral parts of literacy learning which is in a state of becoming. Therefore, emergent literacy perspective views reading and writing as developmental in nature rather than seeing reading as 'all' or 'none' phenomena (Teale and Sulzby, 1986). This way, emergent literacy perspective supports the natural gradual development of a young child's listening, speaking, reading and writing abilities. Children begin to explore the literacy in varied forms before their encounter with formal school. There is a shift of emphasis from teaching of reading and writing to facilitating children's learning by their active engagement in print activities as per emerging literacy perspective.

The emergent literacy perspective gives due emphasis to both reading and writing skills in early years of life. It represents a needed shift in emphasis from an absence of writing in early grades' curriculum to integration of writing and reading. It is not about emergent writing alone, nor emergent reading alone, but about emergent literacy (Harste, Burke and Woodward, 1982; Teale and Sulzby, 1986).

With Vygostsky's valuable ideas, literacy is no longer regarded as simply a cognitive skill but as a complex activity with social, linguistic and psychological aspects. The social setting for literacy learning is also given due emphasis in emergent literacy perspective. Vygotsky's ideas on learning and development extended the notion of the child as a single

player in his/her literacy learning by hypothesising and exploring about the world. He believed that children learn particularly by engaging in activities with experienced and knowledgeable significant others. According to Cambourne (1988), 'certain conditions must operate to permit language learning to occur.' Therefore, it is apparent that learning mechanical aspects of reading and writing in drill and practice sessions cannot add more to a child's literacy learning rather their learning must be accompanied by understanding the functional uses of language. Such functional aspects of literacy are better learned in the day-to-day activities in social settings. This also features holistic view of language. Emergent literacy entails the view that functions of literacy are as integral part of learning to read and write as are the other forms of literacy.

The next section briefs about Vygotskian framework of development and learning and Marie Clay's experiences of literacy learning with young children. Vygotskian theory of development and learning has so much to offer; especially to understand the social nature of literacy learning and the concept of interaction which is often used in emergent literacy perspective. Marie Clay's contributions to the field of early reading and writing provide us with significant experiences to understand the nature of young learners' early attempts of reading and writing.

Vygotsky and Emergent Literacy

Lev Semyo novich Vygotsky is a renowned name in the field of developmental theory. His publications 'Thought and Language' and 'Mind in Society' launched him as a major thinker in western psychology. His concern was with situating the mind within a socio-cultural setting and a historical perspective. He believed that higher mental functioning and human actions is mediated by tools and signs. His understanding of language development and development of literacy skills are placed within this framework.

Vygotskian theory focuses on the social constructs of development. It provides an explanation of how changing social interaction between learner and significant adult leads the learner towards proficiency. Various constructs were introduced by Vygotsky to explain this like adult modelling, scaffolding and the zone of proximal development. These constructs seem to be replacing the traditional way of teacher directed learning and believe in drill and practice routines.

Keeping these constructs in mind, the reading readiness theory which features 'all' or 'none' belief about the nature of reading can be critiqued from Vygotskian perspective. According to Vygotskian theory, literacy development is a complex social phenomenon, grounded in children's spoken language competence. That is reading and writing are multifaceted

and their emergence is supported by children's interactions with one another and with helpful adults (Richgels, 2013).

According to him, development occurs in two interactive but qualitatively different processes. The first category of processes is biological in origin and second processes are socio-cultural in nature. Such socio-cultural processes are not biologically given but culturally acquired. In the light of this understanding of development, it is a simplistic model of development to see reading development merely as a result of neural ripening whereas reading in reality is a sophisticated and culturally acquired skill. Vygotsky believed that learning cannot be explained by looking at the learner only, but it must include the context in which the learner has developed.

Language comes out of a need to communicate with others (Vygotsky, 1978). Learning is a matter of internalising language and actions of others. Family, social and cultural contexts support learning to read, speak and write. As per Vygotskian theory, reading stories to children benefit their literacy development. Vygotsky believed that interaction between adults and children is a Critical aspect of literacy learning. The concept of interaction has also been used by emergent literacy researchers, for instance, while discussing story reading to children in shared reading (Mason and Sinha, 1993). To describe such interaction and literacy activities, terms like scaffolding and interactive nature of learning are often used. Such interactive activities can better be studied with the help of Vygotsky's theory of zone of proximal development (ZPD). ZPD focuses not only on the completed level of development (the stage of development where the child can solve the problem independently) but also on the expected level of development where the child solves a problem with the help of an expert (such experts can be teachers, peers or parents) (Mason and Sinha, 1993). Most emergent literacy research is compatible with the theory of ZPD. Storytelling by an adult serves a good example. Teale and Sulzby (1986) suggest in their review that storybook reading is a socially related and interactive activity. An adult reading a story to the child is functioning in the child's ZPD (Mason and Sinha, 1993). There are certain concepts about the story that the child may already know, for instance, the concept of considering each picture of a storybook separately, as a single unit. With the help of the adult acting as a mediator between the child and the text, the child is able to reach those areas developmentally, where in the child cannot function alone, for instance, being able to see pictures in an integrated manner to form a story, using them to predict, think of another ending and so on. The child may not be reading the story independently but engages with it with the help of

significant others. As Vygotsky (1978) also says, 'The teacher must Orient his work on yesterday devlopment in the child but on tomorrow's. Another example to explain the theory of ZPD is language experience approach. In this process, the child dictates one's experience and the adult writes it. The child may know how to narrate his/her experience, but with the help of the adult's modelling, the child learns the conventions of writing and the aspects of writing process.

Early literacy experiences in the home can have an impact on the child's development as a reader and writer in school: storybook reading, and talking about pictures and words, writing for real purposes modelled by caregivers, parents, older siblings, etc. Reading, because of its complexity, cannot be expected to develop without assistance from others. Therefore, formal schooling provides assistance in teaching reading. Reading instructions need not be delayed but does need to be supported. Supporting reading instructions before formal schooling begins — is a major idea introduced by emergent literacy theorists. Also, teaching of reading must be grounded in adult-child interaction. Learner engagement in reading writing tasks is a process to be mediated and one that is crucial to achieve more independent functioning. Learners while learning literacy skills move from a cooperative to an independent mode of reading and writing.

This way, Vygotsky's ideas on development and learning are very well connected with the emergent literacy perspective.

Marie Clay and Emergent Literacy

'Preschool children can learn about many visual features of print, how to write some letters, know how to write some words, can pretend to write notes or letters to family and friends, or dictate stories they want written for them. They can do all this before they have begun to consider how the words, they say may be coded into print, and in particular how the sounds of speech are coded in print.' (Clay, 2002, p.19)

Marie Clay was another pioneer who developed emergent literacy perspective and applied it to understand early reading attempts of young learners. In fact, 'Emergent Literacy term is coined by Marie Clay (1966), which that refers to the beginning of literacy or the process of becoming literate. Her research focused on the formative years of literacy learning. The work of Marie Clay has provided the foundation for new ways of studying and thinking about early literacy. She did her doctoral research work in the area of early reading. She investigated instead about whether one can see the process of learning to read and write going astray at the beginning. An important outcome of her dissertation was the development of reliable observation tools for the assessment and analysis

of changes over time in children's early literacy learning. Her work, *An Observation Survey of Early Literacy Achievement* (1991) constitutes all these assessments. From her research work, she published the book — *Reading: The Patterning of Complex Behaviour* (1979). In her research work, she found reading to involve the integration of four sources of information: language, concepts about print, visual motor skills and sound sequences in words. Clay's research work brings forth the point that children's movement into reading is not marked by a clear boundary between the reader and non-reader. This was also emphasised by Mason and Allen (1986). They believed that 'reading acquisition' is better conceptualised as a developmental continuum rather than 'all or none' phenomenon.

'Reading Recovery' is one of the Clay's important contributions to education. This research project was developed from the concerns of classroom teachers who, despite following well–designed reading programmes, were not able to change the path of progress for particular children. One of the main ideas introduced and fostered through various reading recovery programmes by Marie Clay is that literature based approach to literacy is highly successful with many students with different needs. The 'Whole Language' movement has also given renewed attention to this (Goodman, 1997).

The other critical argument presented by Clay (1979) is that literacy learning or learning to read and write should be perceived as 'multidimensional and tied to the child's natural surroundings' (Teale and Sulzby, 1986). So, it needs to be studied in both home and school environments. She was amongst the first to acknowledge that learning to read and write begin much early in life and is ongoing. This way, like Vygotsky, she also highlighted the significance of social setting of children in order to develop literacy skills. She believed that young children who live in print-rich environment are constantly observing and learning about reading and writing. Most of their literacy learning occurs as a natural part of their early lives. Such literacy learning requires active participation of children in meaningful activities. She believed that activities like shared book reading play a significant role in young children's literacy development. This way, children learn about written language as they actively engage with adults in reading and writing situations, explore print on their own, and as they observe others around them engaged in literacy activities.

Following points are the gist of her critical arguments which she presented after studying literacy behaviours of young children for years as they learned to read and write.

Literacy development is a continuous process

As discussed earlier, the concept of reading readiness suggests that there is a point in time when children are ready to learn to read and write, whereas the concept emergent literacy, as Clay believed, suggests that there are continuities in children's literacy development between early literacy behaviours and those displayed once children could read independently. Clay believes that children begin to develop literacy long before they begin attending formal instructions in a school-like setting. The term emergent implies that there is something new emerging, and development is taking place. Children become literate, growth in reading-writing comes from within the child and as a result of interaction with the social environment. Hence, she believed that there is no frontier in the development process of literacy, rather literacy learning follows along a developmental continuum.

Reading and writing are complex problem solving processes

After detailed observations of early readers, Clay described reading as a message–getting activity and problem solving activity. She believed that reading and writing are complex problem solving processes. Marie Clay (1991) provides an account of all those complex behaviours and competencies which support literacy learning. She lists the various aspects of reading development as oral language, vocabulary and concepts about print. When children read and write, they bring, use and apply information from a variety of sources, assimilate new information, make a decision and monitor their processes in a continuous cycle of learning. Readers and writers apply strategies to solve problems as they acquire the skills of constructing meaning while reading. She believed that there are no simplified ways to engage in the complex activities like reading and writing.

Reading and writing are interrelated processes

Clay (1979) also emphasised the importance of the relationship between writing and reading in early literacy development.

Reading and writing develop at the same time and are interrelated in young children, rather than being sequential. Literacy involves the ability of listening, speaking, reading and writing developing at the same time in an interrelated manner. Reading and writing processes contribute to each other in early literacy learning.

Children construct their own understanding

Clay believes that children begin to develop literacy long before they begin attending formal instructions in a school-like setting. The child is considered as the active constructor of meaning. The child must actively work on printed messages using one's

abilities and previous knowledge. The underlying assumption here is that only the child can control this inner construct. A teacher can only support or facilitate the process of construction. Teachers should also be observers. Clay introduced the concept of observing reading behaviours to determine what sources of information a child is using or neglecting, whether the child is self-monitoring, self-correcting and problem solving while reading. The teacher, with systematic observations, can encourage readers to engage in using strategies while reading and writing.

Literacy learning involves reading and writing continuous text

Readers read and write continuous texts like storybooks, not just letters, sounds or words in isolation. Since reading and writing are complex problem solving processes, the readers and writers need to experience reading and writing with its inherent complexity. Reading and writing continuous texts let children experience the same, as it requires the integration of all behaviours essential for meaningful communication.

Literacy learning involves continuous change over time with verbal interactions

Clay believed that high quality verbal interaction between parents and children eases children's path to become literate. High quality verbal interaction refers to helping children describe events, engage in verbal problem solving and form cause and effect relationship. Similarly, it is also believed that concepts about reading print can be learned very early. For instance, during storybook reading children learn and demonstrate literate behaviour like hold a book properly, turn pages and read words from left to right. Concept about print is another significant contribution by Clay. This idea holds the basic understanding that it is printed words and not pictures that reveal a message. When children know the concepts of print, it means that they are able to distinguish words from pictures, know that a book has a front and a back and know that printed words across a page in a book are read from left to right and from top to bottom (Clay, 1991). Children develop these concepts about print at early age often at home, long before entering a formal or institutional setting. Presence of print at home environment helps promoting their developing so, which is not the only critical aspect in literacy development. Rather it is the quantity and quality of interactions with print that shape early reading development (Mason and Allen, 1986).

Children bring varying knowledge to learn literacy and take different paths to literacy learning

Children enter the literacy learning processes with different profiles of competencies and motivational level. They take unique paths to literacy

learning. Marie Clay described it as different paths to common outcomes.

This way, Marie Clay's views have been helpful in re-conceptualising early literacy and acknowledging the literacy attempts/experiences of young learners as significant. She has made valuable contribution in re-conceptualising the constructs of prevention, intervention and systematic observation through Reading Recovery Programme developed by her in New Zealand.

Emergent Literacy Perspective and Indian Context: Connections and Implications

As highlighted in this paper, emergent literacy perspective has been accepted widely as a framework to review, analyse and understand the reading and writing in early years. However, it seems to be missing or having negligible influence in Indian context if one reviews the research situation and pedagogy followed in Indian classrooms. There is a need to have massive research about literacy experiences of Indian children with varied contexts and population. Sinha (2010, 2012) has been highlighting the need to research early reading-writing attempts of young learners in Indian context in her studies since the research attempt in this area is negligible in Indian context. Also, the significance of the early years of a child is not adequately recognised here. NCF 2005 has also accepted the fact that children enter school with a variety of experiences with language which should be used as a resource to further enhance their understanding. But the lack of research and adequate understanding of early literacy or training of teachers in the area of early reading and writing is also highlighted in NCF 2005, which clearly states that pre-service and in-service training programmes do not adequately address the issue of traditional ideas followed in reading pedagogy.

A few research attempts made to understand early literacy instructions reveal that in India, literacy tradition and instructional settings are primarily traditional. The focus is mainly on sound of the word rather than its meaning (Sinha, 2010). The early attempts of reading and writing are either not given due attention or taken in a narrow sense. 'Layered approach' to reading is practised in Indian classrooms (Sinha, 2010, p. 23). Literacy instruction follows a sequential approach in Indian schools. First 'sounding out the words' is practised, then meaning is given some attention. Decoding is often conceptualised as the main goal of reading. Such an approach sacrifices meaning. Although with National Curriculum Framework 2005 and new NCERT textbooks, the importance of children's literature has been recognised, the pedagogy and classroom practices are still a major concern.

Although it has been emphasised that young learners must experience

reading-writing in meaningful ways in an enabling print-rich environment, they must read volumes of book to learn reading. This can only happen when they have print-rich environment, wherein they have quality engagement with storybooks, to start with. They should have access to both materials and discussions. In Vygotsky's words, children can reach their potential level with the help of significant others who scaffold learning by organising quality interactions pre, during and post reading. However, either Indian classrooms lack quality reading materials or students have no access to such materials as they remain showcased nicely in glass cupboards only. The only book in their reach is the textbook. Hindi textbook stories are often used to teach language components like grammar and *matras*. Even if they are not used for this purpose, quality engagement with print material does not take place because the entire focus is devoted to explaining the text by the teacher and learning new words. Such pedagogy and instructional contexts push children towards reading mechanically, but with the passive role of a recipient, they push children away from considering reading as a pleasurable activity.

Heath (1990) described how children involve in the functional aspect of literacy in their communities without any access to books or stories, they just learn from one's personal experiences of using language. Yet the initial years of schooling break these patterns of using language for functional purposes and instead present 'lesson' language (p. 19). In the light of these words, there is a definite need of a complete shift from the traditional way of looking at reading and writing from emergent literacy perspective in India, which can give a better understanding of early literacy experiences of children. Emergent literacy perspective suggests that reading-writing behaviours being at birth. Instead of having drill sessions of literacy concepts, they should be built naturally. Children should get exposure to reading-writing for functional purposes.

Marie Clay also provided us with an appropriate understanding that all children learn at different levels and have different needs. Children's prior literacy experiences play a critical role in order to help them make use of any kind of direct formal instructions. Their present knowledge and previous experiences should be acknowledged as potential ones. However, one needs to accept the fact that children coming to schools have different literacy backgrounds. There are differences in their rate of development because there are differences in the ways literacy is organised in different cultures and literacy has different values and functions in daily life of people (Raban, 1997). However, such differences should not considered as a reason to blame them for their poor performance. If children come

from such a background where they have limited or no exposure to literacy, then it is the responsibility of the schools and stakeholders to create the opportunities to engage with literacy in meaningful ways. Franzen and Allington (1992) said that development should not be considered as something that limits what children can accomplish as learners. Rather, differences in how children develop their knowledge base (including reading and writing development) should be taken as an opportunity to personalise our instructions. A teacher should be enabled to extend and elaborate children's present knowledge about reading and writing.

To sum, in Indian context, the early literacy here does not have the same research rigour as we find in the western countries. Traditional ways like reading readiness perspective still continues to influence the reading pedagogy in one or the other way. Also, we, as teachers and curriculum framers, should acknowledge what children already know about literacy, make it a starting point and extend this knowledge in meaningful ways. There is only one way to learn about print and that is by interacting with print. Emergent literacy framework makes us believe that literacy learning cannot take place without having a constant availability of books and written material.

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Colonising the Female Mind and Space through Colonial Pedagogy in India, 1880 to 1920s

PREETI* AND ABHINAV MISHRA**

Abstract

This article articulates how colonial education of women was designed for them to be a cog in the patriarchal machinery. Women were not seen as professionals; instead, they were to get educated enough to fit in the new middle class households where they could administer their chores effectively and raise kids according to the new set standards. Curriculum for the upper caste middle class women got doubly colonised— it was a composite mixture of the Brahmanical code of conduct taking cues from the British patriarchy. Gender was presented on a binary model rather than in an intersectional way. This article traces the gendered dynamics in pedagogical spaces— power and authority— in teaching approaches. Discussing women like Pandita Ramabai, among the lone voices of dissent, this article will argue that albeit the percentage of women educated was far less than the men, yet they had a far-reaching effect on the society, especially the urban society.

INTRODUCTION

There was almost no interest both among the Indians and the British to educate the females of India. The British saw it as a wastage of funds as women were supposed to be married early and bound in the home, whereas the Indians thought it discomforting as women were brought out of seclusion. The reasons could be different, but the consequence was the same. The Charter Act of

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1813 and 1835 did not allot any funds for women's education as it was deemed futile to spend whatever little funding on women (Seth, 2007, p. 137). Not until the mid-19th century, Sir Charles Wood's General Education Despatch of 1854, was there any official pronouncement on the subject of women's education. Review of Education in India (Croft, 1886) also mentions that there was no demand for education as a means of livelihood for girls and women. Thus, the most effective stimulus to the spread of education was removed. Women's education was still low on the government's list of priorities. 'For all these reasons, the expense, the lack of control, and the cultural and political pitfalls, government's encouragement of female education in the late nineteenth century was half-hearted at best.' (Minault, 1998, p. 163). Apart from not being given enough funds to set up enough schools appropriately, many superstitions were also spread, like girls will get widowed if they studied. The orthodox section of the Indian society clung to the argument that if women were granted these opportunities, most of them would become 'unchaste'. Unfortunately, this kind of bias in the orthodox society gained much currency, and it played a crucial role in drafting the curricula in such a way so as not to make females exposed to the 'openness' of Western societies.

Even if we negate the patriarchal bias in Western society, western education promised women relatively more physical mobility, which threatened social control over the Indian women's behaviour and activities (Sen, 2002, p. 207). They were not supposed to be mannish, competitive and dissatisfied with their position in the society, rather they were to be fit for domesticity.

Although the British officials did not find much stimulus in the spread of education among the Indian women, the Christian missionaries and the social reformers, including Radha Kanta Deb and Raja Rammohun Roy did. Thus, the missionaries and the private voluntary bodies became what Paul calls 'votaries of education'. They took immense effort to set up schools and colleges in various parts of the country and, more often than not, even bore the financial burden of women's education (Paul, 1989, p. 4). They were among the first to clamour for education for women in India from the 1820s onwards. Unmarried female missionaries were assigned to work with women and children. Being female, they got entry into the *zenana* (pertaining to females only) section, where they read stories, taught needlework, and attempted to proselytise (Forbes, 2006, p. 37). The Church Missionary Society was more successful in South India, where it opened its first boarding school for girls in Tirunelveli in 1821. However, in North India, they were not much successful as they could not get many converts from the women's quarters. At this Zenana education given at home juncture, proved expensive,

cumbersome and largely ineffectual. 'When it became apparent that these zenana projects were unproductive, the mission authorities substituted girls' schools.' (Forbes, 2006, p. 37). The Ladies Society for Native Female Education was formed in 1824 under the patronage of Lady Amherst, which managed more than 30 women's schools. The missionaries contributed much to the development of women's education. However, their religious overtones checked the development of secular scientific temper among the women and could not attract women from every section.

To top it all, the fear of proselytisation was tremendous both among the Hindus and the Muslims. Various private bodies and local committees like the Anjuman-i-Himayat-i-Islam, the Arya Samaj, the Prarthana Samaj started taking interest in women's education. For instance, during the 1880s, the Amritsar branch of the Arya Samaj had taken the first initiative to provide education to girls. In 1885, it established three girls' schools. The Lahore, Ferozepur and Jalandhar branches also made similar attempts. The Hindus and the Muslims began founding girls' primary schools of their own to ensure that some religious content, the curriculum also include which should be Hinduism and Islamic religion, not Christianity. Religious spokesmen, like Swami Shraddhanand, decided that Hindus would have to make women's education a priority if they wanted to preserve their culture and religion from the influence of Christianity. Similar was the case with the Muslim reformers as well. The Anjuman-i-Himayat-i-Islam of Lahore was an explicitly anti-missionary measure. 'For Muslim reformers, as for their Hindu counterparts, women were symbolic not only of all that was wrong with their culture and religious life, but also of all that was worth preserving.' (Minault, 1998, p. 6).

Pedagogy

It was not that the duties of females did not exist in Indian society prior to the advent of formal education of women (Sreenivas, 2003, p. 64–65). The colonial female education was put under tremendous pressure to infuse new into the old, i.e., to recarve the roles and duties of a female in the society. It borrowed concepts like 'good breeding' and 'good mannerisms' from the western education system, which influenced the urban educated family. 'Teaching was seen more as a mission than a job' (Kishwar, 1986, p. 22). In 1882, the Education Commission explicitly recommended a separate curricula for girls to attract more female students. By and large, academic education was thought to be for boys, while 'domestic' education was for girls (Sen, 2002). The colonial curriculum that was deemed fit for girls was neither secular nor scientific. There was a virtual boundary drawn through pedagogy—'us' versus 'them', the upper castes

versus the lower castes, the urban versus the rural, the Hindus versus the Muslims, the Indian versus the Western. There was a deliberate attempt by the colonial masters to further the wedge of disunity in Indian society through colonial education. This is what the Lieutenant Governor of Bengal, Sir Richard Temple, had to say about the growing popularity of the female schools in the urban areas: 'These schools are attended in the first instance by girls of high caste, whereby popularity is ensured; if they had been attended only by girls of humbler castes, they would never have gained influence.' (Temple, 1880, p. 158). The statement made by Temple underlined the very casteist approach (to gain hegemony in the society) as the schools were attended by the high caste children, probably high class as well, which the rest of the society looked up to. Unpretentious in their claims, these schools worked under the penumbra of the existing caste, class and gender divide.

As discussed, school and its curricula required the dominant caste's ideological configurations to be represented as the pervasive knowledge. The curricula were to be redesigned so that a conspicuous divide was visible between the high caste educated women and the low caste men and women (Gupta, 2008). The high castes were to shun the lower caste 'promiscuous' male gaze; further, they were to distance themselves from the lower caste female as well, replicating a stoic hierarchy. The British felt that the Indian girls needed a special kind of education that would enable them to adapt themselves to the new demands made by the educated men of the family without losing their cultural moorings. Since the donors were primarily men, mainly the *seths* (big businessmen) of Calcutta, Bombay, and the crucial decision to send their daughters rested with the males of the family, education needed not to pose a threat to the status quo of the societal norms (Forbes, 2006, p. 33; Kumar, 1996, p. 146). Hence, there were attempts to combine various elements of different education systems that would contribute in make a 'successful housewife'.

As evident, the colonial curricula were geared for gender-specific socialisation. Girls were to be taught household work at schools to carry out their roles as wives and mothers according to the ideals set by teachers and western doctors (Sen, 2002, p. 212). Girls were taught needlework, basic first aid, cooking, sanitation, reading religious texts, history, geography, arithmetic (at a very rudimentary level), music, hygiene. These efforts led to the birth of Home Science as a subject in the 1930s— a nationalist discourse hugely borrowing from western modernity (Hancock, 2001, p. 875). Subjects such as hygiene, nutrition, first aid were new in terms of the domestic worldview to make Indian women an efficient caregiver, which

borrowed heavily from the European sciences (Hancock, 2001, p. 875). Given below is a remark made by Sam Higginbottom, a missionary who worked in the United Province, regarding the desirable virtues among the Indian mothers: "The illiterate Indian mother has her mind filled with superstition, myth, suspicion, and the consequent dread and terror and darkness that cramp and dwarf life. The mother can convey to her child only what she herself has in her own mind." (Higginbottom, 1929, p. 20)

By the 1880s, it became clear that the scenario for women to get educated was changing. The upper caste people and middle-class city dwellers accepted the need for women to get educated for household budgeting, tailoring, nutrition, and hygiene. Unlike the early 19th century, when women who had learned to read tried to hide their accomplishments from other women, as it would have led their subject them ostracization and humiliation (Devi, 1876). It provided relief to those who were related to the cause of women's education. Nevertheless, the path that lay ahead did not seem easy. By the late 19th century, the women no longer had to hide their desire to get educated, but it was still the patriarch of the family who decided the females' fate. By the turn of the 20th century, the number of schools for girls and their enrolment in them increased dramatically. In 1881, only four in 1,000 women were literate, compared to 137 men in 1,000 who could read and write Bengali. Between 1901 and 1911, the number of day schools for girls all over Bengal became triple as more men began to demand educated wives. In 1901–02, there were some 5,564 female students in East Bengal; this increased to 16,468 in 1906–07. Widows too got educated because it made them self-reliant, for they could be recruited as teachers in girls' schools. They could also get recruited as *Updeshikas* (women preachers) for *Ved prachar* (preaching of Vedic philosophy). The widows, including Vidya Devi of Benares, Mai Bhagwati, Savitri Devi, Lajjyawati, used to give speeches and raise funds for their schools. Widows devoid of their familial relations could channelise their energy towards educating themselves and subsequently others (Hancock, 2001).

From 1890s, another set of issues came to the fore: that girls need secondary education. Social reformers like Pandit Ishwar Chandra Vidyasagar, G.G. Agarkar, Justice M.G. Ranade and others played a significant role in promoting secondary education among women (Srivastava, 1998). Even the Hunter Commission in 1882 prescribed secondary education for women. Getting secondary education was not much of a problem for the Eurasian, the European, the Parsis— supplying three-fifths of the pupils in English secondary girls' schools. The problem mainly lay with the Hindu and the Muslim communities who, due to

societal norms like *purdah system*, early marriage, early pregnancy, were not very keen on their women to receive higher education (Prior, 1923, p. 112). "…, the cost of educating a girl in a secondary school is practically twice as high as the cost of educating a boy, though in primary schools the cost is almost identical. The total number of Indian girls, including those in boys schools, undergoing education at the end of the year 1921–22 was just over one lakh, and represents only 4.1 per cent of the number of girls of school-going age, compared with 27.8 per cent, in the case of boys." (Prior, 1923, p. 112)

Therefore, state did not find it lucrative to invest in the secondary education of females as it was double the cost of males. Moreover, the missionaries were still preoccupied with primary education. Hence, Indians had to take the maximum initiative for secondary education for women. The Arya Samaj and the Brahmo Samaj were championing the cause of women's higher education. Altogether, 38 per cent of the total cost of maintaining the girls' school came from public funds, while 62 per cent was received from fees and other private sources (Croft, 1886, p. 284). The pupils and the female teachers were primarily Europeans and Eurasians or local Christians. However, gradually the institutions like the Kanya Mahavidyalaya started with teachers training institutes, i.e., the regular schools. Subsequently, many women (like Sister Subhalakshmi), who were themselves a part of the first generation of educated women, took part in establishing regular schools for women.

Acquiring women school teachers had always been a problem. The education that the Indian women received was by and large minimalistic. So, the teachers recruited were either European or Eurasian or native Christians. However, hiring them proved costly, highlighting the racial supremacy of the white female vis-a-vis the brown female teacher. Hiring European or a Eurasian teacher was up to 200 times more expensive than their Indian counterparts. So, the state tried to promote regular schools where the locals could be trained for becoming teachers in the schools. However, given the minimalistic salary and India being the society observing *purdah* strictly, the government had a tough time finding such women who could go to the normal schools (Oldham, 1922, p. 69). "There are, however, other special causes affecting progress in female education in this province, namely, the pardah system, the early marriage of girls, the difficulty of obtaining trained teachers and the conveyance problem... Owing to the lack of suitable trained women teachers, the majority of girls' schools have to depend on old age men teachers, whose abilities as teachers are doubtful." (Prior, 1924, p. 90–1)

Various measures were taken to attract women to these schools.

For instance, male teachers were expected to bring their spouse to normal schools. 'The employment as teachers, of the wives of schoolmasters does not seem to make much way.' (Croft, 1886, p. 292). So they tried to invest in widows who were a burden to their families. A petty stipend was given to them, which made them self-dependent. It proved to be successful. Various other *samaj* also attested widow education and channelising their energy into productive work like teaching. Various colleges like the Arya Mahila College, and the Kanya Mahavidyalaya were set up to educate widows. Historian Anshu Malhotra points out that when the scheme became successful, the government withdrew its financial assistance. Therefore, educating the Indian women to become teachers was once again become the responsibility of the Indians.

By the wrap of 1920s, a lot of new things were coupled with the old. The first generation of women beneficiaries were ready to give back to the society by propagating female education. Rokeiya Hossain Shekhawat, Mataji Tapaswani, Sr. Subhalakshmi Iyer, and Pandita Ramabai took up the cause of education and tried to educate women. D. K. Karve, a social reformer, on the model of Japan, started the first university for women which could not get recognition until Subhalakshmi India got freedom. In the 1920s, a boost was given to medical education for women in India. Although women's entry into the medical profession was not welcomed, the social conditions in India, wherein women connected only to female doctors, necessitated the training of female doctors. The educational opportunities available for women and the importance given to midwifery in medical training increased after the 1920s.

Pativrata—Paragon of the Feminine Virtues

Since the political and socio-economic situations were changing, it found its reverberations even in the domestic spheres. With industrialisation, the concept of time became linear important. A responsible wife was supposed to get her man ready for work and send children to school. In a way, they were conditioned which would replicate an average British household. Though the nationalist thinkers thought of making Indian women different from the European women but their discipline was very much based on the industrialisation happening in Europe (Hartigan-O'Connor, 2016; Blunt, 1999). The purpose of education for the women was to make them potential wives and efficient mothers (Kishwar, 1986, p. 10). The meagre salary that their husbands received was to be spent judiciously. Now the role of wives was two-fold, first to administer the household and second, to act as a companion to their husbands so that they may not seek pleasure outside of their marriage (Malhotra, 2009, p. 125–128). For instance, in

January 1902, Lala Devraj began to propagate the necessity for girls to learn English because English was the *Rajya Bhasha* (state language) and women having the knowledge of it was becoming essential for men (Kishwar, 1986). Hence, it became imperative for women to learn English so that there was mutuality in the relationship between men and women.

She had to be educated enough to serve as his confidante, but not enough to pose any kind of challenge to him (Sen, 2002, p. 217). In the urban context, women undertook new forms of domestic work. In areas where the housewife came under criticism — employment of servants, domestic hygiene, cooking, household medicine, and management of finance — extremely complex changes were taking place. A sharper enunciation of gender division of labour accompanied a renewed emphasis on gendered spaces (Oldham, 1922). Thus, there was a greater resistance to women's acquisition of skills that would enable them to earn a place among the upper echelons of the society. From a violation of the 'traditional' roles of men and women to a complete moral degeneracy and collapse of the social order was but a short step (Sen, 1999, p. 57). Gradually the demand for the educated brides increased in cities and also in the middle class and upper middle class economic bracket. But, at the same time, since the females of the Indian society were under the control of the Indian men, they also had to etch how the Indian women were different, in a way better than the western women. Given below is an excerpt from *Godan* where one of its key character Mehta does the, character assassination of the western women and declares that no Indian woman should blindly imitate them

The Western woman doesn't want to remain a housewife. The keen desire for sensual pleasure has robbed her of all restraint. She is sacrificing the modesty and dignity which is her crowning glory on the altar of frivolity and amusement. When I see educated Western girls making a display of their charms — their shapely limbs, their nakedness— I feel sorry for them. Their passions have conquered them so fully that they can't even protect their own modesty. And what greater degradation can exist for a woman? (Premchand, 1968, p. 202)

As described by Mehta in *Godan,* a true Indian woman was not supposed to be 'shameless' like the European women, i.e., to be oblivious of her own sexual pleasures. Education was to help her to purge the obscene language, once in common parlance to emote oneself— a very Brahmanical sense of righteousness. Samita Sen finds through such coating of Brahmanical ideology eroding the customary rights of lower-caste women (Sen, 1999, p. 62). They were attempting to remould the girls who would become better than traditional women in the 'womanly' virtues. The reformers

constantly assured themselves and the others that they would only 'cleanse' the excesses generated within the social structure and not touch the patriarchal structure itself. "The truly modern housewife, it was said, would be so auspicious as to mark the eternal return of the cosmic principle embodied in the goddess Lakshmi— the goddess of domestic well-being by whose grace the extended family (and clan, and hence, by extending the sentiment, the nation, 'Bharat Lakshmi') lived and prospered" (Chakrabarty, 1992, p. 15). In many ways, the movement was intended to 'reform' women rather than to reform the social conditions that oppressed them.

A vast didactic literature proliferated in the domestic manuals and women's journals prescribing and circumscribing the women's domain (Sen, 1999, p. 56). *Stridarpan* (a contemporary didactic magazine) talked about women's conformity, where they had to be an obedient wife in the so-called conjugal relationship (*The Bengal Magazine*, Vol. 4, 1876). Mutuality or conjugality in a marital relationship was a borrowed concept from the West. Though the protégé of the western educated 'natives' borrowed the concepts from their masters but they did not want to blindly replicate the West. In fact, their vision was very much tailored to the needs of India. (*The Bengal Magazine*, Vol. 4, 1876). In an article titled *Dampati Prem*, the author remarked:

> *Humare desh mein jis riti se vivah hota hai usme adhiktar purush hi padhe likhe aur sikshit hote hain, aise dasha mein pati ke agyaanusaar karya karna stri ka mukhya karma hai, parantu aaj kal prayah striyan is ke pratikool dekhi jaati hai (Vasanti, 1910, p. 22).*
> (The manner in which marriages are conducted in our country, the husbands are mostly educated, in these circumstances it is the wife's duty to work according to the wishes of the husband. But these days majority of women do the contrary.) (Authors' translation)

He further says that under no circumstance a woman is supposed to raise her voice to vent her frustrations. Only through her kind words and soft demeanour, she can change the heart of her husband. These newly designed women were the preservers of traditions and mascots of culture, femininity and dignity.

Conclusion

In retrospect, the drafting of the pedagogy of women's education had so many influences emerging from different quarters like the nationalists, reformers, missionaries and the colonial state. Coming from different schools of thought, these significant influences were sometimes acknowledged in each other's endeavours and in most of the cases, were dismissed. No matter from which quarter the influence emerged, they were not devoid of ideologies and motives. However, the underlying thread was the

entrenched patriarchy— the desire to educate women was only for the smooth functioning of men's world. Through conjugality, they meant that women could work better as per the directions given by their husbands. There was no balance of power within the family— women were subservient in the family. Whether housewives or school teachers, women were not perceived as professionals, instead as docile and submissive and not posing any threat to the status quo of the societal norms. They were to be forged into the category of so-called educated women who cannot think for themselves and make their own decisions. A wife's role was the combination of physical, emotional and sexual services that made her work so burdensome and yet invisible (Federici, 1975).

The pedagogical objective was to fit women in the given mould, purging the freedom enjoyed by the women venting their grievances and sexuality through songs and expressions which were henceforth deemed low and immoral. Power and authority in teaching approaches demonstrated the gendered dynamics in pedagogical spaces. Their curricula were re-designed to reinforce the male-centred perception rather than make space for women in the men's world. Society was not evolved enough to give voice to women's dreams— their voice was choked in their drudgery and reforged to fit an ideal woman. The cultural bottleneck in the given political context made the society more rigid and very much defined. As a result the society, including men and women, was made to reach a consensus of stiffening the shackles of patriarchal norms and duties.

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Designing and Developing Yogic Chess Board Game for Adolescents to Teach *Ashtanga Yoga*

An Innovative Learning Methodology

Manish Kukreja*, Paran Gowda** and Poonam Panwar***

Abstract

Chess is a two-player strategy board game, which has been used as a teaching tool for different subjects. With the help of innovatively designed and developed yogic chess game, the extract of Patanjali's Ashtanga Yoga has been disbursed to the adolescents in a simplified, interesting and playful manner. The creatively designed chess board has been used to understand few positive and negative effects producing terms found in yoga philosophy. Its efficacy has been tested among 50 students of Government Senior Secondary School, village Khachrauli of District Jhajjar of Haryana, India. A multiple choice questionnaire comprising 50 questions related to Patanjali's Ashtanga Yoga was designed and students' responses were collected before and after the intervention of yogic chess game module, which included theory as well as practical. Pre- and post-test data was analysed by using paired 't' test and found the t-value as –24.25, which is very much significant as the calculated p-value was found to be <0.0001. Benefit of the designed yogic Chess board game is that it may sharpen the brains with value education based on eight folds of Ashtanga Yoga at young age. A child may understand the concepts of Ashtanga Yoga positive forces and how these may be helpful to achieve the goal

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of liberation. This pilot study may be helpful to propagate the basic concepts of yoga philosophy and thus helpful in achieving the goal of National Education Policy, 2020 (NEP 2020). The education policymakers (SCERT/NCERT) may replicate it and further research may be carried out in different schools.

Introduction

Chess board game has been used by the researchers to enhance cognitive functions. Board games can be offered as a teaching tool (Gardner-Anopol, 2007). It is the need of the hour to teach the essence sage Patanjali's *Ashtanga Yoga* to the children in an interesting and play-way manner. Board games of like chess can be offered as a tool to teach the above mention topic to adolescent students. Of course, a rigorous effort will have to be made to delineate a precise, compact and meaningful pedagogy. It has been tried to explore the five *Yamas* like *Ahimsa* (without violence), *Satya* (trustworthiness), *Asteya* (not to steal), *Brahmacharya* (to pursue Brahma) and *Aparigraha* (no unwanted possession); and five *Niyamas* like *Shaucha* (purity), *Santosha* (satisfaction), *Tapa* (self-command), *Svadhyaya* (study of scriptures/self), *Ishwer-Pranidhana* (give up to Almighty); ten *Vitarkas* (opposites of five *Yamas* and five *Niyamas*) like *Himsa* (brutality), *Asatya* (non-trustworthiness), *Steya* (stealing), *Abrahmacharya* (not to pursue Brahma), *Parigraha* (unwanted possessions), *Ashaucha* (impurity), *Asantosha* (no satisfaction), *Atapa* (no self-command), *Asvadhyaya* (no study of scriptures/self), *Nastikta* (not to give up to Almighty); *Asana* (yogic posture), *Pranayama* (yogic breathing), *Pratyahara* (inward-senses), *Dharna* (concentration), *Dhyana* (meditation) and *Samadhi* (integration); and five *kleshas* like *Avidya* (lack of knowledge), *Asmita* (egoism), *Raga* (desirefulness), *Dwesha* (hatefulness) and *Abhinivesha* (desire to be alive) and *Kaivalya* (supreme spiritual wellness/liberation); as mentioned in sage Patanjali's philosophy. The forces of chess (Pawns, Knights, Rooks, Bishops, King and Queen) have been labelled in such a way that they could represent/symbolise important components of *Ashtanga Yoga.* Designing and developing yogic chess board game for adolescents may prove to be an efficient tool to teach *Ashtanga Yoga*. The purpose of the study is to motivate and help school students to grasp the above mentioned in a playful and joyful manner and learn value based moral education. The impact of every limb of *Ashtanga Yoga* practices such as self-restraints or *niyamas,* etc., have a significant role in social health, well-being and self-control (Brems, 2020, Sullivan, et al., 2017, Jarry, et al., 2017). Most of the commentator's common opinion is that the real purpose of yoga practice is expressed by Patanjali in verse (2.28) (White, 2019). It describes that the highest wisdom of enlightenment may be cultivated

with dedicated practice of the eight limbs of yoga which can remove the impurities of mind (five *kleshas)* and body (hindrances), thus enabling the practitioner to achieve the goal of *kaivalya* (liberation). As both theory and practical are essential in every subject of science and social science, we tried to explore both with the help of yogic chess board game in the present study to attain the ultimate benefit of supreme spiritual wellness. The study material exploring above has also been designed innovatively (Figures 1 to 15). Yoga practices may be more fruitful for the students to attain perfection, if they learn theory prior to practising it. Many yoga instructors are also in favour of the above statement. It is presupposed that theory along with practice of yoga should be a part of school curriculum. In the present study, we administered theory teaching sessions through yogic chess game as well as practical sessions also which included *asana, pranayama* and meditation which enabled the children to understand theory in a meaningful manner.

Review of Related Studies

In the captured study, the researchers observed significant effects on verbal memory, sustained attention and creativity after chess training (Gliga and Flesner, 2014). The captured study reveals that intellectual and socio-emotional behaviour of the students who played chess as extracurricular activity was better than those playing soccer (Aciego, et al., 2012). The study by schools et al., that simple addition task and counting can be improved significantly using chess board game but how to sum up positive affects to conquer the negative affects was not mentioned (Scholz, et al., 2008). Joseph, et al. (2016), in their study, focused on academic performance of middle school children in rural India. Lotfi, et al. (2020) studied two distinct dimensions of emotional experiences and categorised them as positive and negative affect. High energy, pleasurable involvement, pleasant feelings and high concentration may be defined as positive affect, and humiliation, guilt and fear, hate, anger and sadness are seen as negative affect. A study by Joseph (2018) analysed the effect of one-year chess training on the processing speed of children and also established a link between both. Results revealed that there is a significant gain in processing speed among experimental group. In a reviewed study, Joseph, et al. (2017) indicated perceptual reasoning that integrated fluid reasoning, spatial processing, and visual motor integration. Statistical analysis of pre- and post-test reveals that chess training significantly improves the perceptual reasoning. A reviewed study by Ferreira and Palhares (2008), presented the context and results with children (III to VI classes) as subjects, about the relationship between chess and problem solving, involving geometric and numeric

patterns. After analysing the test scores it was verified that chess players had better scores in the test and understood numerical pattern more easily. The chess players showed a better performance in planning and suggested certain differences in flexibility which indicate that chess is very helpful in the executive functions improvement of (Grau-Pérez and Moreira, 2017). A study by (Islam, et al. (2021) found that chess training reduces the level of risk aversion almost a year after the intervention ended. The study by Trinchero (2013) reveals that chess training can significantly improve the scores of a group of children on the OECD-PISA Mathematics Scale. The results of the study by Smith (2000) show that the mathematics achievement of the experimental group was significantly higher than that of the control group. According to Khosrorad, et al. (2014), the mathematical skills, reasoning abilities and executive functions of students with mathematical disorders are quite low in comparison to normal students. After the chess game intervention to both groups of students, it was found that experimental group students were having significantly more executive functions and mathematical skills than that of the control group. Ibrahim (2014), in his review study, concluded that players may become good decision makers by practising the chess. The chess-playing students had become accustomed to looking for more and different alternatives, which resulted in higher scores in fluency and originality. The study by Storey (2000) extolled the use of chess training as a means to promote higher order thinking skills among disabled students. This study recommended that teachers consider 'chess' as an instructional strategy for reinforcing skills such as concentration, problem identification, problem solving, planning strategies, creativity, and lucid thinking. Sigirtmac (2016) conducted a study by giving chess training for two hours to the experimental group, and at last the creativity and Theory of Mind (TOM) skills of both the groups were measured and it was concluded that the children playing chess were found to be more creative and Tom skills than the children not playing chess. Stegariu and Abalaşei (2018) divided Class I students from two schools into control and experimental groups and treated the experimental group with chess practice for one semester. The measurements were made with IQ-Splash puzzle. It was concluded that chess practice may improve intellectual development. Sigirtmac (2012) treated experimental group with a chess course and took a concept test based on chess game. After the data analysis, it was concluded that there was a significant difference between the conceptual developments of both the groups which was in favour of chess group. Kazemi, et al. (2012) evaluated the experimental (chess group) and control group students with meta-cognitive questionnaire of

Panaoura, Phillippou and Christou (2003), and mathematics exam before and after the intervention. Chess players score better in both meta-cognitive abilities and mathematical problem solving skills. Sala, et al. (2015) divided 560 students of 8 to 11 years old into experimental (with chess training) and control group (with normal school activities). After chess intervention, the experimental group showed a higher improvement in mathematical problem solving abilities than the control group.

In most of the captured studies, it was found that chess game is used to evaluate the problems related to the subjects other than yoga such as cognitive functions, math scores, concentration, problem identification, problem solving, executive functions, etc. Any study on yoga related to chess could not be traced.

Why this Study?

The present study may explore a play-way method to teach ancient yogic tradition to students, thus could be helpful in achieving the goal of National Education Policy, 2020. The educational policy is focused on surrender, patience, multiplicity, cultural diversity, noble conduct, gender equality, regards for elders/ others, personality development and creating universal approach (4.28/16 NEP) so that the forthcoming generations could be enriched with career making skill development, amplify traditional Indian values and all basic human and constitutional values such as *ahimsa* (without violence), *shanti* (calm), *swachchhata* (purity), *nishkam-karma* (altruistic-deeds), *satya* (trustworthiness), and *seva* (kindness to the society). By understanding the essence of *Ashtanga Yoga* on a specially designed 'Yogic Chess Board', adolescents may be encouraged to adopt the above mentioned values in their lives. On the yogic chessboard, children may comprehend and learn about *Ashtanga Yoga* in a play-way manner. Among other significant values, adolescents may understand how *Kaivalya* is fringed within ten *vitarkas* and five *kleshas* on one side of the field and how *Ashtanga Yoga* on the opposite side, shown as white pieces, are kept to attain supreme spiritual wellness.

Objectives

The objectives of the study are:

(i) To design and develop a yogic chess board game.

(ii) To explore Patanjalis *Ashtanga Yoga* philosophy on the chess board game.

(iii) To test the statistical efficacy of the designed chess board by applying it on adolescent children.

Hypothesis

H^0: There may not be any significant effect of yogic chess board game on yoga education.

Alternatively,

H^1: There may be significant effect of yogic chess board game on yoga education.

Method

Sample and Sampling Procedure

A sample of 50 students (26 boys and 24 girls) was randomly selected from Classes IX to XII (of 13 to 18 years of age) from Government Senior Secondary School, Village Khachrauli, Tehsil Matanhail located in District Jhajjar, Haryana, India.

Inclusion Criteria

The students of age above 13 years and below 19 years were selected and both boys and girls have been treated at the same level.

Exclusion Criteria

We have excluded the students who were physically disabled, suffering from chronic ailments and unhealthy.

Tools and Procedure

Pre and post-test design is a random selection method in which measurements are taken before and after an intervention on the same sample. Paired statistical 't'-test analysis can then determine if the intervention had a significant effect. The pre-testing may also be considered as control group in the design. Students were asked to appear in pre-test, comprising a multiple choice questionnaire having 50 questions related to *Patanjalis Ashtanga Yoga*. The questionnaire was framed with the consultations of yoga experts. The questionnaire given to the candidates to solve in pre and post-test was validated with five yoga experts. We found the content validity index (CVI) 0.94 (Polit and Beck, 2006; Polit, et al., 2007) and the obtained value of Cronbach's alpha is 0.7. Thereafter, the students were taught about *Ashtanga Yoga* (eight limbs), *Vitarkas* (opposites of *Yamas* and *Niyamas*), five *kleshas* and *kaivalya* as well as their precise meanings with the help of creatively designed and developed Yogic Chess Board (Fig. 3) and study material (Figs. 4 to 15). Before beginning the game, instructions were given to them. Daily sessions of 60 minutes for five days were conducted. For the first thirty minutes, they were taught and instructed to play the Yogic Chess Board Game. The students were allowed to move next turn only if they had answered the related yogic term mentioned on the chess piece. While answering, they were permitted to take help from the study material provided to them. For the last half an hour, they were allowed to sing a prayer, practise *Om* chanting, *Hasya yoga, Asanas (padamasana, tadasana) and Pranayamas (bhramari, anulom-vilom), Gyan Mudra* as well as *Trataka* (Gazing). Post-test was conducted on the last day. The data was analysed by using SPSS version 25.

Design

(i) *Yogic Chess Board Design*

The ordinary chess boards were purchased along with pieces for the study from the market and modified as shown hereby for experiment purpose. In the innovatively designed yogic chess board, positive and negative affects producing battle forces have been given name according to Patanjalis' *Ashtanga Yoga* philosophy.

Figure 1: Positive affect producing forces (eight folds of Ashtanga Yoga)

As illustrated in fig. 1 sixteen positive effects were selected generating values comprising eight folds like five *Yamas (Ahimsa*, *Satya*, *Asteya, Brahmacharya, Aparigraha*), five *Niyamas (Shaucha, Santosha, tapa, svadhyaya, ishwer-pranidhana)*; other six folds *(asana, pranayama, pratyahara, dharna, dhyana and samadhi).* On the side of positive affects producing forces, front row has comprised eight pawns labelled as *Santosha* (contentment), *Tapa* (austerity), *Svadhyaya* (study of self or scriptures), *Ishwer-pranidhana* (surrender to Almighty), *Aparigraha* (not to possess unneeded), *Brahmacharya* (to follow Brahma), *Asteya* (not to steal), and *Satya* (truthfulness) from right to left. Back row is loaded with *Shaucha* (cleanliness), *Asana* (blissful yogic pose), *Pranayama* (yogic breathing), *Smadhi* (integration), *Dhyana* (deep stage of concentration), *Dharna* (concentration), *Pratyahara* (subjugation of senses) and *Ahimsa* (non-violence).

Figure 2: Kaivalya (supreme spiritual wellness) encircled with Negative forces (ten vitarkas and five kleshas)

As illustrated in Fig. 2, ten *vitarkas* (opposites of five *yamas* and five *niyamas*), like *himsa, asatya, steya, abrahmacharya, parigraha, ashaucha, asantosha, atapa*, *asvadhyaya*, *nastikta* five *kleshas*/obstacles (*avidya, asmita, raga, dwesha, abhinivesha*) as negative affects producing deeds/ forces selected from Patanjali *Yoga Sutras* on the chess board. Negative affects generating forces like *Asatya* (non-truthfulness), *Steya* (to steal), *Abrahmcharya* (not to follow Brahma), *Parigraha* (unneeded possession), *Nastikta* (no surrender to almighty), *Asvadhyaya* (not to study scriptures or self), *Atapa* (shirk work), *Asantosha* (no contentment) (Fig. 8) and in the back row are *Himsa* (violence), *Dwesha* (aversion), *Abhinivesha* (fear of death), *Avidya* (wrong knowledge), *Asmita* (egoism), *Raga* (attachment), *Ashaucha* (impuring) and one target *Kaivalya* (supreme spiritual wellness) (Fig.7), *(Sadhan Pada*-3) (Karambelkar, 1987). The concept of *Ashtanga Yoga* chess game is to attain *Kaivalya* (supreme spiritual wellness) which is encircled by 15 negative effects producing the forces stated above.

Possible moves of pieces have been well explained in the study material design. The conceptualisation of positive and negative forces, e.g., *Yamas, Niyamas*, other six limbs of *Ashtanga Yoga, Vitarkas, Kleshas and Kaivalya* (super wellness) are designed and described in the Figs. 4 -15.

After discussions with experts about the designed Yogic Chess Board, their valuable suggestions were taken into account for modifications. According to their recommendations the board was improved and finalised.

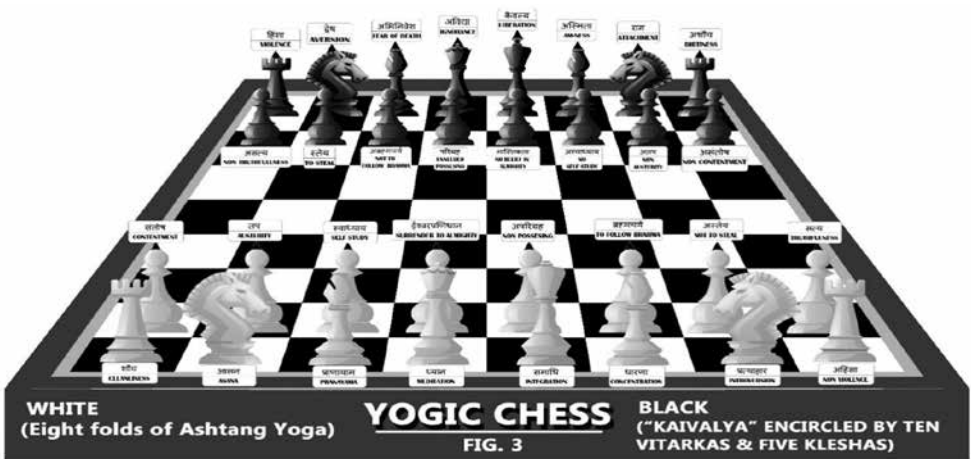


Figure 3: Positive and negative affects producing forces of Ashtanga Yoga on the chess board. Kaivalya (supreme spiritual wellness) is fringed with ten vitarkas and five kleshas. Eight path yoga on the opposite side is shown as solution

(ii) Study Material Design

The study material for the students has been designed in such a way that they can understand the conceptualisation of the contents with the help of illustrated figures given below. Possible moves, placement of the back row positive forces, front row positive forces, front row negative forces, back row negative forces, conceptualisation of *yamas*, *niyamas*, *vitarkas* (opposite to *yamas* and *niyamas)*, *kleshas* and other six limbs of *ashtanga yoga* and how *kaivalya* is fringed have been well explored in Figs. 4–15, respectively. This study material was provided to the students to bring daily in sessions as well as to revise and learn at home.

Data Analysis

By using paired 't' test, data obtained in pre-and post-test was analysed

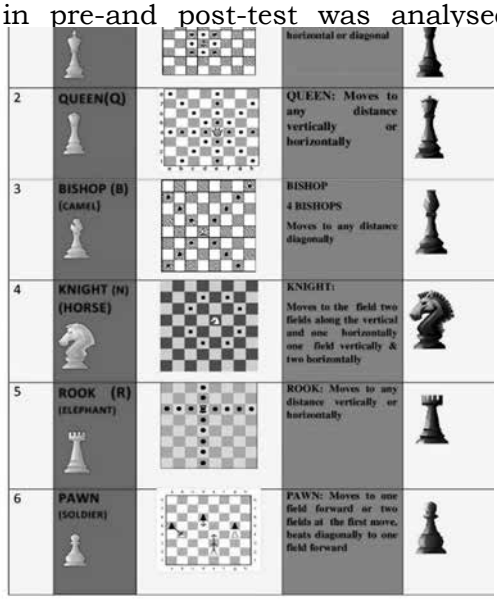


Figure 4: Chesspieces Panas

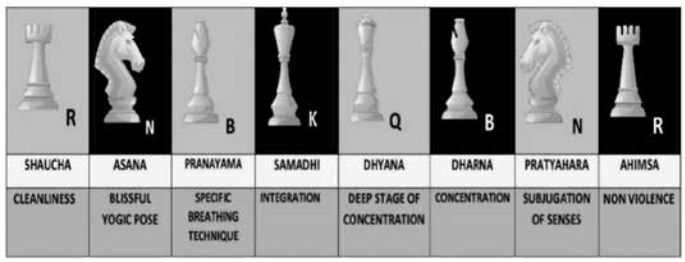


Figure 5: Back row positive affects: white rooks, knights, bishops, queen and king

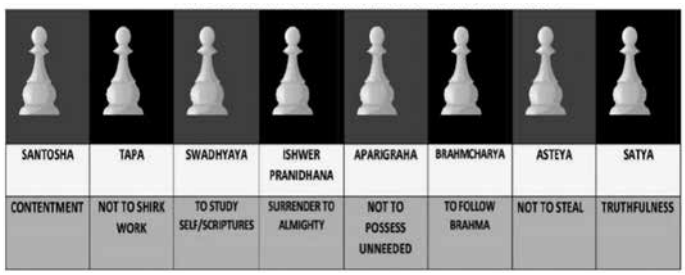
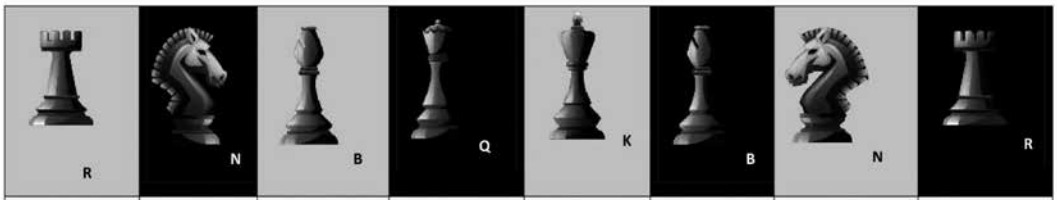
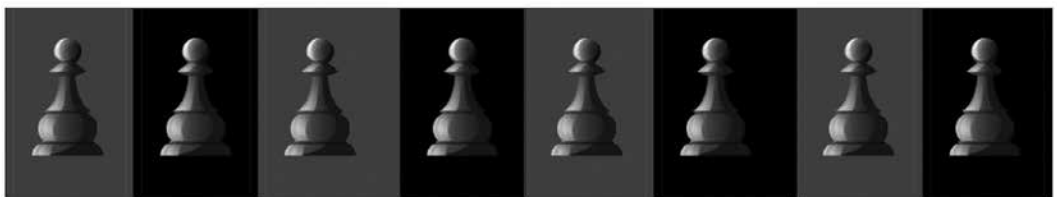


Figure 6: Front row positive affects: eight white pawns



HIMSA	DWESHA	ABHINIVESHA	AVIDYA	KAIVALYA	ASMITA	RAGA	ASHAUCHA
VIOLENCE	AVERSION	FEAR OF DEATH	WRONG KNOWLEDGE	LIBERATION	AM-NESS	ATTACHMENT	DIRTINESS

Figure 7: Back row negative affects: black rooks, knights, bishops, queen and king



ASATYA	STEYA	ABRAHMCHARYA	PARIGRAHA	NASTIKTA	ASVADHYAYA	ATAPA	ASANTOSHA
NON TRUTHFULNESS	TO STEAL	NOT TO FOLLOW BRAHMA	TO POSSESS UNNEEDED	NO SURRENDER TO ALMIGHTY	NOT TO STUDY SELF/SCRIPTURES	SHIRK WORK	NO CONTENTMENT

Figure 8: Front row negative affects: eight black pawns

WELLNESS THROUGH YAMAS	NAME & POSITION	CONCEPT	DESCRIPTION	MOVEMENT INFORMATION
	ROOK: LEFT CORNER	AHIMSA	NOT TO HARM No violent behave with anyone either physically, mentally as well as verbally which results to no enemy	ROOK: Moves to any distance vertically or horizontally
	PAWN: EXTREME LEFT (FRONT ROW)	SATYA	TRUTHFULNESS A habit of speaking truth either physically, mentally as well as verbally. Enables to know the results of actions	PAWN: Moves to one field forward or two fields at the first move, beats diagonally to one field forward
	PAWN: RIGHT TO EXTREME LEFT (FRONT ROW)	ASTEYA	NOT TO STEAL Not to take anything without permission of owner either physically, mentally as well as verbally. Enables to achieve goals	SAME
	PAWN: SECOND RIGHT TO EXTREME LEFT (FRONT ROW)	BRAHMCHARYA	TO FOLLOW BRAHMA To follow the instructions laid by sages either physically, mentally as well as verbally. Enables to get vigor and vitality	SAME
	PAWN: THIRD RIGHT TO EXTREME LEFT (FRONT ROW)	APARIGRAHA	NOT TO POSSESS MORE THAN NEEDED Not to hoard more than required either physically, mentally as well as verbally. Enables to know the purpose of life	SAME

Figure 9: Conceptualisation of Yamas

WELLNESS THROUGH NIYAMAS	NAME & SITUATION	CONCEPT	DESCRIPTION	MOVEMENT INFORMATION
	ROOK: RIGHT CORNER (BACK ROW)	SHAUCHA	CLEANLINESS Clean up at all levels physically, mentally as well as verbally. Enables to get rid of attractions among others and self-body	ROOK: Moves to any distance vertically or horizontally
	PAWN: RIGHT (FRONT ROW)	SANTOSHA	CONTENTMENT Attain satisfaction physically, mentally and verbally. Enables to achieve supreme blisshappiness	PAWN: Moves to one field forward or two fields at the first move, beats diagonally to one field forward
	PAWN: LEFT TO EXTREME RIGHT (FRONT ROW)	TAPA	AUSTERITY Working hard to achieve the goal with sincere efforts physically, mentally and verbally. Enables to remove toxins from body	SAME
	PAWN: SECOND LEFT TO EXTREME RIGHT (FRONT ROW)	SVADHYAYA	STUDY OF SCRIPTURES OR SELF To boost knowledge through learnings physically, mentally and verbally. Enables to get connected with deities	SAME
	PAWN: THIRD LEFT TO EXTREME RIGHT (FRONT ROW)	ISHWER PRANIDHANA	SURRENDER TO ALMIGHTY To pray, worship with full devotions physically, mentally and verbally. Enables to attain integration	SAME

Figure 10: Conceptualisation of Niyamas

WELLNESS THROUGH KILLING VITARKAS	NAME & SITUATION	CONCEPT	DESCRIPTION	MOVEMENT INFORMATION
	ROOK: RIGHT CORNER (BACK ROW)	HIMSA	TO HARM Violent behave with anyone physically, mentally as well as verbally. Results too many enemies.	ROOK: Moves to any distance vertically or horizontally
	PAWN: EXTREME RIGHT (FRONT ROW)	ASATYA	NO TRUTHFULLNESS Speaking lie either physically, mentally as well as verbally. Disables to know the results of actions.	PAWN: Moves to one field foward or two fields at the first move, beats diagonally to one field forward
	PAWN: LEFT TO EXTREME RIGHT (FRONT ROW)	STEYA	TO STEAL Take anything without permission of owner either physically, mentally as well as verbally. Results to loose gems/jewels.	SAME
	PAWN: SECOND LEFT TO EXTREME RIGHT (FRONT ROW)	ABRAHMCHARYA	NOT TO FOLLOW BRAHMA Not to follow the instructions laid by sages either physically, mentally as well as verbally. Disables to get vigor.	SAME
	PAWN: THIRD LEFT TO EXTREME RIGHT (FRONT ROW)	PARIGRAHA	TO POSSESS MORE THAN NEEDED To possess more than needed either physically, mentally as well as verbally. Disables to know the purpose of life.	SAME

Figure 11: Conceptualisation of Vitarkas (Opposites of Yamas)

WELLNESS THROUGH KILLING VITARKAS	NAME & SITUATION	CONCEPT	DESCRIPTION	MOVEMENT INFORMATION
	ROOK: LEFT CORNER (BACK ROW)	ASHAUCHA	DIRTINESS No attitude of remaining clean at all levels either physically, mentally as well as verbally. Disables to get rid of attractions among others and self-body	ROOK: Moves to any distance vertically or horizontally
	PAWN: EXTREME LEFT (FRONT ROW)	ASANTOSHA	NO CONTENTMENT Not to attain satisfaction at all levels either physically, mentally as well as verbally. Disables to achieve supreme bliss/happiness	PAWN: Moves to one field forward or two fields at the first move, beats diagonally to one field forward
	PAWN: RIGHT TO EXTREME LEFT (FRONT ROW)	ATAPA	NO AUSTERITY Not to work hard for achieving goal at all levels either physically, mentally and verbally. Disables to remove toxins from body	SAME
	PAWN: SECOND RIGHT TO EXTREME LEFT (FRONT ROW)	ASVADHYAYA	NOT TO STUDY SCRIPTURES OR SELF Not to boost knowledge through learnings at all levels either physically, mentally as well as verbally. Disables to achieve deities.	SAME
	PAWN:	NASTIKTA	NO SURRENDER TO ALMIGHTY Not to pray, worship with full devotions at all levels either physically, mentally as well as verbally. Disables to attain integration	

Figure 12: Conceptualisation of Vitarkas Contd. (Opposites of Niyamas)

WELLNESS THROUGH KILLING KLESHAS	NAME & POSITION	CONCEPT	DESCRIPTION	MOVEMENT INFORMATION
	QUEEN: THIRD TO EXTREME RIGHT (BACK ROW)	AVIDYA	WRONG KNOWLWDGE To visualize immortal in mortal, cleanliness in dirty and happiness in misery. Disables to attain pure knowledge.	QUEEN: Moves to any distance vertically or horizontally
	BISHOP: SECOND TO EXTREME LEFT (BACK ROW)	ASMITA	AM- NESS Ego is superseding. Self is superimposed upon something out of the seen. Disables to be polite.	BISHOP: Moves to any distance diagonally
	KNIGHT: FIRST TO EXTREME LEFT (BACK ROW)	RAGA	ATTACHMENT Attraction to pleasure giving subjects. Results of pleasure, leads to increase demands.	KNIGHT: Moves to the field two fields along the vertical and one horizontally one field vertically & two horizontally
	KNIGHT: FIRST TO EXTREME RIGHT (BACK ROW)	DWESHA	AVERSION Strong dislike, leads to misery. Results of misery, leads to increase grieve.	KNIGHT: Moves to the field two fields along the vertical and one horizontally one field vertically & two horizontally
	BISHOP: SECOND TO EXTREME RIGHT (BACK ROW)	ABHINIVESHA	FEAR OF DEATH Will to live more and more which is common in wise also. Wishes not to die.	BISHOP : Moves to any distance diagonally

Figure 13: Conceptualisation of Kleshas

WELLNESS THROUGH SIX LIMBS	NAME & POSITION	CONCEPT	DESCRIPTION	MOVEMENT INFORMATION
	KNIGHT: FIRST TO EXTREME RIGHT (BACK ROW)	ASANA		
	BISHOP: SECOND TO EXTREME RIGHT (BACK ROW)	PRANAYAMA		
	KNIGHT: FIRST TO EXTREME LEFT (BACK ROW)	PRATYAHARA		
	BISHOP: SECOND TO EXTREME LEFT (BACK ROW)	DHARNA		
	QUEEN: FOURTH TO EXTREME RIGHT (BACK ROW)	DHYANA		
	KING: FOURTH TO EXTREME LEFT (BACK ROW)	SAMADHI		KING: Moves to one field in the vertical horizontal or diagonal

Figure 14: Conceptualisation of Six Limbs of Ashtang Yoga

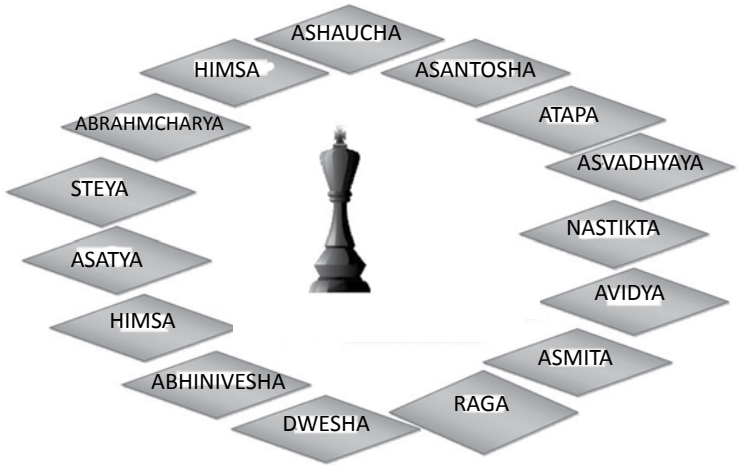


Figure 15: Kaivalya (supreme spiritual wellness encircled by Vitarkas and Kleshas

with the help of SPSS version 25. The data collected from the sample is shown in the chart given below. The two lines correspond pre–test and post–data, respectively.

Results

Tables 1 and 2 show descriptive statistics and paired sample t-test.

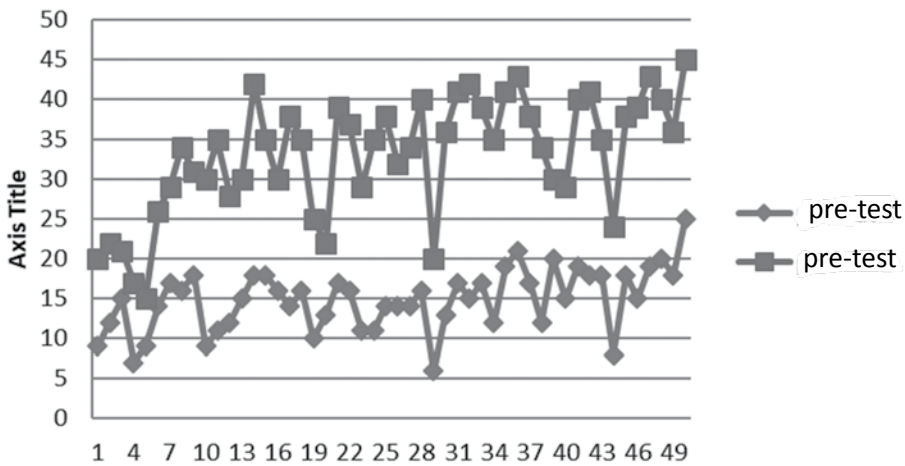


Figure 16: Pre and post–test data of scores of students

Table 1
Descriptive Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Pre-test	50	14.88	3.89	0.55
Post-test	50	33.16	7.45	1.05

Table 2
Paired sample t-test

Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	Sig. (two tailed)
-18.28	5.33	0.75	-19.79	-16.76	-24.25	49	<0.0001

The alpha value is found to be 0.7, which is acceptable reliability value. Tables 1 and 2 depict descriptive statistics and paired t-test values. The intervention drawn from Yogic Chess Game is found to be significant at p < 0.0001, for a sample size of 50 students. The calculated absolute value of the paired t-value was found to be 24.25, which is compared with table value, i.e., 3.496 at 49 degree of freedom, which was significent at p<0.0001 level of significance. As the calculated value of 't' is much greater than the table value, it can be argued that the t-value in the present study is very much significant and hence the designed and developed teaching aid (Yogic Chessboard Game) can be used as an effective media to transform the concepts of ashtanga yoga among adolescent school children.

Discussion

Any research work exploring *Ashtanga Yoga* philosophy on the chess board as a game for adolescents could not be traced in reviewed studies. Based on yogic education for students of Classes I to V, the textbook series, *Let us learn Yoga* (*Aao Seekhen Yog* in Hindi*)* is written in multiple regional languages (Balkrishna, 2010). *Yoga: A Healthy Way of Living* for upper primary stage children has also been published by NCERT in 2015. Some studies have been traced in which *yogic* boards were developed, but that is limited to *Hatha Yoga* only. The efficacy of our study has been statistically proved and found significant in making children understand the essence of sage Patanjali's *Ashtanga Yoga* compared to others (Gardner-Anopol, 2007) (Balkrishna, 2010). Most of the reviewed studies are focused on how chess game may resolve different problems related to other subjects like maths, cognitive functions, verbal reasoning and intelligence. In our study, we tried to educate yogic concepts by using chess game. Our study may improve moral values of the society at adolescent stage of education. Thus, it may be argued

that by applying the designed Yogic Chess Game as teaching strategy, skills of learning the essence of *Ashtanga Yoga* in short span of time and essence of sage Patanjali's yoga philosophy could be learntdisbursed in an easy and play – way manner and hence could achieve the goal of National Educational Policy (NEP), 2020. Yogic chess game may be a useful teaching tool for clarifying the *yogic* concepts. It may create curiosity among students to enter into the depth of Yoga. To understand *Ashtanga Yoga* of Patanjali, it takes one's lifetime, while in this study we attempted to teach children a fraction of the *Ashtanga Yoga Sutras* through the game. As *Ashtanga Yoga* is a vast subject, many other valuable concepts may be included in further researches. The extracts of other *yogic* scriptures can be explored also by the researchers in the same manner.

Here a simple question may arise that chess is a win/loss game and what will happen if black wins? It is hypothesised that on the Yogic chess board games, positive affects (white) or negative affects (black), may win the game. If negative affect any of two wins over side positive affect side liberation could not be achieved (which is the real victory as per *Ashtanga* Yoga). The purpose of yogic chess game is to learn deeply about the path of *Ashtanga Yoga* and the obstacles to be encountered while following it. A wrong move in chess game can lead to a chess player at the edge of defeat. Game is just a model. In the model the forces/ tools are symbolic. The purpose of teaching by yogic chess is to make the player aware of the negative forces, which are the barriers while moving towards the right path. Moreover, chess is a game of concentration of the player. Concentration/*Dharna* (sixth fold of *Ashtanga Yoga*) is again a positive force. One who is winning from the negative affect side in fact concentrated better than the player on the positive affect side. So winning or losing depends upon the player's concentration. In the ancient scripture *Mahabharata*, it is described that Yudhistara lost and Shakuni won the *Chausar* game, but it is also true that the battlefield of *Mahabharata* was conquered by Pandavas. Thus in both situations, either winning or losing may illuminate the player's mind.

Conclusion

The objective of the study is to design and develop yogic chess board game for a basic understanding of Patanjali's *Ashtanga Yoga* philosophy for adolescents and test its efficacy. An innovative 'Yogic chess board game'. To test the efficacy of the developed yogic chess board game has been designed and developed in this study, selected 50 children (26 boys and 24 girls) were selected and found to have significant benefits at $p < 0.0001$. It has also been found that the results of our study are more advantageous. It may be concluded that the designed 'yogic chess board game may improve

and inculcate the skills of *Ashtanga Yoga* in a short span of time and the essence of sage *Patanjali's yoga* philosophy could be disbursed in an easy and play way manner and hence could improve moral values of the society. This study may enable students to become curious to learn more about yoga in a practical and friendly way. Hence, it may be used as a media to inculcate yogic principles in children in adolescence. It may be concluded that by teaching yoga with the help of yogic chess board game may be helpful in achieving the goal of NEP 2020.

Implications of the Study

The educational policymakers and administrators may popularise this yogic chess board game by making it a part of syllabi/curriculum so that children may be benefitted. This game could be used as a tool by secondary and senior secondary school teachers, yoga teachers, physical training instructors (PTIs) and yoga educators to teach the essence of yoga at adolescence stage of schooling. Future research may be carried out for developing *Ashtanga Yoga* Chess game as mobile applications. This pilot study may be helpful for further research across various schools and may also enable the policymakers to replicate.

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Ethnomathematics Approach of Learning Mathematics among the Upper Primary Level Students of West Bengal
A Case Study

SUMANTA HALDER* AND ELIZABETH GANGMEI**

Abstract

Ethnomathematics, as a line of study and research of mathematics education, investigates the roots of mathematical ideas and practices that exist within different cultural groups. The aim of the study is to identify the ethnomathematics approach used by students and teachers for learning mathematics at upper primary level. A Descriptive Survey method was adopted for the study. Sample teachers and students were selected randomly from the upper primary schools of North 24 PGS district of West Bengal. Interview and classroom observation schedule was used for data collection. The study found that teachers motivate students to use cultural games and artefacts which promote mathematical knowledge and belief. The majority of students have learned their elementary arithmetic operations like addition, subtraction and basic geometrical concepts using local culture specific methods, artefacts and games like Kathi Khela and Sholo Guti (Sixteen Soldiers).

INTRODUCTION

Mathematics provides a powerful and universal language and it is considered as one of the most important subjects in the school curriculum. It is the backbone

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of all the scientific technological investigations and the activities of human development. Mathematics is indispensable because of its universal use in all areas (Eraikhuemen, 2003). Mathematics provides the basics of logic and skills that enable a person to deal with day-to-day life problems. The National Curriculum Framework (NCF 2005) for school education in India recommends that the knowledge gained from outside the school be seen as a resource for learning in the classroom. Learners need to feel that each one of these—homes, communities, languages and cultures, is valuable as a resource for experience that leads to nurturing of the capabilities of analysis and inquiry. Experience and prior knowledge could act as tools for the formulation of mathematical ideas in school mathematics. Hence, in order to enhance learning, it is necessary to correlate children's learning of mathematics in the classroom to outside classroom experiences.

Ethnomathematics is a branch of mathematics education which investigates the mathematical ideas that are linked to an individual or cultural groups. More specifically, D'Ambrósio (2002) considers ethnomathematics as an area of mathematics which is practised by various cultural groups such as indigenous groups, people of a particular community (rural or urban), professional workers (like masons, carpenters, etc.), children within a certain age range and many other groups that identify themselves with common goals and traditions. D'Ambrosio (1985) describes the term ethnomathematics: "The prefix "ethno" refers to sociocultural contexts and, therefore, includes language, jargon, and codes of behaviour, myths, and symbols. The derivation of "mathema" means to explain, to know, to understand, and to perform activities such as ciphering, measuring, classifying, ordering, inferring, and modelling. The suffix "tics" is derived from "techné" and has the same root as art and technique".

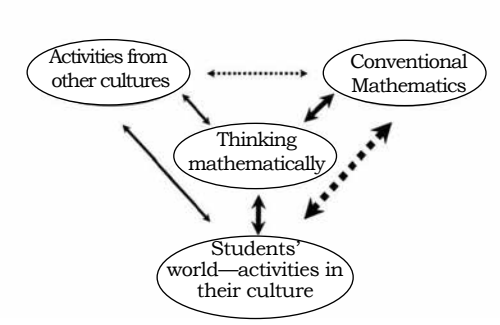


Figure 1: Framework for ethnomathematical curriculum model
Source: W.V.Alangui (2017, p. 202).

Ethnomathematics is practised by cultural groups (D'Ambrósio, 2002). Furuto (2014) defined ethnomathematics as the intersection of culture, historical traditions, sociocultural roots and mathematics. Again D' Ambrosio (1993) said that ethnomathematics should find and try to recognise various ways of doing mathematics within various cultural groups. Thus, ethnomathematics has

evolved as a new area of mathematics education, which deals with the interaction between mathematics and the cultural aspects of peoples and their habitats.

Many studies in India and around the world focused upon how mathematics ideas and thoughts exist among the professional groups, cultural groups, games, and indigenous societies which assists in creating a linkage between socio-economic status of children and their mathematics learning. Pradhan (2019) studied symbiosis between mathematics and cultural games. The study revealed that mathematical knowledge is hidden in the various sectors of gameplay, found as an effective tool to develop mathematical concepts and explore the ideas and practices: Santra and Mukhopadhyay (2019) emphasised on interest and cognitive ability of the learners rather than the universally imposed methods of learning, to consider the importance of situational perspectives (natural environment, socio-political environment) and to consider the input of cultural groups. Supiyati, et al. (2019) found that the evidence of sensitivity on the use of numbers practised by '*sasak*' ancestors long ago in terms of measurement using their anthropometric ability (ethnomathematics). Muhtadi, et al. (2017) reported that Sundanese students used mathematical activities based on the inherent cultural values in performing everyday practical tasks. Pradhan (2017) mentioned that the '*Chundara*' wooden artefacts involve a high level of mathematics knowledge and skills. Sharma and Orey (2017) discussed how the use of culturally contextualised mathematics found in drums may help students to connect school mathematics with their own home cultures by elaborating ethno models. Bose and Subramaniam (2015) mentioned how in India, the archaeological exploration resists the processes of dematematisation and stresses on the comprehension of the hidden underlying concepts. Mukhopadhyay (2013) mentioned the implications for alternative ways of conceptualising mathematical knowledge. Bose and Subramaniam (2011) found that students prefer to calculate orally instead of using the method they have learnt in the classroom. As seen in various studies, mathematical knowledge used for making cultural artefacts like wooden artefacts, drums, etc., is being used in mathematics classrooms. The teachers were using ethnomathematics approach in teaching in his/her research (Pradhan, 2017). Though these studies underlined how different culture specific mathematical ideas exist in different professional groups, cultural groups, cultural games in India and across the world, the ethnomathematical approaches of learning mathematics among upper primary students remain inadequate.

Rationale of the Study

There will be a higher demand for mathematics and computational thinking abilities in various professions in future. Thus, these abilities need to be nurtured among the students from the foundational and preparatory stages. More importantly, a variety of 'innovative methods, including the regular use of puzzles and games that make mathematical thinking more enjoyable and engaging, need to be practised at school level' (NEP 2020). Connections between 'classroom mathematics' and 'real-life mathematics' need to be fostered. One of the major objectives of National Mission on Foundational Literacy and Numeracy (NIPUN Bharat, 2020) is to inculcate play and activity-based pedagogies in the classroom which are linked with children's daily life circumstances. Further, the position paper National Focus Group (NFG) on Teaching of Mathematics (NCF 2005) emphasised the need of local mathematics, in particular those concepts of mathematics which are found embedded in the community and culture. These cultural and contextual resources need to be focused by mathematics teachers to stimulate the learning of mathematics.

Despite the concern on figuring out the mathematical steps and processes to aid the students in solving the contextualised problems, few studies are available which tried to explore the ethnomathematics approach of learning mathematics among students. There is not much evidence of studies on the ethnomathematics approach of learning mathematics among upper primary students in West Bengal. Thus, in the present study, the researcher attempted to explore the experiences of both students and teachers with regards to ethnomathematics and sought to find the answers to the following questions:

- What are the various ethnomathematics approaches to learning mathematics among the students?
- How do mathematics teachers use ethnomathematics approaches for teaching mathematics?
- How do ethnomathematics approaches of learning mathematics vary among students with respect to gender?

Objectives of the Study

- To identify the ethnomathematics approach of learning mathematics among students.
- To find out the teacher's use of ethnomathematics approaches for teaching mathematics.
- To study the ethnomathematics approach of learning mathematics used by upper primary level students with reference to gender.

Methodology

The researcher focuses on ethnomathematics as mathematics practised by upper primary students

belonging to a particular community or cultural groups in the form of indigenous games, activities or cultural practice. Descriptive Survey method was adopted for the study. Purposively, four schools were selected from Bagda block of West Bengal (WB). The population consisted of upper primary students and its teachers. The sample was four mathematics teachers and 40 students of upper primary schools which were selected randomly. The investigator selected 10 students from each school, out of which five students were boys and five were girls. All students were from Class VII. Out of four schools, three were government schools affiliated to West Bengal Board of Secondary Education and one was a private school affiliated to ICSE. The government schools were Naldugari Parmadan Chandrakant Vidyalaya, Charmondal CMPPBK Fulmohan High school and Sindrani Sabitri Vidyalaya. The one private school was St. John's School, Pathuria.

In order to collect data, tools like interview schedule for students and teachers, and classroom observation schedule to observe the teaching learning process were used. Each interview schedule consisted of seven open ended questions related to how they are learning mathematics apart from classroom teaching. The responses were written in the field notes and the whole conversation was recorded in a smartphone and later on, it was transcribed. Interview schedule for teachers consisted of nine open ended questions related to their profession, age of culture specific TLMs, professional training related with ethnomathematics approach of learning, etc. The responses were written in the field notes and the whole conversation was recorded – a smartphone.

The classroom observation schedule consisted of five-point scale. Total 18 questions were taken into consideration under the broad criteria of content knowledge and relevance, pedagogical strategies, teaching-learning resources and evaluation. The five-point scale included choices, like (advanced), (satisfactory), (progressive), relevant and not relevant for the respondents to answer.

Analysis

Data were mostly analysed as per the research questions. After collection, the data were transcribed on a chart paper and it was themed and coded. Part of the students' interview schedules were analysed quantitatively and scored by using frequency and percentage. Plotted bar graphs were used to enable the analysis of data in a meaningful way. The data received from teachers' interview schedule and classroom observation were analysed descriptively. For the third objective (i.e., study of ethnomathematical approach of learning mathematics among boys and girls), graphical interpretation was done based upon the scored frequency and percentage.

Table 1
Students' ethnomathematics approach of learning mathematics

S.No.	Major Items	Yes (%)	No (%)
1.	Arithmetic operations learned from local (culture specific) methods	33 (82.5)	7 (17.5)
2.	Played indigenous games like *Bag Bondi, Kathi Khela, Rangoli,* etc.	11 (27.5)	29 (72.5)
3.	Knows examples of local artefacts connected with classroom geometrical shape	27 (67.5)	13 (32.5)
4.	Played culture specific games having the idea of mathematics	23 (57.5)	17 (42.5)
5.	Students engaged in daily earning activities	13 (32.5)	27 (67.5)

Research Objective 1

To identify the ethnomathematics approach of learning mathematics among students.

To fulfil this objective, the researcher has used an interview schedule for the students. Questions were related to how they are learning mathematics apart from classroom teaching. In particular, how learning of arithmetic operations is related with their culture and daily life activities. The researcher identified various culture specific methods, games and practices among the upper primary students who seam different elementary and secondary mathematical concepts.

- Students were asked the question: Do you know any other ways of doing arithmetic operations (addition, subtraction, multiplication and division) apart from the procedure taught in the classroom? Majority of upper primary students (82.5 %) responded that they have learned their elementary arithmetic operations like addition, subtraction, multiplication and division using local culture specific methods, which are different from classroom learning methods. Most of the students learned basic counting of natural numbers using finger counting method. Apart from counting natural numbers, fingers are used for mathematical operations also Games like '*Kathi Khela'* (stick game) are played by children to learn basic arithmetic operations like addition, subtraction and the concept of greater and smaller numbers.
- A few indigenous games and practices were highlighted to find out students' knowledge of indigenous games or artefacts related to their culture where the concept of mathematics is being used. In this regard when students were asked whether they had any experience of sketching *alpona* (a cultural practice), many of the students responded positively. In addition, students

having an experience of sketching *alpona* (rangoli) are mostly girls as females at homes are used to sketching *alpona* during festivals. Further, on interacting with girl students, it was found that most of them are aware about the geometrical concepts used in the *alpona*. Interestingly, a girl student of Sindrani Shabitri Vidyalaya said that she can figure out various geometrical shapes and concepts through *alpona,* which are similar to classroom mathematics. For example, she said shapes like circle, square, straight line, triangle and various curves are used in alpona.

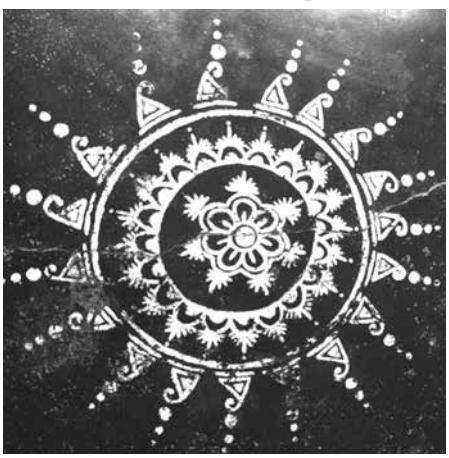


Figure 2: Alpona (Rangoli), mostly drawn by females in a house.
Source: Researchers' personal collection

Figure 2 shows a sample of *alpona,* that is being sketched as a part of the festival and which is related with mathematical concepts.

Mathematical ideas related with *Alpona*:

It involves closed curves, circles, semi circles, triangles, squares, rectangles and many more geometrical dimensions along with the concept of symmetry.

While sketching these artefacts, following steps are followed:

1. An initial point is taken to draw a small circle with the help of rope.
2. Then another bigger circle is drawn with reference to the same point.
3. Then, small circles were made on the circumference of the small circle.
4. Rest of the curves are drawn with symmetry.

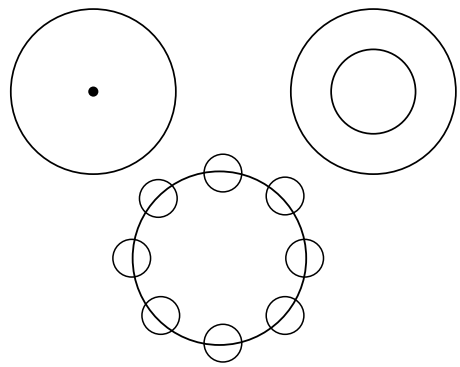


Figure 3: Initial steps involved in drawing an Alpona

In a real sense, *alpona is* a cultural practice followed by local people. The example of this artefact with detailed explanation can be a useful teaching- learning resource for an upper primary mathematics teacher, which is also emphasised in NCF (2005).

- Nearly 57.5 per cent of the students from the four schools

informed that they have played culture specific games that involved the idea of mathematics, while 42.5 per cent of students never played such types of games. Based upon interaction with the students, the researcher identified a few indoor or outdoor games which are discussed hearby.

Indoor Game

Few of the students share their experience with the game *Sholo Guti* (Sixteen Soldiers), a two player abstract strategy board indoor game. In India, it is known as Cows and Leopards. A similar type of game in Bangladesh is known as *Sholo Guti*, the same name researcher also came to know about from the students.

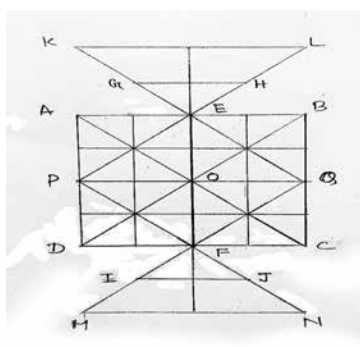
The structure of game:

The game consists of one square shaped board and two triangle boards attached to its two opposite sides, but the student stated that they draw the framework of the game in soil or on a smooth surface with coloured chalk, wherein two players used to play the game at a time. There are a total of 32 pieces of stones used in this game, 16 with each player with distinguishable colour or size. Stone pieces are placed on the intersections of the board, specifically on the half of the square board and the nearest triangular board.

Rules of the game

1. Like the chess game, two players are required to play this game.
2. Upon one's turn, a player can use one piece of stone at a time to move it up to one place in the forward direction (straight line) or capture any stone of the opponent. The move can made only be in forward vacant places or one step ahead of the opposite stone to capture that stone.
3. Capturing the stones is not mandatory. If a player does not wish to capture the opposite, he/

(a)



(b)

Figure 4: (a) A student from Class VII explaining the game ষ ল গুটি (Sholo Guti). (b) A geometrical view of the cardboard.

she can move in vacant places. A piece can continue to be captured within the same turn, and may stop capturing any time. The captured piece (or pieces) is removed from the board.

4. The main target is to capture all the stones of the opponent and the one who accomplish this first, will be the winner.

Mathematical Ideas Present within this Game

The structure of the game *Sholo Guti* is based on the concept of geometrical shapes. Those are:

1. The main board consists of squares: ABCD, AEOP, EBQO, POFD, OQCF, PEQF and many more. Fig. 4 (b)
2. It also consists of different rectangles, for example, ABQP, PQCD, AEFD, EBCF and many more.
3. FMN, EKL, APO, ARO, BOQ, BOE and many more can be the examples of triangles.

Activity Tools

This game board can be used as an activity tool to learn the initial concepts of geometry. Students can be asked to identify the number of triangles, squares and rectangles in the game board. Thus, this activity will help the students in organising and analysing information.

Use in Teaching

The middle board which is square in shape and similar to that of the board of *Bagha Chal* (see Pradhan, 2019) enables the teacher follow to mathematical theorems or verify the concepts.

- Teaching in the verification of the Pythagorean Theorem
- Teaching centroid of triangle
- Teaching of infinite series

Research Objective 2

To find out mathematics teacher's use of ethnomathematics approaches for teaching mathematics.

For this research objective, the researcher used an interview and classroom observation schedule. It is targeted for the teachers. Four teachers (titled as Teacher 1, 2, 3 and 4) have been selected. The responses from the teachers about their use of ethnomathematical approaches for teaching mathematics are:

- Only one out of four teachers is aware about NCF 2005 and its recommendation regarding the pedagogical practices related with mathematical teaching.
- All the four teachers teaching at upper primary level agreed that textbook teaching is necessary but not sufficient.
- It was found that 100 per cent of the teachers used prior knowledge of the students to connect with the present classroom teaching.

- Further, all the four teachers during their classroom teaching, motivate students to use cultural games which promote their mathematical knowledge and beliefs.
- Interlinking of classroom teaching with the local culture of students was supported by all.

Teacher 1 said that classroom teaching needs to be linked with students' daily life activities.

Teacher 2 narrated that culture specific examples of artefacts, which include the concept or application of mathematics, need to be demonstrated during the teaching-learning process.

Teacher 3 shared from his experience, that different locally available objects can be used for understanding geometrical concepts.

How can the knowledge of professional groups or cultural groups or games can be used to teach mathematics? To answer this question, Teacher 1 said that during the introduction of any mathematics chapter, for instance, while teaching the concepts of measurement or geometrical shapes, examples of a carpenter or a mason's work can be cited on how they are using different concepts of measurement and geometry to explain the concepts. Teacher 3 were the example of a shopkeeper in the market using the concept of addition and subtraction, as an for teaching in the class. Further, the teacher said that this example of a shopkeeper can be planned out in the form of classroom activity as role play by the learner, wherein a student can act as shopkeeper and others can be the customers. Teacher 4 precisely and meaningfully explained how the local artefacts like *Dhaner Gola* (a place where raw rice is stored

Figure 5: Dhaner Gola, the structure where raw rice is stored

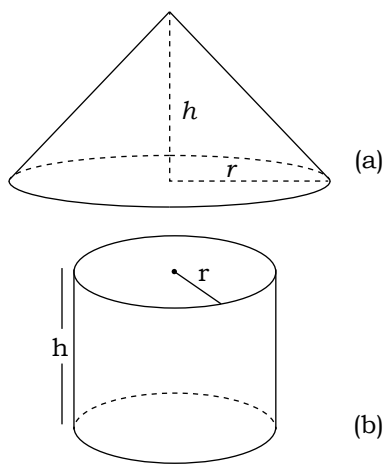


Figure 6: Geometrical shapes— (a) Cone and (b) Cylinder

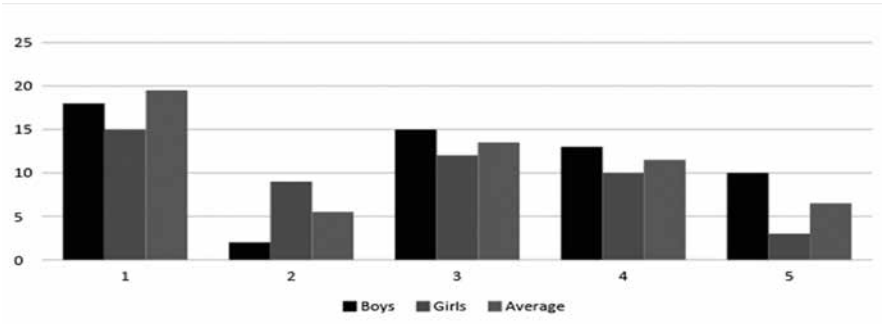


Figure 7: Ethnomathematical approach of learning mathematics among boys and girls

in a village) structure resembles geometrical structures.

Geometrical Concept in Dhaner Gola

The top portion of *Dhaner Gola* is similar to that of a geometrical figure *cone,* which has a height (*h)* and radius (*r),* the bottom portion, of cone has the shape of a circle. Like the top portion, the middle portion of the *Dhaner Gola* is similar to that of the right circular cylinder having height (*h)* and radius (*r).*

Research Objective 3

To study the ethnomathematics approach of learning mathematics used by upper primary level students with reference to gender.

To find out the awareness of the boys and girls on ethnomathematics and how they use culture specific activities in their daily life, the researcher conducted interviews.

In the above bar graph, 1 to 5 depict: 1. Arithmetic operations learned from local (culture specific) methods; 2. Played indigenous games like *Bag Bondi*, *Kathi Khela*, Sketching Rangoli; 3. Knows examples of artefacts, which are connected with mathematics geometrical shapes; 4. Played culture specific games having the ideas of mathematics, and 5. Students engage in daily earning activities.

Based upon the interaction with the students after observation of the class, the following points emerged:

- Both the boys and girls learned their basic mathematical operations like addition, subtraction using local culture
- Girls students narrated that they are familiar with rangoli (*alpona*) and the mathematical concepts, in particular, geometrical concepts that were present in it. In comparison to that, only a few boys played *Kathi Khela* and had experience related to making *Rangoli*.
- Majority of the boys and girls were aware about the various examples of cultural artefacts that are related to mathematical geometrical figures. In this context, it is interesting to know

that this may be because they were familiar with the locally available objects and resources.

Discussion of the Result

The aim of the study is to identify the ethnomathematics approach used by students and teachers for learning mathematics at upper primary level. The result indicated that the students were quite aware and have experienced different culture specific methods of mathematical operations, indigenous games or local artefacts, wherein the concepts of mathematics were encompassed. It is learnt that indoor games, like *Sholo Guti* (Sixteen Soldiers), can be used as TLMs by the teachers as the structure of the game is based upon the concepts of geometrical shapes. This game can be used as an activity tool to teach the initial concepts of geometry, which will help the students to organise and analyse any information. Thus, it is revealed from the study that students have a good amount of knowledge related to culture specific games and artefacts pertinent for building the concepts of mathematics. Further, teachers were aware about local artefacts and used them during the teaching-learning processes. In addition, based upon the finding of the study it can be inferred that there is a slight variation in gender in terms of their experiences with different cultural practices or indigenous games (overall boys were found to be more familiar with the artefacts and indigenous games).

Educational Implications

The results of the study are not only beneficial to the student community, but also have a prospect in giving awareness to the teachers, curriculum developers and policymakers in the following ways:

1. Indigenous games or culture specific practices will help the students to understand various geometrical concepts. For example, games like *Sholo Guti* (Sixteen Soldiers) may help the students to understand the concepts of symmetry and different geometrical shapes that exist in our daily life.
2. Further, understanding of classroom mathematics with the help of local or culture specific resources that students are familiar with, will encourage students to learn maths more easily and in interesting way
3. Various indigenous games, i.e, *Kathi Khela, Sholo Guti,* and artefacts like rangoli can be used as TLMs by the teachers.
4. For the curriculum developers, it will give ideas about framing innovative, effective and inclusive mathematics curriculum. Lastly, the idea of ethnomathematics will be useful in constructing cost effective teaching-material using easily available culture specific resources.

Conclusion

To concluede, it can be mentioned that ethnomathematics is all about the interaction between mathematics and culture, more specifically the concepts of mathematics practised among an identified cultural group. NCF 2005 and its position paper on teaching mathematics also highlight the need and importance of culture, language, and community in learning mathematics. Thus, ethnomathematics acts as a way in which people use certain cultures to explain mathematical concepts, in dealing with relational and spatial aspects in their lives. The study also highlighted a handful of material resources that have the concepts of mathematics, and a number of games based on the principles of geometry. A crucial implication of offering cultural specific to learning mathematics lies in the use of a multiplicity of approaches and procedures, procedures solutions. This gives a clear pathway to liberating school mathematics from teacher-centric approach and enable students' participation, engagement in learning and a joyful learning.

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Facets of Mathematics Education towards Achieving Mathematics Competence in Children

Dori Lal*, Rakesh Batra** and Neeta Rani***

Abstract

Educational reformations around the globe have been structured to address challenges in the attainment of learning objectives that surpass content and topic characterisation. The notion of mathematical competency signifies such objectives. In spite of having variations in the idea and definition of mathematical competency, one common construct is to have an ability to apply mathematics to solve problems in everyday situation. Many international mathematics assessments have provided a platform to children from different countries to get them assessed and know how much competent they are in solving unseen mathematical problems in everyday situations. There is a great need to identify which mathematics competencies a child should have and what the issues and challenges in achieving these competencies are. The idea of these competencies cannot be perceived in isolation. It should be backed up by strong theoretical framework and other integral aspects of mathematics education that are vital as per various studies. The aim of this paper is to explore the idea of mathematics education based upon building mathematical competencies among children and an assessment commensurate to that which may help policymakers in achieving the goal of preparing mathematically competent children who are able to apply mathematics to solve real life problems.

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Introduction

Mathematics teaching and learning of in the last few years has been evolved to be targeted towards achieving mathematics competencies by national policymakers and individual researchers or research establishments. The works of many researchers (for example, Niss and Jensen, 2002) have contributed significantly towards the enrichment of knowledge in this domain. Organisations across the world (for example, OECD, 2009) have been engaged in formulating various mathematical competencies and their assessment. Methods of knowledge description and educational goals are also listed in Trends in International Mathematics and Science Study (Mullis, Martin, and Foy, 2005) and Programme for International Student Assessment (OECD, 2009) that have resulted in major policy revisions in many countries (Pettersson, 2008).

Justification problem is one of the important problems in mathematics education that is suffering from 'relevance paradox'. While many think mathematical knowledge as relevant for the society as a whole, another group of people questions about its relevance to them as an individual being. Traditionally, international patterns are characterised as 'mathematics for all' but the trend has been questioned by different agencies. Societies have not been fully equipped with mathematics knowledge by education providers and necessary competencies were not built among them (Niss, 2003).

Mathematics is seen as an obstruction on by some due to fear and despair to find solution to problems (Benson-O'Connor, McDaniel, and Carr, 2019). It is difficult to change well set principles in the classroom and most teachers teach the way they have been taught (Mosvold, 2005).

The problems related to the quality of mathematics teaching have also been tried to be addressed by agencies in India. NCERT (NFGTM, 2006), through its position paper on mathematics, has highlighted certain key points in mathematics teaching and learning. Mathematising of children is a key point suggested in it and many other important areas of attention have also been suggested in the document. It is pertinent to know to what extent these suggestions are in conformity with mathematics competencies of the children of Indian schools.

Mathematics competencies have been broadly discussed in various policy papers and research documents and most of them associate these competencies with the children's ability to use their mathematical knowledge in solving real life contextual problems in everyday situation. So the competencies have to be weighed according to this perspective also while framing policies.

Mathematisation

The origin of the term 'mathematisation' is not known but the concept of mathematisation has been adopted and supported by many researchers. While Freudenthal

(1991) considered mathematising as 'the process by which reality is trimmed to the mathematician's needs and preferences and that continues as long as reality is changing, broadening and deepening under a variety of influences, including that of mathematics, which in turn is absorbed by that changing reality.' According to him, mathematising as a term' might have been resulted from informal talks and possibly preceded by the terms like 'axiomatising, formalising and schematising'. His interpretation of the term 'mathematisation' was a product of his description of mathematics as an activity of raising the level of certainty where modes of raising the lower level become significant for leaving at upper levels. He advocated for the importance of capability of a child to identify the problem in a situation.

'Mathematisation' as an idea was further enriched by Treffers, A. 1987 Three Dimensions, a Model of Goal and Theory Description in Mathemacties Instraction The Wiskobas project. Dordrecht, the Nether and Reidel Publishing Companey who proposed a distinction between horizontal mathematisation and vertical mathematisation through his design practices. The aim of vertical mathematisation is to raise the understanding of children by developing a mathematical model through problem symbolisation and organisation that allows children to provide orientation through beginning from a paradigmatic situation. Horizontal mathematics focuses on context organisation and preparation for mathematical treatment.

National Council of Educational Research and Training, in its National Curriculum Framework 2005 (NCERT, 2005), suggested that students' focus while learning mathematics should be on the aspect of mathematisation and developing this should be the primary aim of mathematics teaching in schools. It suggested new mathematics teaching practices considering mathematisation as a broad aim of education. The suggestion was commensurate to the idea of Wheeler who opined that knowing the way of mathematisation development among learners is far more required than knowing mathematics itself (NFGTM, 2006).

So, mathematisation should be at the core of mathematics learning processes. It can be promoted by the classroom interactions of teachers and students. Many mathematics education models stressed on mathematisation rather than rote memorisation of concepts. Realistic Mathematics Education (RME) model has its roots in Hans Freudenthal's interpretation of mathematics as a human activity (Freudenthal, 1991). To this end, Freudenthal accentuated that it is more important to reinvent mathematisation rather than doing mathematics. Gravemeijer (1994) states that realistic education in mathematics is supported by 'guided reinvention,

progressive mathematisation through phenomenological exploration and self-developed models.' The learner, the teacher and the curriculum content — all play their part in the process which is characterised by mathematisation of learners' thoughts through careful guidance by the teacher, of all the activities done by the learner. The student is not told exactly what to be done but he/she is guided so that mathematics may be reinvented by themself by exploration and establishment of connection between the ideas. Concepts are developed as abstract ideas from informal thoughts of the learners through this process involving mathematisation.

Mathematical Literacy

According to OECD (1999), real mathematics learning by an individual gets reflected in their competency to understand and recognise the use of mathematics in the world, to make prediction based on mathematical foundations and to engage in mathematics in a manner that fulfils the requirements of their present and future life as a careful and thoughtful citizen, who can construct and reflect upon one's thoughts. 'Mathematical literacy' here not only includes the traditional knowledge and skills but also applying these in multiple contexts in multiple ways. The context should have an element of reflection and insight. Thus, mathematical literacy cannot be restricted to acquiring knowledge but it requires how the factual knowledge and skill has to be used to implement the procedures. 'The world' represents the society and the culture where one lives. As Freudenthal 1991 states that all natural, societal, psychological phenomena in this world are controlled by mathematical theories, edifices and notions. The word 'engaged' not only means activities of physical or social involvement, but it also includes many other aspects like ascertaining, standing behind, being vocal towards various elements of mathematics. 'Present and future life' stands for personal and professional life with friends and relatives as well as life as a community member. Thus mathematical literacy pertain not only having the knowledge of formulae and procedures but also the capacity of using mathematics in many types of situations. These situations may be solving a problem using mathematical knowledge, formulae, results and theory, and also those situations which require how to convert the problem into a mathematical problem. The identification of mathematical structure involved in the solution has to be done by the one who wants to pose or solve the problem. Capability of solving mathematical problems together with the ability to formulate and pose problems in various domains and situations is an integral requirement of mathematical literacy.

Characterisation of Mathematical Literacy

Mathematics literacy as per OECD (1999) is characterised by primary and secondary attributes. The primary attributes comprise mathematical competency and mathematical themes, and the secondary attributes comprise mathematical curricular strands, and situations and contexts. The primary attributes characterise how proficient the learner is and the secondary aspects give a description of the balance between tasks and ensure that the domain is adequately covered. 'Mathematical themes' and 'mathematical curricular strands' together describe the content of mathematics.

'Mathematical competencies' are those that give an insight into how much proficient a learner is in solving mathematical problems, how much competent a learner is in using mathematical language and how much perfect a person is in mathematical modelling.

Themes in Mathematics are so called because they do not mean division of mathematics into distinct topics but they are groups of related mathematical notions that emerge in various contexts and real life situations, for example, chance, geometry, change, relationship, etc.

'Mathematical curricular strand' signifies classroom mathematics content taught in schools, for example, geometry, sets, statistics, etc.

The other secondary attribute is that of contexts and situations in which mathematical problems are posed, for example, professional, personal, social and academic or educational context.

Mathematical Competencies

This is the first major characteristic of mathematical literacy structure. This structure is a set of mathematical skills admissible and appropriate to all strata of mathematics students. There is no hierarchy in these skills. The under mentioned eight skills belong to the set.

Mathematical Thinking

It means characterisation of mathematical problems through the ability to pose a question and to have the knowledge of answers offered by mathematics; familiarity with various types of statements like 'definitions', 'theorems', 'conjectures', 'hypotheses', 'examples' and 'conditioned assertions', etc. and also having the capacity of assessing limit and extent of a mathematical concept.

Mathematical Argument

It is the ability of knowing and understanding the proofs of mathematics results and differentiating them from other types of reasoning; using and evaluating the sequence of various kinds of logics and reasoning; building a sense of heuristics and analysing the statements logically.

Modelling

It consists of structuration of the problem to be modelled, infusing 'reality' into mathematics and its structure through mathematisation, describing mathematical models using the mirror of reality via de-mathematisation, trying various mathematical models and doing their validation, critically reviewing mathematical model and outcomes achieved, drawing conclusions on the basis of modelling and results, and supervision and governance of the modelling process.

Problem Posing and Solving Skill

It consists of asking, framing and describing various types of mathematical questions as well as providing their multiple solutions.

Representation

It consists of unscrambling, inferring and differentiating, among various types of representations, of mathematics based conditions and entities and also interdependence among them. It also includes the skill to choose from and switch over various forms of representation as per the objective and the situation.

Symbolic, Formal and Technical Skill

It consists of unscrambling and inferring symbols based abstractions and ability to understand its relation with common language, expressing linguistic mathematical thoughts through signs and symbols, working with mathematical statements that contain formula or symbols, identification of variables, solving equations and performing calculations.

Further enrichment of this skill among learners requires them to express themselves or understand what others wish to express in a variety of innovative and creative ways like written, verbal, visual, etc. By adopting such means, the abstract and symbolic content may be better delivered or understood by the learners. For example, venn diagrams in set theory, pie charts, graphs in problems based on distance, speed or acceleration, timeline for problems like growth of microorganisms/human population and number line to understand the behaviour of real numbers, etc. The symbolic, formal and technical skill is linked with this additional skill named as 'communication skill' in the sense that the former is about knowing, understanding and expressing mathematical thoughts through formal mathematical symbols and abstraction, while the latter deals with understanding mathematical thoughts that others tried to communicate by adopting multiple means and also organising and presenting the abstract symbolic ideas in a form that may be well understood by others.

Communication Skill

It consists of the ability to express mathematical thoughts in

mathematical language in multitude of directions and ways, and also the ability to understand such mathematical languages in which others expressed their mathematical content and viewpoints and the languages may be both verbal and written.

Aids and Tools

It consists of familiarity with various instruments and technological and physical aids, software, etc., that provide assistance in mathematical activity and also with the constraints of such aids and instruments. It is considered as a skill because it involves knowing which tool, software or aid should be used for a specific problem, using it what are the limitations of their use, what are the constraints, etc., and also reflective use of these tools, software or aids in solving a mathematics problem. For example, a spreadsheet may be helpful when the aim is to see the effect of multiplication of decimal numbers by 0.01. A graphical calculator may help in understanding that quadratic equations like $x^2+x+1=0$ have no real root. Equations such as $x^2-2x-1=0$, whose roots are irrational numbers, can be observed through graphic tools by noting down the points of intersection of the parabolic graph with x-axis. Cabrilog is useful for school geometry. Excel and SPSS are useful for statistics. Mathigon and Wolfram Alpha are good resources to understand a few topics in school mathematics.

Competency Levels

According to OECD (1999), assessment of the above mentioned skills should not be made individually. While applying mathematics to real life situations, usually many and perhaps all of the skills are used simultaneously. So, the process of developing test items that aim to assess individual mathematical skills may lead to a false partitioning of the area of mathematical literacy.

For the purpose of assessment of the aspects of mathematical competencies through development of tests and items, skills are proposed to be organised into three broad competency levels which may be characterised as follows:

- **Level 1:** Defining various mathematical terms, ability to reproduce mathematical facts and calculation skill come under this level.
- **Level 2:** Capability of connecting real life problems with mathematics and integrating mathematical information for solving them is part of this level.
- **Level 3:** Ability of generating mathematics based thoughts, generalising basic mathematical facts and having an insight of solving a problem using mathematics is included under this level.

All the skills discussed earlier are expected to affect all these three competency levels. Those skills cannot be categorised into a

single competency level. There is a 'conceptual continuum' formed of these levels spread over from the ability of knowledge reproduction and computations to the ability of connecting different components of mathematical activities aimed at solving real life mathematics problems.

Thus the levels are hierarchical in nature in a manner that a series of goals to be achieved in Level 3 competencies is tougher than the series of goals to be achieved in Level 2 competencies. But this does not mean that Level 2 competencies are necessary for achieving Level 3 competencies. A few studies (De Lange, 1987; Shafer and Romberg, 1999) emphasised that it is not compulsory to attain perfection in Level 1 competencies to achieve Level 2 or Level 3 competencies.

To understand it more clearly, consider the following example.

Example: You want to buy 150 juice bottles for a party. How many eight-bottle packs do you need to buy?

Even if a learner is not perfect in Level 1 competency and is not able to perform division, still by using one's own approach he/she may discover the answer. This means he/she could connect the problem with mathematics without knowing the area of mathematics to which the problem is related. Thus he had a good Level 2 mathematics competency of connection and integration without having enough Level 1 competency. One such approach could be given ratio table method below:

1	10	5	15	2	17	2	19
8	80	40	120	16	136	16	152

Thus tasks become more difficult as we progress from Level 1 to Level 3, but a person may achieve a higher level competency even without having lower level of mathematics competency. But sometimes in higher level competency, tasks related to a lower level competency are also involved and so it is important to achieve competency in all the three levels.

Example: An auto charges a fixed amount of ₹25 for first 2 kms and thereafter it charges a fixed amount per km (less than 500 m are ignored by the bill meter and 500 m or more is rounded to an extra km). You paid a bill of ₹265 for a distance of 25.650 km. What is the fixed charge per km?

In the above example, having Level 2 competency may help learners to formulate the problem into a one variable linear equation (such as $25+24x = 265$), but equally important is Level 1 mathematics competency that helps them to solve it and arrive at the answer. So connection and reproduction both are required here.

Mathematical literacy as proposed by OECD (1999) focuses on students' capacity building in undertaking activities that require skills in the three competency levels. Thus, assessment assignment should be composed of by assigning weightage to all three competency levels so as to

provide opportunity to policymakers to judge wellness of their schools and curricula as regards the three competency levels.

Level 1 Competencies: Reproduction, Definitions and Computations

This level consists of factual understanding, symbolisation and expression, ability to differentiate and establish equivalences, familiarity with mathematical facts entities, performing mathematical procedure, having idea about how to apply basic algorithm and proper technical skills, ability to manipulate symbolic mathematical language and computations. Test items meant for the assessment of Level 1 competency should be MCQ type or partly subjective type.

Examples

1. Solve the equation $2y + 5 = 3 – y$.
2. The longest chord of a circle is called _____.
3. What is the area of a rectangle with sides measuring 5 cm and 3 cm?
4. What is the factorisation of $x^3 – 8$?
5. Locate the points (–3, 6) and (3, 6) on a graph paper.

Level 2 Competencies: Connections and Integration for Problem Solving

The competencies in this level aim at connecting various fields and areas of mathematics and integrating the knowledge for solving elementary level mathematical problems. The learners are encouraged to exercise the choice of strategy and suitable mathematical tool to solve the problems. A lower degree of mathematisation is required to solve problems in this competency level that are classified as 'non-routine'. Students are hoped to be able to use various techniques of representation as per the motive and requirement of the situation. The aspect of connecting mathematical problems expects the learners to have an ability of differentiating and establishing relationship between statements like 'definitions, claims, examples, conditioned assertions and proofs'.

This level is related to the above mentioned skills. Solutions to problems in the example below require acquaintance with 'mathematical argumentation skills' because a little bit of reasoning and argumentation is needed to obtain the answers to the problems listed. Modelling skill is also required in this competency level and this can be observed in the example. The task of problem solving itself requires 'problem posing and problem solving skill'. 'Representation skill' is used by the students when they use different modes of mathematical representation like chart, graph, tables and diagram, etc.

Language is an important aspect of mathematical literacy components. Describing and decoding symbolic and formal language, and studying their relationship with natural

languages are also imperative skills included in this competency level. Items included in the assessment of competencies in this level are usually based on a context and students are engaged to understand the context and take decisions accordingly. From the following example of this level, one may observe that, unlike Level 1 example, neither the mathematical curriculum domain to which the example belongs nor the algorithm, method or technique that is the best way to solve the problem, In fact, at times, curricular strand depends upon the strategy choice by students and there may be multiple strategies suitable for a problem.

Examples

1. You started the month of June with a full bottle of edible oil in your kitchen. After 20 days, the bottle remains only a quarter full. Will there be a shortage of the oil before expiry of the month? (Assume that the same pattern of consumption continues during the last ten days).
2. You went to buy a shirt in a shop. There were two schemes of discount—. Scheme 1: Flat 30% off, *Scheme 2:* 20% + 10% off.

   Which scheme will result in more saving?

Level 3 Competencies: Mathematical Thinking, Generalisation and Insight

This competency level requires learners to be assessed on the basis of test items in which students are expected to 'mathematise' situations. They are expected to identify and source mathematics rooted in these situations, to apply mathematics to provide solutions to problems, to be engaged in analysis and interpretation, to build their own models, to prepare strategies, and to develop mathematical arguments through proofs, deductions, generalisations, etc. Model analysing and reflecting on the process are also the competencies included in this level. Posing problems along with solving them is significant to achieving competencies in this level. An adequate and effective communication is a key for achieving competencies in this level. Communication may be in multiple forms like written, verbal and visual, etc., and is a two-sided process. This means that the learners should be able to communicate their own thoughts and ideas and also they should be competent to understand what others are willing to communicate. Lastly, the learners should be able to enquire about many other important aspects of mathematics. They should be able to have an understanding about the inherent characteristics of mathematics that include cultural aspects of the subject as well as history associated with its different concepts. Applying mathematics to unscramble contextual problems and problems arising in other discipline areas is also significant for achieving competencies in this level. Considerable perfection in mathematical modelling of such

problems is expected to promote these competencies.

Tasks to be executed for the assessment of competencies in this level often include competencies and skills from other two levels also. This level, though is the most hard to be assessed, yet is a key component of mathematical literacy. The construction of items in the assessment of competencies in this level relies, in terms of suitability, on extended response questions with multiple answers instead of multiple choice questions. But designing of such items along with the evaluation of students' responses is not an easy process. Still, since this level is an important level for achieving mathematical literacy, so effort should be made to include items from this level, even though in a limited number.

Example

A pizzeria shop sells small, medium and large size pizzas with diameter 4, 6 and 8 inches, respectively, the mentioned in its menu card along with their prices— ₹100, ₹200 and ₹300, respectively. You want to spend a total of ₹500 to buy pizzas. How many pizzas of each size will you buy to get a better deal? Assume that all pizzas sold by the pizzeria have the same thickness.

One aspect that rarely gets noticed in the mathematisation process is the necessary step of pondering upon and analysing the solution of mathematical contextual problems. It can be said that every competency level involves mathematisation because in every contextual problem various mathematics concepts has to be applied. But mathematisation involved in Level 3 competencies is particularly important and it goes beyond merely identification of important mathematics involved in a problem. Below given are two examples. The first one involves Level 2 competency and simple mathematisation. Second example is based on Level 3 competency as it involves a little complex mathematisation. It expects the student to identify the relevant mathematics and also to formulate and communicate a mathematical argument.

Examples

1. You need to cut a thread of length 16 cm into two pieces such that the length of one piece is thrice the length of the other piece. What are the lengths of the two pieces?
2. Suppose the government of a country bought wheat from farmers in the year 2020 at the rate of ₹1800 per quintal and in the year 2021 at the rate of ₹2000 per quintal. Inflation from the year 2020 to the year 2021 amounted to 12 per cent. Government sold the wheat to general public at buying price.
   (a) You are the minister of food in your country and you need to attend farmers' conference. How will you convince them

that buying price has been increased by the government?

(b) After few days you have to address a public rally. How will you convince the public that wheat selling price has been decreased?

Pedagogical Aspects of Achieving the Competencies

Mathematical literacy is important for every student to do well in most of the fields—academic or professional. Effective mathematisation of students' thoughts by the teachers is necessary to achieve this literacy during curriculum and instructions delivery. Mathematisation enables the learners to think and visualise the situations through the lens of mathematics. The important components of mathematisation are identification of the contextual problem, organising it using concepts in mathematics, conversion of the real problem into a mathematical one, solving the mathematical problem so obtained using mathematics and context specific interpretation of the solution obtained, all of which help the learners to solve the problem by mathematising the situation. It may not be an easy task for students to formulate the given real life problem mathematically and interpret the mathematical solution into useful information. Consistent efforts should be made by the teachers to simplify the process of mathematisation among students. The following strategies are important towards an effective classroom transaction directed towards Mathematical Literacy through mathematisation of children's minds.

Mathematics can be seen an a language a language too and understanding this behaviour of mathematics is important for mathematisation. A student may easily express a given situation mathematically if he/she can recognise patterns by observing connection, structures, similarity, rules, etc. The role of a teacher is helping students to look for patterns in various daily life situation Language of mathematics proves crucial at the next stage in which the identified pattern is represented using the mathematics symbols, notations and rules, etc. A teacher may help the students understand these notations, rules and symbols, etc., through different examples.

A connection based mathematics learning environment with an element of independent thinking and exploration may be created by teachers. Students should be engaged in real life situations where they learn to discover and extract mathematics and a teacher should help them in filling the learning or knowledge gap, if any, . This integrated approach may help children in achieving necessary mathematics skills and competencies.

Conclusion

Mathematical competencies, if built among students, have the potential to prepare a level of students who are competent enough to apply mathematics to real life problems and are truly compelent in mathematics. These competencies do not work in isolation but many of them are required together to perform a mathematical task. Depending upon the difficulty of mathematisation level involved and of the mathematical task to be performed, different mathematical competencies may be categorised into various non-hierarchical levels such that mathematical task to be done for assessing the Level 3 competency is more difficult than that for assessing Level 2 competencies. Also items meant for assessing Level 3 competencies involve more complex mathematisation than the level of mathematisation involved in items meant for assessing Level 2 competencies.

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Quality Enabling Conditions and Teaching-learning Process in Chemistry at Senior Secondary Level

Teachers' Perspective

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Abstract

There are several factors which influence the regularity and performance of learners in the school and the learning environment of schools is one of them. Learning environment refers to the diverse physical locations, contexts, and cultures in which students learn. It gives the experience of pleasure or pain, success or failure, active involvement or passive listening, to the students. Proper learning of students depends on quality enabling conditions and teaching-learning process. Teachers play an important role in creating a learning environment, especially in the teaching-learning process. NCF 2005 (NCERT, 2005) recommends experiential learning in science and quality enabling conditions are required for it. In the present study, efforts have been made to study the quality enabling conditions and teaching-learning process of chemistry from the perspective of teachers in 20 senior secondary schools of Ajmer district of Rajasthan using mixed method (qualitative and quantitative) of research. It has been observed that schools under study lacks in desired quality enabling conditions and teaching-learning process and thus, interventions are needed to improve the quality.

Introduction

Quality of education has always been the concern of everyone and a large number of studies has been conducted on various aspects of improvement of quality education (Ameh and Dantani, 2012; Bedriye and Gulcin, 2020). Based on research outputs and

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practices, educational policymakers have been able to plan and execute various flagship programmes for it (Bowen and Bodner, 1991, and Bodner, 2003). In the recent past, India has also initiated a large number of programmes for quality improvement of education in the country. Recently launched National Education Policy 2020 says that a good education institution is one in which every student feels welcomed and cared for, where a safe and stimulating learning environment exists, where a wide range of learning experiences are offered, and where good physical infrastructure and appropriate resources conducive to learning are available to all students (MHRD, 2020). All these aspects are important in view of quality enabling conditions and teaching-learning process. NCF 2005 NCERT 2005 recommends experiential learning in the teaching-learning process, for which quality enabling conditions are necessary.

In view of the above, a study was undertaken to see the quality enabling conditions and teaching-learning process of chemistry in selected schools of Ajmer district. The present study is mainly based on the perspective of teachers with respect to quality enabling conditions and teaching-learning process and the findings of the study are being presented in this paper.

Rationale of the Study

Chemistry is one of the important science subjects taught at senior secondary level in school education programmes/courses to prepare the students for developing knowledge and research aptitude, and attitude in the area of chemical sciences. Therefore, at school level, understanding of the subject must be emphasised considering the importance of experiential learning. Quality enabling conditions and teaching-learning process in the school aimed at experiential learning requires availability of learning resources like laboratories, models, improvised teaching-learning aids and e-resources, etc., in certain areas of chemistry like reaction mechanism and stereochemistry (Brand,1987). In view of the above, it was planned to study the availability, condition and use of learning resources with respect to quality enabling conditions and teaching-learning process in selected schools of Ajmer.

Objectives

The main objective of the study was to explore the quality enabling conditions and quality teaching-learning process in chemistry at senior secondary level especially in the form of availability, condition and use of learning resources.

Method

A mix method (qualitative and quantitative) of research was used in the present study. A questionnaire

was developed to know the quality enabling conditions and quality teaching-learning process through 20 chemistry teachers (one PGT from each school) of the twenty schools selected for the study. Researchers personally visited the sample schools to get information through questionnaire and also interacted with the teachers of sample schools located in different blocks of Ajmer district to find out more aspects of these parameters in depth. The interaction with the teachers was done in the form of unstructured interview.

Sample

The present study was conducted in the selected schools of Ajmer district. To conduct the study, State authorities were requested to facilitate the study and accordingly, a list of 20 schools having science stream was provided by considering the parameters of study for screening of schools like rural and urban schools, representation of blocks, availability of PGT and performance of the schools in State board examinations, etc.

Tools

In the present study, tools were developed and validated by the experts. These tools were in the form of questionnaires to obtain information about quality enabling conditions and quality teaching-learning process in organic chemistry in selected senior secondary schools of Ajmer district in Rajasthan. The close-and open -ended questions were included in the questionnaire as per the requirement of the study. Qualitative interviews of teachers were also conducted by considering the open-ended questions other than the questions included in the questionnaire.

Following questionnaires were used in the present study:

Questionnaire for the Principals

This questionnaire was developed to get general information about the school, and enrolment and attendance of the students at the time of visit of researchers.

Questionnaire for Teachers

This questionnaire was intended to seek information pertaining to school and teachers regarding quality enabling conditions and quality teaching-learning process. The information related to quality enabling conditions was taken in the form of availability of resources, time to complete the content matter and in-service training of the teachers, etc. To seek the information related to quality teaching-learning process, questions about content analysis, participation of students in teaching-learning process, teaching methods, teaching aids, assessments, source of information other than textbooks and remedial teaching, etc. were asked.

Procedure of Data Collection

In relation to collection of data regarding the learning environment of chemistry, investigators personally

visited the sample schools. The information about school, quality enabling conditions and quality teaching-learning process was obtained through questionnaires developed for principals and chemistry teachers of the sample schools. After collecting information in the form of questionnaire, each chemistry teacher was interviewed separately by the investigator to know more about their experiences related to quality enabling conditions and quality teaching-learning process in the schools.

Analysis of the Data

In the current study, quality of chemistry learning was observed considering the parameters of quality enabling conditions and quality teaching-learning process. Various aspects of quality were included in the above parameters and their detailed analysis is being presented here.

In general, the quality of education can be assessed through quality enabling conditions and quality teaching-learning process. These aspects frame a conducive learning environment in the school (Bedriye and Gulcin, 2020). Enabling conditions are characteristic of the school that facilitate effective teaching and learning and include the availability of adequate resources, accessibility of resources, effective management and organisation, including time spent for teaching, organisation of instruction, professional development of teachers for achieving desired learning outcomes and values by the students. A set of validated questionnaire was administered to seek the information pertaining to the quality enabling conditions and quality teaching-learning process in organic chemistry at senior secondary level and the data obtained were analysed. Analysis of the data is discussed below under the headings —(i) Quality: Enabling Conditions, and (ii) Quality: Teaching-Learning Process.

1. Quality: Enabling Conditions

Quality enabling conditions were observed by administering questionnaire to be filled by the PGTs of schools under study. The information pertaining to qualification of teachers was taken in the first part of the questionnaire and information related to quality enabling conditions—availability of resources, time duration and professional development—was taken in its second part. An analysis of the data is given below.

Availability of Resources

Teachers were asked about the availability of adequate resources in the school to transact the content matter of chemistry with special reference to stereochemistry and reaction mechanism. An analysis of the responses obtained indicates that 15.38 per cent teachers have adequate resources available in the school for chemistry teaching. During personal interaction with the teachers, it was found that e-resources are also

frequently used but the authenticity of e-resources is not checked.

Time Duration

When simply asked were whether they have sufficient time to complete the topics of stereochemistry and reaction mechanism, 84.61 per cent teachers said YES, but when they were asked about the required time duration for these topics, answers were different seven by teachers given in Table 1.

Table 1
Time Duration Required for the Topics

S.No.	Periods/Weeks Needed	Percentage of teachers
1.	1 week	7.69%
2.	2 weeks	30.76%
3.	3 weeks	23.07%
4.	More than 3 weeks	38.46%

Rajasthan Board of Secondary Education has prescribed the time duration of each topic, but different responses of teachers indicate that they are more concerned about the completion of syllabus instead of focusing on effective learning of students. It is also supported by the views of teachers on the same issue that the revealed while having personal interaction with them.

Professional Development

The professional development programmes are systemic efforts aimed at bringing about changes in the classroom practices of teachers, their attitudes and beliefs, and in the learning outcomes of the students (Guskey, 2002). In the present study, information was collected pertaining to the in-service training programmes on content enrichment and pedagogical processes attended by the teachers to improve their teaching skills in terms of content as well as pedagogy. The data indicates that only 30.76 per cent teachers got an opportunity to attend the in-service training programmes organised either by central government institutes like Regional Institute of Education, NCERT or Institute of Advanced Studies (a unit of teachers' training under state government). According to the teachers who attended the in-service training, they gained new insights into students' difficulties, increased their knowledge and understanding about the pedagogy, content knowledge and philosophy of chemistry.

2. Quality: Teaching-learning Process

Educational quality of students can be improved through adopting various innovative teaching-learning processes by the well-educated and trained teachers. Quality does not only mean to impart a quantum of knowledge to students but also the effectiveness with which they apply that knowledge in meeting the challenges of tomorrow. During the course of present study, information related to quality teaching-learning process was collected by administering the questionnaire consisting of

questions on content analysis, participation of students in teaching-learning process, teaching methods, teaching aids, assessments, source of information other than textbooks, remedial teaching and innovation to improve the quality of teaching, etc.

Content Analysis

The content of chemistry should be delivered in a simplified form so that students can easily understand it. It is possible by having the required academic competence of the teachers in content as well as pedagogy. It also includes content analysis for organising and planning the effective transaction of the topic. When teachers were asked whether they do content analysis or not, 92.30 per cent said that content analysis is done before transacting the lessons of stereochemistry and reaction mechanism. It shows the concern of teachers regarding content analysis for effective classroom planning.

Students' Participation

In the classroom, it is expected that students are engaged actively by playing the role of information seekers. It makes the process more supportive, cooperative, and student-centred (Fassinger, 1995). Asking questions during the process is an important way of participation by students. It has been reported that students are more likely to ask questions if they receive higher levels of support (Karabenick and Sharma, 1994) and lower levels of threat from their teachers (Peters, 1978).

In the present study, it has been reported by the teachers that 76.92 per cent of the students effectively participate in the learning process. Teachers were unaware about the. The reason for poor or no participation of 23.08 per cent students. When they were asked about the mode of participation of the students they revealed that it the participation's limited to asking question only. Teachers also argued that 92.30 per cent of the students ask the questions during the classroom transaction but most of the questions are of general nature and most of the times they are related to the blackboard work and dialogue during the process. Participation of students by asking questions in this way is not a reflection of effective participation of students in the conceptual understanding.

Teaching Method and Use of Teaching Aids

Methodology or the strategies used by the teacher during delivery of the topic is an important factor in making the class active for learning. In any teaching-learning situation the methodology used is vital and the method adopted by the teacher may promote or hinder learning amongst students (Ameh and Dantani, 2012). The studies focused on teaching organic chemistry at the introductory level have made it obvious to the teachers that understanding stereochemistry can be difficult

for students. Stereochemistry is frequently a source of confusion when students are first exposed to it, and unfortunately, this feeling may linger even after repeated exposure to the subject (Bowen and Bodner, 1991; Bodner, 2003). Visualising the three-dimensional aspects of molecules and their relationship with other molecules is difficult (Brand, 1987). Various studies have indicated that stereochemistry requires the use of Visio-spatial strategies because scientific problems often require explicit consideration of spatial relationships (Gilbert, 2005). The chemistry teachers should design students-centred and active learning approaches to integrate the concept is a three dimensional way for better learning of visual activities, wherever necessary, for the teaching of topics like stereochemistry and reaction mechanism at senior secondary level.

In view of the above, it is necessary to adopt suitable methodology and use proper learning aids during teaching-learning process of organic chemistry, especially stereochemistry and reaction mechanism. In the present study, it has been found that 90 per cent teachers use conventional lecture method in teaching of the entire organic chemistry. During interaction with the teachers, it was also revealed that no learning resources/teaching aids are used in the teaching-learning process of the concepts of stereochemistry and reaction mechanism due to unavailability of resources. These data indicate that most of the teachers follow conventional teaching methods mainly the chalk-and-talk method, which is not sufficient as per the needs of an active classroom.

Use of Source of Information Other Than Textbooks

Large number of sources of information on content of chemistry are available in the form of reference books, handbooks, journals and online resources, etc. These sources of information should be frequently used for content enrichment and making the classroom process effective. In the present study, it has been found that 61.53 per cent teachers use other resource material also along with textbooks, but it was confined to YouTube videos, and model papers. In this era of education, a large number of online resources are available in the form of softwares, programmes and apps, etc., and, therefore, they should be utilised in the teaching-learning process.

Assessment of Students during Classroom Process

Assessment is an important component of teaching-learning process, by which the effectiveness of the process can be observed. In the present study, teachers were asked about the methods of assessment by giving some common modes of assessment like asking verbal questions, conducting an activity, exercise or by giving some

assignment. The data obtained with respect to the methods of assessment used by teachers are given in Table 2.

Table 2
Assessment of Students during Classroom Process

S.No.	Method of Assessment	Percentage of teachers used
1.	By asking verbal questions	65
2.	By an activity	10
3.	By giving exercise during class	55
4.	By giving assignment	20

An analysis of the data indicates that asking verbal questions is most widely (65%) used method of assessment. Assessment through activities is considered an important way of assessment but in the present study, it is carried out only by 10 per cent teachers. Giving exercises is also a popular method indicating inclination towards the conventional method of assessment. Assessment through giving assignments is also not much popular amongst the teachers. All the teachers said that they assess their students by adopting various methods as mentioned, but asking questions during discussion is the most common method. When teachers were asked about their satisfaction with the assessment method used, 53.84 per cent teachers said that they are satisfied, but they need further orientation on using the new methods of assessment.

Remedial Teaching/Corrective Measures

Remedial teaching is given to the students who have not been able to achieve the expected learning outcomes. As per the present study, 69.23 per cent teachers conducted remedial classes to improve performance of the students.

Teachers' Satisfaction

Teachers feel highly satisfied if they have been able to transact the concept in the class to the level of understanding of students. When the teacher were asked whether they are satisfied with their teaching, especially in with respect to reaction mechanism and stereochemistry, 30.76 per cent teachers told that they are satisfied. However, this satisfaction was mainly based on the result of the students in the examination, not on their own satisfaction level of teaching. Teachers who felt unsatisfied responded that it is due to the lack of adequate learning resources that they are not able to transact the concept in an effective manner.

Improvement in Teaching-learning Process

In the present case, teachers had an opinion that they can improve the teaching-learning process in a

better way, if learning resources are made available to them. It was also emphasised that their duties other than teaching should be minimised so that they can focus more on learning activities.

Major Findings, Conclusion and Recommendations

During the course of the present investigation, various meaningful aspects related to quality enabling conditions and quality teaching-learning process of chemistry in the selected schools were observed and findings of the study are given below:

- During visit of the schools and interaction with PGTs with respect to quality enabling conditions and quality teaching-learning process of chemistry in the schools, most of the teachers highlighted that they do not have appropriate resource material to teach the concepts of stereochemistry and reaction mechanism. However, it has been observed that urban schools have relatively more resource materials than rural schools.
- It was also observed that teachers have not undergone any professional development programme. Same thing was also mentioned by the teachers through the questionnaire related to quality teaching-learning process.
- As far as quality teaching-learning process is concerned, it has been observed that teachers are using conventional teaching methods without any innovative ideas; it needs immediate attention of the authorities.
- There is a lack of learning resources in these schools and even minimum required resources are not available.
- Even after sincere efforts, students' participation in the teaching-learning process is poor and needs improvement.
- It was mentioned that topics like stereochemistry and reaction mechanism are least interesting for students and, therefore, most of the time, these topics are ignored.
- It was also pointed by the teachers that they are not much comfortable in teaching these topics as they do not have much clarity about the content because these two topics deal with 3-D structures of the compounds.

In view of the above, it is recommended that:

- Resource material must be made available to the PGTs of schools. At least ball and stick models may be given to each PGT to use these models in the teaching-learning process. Models developed by the NCERT are economical and effective, so these models can be procured for the same purpose.
- Capacity building programmes for content enrichment and pedagogical skills should be frequently organised for the teachers to make them confident and help them to make the

teaching-learning process effective.

- Professional development programme should be an integral part of the service of teachers. It can be linked with promotion for effective participation of teachers in these programmes.
- More attention is needed to be paid in rural schools in comparison to the urban schools, as these schools are highly lagging behind in the availability of learning resources.

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Teaching English Language through 'Langauge Immersed Science' for Secondary Classes

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Abstract

This study endeavours to investigate the effectiveness of 'Language Immersion Programme' in our classrooms with respect to physics. It is taken for granted that learners from science background are less eloquent and not much confident in verbal expressions. In order to help physics learners master English language effortlessly, an immersion module has been prepared, validated and tried out in class IX in the schools of Kerala. 'Immerse' means to dip in water. Here the study is done as to how the elements of English language can be dipped into the subjects to be learned by preparing a package and making a tryout of the same. As taking all the disciplines for the package is beyond the purview of research, the representative items were selected. The study reveals that the package is highly useful and effective. After going through ten sessions of the package, they are reported to be highly confident in using affluent language with creative touch and texture.

INTRODUCTION

Teaching English has got different kinds of updations across the ages as well as across the countries. For a longer time, English teaching has been an exclusive task with registered features, but eventually there was some glaring modifications. In teaching English, deliberate attempts were made to create an English learning ambience which culminated sometimes into tedious routines for

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learners. When teaching English through the medium of English, both means and end become one. Variety is lost and learners are largely prone to be mind-numbing. So, attempts were made to teach English by way of learning other subjects.

As a result, English language teaching has switched over to an integrated approach where teaching English won't be taken as a separate practice. There are myriads of attempts to integrate the contents of learning with language so that mastery in the target language can be guaranteed easily and smoothly. Instead of taking the language learning as a tedious process, learners unintentionally acquire the mastery of language through an integrated approach.

Language Integration

Integration is possible according to the use and link of each language with various subjects and disciplines. Disciplines can be divided on the basis of language viability. Some disciplines need the use of more verbal language whereas some other disciplines rely on nominal degree of language plus visual and graphic presentations. The first category include subjects like anthropology, history, philosophy, sociology, political science, etc., and disciplines like physical science, biology, geography, etc., fall in the second category. We can divide the medium of instruction used in the classroom as general language and specific or technical language.

In order to teach human sciences, general language is used, whereas specific or technical language is used to teach sciences and disciplines which are scientific in nature. The first type imprisco words and phrases from the common realm of communication whereas the latter has specially structured terminologies and technical words. Language immersion can be simply defined as a method used in bilingual classes where two languages are used for instruction in a variety of topics including maths, science, or social studies. Immersion can be done with any content item like geography, history, mathematics, anthropology and even statistics. In the present study, physics has been selected.

Language Immersion

Language immersion is an educational approach to second language learning, in which the second language is not only the medium of instruction but also the object of instruction. Immersion programmes offer an 'early start' to second language learning at an optimal developmental period, when young brains are keenly receptive to language acquisition. Learning the second language as a young child provides students more time to achieve high levels of language proficiency; acquire the correct pronunciation; gain intercultural competency and other linguistically creative skills.

Here language learning is free from pressures as language is not systematically transacted in the classroom. As the target language is used to transfer the content and for doing different activities and routine communications, learners acquire the language as children do with their first language.

Immersion programme has been practised worldwide these days for teaching second language in a swifter and easier way and has brought about all-encompassing results. The study conducted by Fortune Tedick (2011) reportedly proved that immersion education offers an exciting opportunity for students to reach high levels of academic achievement and to acquire strong proficiency in English and another language. Roberts (1998) conducted a study on the effectiveness of immersion programme with regard to the use of appropriate grammar, sentence structure, and vocabulary, which revealed that the immersion programme was highly beneficial to the students even though there was a discrepancy between the quantitative and qualitative results. Obudo (2007) conducted a comparative study between bilingual education and English immersion. The study rather supports the immersion programme even though the final result appears to be a little bit inconclusive.

Lasekan-Olusiji 2017 conducted a study titled 'Factors Influencing Motivational Intensity and English Proficiency among Early Middle and Late Immersion Undergraduate Students', which brought out the finding that the early immersion students could perform well followed by the middle group and the late immersion students ranked last. This recommends that being in English immersion programme as early as possible leads to English proficiency. Amaliraj (1995) has conducted a study titled as 'Bilingual Education and the Teaching of English as a Second Language in India: A case study of Kendriya Vidyalayas'. The research indicates that the learning environment influences the learning of a second language which assures that an immersion ambience will contribute much to language learning. Theporal and Singh (2017) conducted a study on the effectiveness of integrated language study focusing on Content and Language Integrated Learning (CLIL) on English language, immersing mathematics and social science with English. The study reveals that the method is highly useful in enabling the students to acquire various skills related to language proficiency.

Need and Significance

In India, language and literacy are generally seen as the concern of only the language teachers. However, no matter what the subject is teaching cannot take place in a language-free environment. Assumptions about the language and literacy background of students influence classroom interactions, pedagogical decisions

and the nature of students' learning. Thus, it is important to understand their language background and know how oral and written language can be used in the classroom to ensure optimal learning of the subject. Several studies have shown that Indian students perform weakly in reading comprehension (Sinha, 2012). This, in itself, should be a crucial concern of all teachers *(Curriculum Framework: Two-year B.Ed. Programme,* National Council for Teacher Education, 2016). In the new curriculum, much importance has been given to language learning and two papers have been introduced namely, 'Language across Curriculum' and 'Reading and Reflecting on Text'.

Objectives of the Study

- To explain how immersion programme serve the purpose of language integration
- To find out the benefits of the programme based on the package and tryout
- To try out the immersion package in Class IX students of Kerala
- To find out the benefit of this programme based on the statistical analysis
- To discuss the effectiveness of the package based on feedbacks and focused interviews

Preparation and Validation of Module

The present study was conducted as an experimental study. The investigator made use of pre-test and post-test control group as the experimental group design for the study. Two types of variables are identified in the present study, dependent and independent variables. Instruction based on immersion package is the independent variable. Achievement and creativity are the dependent variables.

Students at secondary level are the target population of the study. They belong to Classes VIII, IX and X. The investigator, through purposive and convenient sampling, selected Class IX students of Sir Syed High School, Talipparamba which is an English medium School. He selected students from Class IX-E as control group and students from Class IX-F as experimental group, and separate packages were developed and implemented for social science, mathematics and physics. Total number of students in control group was 32 and 28 in experimental group. The researcher chalked out some of the language items which were related to physics, but useful in enhancing the language capacity. The assumption of immersion is that while learning some topics of physical science, the learner can imbibe some of the pivotal aspects of language so that the immersion programme will be highly competent in subjects and fairly proficient in English tongue.

While preparing content on the topic of gravitation, the investigator was very meticulous to incorporate some of the very essential language items. The very first and classical

item found was the word 'centre'. The first difference is related to American-British spelling choice. The teacher explains 'center' is American and 'centre' is British, and we have follow the latter. Along with this, the investigator provides a short list of some very essential words having the same spelling difference. Here the teachers handling the immersion classroom are likely to face the problem of not having deeper knowledge in this regard. Students are expected to ask more questions and pose complicated doubts.

If teachers are unable to give proper replies to the queries, they will hesitate to go forward with the programme. This was a great problem and a challenging issue before the investigator. The investigator tried to solve this problem by incorporating more examples, supported by language rules in the content to be taught by teachers. This appears not only to help teachers get rid of their nervousness but also to enhance their expertise and boost up their confidence.

The investigator has opted the maxim of 'simple to complex', so that the researcher started with the spelling items. Then the researcher focused on one of the most common errors committed not only by non-English speakers but even those who are from English background. Besides, the term is recurrently used by everybody in our day-to-day interactions. The item is 'discuss about'. As 'discuss' means talk about, discuss about would mean 'talk about about' which is purely impure redundant! It is true that we have a natural tendency to utter 'about' immediately after discuss, and we have an obsession to use direct object without the interlinking 'about'. So the researcher added one special activity of grouping students in the class and asking each of them to say alone each object such as "Let us discuss the poem..../the issue..../ the problem/....the topic, etc.

The lesson on gravity starts with a beautiful and meaningful cartoon. It follows a story-like narrative of two friends, who observed different motions in the nature. While Adeeb focuses on water going up when it is in the form of steam, Alok stresses on the heavy and weighty rain coming down. They analyse the difference between both the motions. The teacher has to introduce this in an interesting manner and consolidate their views by putting different stones of different sizes on the ground. They gradually arrive at the concept of gravity along with learning 'centre' and 'discuss about', which the learners in traditional classroom are deprived of. Immersion, as it warrants creativity provides a chance to imagine a situation where there is no gravity at all. They see in their mind's cats and goats, cars and bikes floating up in the space. Plants and stars are wandering according to their whims. Though dreaming is

beautiful, such a situation in real life will not be possible.

The investigator deliberately added a brief biography of Newton. His childhood, his growth, his turning points, his views and dreams may motivate students. Further, they can prepare the biographies of Kepler, Copernicus, Galileo, etc. They can penetrate into the heart of physics swimming through narrative language. Here the investigator inserts an expression of 'bare bond between' so that he can easily introduce alliteration, a beautiful figure of speech. With the end of this part, a worksheet is provided. By doing this, learners themselves develop creative writing.

Among the different language items the fourth one is noteworthy. That is about preparing an E-letter. It is to be sent to Isaac Newton. The reason is more important. One of the students of during the try out contributes some ideas to the existing theories of gravity. Here students are unknowingly motivated. They are helped to break the socially constructed cocoons and grow up at par or more than the intellectual realm of Newton. While covering the next two items of physics content such as gravity and moon/tide, gravity and gravitation, learners come in touch with some very important terms like 'whereas', 'neck and neck' with numerous examples. With this, the next worksheet is provided of which the very first item is sufficient for four things:

(a) Learning of content
(b) Development of language
(c) Enhancement of creativity
(d) Assessment

In the last part, the investigator has incorporated some knowledge of words asking 'Do you know the opposite of questions such as because'. about. It not making same at all. Then many situations are also provided to create sentences. When the discussion regarding kilogram and Kilogram weight is over, learners get a luminous 'award of actually'. More synonyms are provided for 'actually'–'likewise', 'no matter' and 'as well' and they are also vividly illustrated so that learners can make use of them in their interactive language.

Pronunciation is very instrumental as regards english language. Some of the people are poor in pronouncing common words. But some pronunciation mistakes are quite common, like target, entrepreneur, etc. But one is always mispronounced, i.e. tier…(from the railway station.) Attached to this more examples of mispronounced are provided. Then comes the use of 'provided', Only learned men use it properly. But learners of immersion can use this very easily.

SAMPLING

Students at secondary level are the target population of the study. They

belong to Classes VIII, IX and X. The investigator, through a purposive and convenient sampling method, selected two of Class IX from Sir Syed High School, Talipparamba (an English medium school). He selected students from Class IX-E as control group and students from Class IX-F as experimental group and separate packages were developed and implemented for social science, mathematics and physics. Total number of students in control group was 32 and 28 in experimental group.

Design of the Study

The present study was conducted as an experimental study. The investigator made use of pre-test and post-test control group an experimental group design for the study. Pre-test and post-test scores on total samples, sub-samples and on creativity constituted the data of the study. The layout of the study is given in the figure 1.1.

Layout of immersion package

Experimental Group O_1 x O_2
Control Group O_3 c O_4
O_1, O_3 — Pre-test
O_2, O_4 — Post-test

'x' is the experimental group in which instruction is given using immersion package and 'c' is the control group in which instruction is given using the existing textbooks.

Implementation

Two section of class IX were selected of which One was experimental group and the other was control group. Pre-test was conducted based on 'content and language' and 'creativity'. Then classes were conducted based on immersion module. After that post-tests were done and the data was subjected to statistical analysis.

Variables of the Study

Two types of variables are identified in the present study— dependent and independent variables. Instruction based on immersion package is the independent variable. Achievement and creativity are the dependent variables.

Table 1 shows that mean of the scores on achievement of the students in the experimental group is 3.654 and that of the control group is 4.313. This indicates that the students in the experimental group and control group differ slightly in the mean scores on achievement. The median of the scores on achievement of the students in the experimental

Table 1

Experimental group	26	3.654	4.000	4.0	1.953	0.639	0.597
Control group	32	4.313	4.500	6.0	1.817	0.228	-0.687

and control groups are 4 and 4.5, respectively. This shows that 50 per cent of students in the experimental group scored more than 4 in physics, while control group students scored more than 4.5. Table also reveals that the mode score of experimental and control group are 4 and 6 respectively, with a substantiate difference in favour of the control group students.

Table 2
Results of the Test of Significance of Difference between the Pre-test Scores on Achievement in Physics

Groups	N	Mean	SD	t-value
Experimental	26	3.654	1.953	1.33
Control	32	4.313	1.82	

Table 3
Results of the Test of Significance of Difference between the Pre-test and Post-test Scores in Physics

Test	N	Mean	SD	t=value
Pre-test	32	4.31	1.81	2.502*
Post-test	32	5.04	1.98	

*significant at 0.05 level

Table 4
Results of the Test of Significance of Difference between the Pre-test and Post-test Scores on Physics in Experimental Group

Test	N	Mean	SD	t-value
Pre-test	28	3.65	1.95	5.78*
Post-test	28	6.34	2.90	

*significant at 0.05 level

Table 5
Descriptive Statistics of the Score in Creativity

Group	N	Mean	Std. Deviation	Std. Error Mean	Median	Skewness	Kurtosis	Mode
Experimental	28	12.821	6.071	1.147	12.500	0.944	1.556	4.0
Control	32	12.518	6.936	1.311	11.250	0.843	0.191	3.0

Table 5 shows that the mean of the scores in creativity of the students in the experimental group is 12.821 and that of the control group is 12.518. This indicates that the number of students in the experimental group and control group differ slightly in the mean scores on creativity. The median of the scores on achievement of the students in the experimental and control groups is 12.500 and 11.250, respectively. This shows that 50 per cent of students in the experimental group scored more than 12.500 in creativity, while control group students scored more than 11.250 marks. Table 5 also reveals that the mode of experimental and control group is 4 and 3, respectively, with a substantiate difference in favour of experimental group students.

Results and Discussion

The statistical analysis indicates that the programme is highly effective. The sample and sub- sample show a higher rate of effectiveness with regards to content, language and creativity. The focused interview done by the investigator with selected students and teachers of the school gave positive results. Handbooks exclusively made for teachers with elaborate language items were reported to be highly useful to the teachers and teacher also appreciated the programme.

The findings are more or less in tune with what is already proven true is the previous studies. It is believed that immersion package will help learners achieve more in content as well as in language. So this study corroborates what is found true by the study conducted by Fortune and Tedick (2011). Some studies revealed that immersion method does not guarantee achievement in academic subject. The study by Lindholm-Leary (2015) is the best example. His finding was that academic achievement of immersion students is on a par with that of monolingual students, who are studying the same subjects in their native language. This finding is supported by a study conducted by Batey, et al. (2010).

Conclusion and Implications of the Study

As the immersion programme has been proven to be highly effective, it has to demand wider attention from the educational experts of our country. If content experts and language monarchs work together in the presence of illuminated men of letters, no wonder, we can make wonders in the field of second language education. As our country is rich with knowledgeable people and we lack transnational hegemony only because of language proficiency, this immersion programme can be a better alternative.

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Strengthening School-University Partnership through 'Lesson Study' in School Internship

ANITA RASTOGI* AND SANDHYA VAID**

Abstract

School-university partnership is gaining momentum for the preparation of prospective teachers. The authors are of the view that lesson study, with its proven effectiveness in other countries, can be adapted and followed in the school internship of pre-service teacher education programmes in India. It can go a long way in strengthening the partnership between the school and teacher education institutions, which at present is just ornamental. It would lead to a win-win situation for both by equipping the prospective teachers with the skills to handle the real classroom situations effectively under the mentorship of school teachers and facilitating the school mentors in their professional growth with the shared focus on school students' learning. The seeds of sustainable professional development could also be sown among prospective teachers during school internship through the adoption of lesson study practices. Against this backdrop, the authors have suggested an adapted model of lesson study and conditions for its success in India.

INTRODUCTION

Like any other professional programme, theory and practice are inextricable components of a teacher education programme. But the successful amalgamation of the knowledge which is being transacted within the four walls of the university

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classroom and its application in the territory of the school is the real challenge. The pre-service teacher education programme attempts to address this challenge by providing practical school experiences through internship in schools. These practical field experiences aim at familiarising student-teachers with school classrooms, thereby helping them to avoid a 'reality shock' in the initial phase of their teaching career (Musset, 2010). Therefore, there is a need to develop an exhaustive alliance between teacher education institutions and schools to prepare all-inclusive future teachers (Darling-Hammond, 2006; Down, et al., 1994).

The conventional model of school internship views school as a site provider for teaching practice as teacher preparation is mainly considered a responsibility of teacher education college or university department. But the partnership model that accepts a triadic relationship between university supervisor, student-teacher and school mentor, enfolds the belief that the teacher education programme has the potential to create efficient, effective and successful future teachers through school-university partnership (Clark, 1999; Huong, et al., 2020; Kenny, 2012).

It is a collaborative setting in which both the agencies are at equal footing towards their development while addressing some common issues that persist (Gilles, et al., 2009).

The partnership opens doors for higher education academics and school teachers to utilise each other's expertise and experience for their professional development. With teacher education institutions' onus to educate and prepare future teachers, higher education academics appear in a position to advance school teachers in making use of effectual teaching-learning procedures, which may also be esteemed as a reference point for pre-service teachers. Alternatively, schools, as a site of ground realities, supply adequate knowledge that enables teacher education institutions to conceive the courses of teacher education, elicited from substantial needs. On that account, a partnership between schools and teacher education institutions give rise to a constructive ambience that is indispensable for professional learning (Letloenyane and Loyiso, 2015).

Lesson Study for Professional Development of Teachers

A recent reform that is manoeuvring all the requisites of a partnership approach to teacher education springs from Japan in the form of 'lesson study' (*jugyoukenkyuu*). 'Lesson study' is a school-based professional development in which a set of teachers and knowledgeable others collaborate in an iterative

process that involves identification of a problem, planning of a research lesson, teaching of the research lesson followed by collective observation of the lesson by the group members and, ultimately, a critical reflection in the post-lesson meeting (Fig.1). This may also lead to the collective development of the modified version of the research lesson and progression again around the cycle. The lessons that are the object of teachers' study in a lesson study process are called research lessons (Frernandesz and Yoshida, 2004). They are developed to test and exercise an idea within the actual classroom context (Stigler and Hiebert, 1999). The knowledgeable others in a lesson study cycle are experts from the concerned field including teacher educators, who make a valuable contribution to the post-lesson discussions by providing insights associated with research and in-depth knowledge of the curriculum (Doig and Groves, 2011).

The assumption grounded in the practice of lesson study is that the teaching-learning process could be made effective by way of preparing and teaching a research-based lesson in a classroom context. The role of the teachers is not confined to practising educational theories in the classroom; rather, they can also execute research on their own to address an immediate issue. In this way, the gulf between practice and research can be minimised (Stigler and Hiebert, 1999).

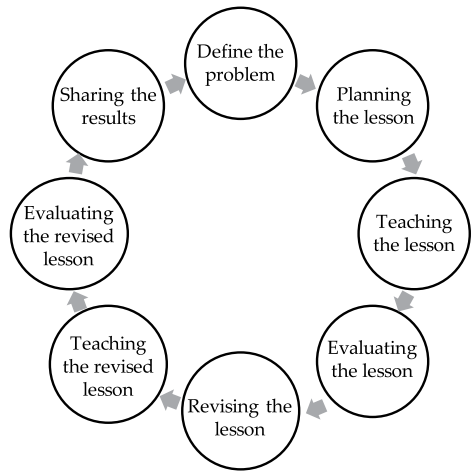

Figure 1: Steps involved in a Lesson study cycle in Japan (Stigler and Hiebert, 1999).

Essential Features of Lesson Study

1. Lesson study promotes site-based teachers' improvement that gets developed in the real classroom scenario, taking local context into account (Stigler and Hiebert, 1999).
2. The collaboration between the teachers and knowledgeable others is compulsory for the transition from one step to another.
3. Research lesson developed in consultation with the cooperative school mentor teacher is the hallmark of lesson study.
4. All the activities in the lesson study cycle revolve around students' learning. Deliberations are made based on the data of students' learning, before enacting changes in the research lesson.

5. It is research-oriented as from planning to the assessment of the research lesson all decisions are developed on careful investigation, not intuition.
6. The practice of lesson study provides expansive scope for teachers to reflect on their own, other group members' teaching practices and students' learning.

Research Support for Lesson Study in Pre-service Teacher Education Programme

In the past two decades, educational researchers have validated the potency of lesson study to develop a flair for teaching. As pre-service teachers absorb themselves in the lesson study process, their lesson planning and readiness for delivering a lesson improve remarkably (Marble, 2007; Naesheim-Bjorkvik and Larssen, 2019). In addition to classroom teaching, they become magnificent assessors of the learning environment in the matter of selecting teaching-learning material, content, assessment strategies and the progression of the lesson, which subsequently promotes confidence and teaching skills (Marble, 2007). It also serves as a tool for acquainting pre-service teachers to the school culture (Boonsena, et al., 2019).

The involvement of mentor teachers with pre-service teachers makes practice teaching a collaborative effort. The decisions related to teaching and learning in field placements lean on the understanding of students' course of action in the classroom and scaffolding from the mentor which translates into pre-service teachers' 'pedagogic capital' and the lesson study paves the way to the students' unnoticed 'pedagogic black box' (Cajkler and Wood, 2016). The guidance provided at every level of lesson study promotes specific observations, not general (Munthe, et al., 2016). Pre-service teachers observed but important events related to students' learning, their own and other group members' teaching (Amador and Weiland, 2015). They reckon themselves as lifelong learners. The lesson study bestows them with an equity lens so that they can plan learning experiences concerning the individual needs of the students (Parks, 2008).

Lesson study can be utilised to detect the effectiveness of propounded teaching and learning strategies and to construct the locally relevant theoretical framework. It reduces the theory-practice divide, keeps a check on the culture of teaching being transferred from one generation to another and culminates into a knowledge base for teaching and teachers' preparation (Hiebert, et al., 2003; Hj Iksan, et al., 2014). It serves as a vehicle for pre-service teachers' professional development through channelising into reflective practice relevant to learning goals, students' understanding, appropriate content representation and students' assessment which leads to better

students' learning outcomes (Espinosa, et al., 2018)

The theory-practice rift can be covered when pre-service teachers are enabled to analyse the first-hand result of their teaching. The lesson study prepares them for taking up the future role of educational researchers and teacher educators. Lesson study brings out a balance between pre-service teachers' creative student-centred pedagogic practices and experienced teachers' expertise in traditional repertoire of the teaching-learning process, during collective collaborative activity (Hart, et al., 2011). The mentor teachers and university supervisors as knowledgeable others have the potential to create a dialogic space of 'inter thinking' and to direct the pre-service teachers' conversations in a productive direction, towards students' learning (Bjuland and Helgevold, 2018; Hart, et al., 2011).

Lesson Study for Pre-Service Teacher Education

Countries like the USA, Canada, England, Greece, Turkey, Thailand, Ireland, Spain, Norway, South Africa and Indonesia are assimilating the process of lesson study in their initial teacher education programmes (Kanellopoulou and Darra, 2019).

Adaptation of Lesson Study in Pre-Service Teacher Education in India: Suggested Model

Traditionally, teaching is considered a private activity (Stigler and Hiebert, 1999). Teachers go through a feeling of hostility when external educational authorities or the school's quality assurance committee observes their classroom teaching. The collaborative nature of the lesson study holds that successful teaching is a joint responsibility, not the jurisdiction of an individual (Stigler and Hiebert, 1999). Working in a community of practice accelerates student teachers' cognitive and social interactions (Cohan and Honigsfeld, 2006; Kostas, et al., 2014), initiates the collaborative reflection and provides a window of opportunities to ask questions and clarify doubts (McMohan and Hines, 2008; Post and Varoz, 2008).

The existing consecutive and concurrent programmes of teacher education in India provide for 16- and 20-weeks exhaustive school internship, respectively. The cooperative schools are thought out as lab schools, attached to a teacher education institute, which further the pre-service teachers' interaction with school students, teachers, and community. The pre-service teachers are expected to work as full-time teachers in a cooperative school under the leadership of the school principal and guidance of school mentors. At least 25 per cent of the total lesson plans delivered by the pre-service teachers for each subject are observed and evaluated. Apart from teaching in the cooperative schools through preparing unit plans and lesson plans, the pre-service teachers also observe the classroom

teaching by school teachers and their fellow pre-service teachers, analyse syllabi and textbooks, and prepare diagnostic tests and plan for remedial teaching, conduct action research and case studies. Teacher education institute's supervisors, cooperative school principal and school mentors do the pre-service teachers' assessment during school internship collectively. (National Council for Teacher Education Notification, dated 28 November 2014, New Delhi; School Internship: Framework and Guidelines, 2016).

Experience shows that the student teachers are treated as aliens in the practising school. The supervision is done by the teacher educators and the school teachers, called cooperative teachers/school mentors. The majority of the school mentors, if involved in the supervision of student teachers, try to help the student teachers by giving positive comments rather than participating effectively in the teacher preparation process to prepare effective teachers. Generally, the schools also do not facilitate the students to participate in various activities of the school under the guidance of school teachers. The pre-service teachers, therefore, enter the teaching profession with a restricted understanding of social, cultural, and political perspectives that shape a school context. In this model, the student, teachers, university supervisors and the school faculty do not take the advantage of each other's presence in the school for their professional development.

Given the above scenario, the symbiotic relationship between pre-service teachers, school mentors and university supervisors in the lesson study process cannot be neglected. The National Education Policy, 2020 has acknowledged the role of mentors in teacher education. It also suggests the association of higher education institutions with schools, wherein pre-service teachers will teach and participate in other activities of the school. This demands a partnership between schools and teacher education institutions. Partnership, in the form of inquiry-based lesson study, has the potential to cohere both the agencies into a collaborative relationship,in contrast with the usual theory-practice divide (Helgevold and Wilkins, 2019). Figure 2 shows the suggested model of lesson study that may be used in the pre-service teacher education programmes in India.

Determining Aims and Objectives

The review has revealed that in pre-service teacher education, the research lesson hinges on an overarching goal which is identified from the current syllabus, textbooks (Hj Iksan, et al., 2014) or state curriculum standards (Akerson, et al., 2017; Fernandez, 2010; Parks, 2008; Post and Varoz, 2008; Yakar and Turgut, 2017) and sometimes, prescribed by the educators (Amador

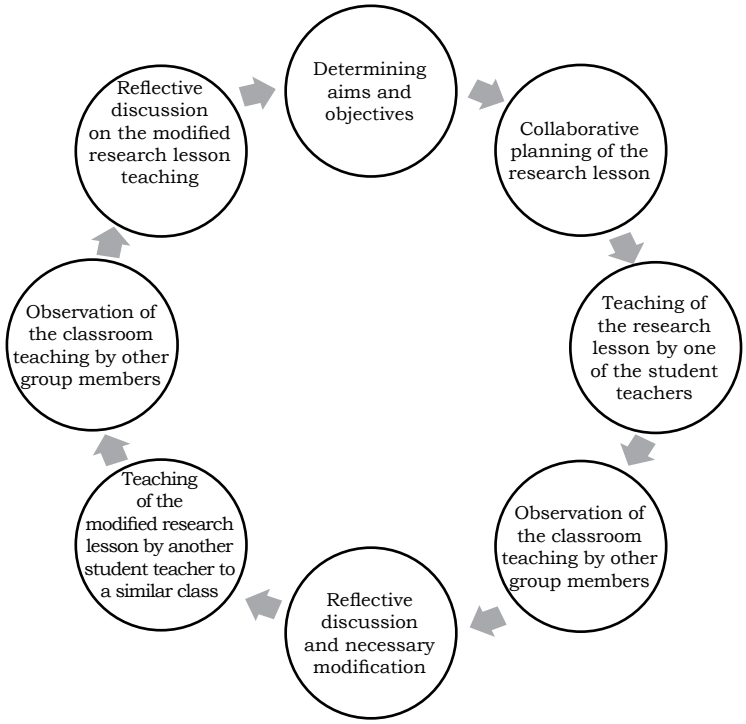

Figure 2: Lesson Study Cycle for Initial Teacher Preparation in India.

and Weiland, 2015), taking into cognizance the multiple curricula about the topic, related articles and researches (Parks, 2008), problems faced by teachers during transacting particular topics, misconceptions of students and learning challenges identified by sample students (Bjuland and Helgevold, 2018; Cajkler and Wood, 2016; Hart, et al., 2011).

However, in India, it is not feasible that all the lessons are delivered through lesson study as school teachers and teacher educators may not be able to so much time to do justice with the requirements. It is, therefore, recommended that out of the total duration of the school internship, at least two weeks may be assigned for lesson study. For a research lesson, a precise goal can be opted to address a particular topic from one discipline. The topic will be chosen as per the school mentor's preferences, university supervisor's inputs related to the placement of topic within academic literature and student teachers' personal intent for their professional development. In the discussion of topic selection, the knowledgeable other will guide the group for the development of aims and objectives for a research lesson. It can undergo numerous rounds of refinement.

Collaborative Planning of the Research Lesson

Collaborative planning is a new term for practising teachers in India. Most of the teaching in schools relies upon the activities given in the textbooks and the teachers develop individualistic lesson plans. The lesson planning in lesson study is not ordinary. Its main determinant is *Kyouzai Kenkyuu*, which is a thorough consideration of the curriculum materials and research literature for situating the lesson plan in a cogent theoretical framework. It is improbable for school mentors to have access to a wide range of sources or the time and authority to manage sources to be used in research lessons. The university supervisor will assist the pre-service teachers in locating the resources and researches to plan research lessons collaboratively with the school mentor, focusing upon students' learning.

Teaching of the Research Lesson by One of the Student Teachers

One of the student teachers from the lesson study group will teach the planned research lesson to a predetermined class of students.

Observation of the Classroom Teaching by Other Group Members

Many people usually observe the observation phase in the Japanese lesson study cycle. The other group members include lesson study group members, school teachers, teachers from other schools and school education board personnel. In the current model of school internship in India, university supervisors and school mentors observe the classroom teaching of pre-service teachers and in some universities, an outsider is called to evaluate the final lesson. These observations judge the teaching performance of the pre-service teachers and suggest further improvements. The existing practice of classroom observation cannot be transformed in one go. The first step will be to tutor the lesson study group to write detailed observation notes, which will facilitate the debriefing session. Only the members of lesson study group will observe the classroom teaching. An observation scale can be introduced to pre-service teachers from the university supervisor for collecting scrupulous observations and the same can be shared with other members of the group (in-service teachers). For focused observations, sample students will be identified and their learning will become the source of research lessons (Cajkler and Wood, 2016). Sample students can be interviewed about what they learned during the research lesson.

Reflective Discussion and Necessary Modification

The knowledgeable other in a lesson study cycle in Japan is customarily an expert from the field of education who synthesizes the reflective

discussions in the debriefing session and relate the discrete pedagogical learning with the broad educational theoretical framework. But in the Indian context, the university supervisor and cooperative school mentor teacher must take on the role of knowledgeable others. The university supervisor may not participate in the process directly, but will prepare the pre-service teachers for lesson study by familiarising them with the process, presenting practical suggestions and resources. In the current scenario, the university supervisor visits the cooperative school to observe the classroom teaching of pre-service teachers. During this visit, the university supervisor will investigate the progression of the lesson study cycle and give a helping hand, if necessary. The cooperative school mentors, as knowledgeable others, will introduce the pre-service teachers to the school classroom, provide their expertise for selecting topics for research lessons in connection with students' learning and their professional development. They will also observe the pre-service teachers' teaching and lend thorough feedback in a debriefing session.

The knowledgeable other will perform the duty of a moderator to facilitate the pre-service teachers to reflect upon students' thinking when they have not understood a concept so that the research lesson can be polished up.

Teaching of the Modified Research Lesson by Another Student Teacher to a Similar Class

The re-teaching of the research lesson is not mandatory in Japan. The researchers in Japan pay attention to learning from lesson study, not perfecting a specific lesson. As we will incorporate the lesson study in our secondary teacher education programmes, we would like all the pre-service teachers to go through the above steps in a lesson study cycle. If a lesson study group has two pre-service teachers—, a cooperative school mentor and one university supervisor, we will recommend two lesson study cycles so that both the pre-service teachers will get a chance to teach.

Observation of the Classroom Teaching by Other Group Members

While the other student teacher will teach the modified research lesson to a similar class of students, the remaining group members will take detailed notes of the students' learning.

Reflective Discussion and Final Report

The group members will be engaged in collaborative reflection of the students' learning from the modified research lesson. The group, with the assistance of knowledgeable others, will ruminate whether the requirements for which the

modifications have been made in the preceding research lesson, have been met or not and give suggestions for improvement. In the end, the group will compile all the lesson plans, debriefing minutes and their reflection write-ups in the form of a report to be submitted as a marked component of their teacher education course.

Conditions for the Success of Suggested Model of Lesson Study in India

- *Designing New Structures for Partnership*

The lesson study calls for new structures for school internship. To build a sound school-university partnership through advocating lesson study, we need 'boundary spanners' (Clark, 1999). These leaders from universities and schools will act as initiators in a lesson study project and will plan the discourse of action. They will perform the duties of a coordinator and communicate the concerns, issues, and problems to their counterparts.

- *Deciding the Core Principles*

In line with the National Curriculum Framework for Teacher Education, the teacher education institutions will draft their syllabus about field placement and the same will be talked through the school leaders. Although schools and teacher education institutions already assume their joint responsibility to prepare future teachers, a small-scale collaboration is observed. In most cases, school personnel appear unaware of the role for which pre-service teachers are placed in their school. It is required that the co-partners share a common philosophical base (Clark, 1999), not only on structural concerns but also on matters that are directly related to the professional development of pre-service teachers.

- *Finding Place in Established Norms*

The delivery of a specified number of lesson plans in a prescribed duration is considered as the sign of a successful school internship. The prevailing realities cannot be altered overnight but an attempt can be made to constitute lesson study as a component of school internship. The pre-service teachers, in consultation with school mentors and of the teacher education institute academics of the, will discern the topics that pertain to the immediate needs. The lesson plans of pre-decided units will be delivered through conventional medium and the need-based topics will be executed through lesson study. These topics are difficult areas where cooperative school teachers encounter hurdles in connection with pedagogical content knowledge and students' perceived understanding level.

- *Selection of Mentor Teachers*

'Well qualified and adequately motivated teachers [need] to be associated with TEIs as mentor teachers.' (NCTE, 2016). Qualitative mechanisms should be espoused to select expert mentor teachers across

various disciplines. Mechanism such as classroom observations of teachers who will be volunteers may be used to become mentors and personal interviews by university and school team leaders (Burstein, et al., 1999). Monetary and status (promotion) benefits will uplift the motivation of cooperative schools' mentor teachers, along with pre-service teachers and teacher education institutions' academics ensuring their active participation in lesson study (Huang, et al., 2017; Xu and Pedder, 2015).

- *Hand Holding*

The pre-service and in-service teachers are the keystone of the lesson study process. The preliminary introduction of lesson study has to pre-service teachers. The student teachers will form groups and engage in collaborative planning, teaching and reflection be given where their classmates will act as students (Carrier, 2011; Fernández, 2010). A competent professional from the university, on the recommendation of university leaders, can perform the role of the trainer to orient in-service teachers about lesson study. The training will include simulations, reviewing readings, videotapes, and reflections on lesson study researches.

- *Mentor Teacher and University Academic in Lesson Study Group*

Mentor teachers' constant interaction with pre-service teachers will devise ways to assist and provide guidance to the pre-service teachers. They can learn along with pre-service teachers using collaborative planning, locating teaching-learning resources and exhibiting effective strategies. In lesson study, the mentor teacher will be in a state to seek university academics' knowledge and pre-service teachers' progressive ideas for school upgradation.

The university academics have an influential role to play in the lesson study team. During initial classroom observations, the pre-service teachers can come up with general themes they have decided to be brought up in the lesson study cycle. Here, the university teachers can support in identifying the specific issues from a general theme. The university teacher will play the role of a 'critical friend', who will become a part of classroom teaching observations and debriefing sessions but avoid giving the answers. Rather, by asking reflective questions, they can encourage the other team members to reflect more on the learning they have witnessed (Clark, 1999). The principal task of a university teacher is to relate the teaching and learning experiences with broad educational theories and their implications, at the end of the debriefing session.

- *Administrative Support*

School leadership and support are decisive factors in the effective accomplishment of lesson study (Xu and Pedder, 2015). A lot of time is devoted to planning research lessons, choosing pertinent experiences and reflections during debriefing sessions. School authorities should

design timetables and make flexible arrangements in such a way that school mentor teachers do not feel burdened by school responsibilities and extra accountability for preparing pre-service teachers (Fernandez, 2002).

- *Establishing Resource Centre*

The association school and university for preparing lesson study should not be a one-time affair. Every year, pre-service teachers along with school mentors and university teachers will undertake lesson studies to address different issues. The lesson study teams require a stable place where they can hold planning meetings, prepare, and keep teaching-learning resources and arrange debriefing sessions. Having their own collective space will evoke the feeling of community and collaborative culture (Burstein, et al., 1999).

- *Time Alignment*

All the activities under the lesson study process should be aligned with the school's calendar. The coordination between the schools and university's calendar will facilitate the smooth achievement of lesson study goals, without disturbing other school events.

- *Adoption of Innovative Assessment Technique*

The desired results of a reformist endeavour, like lesson study, cannot be accomplished without an innovative protocol for pre-service teachers' assessment. Getting remarks as feedback should not be perceived as sufficient. The school and university leaders shall select or formulate assessment procedures to determine the pre-service teachers' progression through the lesson study process. For instance, appraising the development of pre-service teachers through research lesson plans, reflective discussions in planning and debriefing sessions or self-assessment reports.

- *Teaching as the Focal Point, not the Teachers*

In contrast with the responsibilities and accountability that school teachers shoulder every day, school teaching has always been looked down upon by society. The same notion has been diffused in pre-service teachers as a result of their own past school experiences or what they have heard from their seniors or university teachers. Pre-service teachers coupled with prejudgements about school teachers' disinterest and incompetence would take the lesson study to nowhere. The pre-service teachers and university academics should account for in-service teachers as co-learners, respecting their individuality and experiences during the lesson study process. The focus of the lesson study should be the improvement of teaching for students' learning.

- *Lesson Study Network*

An online government portal should be set up in which lesson studies from all over the nation can be shared. The research lesson

plans, group members' reflections, students' results and suggestions can be publicised this portal and regarded as a reference for groups that are planning lesson study on similar topics.

Conclusion

Lesson study is one of the means by which the school-university partnership can be strengthened. It can lead to the professional development of both the prospective teachers and in-service teachers in India. Its adoption, however, requires among others, the change in the mindset of school authorities and university faculty. They should treat themselves as co-learners, consider teacher preparation as their joint responsibility and work towards the common goal of improvement of school students' learning.

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Emancipatory Pedagogy: Teaching of Gender in an Elementary Teacher Education Programme

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Abstract

This article focuses on the transaction of Gender and Schooling course to final year graduate students of B.El.Ed. Programme of University of Delhi for achieving knowledge goals—self-awareness, actualisation and change agency by the student-teachers. NCF 2005 and National Education Policy 2020 emphasise the need to address gender-related issues in our schools and in society at large. Gender relations are a lens to study inequity between women and men in society. These are essentially relations of power in which women have far less substantive power in relation to men. These relations manifest in explicit and implicit ways. The student-teachers study the Gender and Schooling course in their final year for theoretical understanding as well as critical examination and application during their school internship in the same year, operationalising what NCFTE calls the linking of book-view to field-view. The gender course in the B.El.Ed programme acts as a discursive field of knowledge, empowerment and action.

Introduction

Gender relations are a lens to study gender inequality in society. These are essentially relations of power which manifest in explicit and implicit ways. Statistical indicators like sex ratio, health and nutrition measures, crimes against women, ownership of property, occupancy in jobs, employment, authority

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positions, political positions, etc., explicitly reveal the unmistakable nature of gender inequality in society. Implicit measures are entrenched in power relations and hierarchies which are complex to be quantified, being situated in the realms of custom, religion, culture, household dimensions, etc. Such inequalities in turn reinforce unequal power relations, unequal decision-making and unequal control over resources, resulting in lower status of women. These indicators also serve as tools for government policy to identify inequalities and redress them towards the goal of equality and equity.

Issues of gender being central to our lives, also need to be examined within the spaces of learning. The National Curriculum Framework Position Paper on 'Gender Issues in Education' states that, 'knowledge, teaching and learning should be linked with the objective of allowing gendered inquiry and not only 'fixing it' in conventional designs. It needs to provide avenues to educate students to think analytically, contest with relations of power, and envisage versions of an inclusive world open to dialogue and dissent (NCERT,2006:38). In the same vein, the recent National Education Policy 2020 emphasises the critical role of education in attaining social justice and equality (NCERT, 2020:24). Thus, gender discourse is now gaining attention in academic discourses as well as professional programmes. Teachers are harbingers of changemakers and their engagement with such issues creates a positive impact on the lives of future generations, also liberating them in this process to think discursively and critically about their own situation in society as conscientious citizens.

Significantly, the National Curriculum Framework of Teacher Education (NCFTE, 2009) also states that engagement with gender need not be limited to the book-view focusing on theories but need to get extended to the field-view dealing with practical social realities.

In this backdrop, this paper seeks to build an analytical narrative about the change—experiences of the student-teachers through a course that acts as a 'discourse' on gender in helping them understand their situation in life better and gain agency to create the possibilities of change. Intensive dialogue on student-teachers' perceptions, beliefs and ideas can pave the way for connecting gender theories to their personal experiences.

'Gender and Schooling' in B.El.Ed. Programme

The Bachelor of Elementary Education (B.El.Ed.) is a four-year professional graduate programme of teacher education introduced by the University of Delhi in 1994, now offered in eight women's colleges. In the B.El.Ed. programme, the first year social science papers like Contemporary India and Core Social Sciences also have a space to discuss

and debate gender issues. However, in the final year, a compulsory paper of 'Gender and Schooling' is offered to students with the objective of— (i) 'critically examining gender inequities in society through feminist theoretical frameworks', and (ii)'to observe and analyse manifestation of gender inequities in the schooling process besides developing strategies for intervention'. The present paper examines the significance of the 'Gender and Schooling' course in the teacher education programme in enabling the teacher trainees to become empowered in order to act as the agents of change. In this paper, the students of this programme are henceforth referred to as 'student-teachers' to recognise their conscious self-orientation as teachers in the making. This paper draws from the author's experience and engagement over several years with the student-teachers while teaching them the 'Gender and Schooling' course.

Methodology

Action Research

Action research, referred to as 'practice changing practice', is a mechanism for change and progress that alters the 'practitioner's practice, their comprehension of that practice and the situation in which they practice'. It is both a 'democratic and democratising process' (Cohen et al., 2018:440–41). It can be used in any situation where in a problem concerned with people, tasks and procedures needs to be addressed and immediate remedies sought. Thus, a problem is posed and a solution arrived at. This method has the potential to germinate new ideas, empower individuals as well as groups and also motivate people towards reflective practice. In fact, Carr and Kemmis (1986) term it as 'self-reflective inquiry', which is pursued to improve people's understanding of situations and ensure enhanced 'social justice for them'. Similarly, Grundy states that action research seeks to improve the 'social conditions of existence'. It is geared to modify both individuals and institutions and societies and cultures to which they belong. Action research includes the components of diagnosis, action as well as reflection, where in the researcher attempts to conduct research on oneself basically (ibid: 442).

This paper uses action research methodology on a study sample comprising 42 final year students (all women) of 2019–20 batch of B.El.Ed. programme. It is pertinent to mention that this research idea has taken shape while transacting the course to their previous batches by means of observation and discussions held. This paper, however, for the purpose of specificity, contains the qualitative data obtained from the study sample of 42 student-teachers through observation and discussion methods using action research methodology. Although the author's experiences with the previous batches of student-

teachers are similar, this present paper would discuss the responses of the aforementioned sample. The names of the student-teachers have been changed for the sake of confidentiality.

Research Questions

In a way, the elements of action research are embedded in the curriculum and pedagogy of the Gender and Schooling course itself. However, employing action research, the data has been collected through classroom-based intervention strategies to address certain questions: How to enable students to become critical thinkers and emerge as instruments of empowerment and emancipation? What role can a course like 'Gender and Schooling' play in turning this aspect into reality? What measures can we adopt to respond to this system? According to Bell Hooks, schools are important in reinforcing certain feminist values. This can become a possibility only when the society gets intertwined with theory, and teaching with learning and thus contributing to essentially 'response-able' forms of knowledge and its practices (Revelles-Benavente and Ramos, 2017).

In this perspective, this paper attempts to explore novel feminist approaches, thereby advancing a horizontal perspective on teaching, where in both students and teachers are partners in creation of knowledge and operate in a decentralised environment. The central questions therefore are— How to conceive of gender pedagogy? In what way can the feminist philosophy of 'teaching with responsibility' emerge? As co-learners in knowledge production and dissemination, how do we probe systems of knowledge that are both racial and gendered in nature (Revelles-Benavente and Ramos 2017:2–3). How far can gender and women be discussed by focusing on pedagogical, theoretical and political aspects of teaching and learning? As teacher educators, how do we enable gender pedagogies to question gender biases, stereotypes and prejudices prevailing in our society— is an objective of exploration for this paper.

Finally, the data gathered in this study are put to critical analysis to figure out how emancipatory pedagogies can emerge, thereby creating liberating systems of educational practice. It is to indicate to what extent feminist classrooms are possible, especially where conflict is used as a means to learn, unlearn and relearn. It is also to see how spaces can be created to question experiences. Epistemologies that reinforce gendered notions need questioning and this can happen when students realise such politics of hegemony that function to create hierarchies in our society.

The Book View

Academic Theories and Lived Experiences

Although girlhood is a subset of the childhood, but only girlhood gets

designed in a way to counter the free and emancipated spirit that childhood embodies. The family and the community both socialise a girl in expected ways of emphasised femininity. Next, education through the School system and the State policy culture her personality to create an educated citizen. All these gendered dimensions reflect in the growing up of girls and finally attaining womanhood. Kumar's book, *Choori Bazaar Mein Ladki* ('A Girl in the Bangle Market',) which is a significant contribution to the field of Women Studies, shows the bangle shop as suggestive of the hegemonic masculine world that controls and manipulates a girl's life at different stages (kumar, 2013:73).

However, in the educational realm, the concepts of gender and sexuality are not dwelt upon and pushed away in order to avoid 'embarrassment'. A closer look at the student-teachers' life experiences as observed during this present study, suggest that the way they think about gender is integral to forming an understanding of relations of power existing in our society.

In teacher education programmes, discussion on gender issues can be crucial in order to develop sensitivity and empathy amongst learners. The B.El.Ed. programme offers 'Gender and Schooling' as a compulsory course to the final year student-teachers while they also undergo internship training in specific teaching schools. These student-teachers have already read about gender in various papers in the previous years and the focus in the final year is to start with an in-depth analysis of one's situation *vis-a-vis* the wider world outside.

At the beginning of this course, student-teachers are helped to decode what they think or mean by 'sex', 'gender', 'masculinity', 'sexuality', 'feminism', etc., how they interpret these and what inferences they draw from their own lives regarding these. Moving ahead, the purpose is to enable them to relate their personal experiences with the theories they have studied. The move is clearly to make a shift from the personal to the academic realms. These ideas and concepts need to be revisited as a part of academic practice and dimension of daily lives.

Through focused group discussions, critical reflection of personal and social realities, fact and interpretation method and media deconstruction method, the course 'gender and schooling' tries to comprehend students' localised knowledge and its prevalence in the wider global milieu. How do learners interpret the concepts of 'sex', 'gender', 'sexuality', masculinity', 'patriarchy', and 'feminism', to name a few, and identify with them. Also, it is to examine how folk-tale narratives focus on particular gender roles and expectations. The role of media in extrapolating these ideas in culturally-specific terms is also examined.

It is observed that feminism in general terms is read quite differently by the student-teachers. The initial discussion on feminism brought out their reluctance in identifying themselves as 'feminists' since they being feminists thought that pulled them away from men altogether. A student-teacher Reema stated that she was 'wary of using the label 'feminist' because they are considered to be anti-men' while Anu observed that 'such women are isolated by society'. Thus, they were cautious of this term and its usage. However, gradual acquaintance with the concept and the follow-up discussions helped them understand that feminism is a 'way of life', rather than being just a concept. After discussing various strains of feminisms like liberal, radical and socialist, among others, students started exploring as to which feminist theory adopted what strategy and why. They then shared their understanding of coeducational and single-sex (girls') schools and reasons for their preference for one of those. Liberal feminism appealed to most of the students. They found its strategies were much possible to be implemented. Some others preferred radical feminism since it challenged the patriarchal system and ideology. This turned out to be the beginning of the debate as to which feminism can actually alter/modify the current situation of subordination and exclusion of women. It was observed that personal situation and experiences had a major role to play in their choice of the academic strand.

The student-teachers also undertook content analysis of textbooks that they were teaching as a part of the School Internship programme. Now, they were able to critically look at the textbooks using a gender lens. They were able to add these subtle cues to the existing schemas to challenge gender stereotyping that largely prevailed.

Personal Realms

Negotiating Restrictions

Restrictions over sexuality seemed quite obvious to the student-teachers and they realised what was expected from them was compliance and subservience. A student-teacher Gauri remarked how her parents have always tried to be protective and, in the process, denied any outings to her friends' places. She was not even allowed to go to her own terrace for the fear of being 'seen by boys'. However, she said she had now been able to negotiate her with, parents to go on outings to places outside Delhi with friends (Classroom Discussions). Many student-teachers shared that their mobility remained restricted by and large and they had started gradually negotiating with their families to allow them access to more to places of their choice.

A student-teacher Meera shared a similar experience that her younger brother was seen as her guardian/ custodian ('I was seen as a 'liability'

and my younger brother would escort me whenever I travelled from one place to another'). Her parents were keen to get her married and also kept a close vigil on her to check any 'transgressions'. She was, however, keen to gain higher education and worked very hard to secure highest marks so that her parents could not cite low marks as an excuse to deny her further education (Focused group discussions). This is just one indication of the struggles and pressures a girl has to deal with within the household.

Visibility and Invisibility

A student-teacher Saroj who belonged to Haryana shared that her *parda* (veil) was an 'everyday reality and women of the household are expected to abide by such customary practices'. A remarkable finding came out in her narration that earlier in her family, photographs of women were taken with *parda* over their faces, thus making it difficult to distinguish the identities of the women (Classroom discussions). Visibility allots power while invisibility makes women powerless and vulnerable. Every student-teacher seemed to agree that power vests in men who take the major decisions of the family. Girls felt that as they grew up, they were gradually pushed to less-visible/ invisible spaces while the boys started occupying the more-visible/visible spaces. In a given set of parents, the mother is relegated to the realm of less-visibility, reducing her power and decision-making capabilities. The girls felt empathetic towards their mothers who were assigned household chores (Focused group discussions).

Striving for Economic Agency

In their struggle to study, gain education and become financially independent, the student-teachers have sought to carve out a space for themselves. A student-teacher Hema described that after finishing school, she tried to be self-dependent by giving tuitions to fund her own education as well as to contribute to family finances. She was happy that she was able to buy a costly mobile of her choice from her own savings which also upscaled her status within her family. However, the burden of expectations on her started increasing and her family wanted her to buy a laptop for her brother. She found herself under pressure and sometimes clueless as to how to deal with such situations. Yet, girls did realise their potential and were also eager to fulfil their responsibilities towards their families. A student-teacher Beena shared that her father was dependent on his elder brother (her *Tau*), a situation not to their liking and that she was their only hope to be able to earn and support the family finances. She said, 'I want to support my parents and look after them after graduating from B.El.Ed. and getting a teaching job' and thus wanted to be the 'son of the house' (Classroom Discussions).

Most student-teachers are trying to carve out some space for themselves within their families while trying to understand the patriarchal system and operation of gender inequities in society. A student-teacher Deepa, whose parents gave birth to have three daughters in their wish to beget a son, narrated that 'she and her sisters were initially looked upon as liabilities by their extended family'. The absence of a son is always pointed out by the society and the family is seen as incomplete. Her parents wondered how they would live after their daughters were married off. She however assured them that she was keen to be with them somehow and extend them all the possible support.

The Field–View: Internship Experiences

Dealing with Stereotypes and Prejudices

During the school internship programme, student-teachers could assess how the approaches adopted by male teachers differed from those of female teachers. As teacher interns, their status remains ill-defined and inconsistent and they were not assigned due status either by the students or by regular teachers. In some schools, the boys of senior classes would try to enter their classes or pass comments which they disliked. In a particular case, a student-teacher was referred to as '*Cheh kamre wali'* (occupant of room number 6) because she was teaching Class VI. She expressed her discomfort to the headmistress of the school and also to the male class teacher. Still this practice continued much to her discomfort until she sternly asserted her authority. Although it may be said that their temporary position as teacher-interns also has to do with such lack of status, one wonders if male teacher-interns would also have to face such demeaning behaviour. Through such situations, student-teachers have learnt to identify the demeaning, sexualised comments and gestures and have started questioning those because of the learning that gender equality needs to be emphasised in all spheres.

A common question that each batch of student-teachers raise is why the B.El.Ed. programme is limited only to girls' colleges. Perhaps co-educational spaces also can be useful in socialising boys to become conscientious of gender issues. They feel that issues central to 'masculinity' need more effective addressing in spaces where male socialisation process could be brought under close scrutiny.

Another challenge which the student-teachers faced is with regard to the usage of abusive terms and expressions by students, (both girls and boys). Girls told that they use it upon by seeing that the boys use it, meaning thereby that these were perceived to be masculine and related to power. The student-teachers kept checking their students and

reinforced the practice of discarding such phrases.

In an internship school, a regular teacher wanted to ascertain the community background of a student-teacher who belonged to a scheduled tribe. She felt distressed and teacher educators had to intervene with the school to address this matter. It was then learnt that the regular teacher wanted to recommend her to somebody she knew for a matrimonial alliance. The outlook of educated persons towards women at professional work is also coloured by patriarchal lens.

In a particular incident, when some students of a school were taken out on a picnic to a nearby park, a student-teacher Reema also joined. While she was lying down feeling unwell, a male teacher asked her to get up and be active. Reema replied that she was 'down' and feeling quite unwell. Feeling embarrassed, the male teacher left. However, later on, he was heard stating that he also has mother, wife and sisters at home and was well aware of the trials and tribulations of women, however, 'women should not talk about their menstruation issues uninhibitedly'. This matter was elaborately discussed in the 'gender and schooling' class and viewpoints were shared as to how does one draw boundaries between personal and professional spheres and also create her own special space to manage life-situations which are exclusive to women.

Confronting Deviant Male Behaviour

Mobile phones and internet have become a part of everyone's life now. Some student-teachers narrated that they came to know that certain students in their classes watched pornographic content on their phones. This became obvious when some students were found showing their phones to one another. Pornographic images, films and pictures are part of a discourse which has its own signs and meanings, wherein it is visually and contextually suggested that women are to be 'dominated'. It is like a strategy of domination and violence, which is used to degrade and humiliate women and is surely a 'crime against humanity'. The second aspect is that it is used as a 'warning' to create fear, as a result of which women are expected to stay in tandem with the system (Wittig 1978: 344). Mackinnon similarly states that now a days, media is a medium through which sexuality is socially constructed women get objectified as 'things' for sexual use. Those who consume it then create a desire to not only possess women but also dehumanise them (Mackinnon, 1989). For student-teachers, it came as a big challenge to deal with such incidents due to their own identities of being women. They narrated that they experienced anxiety and humiliation internally, while trying to discipline the deviant male students without possessing the requisite 'male' authority.

As Change Agents

What is projected in this paper is a miniscule of experiences and expressions made by the student-teachers. While they acted as change agents for themselves and within personal spheres, in the work sphere too, they began acting as change agents as described in the instances in aforesaid sections. They acted sensitively towards their students and tried to cater to girl students particularly. They motivated them to be vocal in expressing their ideas and opinions.

The student-teachers tried to encourage children to participate in cross-gender interaction and learn about different perspectives that are not usual. They made small groups to facilitate discussion on disciplinary themes. When girls in their classes appeared reticent, shy and not so keen to share their observation in classroom transactions, student-teacher made special efforts to involve them in teaching-learning practices. They assigned leadership roles to girls in games and activities to enhance their self-confidence. In certain situations, when they saw girls absenting themselves from school processes, they ensured their attendance that led to not only their to school activities but also success, to an extent. They also attempted to sensitize the boys to not bully girls and treat them as equals.

Besides such initiatives, at times, the student-teachers felt desperate to introduce many changes which the school system was mostly reluctant to introduce and innovate. However, many such efforts continue both officially and unofficially to address the concerns of gender equity. In their limited time and roles, they still showed the way towards building more egalitarian school and society. Many issues related to gender and sexuality surfaced in the school premises but these got pushed aside or ignored in various ways in those settings. This caused discomfort to student teachers who tried to deal with these issues within their own capacities and also brought these along to the 'gender and schooling' class for discussion and deliberation.

Conclusion: Towards an Emancipatory Pedagogy

A course like 'Gender and Schooling' goes a long way in nurturing the possibility of understanding differences and bring about change through self-consciousness and informed action. It ensures a secure space for expression, voicing and resolution of conflicts to strive for achieving gender equality. Education system should make room for emancipatory pedagogy that brings in liberating experiences in a process of self-reflective enquiry. It is only through such education that change can occur, and therefore, it must allow space for reflection, deliberation and action to address issues central to the lives of women. As the ancient Indian *puranic shloka* (*Shri Vishnu Purana*, 1-19-41, ancient Indian

philosophical text) states, the goal of education and acquirement of knowledge is emancipation of the self and liberation of the soul.

तत्कर्म यन्नबन्धाय सा विद्या या विमुक्तये ।
आयासायापरंकर्म विद्यऽन्या शिल्पनैपुणम् ॥

—श्री विष्णुपुराण ॥१-१९-४१॥

Tatkarma yanna bandhāaya sā vidyā
yā vimuktaye |
āyāsāyāpara karma vidya'nyā
śilpanaipuam | |

—*Shri Viśnu Purāna* | |1-19-41| |

{That is action which does not lead to bondage; That is knowledge which liberates.
All other action is mere effort; Any other knowledge is merely another skill in craft.}

The course 'Gender and Schooling' embodies this spirit in theory and action to make the student-teachers conscious selves who as change-agents act to bring about change in their immediate environments and also in their encountered worlds. The student-teachers who were of the opinion that often they tended to naturalize the patriarchal system, state that through the 'Gender and Schooling' course they get a window to think, reflect and act.

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Exploring Relationship between Home Environment and Study Habits of Pre-service Teachers of DIETs from Delhi

CHITER REKHA*

Abstract

The present study was an attempt to explore the relationship between home environment and study habits of pre-service teachers of DIETs from Delhi. The main objectives of this paper were to study the home environment and study habits of pre-service teachers and to study the relationship between their home environment and study habits. sample of 80 pre-service teachers was taken into consideration by using random sampling. The study habit inventory developed by M.N. Palsane and Anuradha Sharma, and home environment inventory developed by Karuna Shanker Mishra were used to measure the study habits and the home environment of pre-service teachers of DIETs from Delhi. Percentage (%), t-test and co-efficient of correlation were used by the investigator to analyse the data for testing the hypotheses and relationship between study habits and home environment of pre-service teachers. The investigator found no significant difference between home environment and study habits of male and female pre-service teachers of DIETs. Positive and significant relationships were found between the study habits and home environment of pre-service teachers.

INTRODUCTION

Education is the process of change and development. The education and study habits are connected with each other. Education helps in the development of good study habits

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and study habits lead to educational achievement and success in future. Study habits refer to the ability of the learner to schedule the time according to one's needs and interests; devotion of time and attention to gain new, extra and advanced knowledge; plan of the study; the habit of concentration, learning, thinking, decision making, retention, reading, memorisation, note taking, mental review, etc. Hence good study habits are more important for teachers, prospective teachers and students, etc.

A study habit occupies an important place in educational achievement as well as the learning process in our lives.

It has become a milestone of student's future in this highly competitive and progressive world. Good study habits are the gateway of knowledge, understanding and wisdom. Education and study habits are positively intertwined. The home environment provides the basic initial foundation for learning and development of children. It is an informal environment in which a child lives. Home environment affects study habits directly and indirectly. Healthy home environment improves the quality of cognitive, affective, psychomotor, social and intellectual aspects of the children.

Review of Literature

Monika Saini (2010) conducted a study on the academic achievement of senior secondary school students by taking the variables of study habits, home environment and school environment. Descriptive survey method was used for this study and a sample of 600 Scheduled Caste students from three districts were taken into consideration. The research findings showed no significant relationship between study habits and academic achievement. Home environment played a significant role in the academic achievement of senior secondary school students. Rajakumar and Soundararajan (2012) studied the study habits of higher secondary students in Tirunelveli District. They considered 1060 higher secondary students as sample. It was found that there was no significant difference between male and female, rural and urban higher secondary students with respect to their study habits. No significant difference was found between day scholar and hostel staying, government and aided higher secondary school students with respect to their study habits. Chand (2013) conducted a study on the study habits of government and private school students. Students from nuclear and joint families were considered as sample in this study. There was no significant difference between school students belonging to nuclear and joint families on different components of study habits. Students studying in home environment government the schools were significantly better that of than students studying in private schools. With the regards to the were significantly better than government

school students. There was no significant difference found between government and private secondary school students with respect reading and note taking, concentration, habit and interest. Singh (2016) studied the academic achievement of Class XI and XII students in mathematics subject in relation with study habits and home environment. 600 students from the government and non-government senior secondary schools were considered as sample. Findings revealed that the relationship among the different categories of study habits, and the different categories of the home environment and their academic achievement in mathematics was significant. Rathee, et al. (2017) had undertaken a study on the effect of home environment on study habits of secondary school students. The findings of the study revealed significant difference in the study habits of boys and girls belonging to rural and urban background. No significant difference was found in the study habits of urban and rural students but significant relationship existed between the home environment and study habits of secondary school students. After reviewing the literature, it was found that many studies were conducted on secondary and senior secondary school students by taking different variables, i.e., academic achievements and study habits, home environment and school environment (Saini 2010) and study habits and types of family (Rajakumar and Soundararajan, 2012; Chand, 2013), and home environment and study habits (Rathe et al., 2017). Very few studies have been conducted by taking the variables of home environment and study habits together and no study was done on pre-service teachers regarding these two variables. Therefore, the investigator chose to explore the relationship between the study habits and home environment of pre-service teachers.

Need and Significance of the Study

Pre-service teachers are the prospective teachers. Therefore, it is mandatory that pre-service teachers should know the importance of study habits and develop their study habits properly. They should know the proper, accurate, systematic and efficient way of learning. If they are well aware of the situation, they can guide their children or make arrangements for the same. Study habits are imperative for all the pre-service teachers for improvement in their learning. A proper study habit helps pre-service teachers to develop proper attitude towards study and avoid wasting time or energy unnecessarily. It has been concluded after the review of related literature that many studies have been conducted on school students by taking the variables of home environment, study habits and academic achievements, etc. No study has been conducted on the variables of home environment and

study habits of pre-service teachers of DIETs from Delhi. Therefore, in this study, an attempt has been made to analyse the study habits and home environment of pre-service teachers of DIETs from Delhi. The result of this study will provide awareness to parents, students, pre-service teachers, teacher educators and educational institutes.

Objectives of the Study

1. To study the home environment and study habits of pre-service teachers of DIETs from Delhi.
2. To study the relationship between home environment and study habits of pre-service teachers of DIETs from Delhi.

Hypotheses of the Study

1. There is a significant relationship between home environment and study habits of pre-service teachers of DIETs from Delhi.
2. There is a significant difference in study habits between male and female pre-service teachers of DIETs from Delhi.
3. There is a significant difference in the home environment of male and female pre-service teachers of DIETs from Delhi.

Operational Definitions

Study Habit: It refers to a consistent routine followed by the students for their studies on a daily basis. It includes eight dimensions of study habits inventory, i.e., Budgeting Time (BT), Physical Conditions (PC), Reading Ability (RA), Note Taking (NT), Learning Motivation (LM), Memory (M), Taking Examination (TE), Health (H), etc.

Home Environment: It refers to psychological, social relationship of parents with their children at home. It includes all the 10 areas of home environment inventory, i.e., control, protectiveness, punishment, conformity, social isolation, reward, deprivation of privileges nurturance, rejection, and Permissiveness.

Pre-service Teachers: Pre-service teachers are prospective teacher trainees or D.El.Ed. students who are taking training from the District Institute of Education and Training.

Research Design

Survey method was used for collecting the data. Total 80 (40 males and 40 females) pre-service teachers were selected through random sampling. Two standardised tools (Environment Inventory and Study Habit Inventory) were used in this study. M.N. Palsane and Anuradha Sharma's 1971 study habit inventory was used to measure the study habits of pre-service teachers of DIETs. This inventory covered eight major areas and home environment inventory developed by Karuna Shanker Mishra 1983 was used to analyse home environment of pre-service teachers of DIETs. Home environment inventory contained 10 dimensions.

Delimitations of the Study

- The present study was confined to 80 pre-service teachers of DIETs from Delhi.
- This study was confined to eight areas of M. N. Palsane and Anuradha Sharma's 1971 study habit inventory, and 10 dimensions of Karuna Shanker Mishra's 1983 home environment inventory.

Analysis of the Data

Descriptive and inferential statistics were used by the investigator to analyse the data collected by using the standardised tools of home environment inventory (Karuna Shanker Mishra) and study habit inventory (M. N. Palsane and Anuradha Sharma). Percentage was used to study the home environment and study habits of pre-service teachers, and t-test and co-efficient of correlation were used to test the hypothesis and relationship between home environment and study habits of pre-service teachers.

Tools of Home Environment Inventory

A. Control

Control means autocratic and very restricted atmosphere at home. 27.5 per cent pre-service teachers reported high control by their parents at home, 47.5 per cent of the pre-service teachers' reported that control was average at home and 25 per cent of the pre-service teachers' their parents control was low.

B. Protectiveness

After the analysis of data, it was found that protectiveness the 34 per cent of pre-service teachers' of was high at

Table 1
Home Environment of the Pre-service Teachers of DIETs from Delhi

S.No	Dimensions	High		Average		Low	
		N	*%*	*N*	*%*	*N*	*%*
1.	A: Control	22	27.5	38	47.5	20	25
2.	B: Protectiveness	27	34	32	40	21	26
3.	C: Punishment	21	26	33	41	26	33
4.	D: Conformity	22	27.5	38	47.5	20	25
5.	E: Social isolation	20	25	37	46	23	29
6.	F: Reward	25	31	41	51	14	18
7.	G: Deprivation of privileges	20	25	44	55	16	20
8.	H: Nurturance	24	30	41	51	15	19
9.	I: Rejection	24	30	32	40	24	30
10.	J: Permissiveness	21	26	39	49	20	25

home. This showed their parents were concerned about them, protectiveness of 40 per cent of the pre-service teachers' was average at home and protectiveness of 26 per cent of the pre-service teachers was low.

C. Punishment

26 per cent pre-service teachers responded that punishment level was high at home. This showed rigid and strict discipline at home, 41 per cent of the pre-service teachers' punishment was average whereas 33 per cent of the pre-service teachers' punishment was low.

D. Conformity

On the basis of the responses of pre-service teachers in the case of conformity dimension of home environment (commands or orders followed by them), it was found that 27.5 per cent of the pre-service teachers' conformity was high. They follow the commands and directions given by their parents, 47.5 per cent of the pre-service teachers' conformity was average and 25 per cent of the pre-service teachers' conformity was low.

E. Social Isolation

In the case of social isolation dimension of home environment, it was found that 25 per cent of the pre-service teachers' social isolation was high. They want to live alone in case of negative sensations, 46 per cent of the pre-service teachers' social isolation was average and 29 per cent of the pre-service teachers' social isolation was low.

F. Reward

31 per cent pre-service teachers reported receiving high reward. They believed that reward is to strengthen the desired behaviour. They received materialistic and symbolic rewards from their parents. 51 per cent of the pre-service teachers' responded receiving average rewards and 18 per cent of the pre-service teachers reported receiving low rewards.

G. Deprivation of Privileges

In case of deprivation of privileges dimension, it was found that 25 per cent of the pre-service teachers' deprivation of privileges was high. Their parents were controlling their behaviour by depriving them their rights. 55 per cent of the pre-service teachers' deprivation of privileges was average and 20 per cent of the pre-service teachers' deprivation of privileges was low.

H. Nurturance

On the basis of the perception of pre-service teachers in case of nurturance dimension of home environment, it was found that 30 per cent of the pre-service teachers' nurturance was high at home. 51 per cent of the pre-service teachers' nurturance was average and 19 per cent of the pre-service teachers' nurturance was low at home.

I. Rejection

It means conditional love, conditional freedom and have no all rights as a person. In the case of rejection dimension of home environment, it was found that 30 per cent of the

pre-service teachers reported high rejection, 40 per cent of the pre-service teachers reported' average rejection and 30 per cent of the pre-service teachers reported' low rejection.

J. Permissiveness

It means freedom to express one's views freely. On the basis of the responses of pre-service teachers, it can be concluded that 26 per cent of the pre-service teachers' permissiveness was high, 49 per cent of the pre-service teachers' permissiveness was average and 25 per cent of the pre-service teachers' permissiveness was low. The results of the above analysis are shown in Figure 1 with the help of a bar graph.

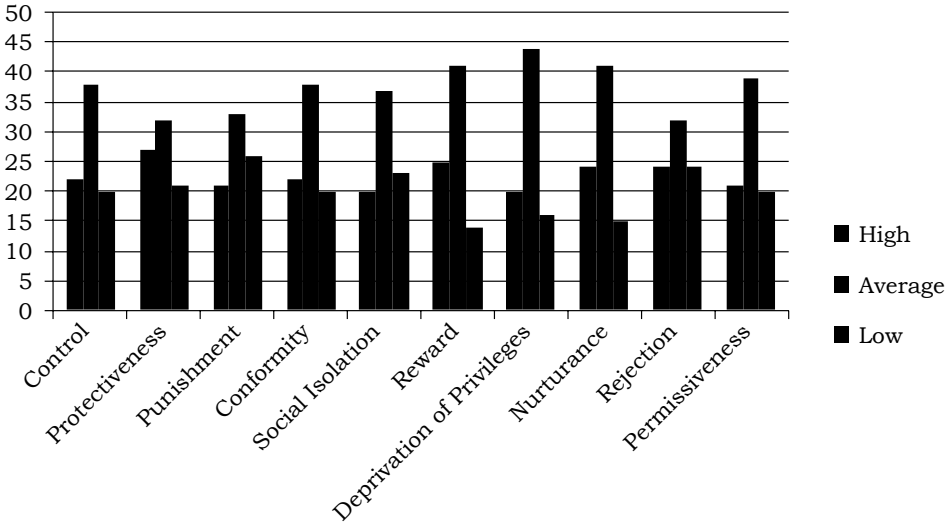

Figure 1: Home Environment of the Pre-service Teachers of DIETs from Delhi

Table 2
Study Habits of Pre-service Teachers of DIETs from Delhi

S. No	Area	Excellent (E)	Very Good (VG)	Average (A)	Unsatisfactory (U)	Very Unsatisfactory (VU)
1.	Budgeting time (BT)	13 (16%)	24 (30%)	31 (39%)	8 (10%)	4 (5%)
2.	Physical Conditions (PC)	16 (20%)	17 (21%)	29 (36%)	14 (18%)	4 (5%)
3.	Reading Ability (RA)	12 (15%)	19 (23%)	41 (51%)	4 (5%)	4 (5%)
4.	Note Taking (NT)	10 (12.5%)	11 (14%)	30 (37.5%)	24 (30%)	5 (6%)

5.	Learning Motivation (LM)	10 (12.5%)	23 (29%)	35 (44%)	9 (11%)	3 (4%)
6.	Memory (M)	9 (11%)	19 (24%)	34 (42%)	11 (14%)	7 (9%)
7.	Taking Examination (TE)	15 (19%)	20 (25%)	25 (31%)	14 (17.5%)	6 (7.5%)
8.	Health (H)	13 (16%)	19 (24%)	33 (41%)	11 (14%)	4 (5%)

Tools of Study Habits Inventory

Table 2 represents the analysis of data collected by the use of study habit inventory (M. N. Palsane and Anuradha Sharma1971, regarding pre-service teachers of DIETs.

Budgeting Time (BT)

Budgeting time is important to plan the study time. with respect to the budgeting time aspect of study habits inventory, it was found that 16 per cent pre-service teachers were excellent in budgeting time, 30 per cent pre-service teachers were very good, 39 per cent pre-service teachers were average, 10 per cent pre-service teachers were unsatisfactory and only 5 per cent pre-service teachers were very unsatisfactory.

Physical Conditions (PC)

Physical conditions play an important part in study habits. The place for study should be calm and quiet, it is the desirable condition for developing a good study habit. From the Table 2, it was found that 20 per cent pre-service teachers agreed that they have excellent physical conditions for study at home and their physical conditions support them in developing study habits, 21 per cent pre-service teachers have very good physical conditions for study, 36 per cent pre-service teachers have average physical conditions for study, 18 per cent pre-service teachers have unsatisfactory physical conditions for study, whereas only 5 per cent pre-service teachers have unsatisfactory physical conditions for study at home.

Reading Ability (RA)

Reading ability and skills, whether it is loud reading or silent reading, are very important for any kind of study. In case of reading ability area of study habits inventory, it was found that 15 per cent pre-service teachers have excellent reading ability, 23 per cent pre-service teachers have very good reading ability, 51 per cent pre-service teachers have average reading ability, 5 per cent pre-service teachers have unsatisfactory reading ability and only 5 per cent pre-service teachers have very unsatisfactory reading ability.

Note Taking (NT)

Taking notes is an important learning activity and helps in study. In case of note taking dimension of study habit

inventory, it was found that 12.5 per cent pre-service teachers have excellent note taking habit, 14 per cent pre-service teachers have very good note taking habit, 37.5 per cent pre-service teachers were average in note taking, 30 per cent pre-service teachers have unsatisfactory note taking habit and only 6 per cent pre-service teachers have very unsatisfactory note taking habit.

Learning Motivation (LM)

Desire to learn is an important consideration for self-motivation. If someone is genuinely interested in learning, he/she may quickly learn and retain it for a long time. Learning motivation affects the study habits. In case of learning motivation aspect of study habit inventory, it was found that 12.5 per cent pre-service teachers stated that they excellent learning motivation, 29 per cent pre-service teachers have very good learning motivation, 44 per cent pre-service teachers have average learning motivation, 11 per cent pre-service teachers have unsatisfactory and only 4 per cent pre-service teachers have very unsatisfactory learning motivation.

Memory (M)

Memory helps in learning, updating improving and retaining the matter. With respect to the memory aspect of study habit inventory, it was found that 11 per cent pre-service teachers have excellent memory for developing and improving study habits, 24 per cent pre-service teachers have very good memory, 42 per cent pre-service teachers have average memory, 14 per cent pre-service teachers have unsatisfactory memory and 9 per cent pre-service teachers have very unsatisfactory memory.

Taking Examination (TE)

Regular study habits prepare students mentally for the examination. Knowledge of the result motivates us and direct our efforts. In case of 'taking examination' aspect of study habit inventory, it was found that 19 per cent pre-service teachers were excellent in this area of study habits, 25 per cent pre-service teachers were very good in this area, 31 per cent pre-service teachers were average, 17.5 per cent pre-service teachers were unsatisfactory, whereas 7.5 per cent pre-service were very unsatisfactory in this area.

Health (H):

Regular and healthy food eating, exercise, recreation and sleep help in maintaining good health and sound mental health which are necessary to achieve success in the examination and for developing regular study habits. In case of health area of study habit inventory, it was found that 16 per cent pre-service teachers have excellent healthy habits, 24 per cent pre-service teachers have very good healthy study habits, 41 per cent pre-service teachers have average, 14 per cent pre-service teachers have unsatisfactory and only 5 per cent have very unsatisfactory healthy

study habits. The results of the above analysis are shown in Figure 2 with the help of a bar graph.

Table 3 shows that there was no significant difference at 0.05 level of significance between the home environment of male and female pre-service teachers in the dimensions of control, conformity, protectiveness, social isolation, reward, nurturance, punishment and permissiveness. It was found that there was a significant difference in the dimension of deprivation of privileges and rejection.

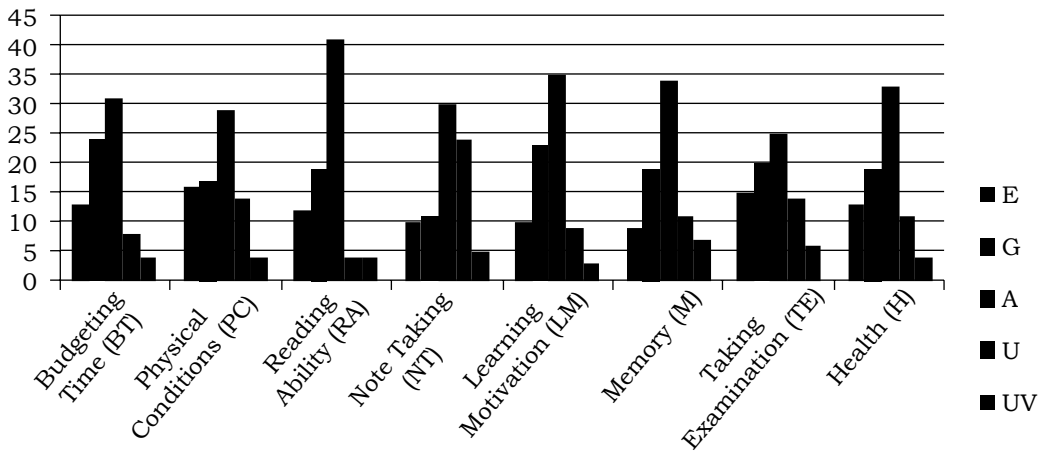

Figure 2: Study Habits of Pre-service Teachers of DIETs from Delhi

Table 3
Home Environment of Male and Female Pre-service Teachers of DIETs from Delhi

S.No.	Dimensions	Male Student Teachers (40)		Female Student Teachers (40)		
		Mean	SD	Mean	SD	T-test
1.	Control	23.1	4.41	24.35	6.04	0.294
2.	Protectiveness	28.7	5.68	27.85	5.38	0.494
3.	Punishment	26.4	8.3	26.25	4.05	0.9189
4.	Conformity	27.72	4.05	25	5.04	.0094
5.	Social Isolation	13.3	5.91	17.82	4.41	.00021
6.	Reward	28.47	5.76	23.95	8.81	.00081
7.	Deprivation Privileges	7.72	5.33	13.77	3.60	7.547
8.	Nurturance	20.75	4.93	20.22	5.13	0.642
9.	Rejection	11.12	5.62	16.15	4.42	2.917
10.	Permissiveness	22.25	4.69	22.77	3.31	0.565

Table4
Study Habits of Male and Female Pre-service Teachers of DIETs from Delhi

S. No	Area of study habit inventory	Male pre-service Teachers (40)		Female pre-service Teachers (40)		
		Mean	***SD***	***Mean***	***SD***	***t-value***
1.	Budgeting time (BT)	7.22	1.25	8.1	1.03	.001
2.	Physical Conditions (PC)	8.15	1.65	7.92	1.60	0.53
3.	Reading Ability (RA)	9.75	1.10	9.87	1.50	0.67
4.	Note Taking (NT)	3.45	1.31	4.27	1.30	.006
5.	Learning Motivation (LM)	7.15	1.35	6.65	1.45	.115
6.	Memory (M)	5.15	1.05	5.1	0.84	0.814
7.	Taking Examination (TE)	12.9	2.84	12.6	2.58	0.623
8.	Health (H)	4.47	1.08	3.95	1.08	0.033

Table 5
Relationship between Home Environment and Study Habits of Pre-service Teachers of DIETs from Delhi

Variables	Number of Student Teachers	R	Significance Level
Study habit	80	0.224	Significant at .05 level and .01 level
Home environment	80		

Table 4 shows that t-value of study habits of male and female pre=service teachers were not significant. Hence, the second hypothesis that there is a significant difference in the study habits of male and female pre-service teachers of DIETs is rejected.

It was observed that the correlation coefficient between overall home environment and study habits of the pre-service teachers is 0.224, which is positive and also significant at .05 level. It indicated a significant relationship between home environment and study habits, and both are positively correlated. Therefore, it can be concluded that home environment of the D.El.Ed. student teachers has a positive impact on their study habits.

Findings and Discussion

A healthy favourable home environment is likely to enhance pre-service teachers' personality and temperament to achieve academic success. 47.5 per cent pre-service teachers agreed that parents have an average level of control over them at home. 40 per cent pre-service teachers felt that parents show average protectiveness over them. 46 per cent perceived that parents do isolate them from the people for negative sanction. It has been found

after the study of home environment of the pre=service teachers that in the 'high level' category, highest number of student teachers, i.e., 34 and 31 per cent falls in protectiveness and reward dimension of home environment. On the other hand, in the category 'low level', highest number of student teachers i.e., 33 per cent falls in punishment dimension of home environment. The present study indicated that 51 per cent pre-service teachers show average level of study habits. Only 11 to 20 per cent of pre-service teachers shows excellent study habits inventory.

A significant difference was found in the dimension of deprivation of privileges and rejection among male and female pre-service teachers. Home environment played a significant effect on the academic achievement of senior secondary school students (Saini, 2010; Parvinder, 2016). The correlation coefficient between overall home environment and study habits of the pre-service teachers is 0.224, which is positive and indicated a significant relationship between home environment and study habits, and both are positively correlated. Rajakumar and Soundararajan (2012) and Rathee, Neeru and Seema (2017) discussed that there was no significant difference between male and female, rural and urban higher secondary students with respect to their study habits. After investigation, it was found that the study habits of male and female pre-service teachers were not significant.

Conclusion

This study revealed that there is a positive relation in the study habits of male and female pre-service teachers with regard to their home environment. Home environment plays an important role in the life of an individual and helps in one's all-round development. Therefore, it is the duty of parents to provide a comfortable home environment to their wards inside as well as outside the home.

Many pre-service teachers have the urge to study and achieve better but they are not well aware of the strategies or techniques to study effectively. Pre-service teachers can be benefited if an effective study habits programme is developed and implemented in the DIETs. The findings of the study will be helpful for the teacher educators and prospective teachers to develop the regular study habit student of teachers by providing congenial environment to improve their study habits. The findings of the study instruct and guide the teachers and parents. This research suggests to think deeply about a new direction and ways for the improvement of the education of pre-service teachers of DIETs. In a nutshell, the present study will help pre-service teachers to develop proper study habits, and actualise their abilities and potentials. A well-planned study programme should be organised for pre-service teachers to pursue their interests in various subjects, which will lead to the development of their personalities. This will enable them to do smart work during their studies.

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Learning Achievement of Elementary School Students of Ichhawar Block of Madhya Pradesh
A Trends Analysis

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Abstract

This paper is based on the results of NCERT's longitudinal study being conducted since 2017–18 Ichhawar block of Sehore district, Madhya Pradesh. The paper compiles data on the learning achievement of elementary school level students from three research reports of the same title 'Implementing Interventions at the School Stage: Learning Levels of Elementary School Students in Ichhawar Block', brought out by the Regional Institute of Education in the years 2017–18; 2018–19 and 2019–20. The levels of learning outcomes of 43,084 children (Classes III to VIII) of Ichhawar block, assessed through National Achievement Survey (NAS) tools developed by NCERT, are subjected to cluster-wise analysis of the trend of growth/change in learning levels of students in basic school subjects, as a result of various training-based interventions provided by NCERT during these years. The analysis revealed an overall incremental growth in the rate of learning achievement of both primary as well as upper primary school children in all the basic school subjects, viz., environmental studies, mathematics, science, social science and language, across 10 education clusters of the block. These results imply that further training of teachers need to be undertaken after identification of the training needs in different subjects as well as cross-cutting areas, keeping in view the philosophy of India's National Education Policy 2020.

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Introduction

The National Council of Educational Research and Training (NCERT) decided in the year 2017 to undertake an in-depth and longitudinal study, with a rural block as unit of the study, with the broad objectives to: (i) implement various interventions brought out by the council from time to time, e.g., innovative practices, learning resources, educational kits, supplementary readers, training packages, research tools; and (ii) assess their impacts on the attainment of learning outcomes. For this purpose, a rural block, Ichhawar of Sehore district, Madhya Pradesh, was chosen in consultation with the Department of School Education, Madhya Pradesh; and Regional Institute of Education, Bhopal, was designated as the nodal implementing agency. The project was launched in the academic session 2017–18 and a baseline assessment of students' learning levels in basic school subjects were done the using National Achievement Survey (NAS) tools developed by NCERT. On the basis of the results of this survey, various interventions, including training of teachers, block level functionaries and school heads, were provided in the academic session 2018–19 and a survey of learning level was made using the same NAS tools towards the end of the session.

For this study, all the elementary level children across 10 education clusters of Ichhawar block, constituted the subjects of the study. The major findings, as derived from comparison of the results of baseline assessment survey conducted in the academic session, 2017–18 and achievement survey conducted in the academic session 2018–19, revealed the growth in the rate of learning achievement of both primary and upper primary level children in all the basic school subjects in the year 2018–19, as compared to that of the year 2017–18. An achievement survey was also conducted towards the end of academic session 2019–2020 using the National Achievement Survey (NAS) tools used in the previous years, i.e., 2017–18 and 2018–19. This paper provides a comparative picture of learning levels of students in basic school subjects in respect of the academic sessions 2017–18, 2018–19 and 2019–2020, depicting the trend of learning levels of elementary level children (Classes III–VIII) in these years.

Objective

The objective of the study is—to study the cluster-wise learning achievement of the boy and girl students of Ichhawar Block studying in different classes from Class III to VIII for individual subjects of language,

mathematics, EVS, science and social studies for the years 2017–18, 2018–19 and 2019–2020.

Methodology

Since the study seeks to analyse the impact of various programmes, learning resources, innovations brought out, from time to time, by the NCERT to improve the quality of education and teacher education in the adopted Ichhawar block of Sehore District, Madhya Pradesh. The major interventions provided in the block, *inter alia*, include: orientation of teachers on Art Integrated Learning (AIL) approach, use of science and mathematics kits, use of ICT in teaching-learning process; supply of computers; on-site academic support to teachers and members of School Management Committee. The National Achievement Survey (NAS) tests developed for Classes III to VIII developed by Education Survey Division, NCERT, was used at the beginning of the academic session 2017–18 for the purpose of baseline assessment; and the same tools were used for the purpose of assessment of learning outcomes in the years 2018–19 and 2019–20. The sample for this analytical study constituted all the elementary level children in 290 schools (190 primary and 100 upper primary schools) across 10 educational clusters of Ichhawar block, viz. Ichhawar, Semli Jadeed, Bhaukhedi, Dhamanda, Ramnagar, Brijesh Nagar, Dewadiya, Balondiya, Kheri and Veerpur Dem. The year-wise sample of students, whose learning outcomes are analysed are 16,819 for the year 2017–18; 14,491 for the year 2018–19; and 11,774 for the year 2019–20. The data collected through the National Achievement Survey (NAS) tests were analysed with the help of SPSS software and presented in tabular form.

Results

The major achievement of the study depict the trend of growth of learning levels of primary and upper primary school children in basic school subjects, viz. language, mathematics, social sciences and EVS for the years 2017–18, 2018–19 and 2019–2020. The cluster-wise learning achievement of the boy and girl students of Ichhawar Block in Classes III to VIII for individual subjects of language, mathematics, EVS, science and social studies for the years 2017–18, 2018–19 and 2019–2020 are given below:

(a) Cluster, Class and Sex-wise Learning Achievement of students in Language Subject

The results pertaining to the clusters, class and sex-wise learning achievement of both boys and girls from Classes III to VIII for language subject for the years 2017–18, 2018–19 and 2019–20, are presented in Table 1.

Table 1
Cluster, Class and Sex-wise Learning Achievement of Students in Language Subject

Cluster	Year	Percentage of Language Achievement											
		III		*IV*		*V*		*VI*		*VII*		*VIII*	
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Ichhawar	2017–18	63.2	63.2	61.46	62.88	65.00	66.1	48.59	41.83	58.83	46.52	68.38	69.28
	2018–19	78.46	72.14	70.34	66.47	67.97	72.64	55.42	55.95	69.41	70.44	70.69	82.18
	2019–20	74.19	77.37	74.86	72.66	73.80	64.26	72.09	65.42	58.40	74.87	67.18	61.44
Semli Jadeed	2017–18	61.51	59.07	60.15	59.49	60.09	55.58	48.6	49.56	57.25	66.4	63.7	62.53
	2018–19	75.58	47.70	74.62	73.82	69.13	74.42	56.96	62.76	62.03	65.21	69.13	75.90
	2019–20	70.93	72.01	75.59	78.22	70.20	69.29	58.59	62.70	58.30	60.39	71.82	74.58
Bhaukhedi	2017–18	56.16	58.82	64.76	59.21	64.71	68.05	57.08	56.72	59.01	70.37	65.00	64.54
	2018–19	79.48	82.01	72.63	73.97	73.59	76.23	68.00	64.85	49.50	51.58	73.03	71.01
	2019–20	72.34	64.00	73.94	67.59	70.16	78.10	68.86	65.94	74.19	68.37	76.16	73.49
Dhamanda	2017–18	65.41	73.41	65.45	60.94	66.22	64.7	58.97	62.8	65.82	66.84	79.82	74.29
	2018–19	84.21	76.09	75.57	73.82	71.52	76.31	69.93	67.23	74.72	74.27	77.25	77.98
	2019–20	78.21	75.60	68.86	70.93	73.48	75.90	64.64	68.67	68.26	70.56	78.26	77.27
Ramnagar	2017–18	58.12	52.14	59.86	60.13	57.82	57.51	48.06	46.28	57.32	53.65	66.80	58.51
	2018–19	72.46	70.02	69.11	69.34	75.28	75.57	54.54	55.48	69.33	66.06	63.91	68.00
	2019–20	69.69	66.37	65.85	70.48	73.33	72.70	69.33	69.25	70.35	75.04	58.34	61.31

Brijesh Nagar	2017–18	60.81	53.56	53.21	53.91	51.47	56.23	58.67	56.87	53.17	52.16	70.26	66.26
	2018–19	63.81	70.24	57.44	60.00	64.48	68.70	59.43	57.70	59.11	66.66	56.85	66.94
	2019–20	66.22	72.67	71.78	76.81	61.57	54.77	65.16	71.63	71.83	78.09	69.33	81.03
Dewadiya	2017–18	62.59	63.62	63.37	65.94	62.22	61.43	54.01	54.92	56.96	62.89	75.42	69.68
	2018–19	61.66	65.83	66.22	67.93	67.29	70.69	52.23	43.30	53.40	51.63	58.11	59.45
	2019–20	75.03	75.01	67.56	68.90	71.75	66.50	57.86	60.71	55.93	57.17	60.75	67.68
Balondiya	2017–18	60.17	61.86	63.15	60.97	63.08	64.99	64.04	67.48	65.52	59.29	69.76	63.58
	2018–19	67.60	63.77	67.50	64.71	68.64	61.06	57.51	62.48	68.33	68.24	66.53	70.58
	2019–20	74.03	73.78	68.37	65.26	72.28	73.57	71.81	69.19	67.95	77.18	70.00	70.99
Kheri	2017–18	67.03	62.98	59.21	60.11	57.93	54.75	60.34	64.17	63.64	61.37	59.84	63.97
	2018–19	69.32	68.70	66.36	65.89	64.62	64.80	54.22	60.28	68.33	66.28	61.44	58.63
	2019–20	68.53	70.67	68.93	67.54	66.82	66.90	57.50	58.90	57.13	72.22	59.74	59.29
Veerpur Dem	2017–18	52.07	49.23	53.33	51.87	48.57	49.39	45.13	42.16	53.98	56.14	55.9	71.37
	2018–19	64.06	76.44	67.60	68.83	66.81	67.16	63.33	63.66	82.05	78.87	68.88	64.25
	2019–20	74.05	76.50	68.80	67.62	66.02	74.30	66.23	69.59	67.42	66.82	88.33	60.04
Overall	2017–18	0.64	59.3	60.07	59.51	59.28	59.93	53.57	53.5	59.16	58.69	67.64	66.38
	2018–19	71.08	70.92	68.59	68.19	69.13	70.45	59.03	58.77	64.55	64.80	66.67	70.29
	2019–20	72.47	72.69	69.68	70.10	69.91	69.40	65.55	66.09	65.41	70.60	68.51	67.91

The results of Table 1 pertaining to the clusters, class and sex-wise learning achievement of students in language subject reveal the following:

(i) Overall, in Ichhawar block, there is an increase in the percentage of learning achievement of students among boys and girls both, in all the classes in the year 2019–20 as compared to the previous years, except for girls of Class V and VIII (in the year 2019–2020 as compared to 2018–2019) and boys of Class VIII (in the year 2018–2019 as compared to 2017–2018).

(ii) There is a continual increase in the percentage of learning achievement of Class III students in the case of both boys and girls in Brijesh Nagar, Veerpur Dem and Balondiya clusters, and for girls only in Dewadiya and Kheri clusters in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, such trend is not visible for the whole sample boys and also girls separately.

(iii) There is a continual increase in the percentage of learning achievement of Class IV students in the case of both boys and girls in the clusters of Ichhawar, Semli Jadeed, Brijesh Nagar, Dewadiya, Balondiya and Kheri; for boys only in the clusters Bhau Khedi and Veerpur Dem, and for girls only in the clusters of Dhamanda and Ramnagar in the year 2019–20, as compared to the previous years. While in all other clusters of Ichhawar block, for the whose sample and also for boys and girls separately.

(iv) There is a continual increase in the percentage of learning achievement of Class V students in the case of both boys and girls of cluster Kheri; for boys only in the clusters of Ichhawar, Semli Jadeed, Dhamanda, Dewadiya and Balondiya, and for girls only in the clusters of Bhaukhedi and Veerpur in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block for the whose sample and also for boys and girls separately.

(v) There is a continual increase in the percentage of learning achievement of Class VI students in the case of both boys and girls of Ichhawar, Bhaukhedi, Ramnagar and Veerpur Dem Clusters; only for boys in the cluster Semli of Jadeed and girls in the clusters of Dhamanda and Brijesh Nagar in the year 2019–20, as compared to the previous years. While in the other clusters of Ichhawar block, for the whose sample and also for boys and girls separately.

(vi) There is a continual increase in the percentage of learning achievement of Class VII students in the case of both boys and girls of Bhaukhedi, Ramnagar and

Brijesh Nagar clusters; for girls only in the clusters of Ichhawar, Balondiya and Kheri in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(vii) There is a continual increase in the percentage of learning achievement of Class VIII students in the case of both boys and girls of Bhaukhedi cluster; for boys of Semli Jadeed and Veerpur Dem clusters, and for girls in Balondiya cluster in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, whole sample and also for boys and girls separately.

(b) Cluster, Class and Sex-wise Learning Achievement of Students in Mathematics Subject

The results pertaining to the clusters, class and sex-wise learning achievement of both boys and girls in Classes III to VIII for mathematics subject for the years 2017–18, 2018–19 and 2019–20, are presented in Table 2.

Table 2
Cluster, Class and Sex-wise Learning Achievement of Students in Mathematics Subject

Cluster	Year	Percentage of mathematics achievement											
		III		*IV*		*V*		*VI*		*VII*		*VIII*	
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Ichhawar	2017–18	57.7	46.5	58.5	66.7	50.8	53.8	40.4	32.7	47.6	39.2	35.4	36.2
	2018–19	56.1	53.2	58.8	56.7	57.2	51.5	48.0	48.9	66.3	61.2	58.2	54.0
	2019–20	63.6	68.7	53.3	55.7	73.2	67.2	54.6	52.6	44.0	66.7	52.0	50.2
Semli Jadeed	2017–18	48.3	50.3	51.8	45.9	46.5	46.1	36.6	34.4	45.7	45.9	32.3	32.5
	2018–19	57.6	56.8	62.8	63.9	59.4	59.0	54.2	55.0	58.9	65.7	52.3	55.6
	2019–20	67.1	61.1	71.1	64.6	69.8	61.1	56.4	58.9	58.3	60.4	53.3	61.0
Bhaukhedi	2017–18	45.4	48.5	63.1	64.6	59.3	60.1	54.3	50.9	47.9	59.8	37.8	35.7
	2018–19	73.5	71.0	67.3	64.9	62.9	64.3	68.7	63.6	46.4	47.8	53.6	51.8
	2019–20	66.6	58.9	76.0	72.0	71.7	72.7	62.3	54.7	74.2	68.4	60.9	53.3
Dhamanda	2017–18	60.3	63.2	67.0	55.8	57.0	52.8	52.5	56.4	62.5	60.3	47.5	48.1
	2018–19	66.1	63.7	71.5	66.6	66.2	66.9	58.7	57.3	61.6	59.4	36.6	39.3
	2019–20	71.8	69.3	68.5	69.4	69.4	69.0	53.9	57.8	59.3	64.8	42.8	39.0
Ramnagar	2017–18	55.9	46.7	46.1	45.7	46.5	44.6	35.6	31.6	44.2	38.2	33.2	28.9
	2018–19	55.7	53.3	58.4	58.4	56.9	61.3	53.7	52.1	50.0	58.9	34.3	32.8
	2019–20	61.1	53.6	51.8	58.9	62.3	64.7	65.2	70.5	54.7	51.8	32.3	37.1
Brijesh Nagar	2017–18	51.0	48.2	48.9	45.7	42.0	42.0	43.3	46.9	46.1	42.9	38.5	35.5
	2018–19	48.5	52.0	60.0	54.3	53.9	53.8	66.7	53.5	51.5	56.2	32.3	41.8
	2019–20	64.2	67.9	68.4	70.9	54.8	59.2	48.2	52.6	72.7	80.3	54.3	61.0

Dewadiya	2017–18	54.1	55.5	49.5	50.6	48.6	45.8	48.8	50.3	41.2	49.1	30.1	30.6
	2018–19	56.0	56.7	59.1	63.7	55.5	55.7	43.7	33.3	41.4	38.4	26.6	26.5
	2019–20	65.3	64.3	72.1	75.1	65.3	60.7	49.6	59.5	61.6	63.8	45.1	51.3
Balondiya	2017–18	53.8	51.4	60.3	61.2	43.3	42.5	50.5	57.0	56.0	52.3	33.7	31.9
	2018–19	56.3	55.8	57.1	58.9	52.5	47.1	50.5	59.4	54.9	48.4	38.9	41.4
	2019–20	65.9	66.3	68.1	67.5	59.2	58.6	59.0	55.2	63.2	63.4	51.2	52.6
Kheri	2017–18	61.2	55.7	51.3	51.1	38.8	39.8	44.9	49.0	45.5	41.5	33.7	38.9
	2018–19	62.2	58.1	60.0	60.3	51.8	53.3	48.3	56.0	50.2	50.4	39.6	41.3
	2019–20	59.9	62.1	65.4	62.3	61.8	57.8	55.9	62.1	58.3	71.3	51.1	50.2
Veerpur Dem	2017–18	41.3	35.9	44.9	41.0	37.9	33.3	35.0	40.4	40.7	42.7	31.8	35.1
	2018–19	54.6	57.9	58.8	56.3	54.7	52.6	64.4	64.2	69.9	69.0	40.4	40.7
	2019–20	63.1	64.0	63.4	61.6	55.7	58.4	58.9	63.3	74.4	59.9	66.3	57.9
Overall	2017–18	52.8	49.8	53.6	52.4	45.8	45.5	42.9	43.6	47.8	46.1	34.9	34.9
	2018–19	58.6	57.7	61.4	60.4	56.8	56.5	55.3	53.5	53.9	54.0	40.9	42.8
	2019–20	64.7	63.7	65.4	65.9	63.4	61.1	57.0	58.8	62.4	63.6	49.8	49.7

The results of Table 2 pertaining to the clusters, class and sex–wise learning achievement of students in mathematics subject for the years 2017–18, 2018–19 and 2019–20, reveal the following:

(i) Overall, in Ichhawar block, there is an increase in the percentage of learning achievement of students among boys and girls both, in all the classes in the year 2019–20 as compared to the previous years.

(ii) There is a continual increase in the percentage of learning achievement of Class III students in the case of both boys and girls in the Veerpur Dem, Dhamanda, Dewadiya, Balondiya and Semli Jadeed clusters; for boys only in the cluster of Bhau Khedi and for girls in the Ichhawar, Ramnagar, Brijesh Nagar and Kheri clusters in the year 2019–20; as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iii) There is a continual increase in the percentage of learning achievement of Class IV students in the case of both boys and girls in Semli Jadeed, Bhau Khedi, Brijesh Nagar, Dewadiya and Kheri clusters, and for girls only in the clusters of Dhamanda and Ramnagar in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iv) There is a continual increase in the percentage of learning achievement of Class V students for both boys and girls in all the clusters except only in the case of girls of Ichhawar cluster in the year 2019–20, as compared to the previous years.

(v) There is a continual increase in the percentage of learning achievement of Class VI students in the case of both boys and girls of Ichhawar, Semli Jadeed, Ramnagar and Kheri clusters, and for girls only in Dhamanda cluster in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(vi) There is a continual increase in the percentage of learning achievement of Class VII students in the case of both boys and girls of Brijesh Nagar and Kheri clusters; for boys only in Ramnagar and Dewadiya clusters, and for girls only in Ichhawar and Veerpur Dem clusters in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(vii) There is a continual increase in the percentage of learning achievement of Class VIII students in the case of both boys and girls, in Semli Jadeed,

Bhaukhedi, Balondiya, Kheri and Veerpur Dem clusters, and for girls only in Ramnagar and Brijesh Nagar clusters in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(c) Cluster, Class and Sex-wise Learning Achievement of Students in EVS Subject

The results pertaining to the clusters, class and sex-wise learning achievement of both boys and girls in Classes III to V for EVS subject for the years 2017–18, 2018–19 and 2019–20 are presented in Table 3.

Table 3
Cluster, Class and Sex-wise Learning Achievement of Students in EVS Subject

Cluster	Year	Percentage of EVS achievement					
		III		*IV*		*V*	
		Boys	Girls	Boys	Girls	Boys	Girls
Ichhawar	2017–18	55.73	54.61	53.33	55.72	66.44	68.16
	2018–19	65.47	66.78	55.78	53.42	65.79	65.89
	2019–20	68.27	71.26	53.19	54.88	69.88	62.84
Semli Jadeed	2017–18	56.09	58.35	53.10	47.85	57.78	58.88
	2018–19	72.72	75.29	65.80	65.39	69.24	72.93
	2019–20	76.00	73.07	59.90	58.90	68.68	72.52
Bhaukhedi	2017–18	53.33	56.55	51.85	50.35	72.18	73.59
	2018–19	83.41	84.72	67.10	67.14	75.81	73.67
	2019–20	77.37	73.00	68.10	63.96	69.39	77.02
Dhamanda	2017–18	65.59	68.97	57.63	53.73	66.22	67.09
	2018–19	82.52	80.22	64.20	60.21	68.98	71.38
	2019–20	78.59	78.09	59.53	61.57	70.95	74.65
Ramnagar	2017–18	56.06	53.10	47.03	45.12	55.79	55.82
	2018–19	64.20	65.12	59.85	61.04	69.08	71.55
	2019–20	69.21	67.50	51.14	56.50	64.34	66.80
Brijesh Nagar	2017–18	52.74	51.88	45.42	43.88	48.95	52.52
	2018–19	58.95	65.26	53.49	48.93	63.42	66.17
	2019–20	68.05	73.51	64.98	66.73	62.03	53.16
Dewadiya	2017–18	56.32	56.7	53.26	54.67	62.48	58.15
	2018–19	66.66	67.83	56.80	58.65	65.56	68.31
	2019–20	76.54	74.79	72.73	71.44	70.91	68.83
Balondiya	2017–18	63.22	61.96	55.73	56.62	57.43	56.93
	2018–19	66.35	62.74	*55.43*	*55.98*	65.10	58.64
	2019–20	69.93	68.37	*65.26*	*63.24*	70.37	72.50

Kheri	2017–18	65.64	58.1	54.91	51.4	50.74	51.21
	2018–19	69.56	69.54	58.69	56.69	60.52	58.41
	2019–20	65.42	69.38	62.39	60.38	68.27	66.96
Veerpur Dem	2017–18	43.85	41.13	46.92	42.47	48.23	44.09
	2018–19	60.16	68.44	54.26	54.50	58.66	59.60
	2019–20	67.09	65.60	59.87	60.10	65.19	70.94
Overall	2017–18	57.18	55.69	51.86	50.26	57.34	58.11
	2018–19	69.15	70.00	59.17	58.23	66.52	66.37
	2019–20	71.15	70.95	61.50	61.96	68.11	67.99

The results of Table 3 pertaining to the clusters, class and sex-wise (boys and girls) learning achievement of students in EVS subject for the years 2017–18, 2018–19 and 2019–20 reveal the following:

(i) Overall, in Ichhawar block, there is a continual increase in the percentage of learning achievement of students among boys and girls both in all the classes in the year 2019–20 as compared to the previous years.

(ii) There is a continual increase in the percentage of learning achievement of Class III students in the case of both boys and girls in Ichhawar, Ramnagar, Brijesh Nagar, Dewadiya and Balondiya clusters; for boys only in Semli Jadeed and Veerpur Dem clusters in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iii) There is continual increase in the percentage of learning achievement of Class IV students in the case of both boys and girls in Dewadiya, Kheri and Veerpur Dem clusters; for boys only in Bhaukhedi cluster, and for girls only in Dhamanda and Brijesh Nagar clusters in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iv) There is a continual increase in the percentage of learning achievement of Class V students in the case of both boys and girls in Dhamanda, Dewadiya, Balondiya, Kheri and Veerpur Dem clusters; for girls only in Bhaukhedi cluster in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(d) Cluster, Class and Sex-wise Learning Achievement of Students in Science Subject

The results pertaining to the clusters, class and sex-wise (boys and girls) in Classes VI to VIII for science subject for the years 2017–18, 2018–19 and 2019–20 are presented in Table 4.

Table 4
Cluster, Class and Sex-wise Learning Achievement of Students in Science Subject

Cluster	Year	Class-wise Percentage of achievement in Science Subject					
		VI		*VII*		*VIII*	
		Boys	Girls	Boys	Girls	Boys	Girls
Ichhawar	2017–18	41.92	35.93	42.12	37.14	40.40	40.81
	2018–19	48.00	50.56	47.91	60.75	48.68	56.05
	2019–20	46.41	56.00	47.80	54.10	51.00	48.19
Semli Jadeed	2017–18	33.00	31.77	32.31	36.80	34.32	36.80
	2018–19	46.30	47.69	54.12	63.75	42.02	49.90
	2019–20	50.52	47.50	44.31	50.0	61.63	59.68
Bhaukhedi	2017–18	49.36	52.43	40.00	46.67	44.83	50.63
	2018–19	57.42	55.39	41.06	43.37	46.29	52.13
	2019–20	48.07	47.38	56.19	56.60	55.80	57.14
Dhamanda	2017–18	42.48	46.97	48.81	48.29	47.93	51.27
	2018–19	52.46	52.70	44.11	42.38	39.93	46.97
	2019–20	39.86	39.67	39.80	45.80	41.15	38.12
Ramnagar	2017–18	32.90	31.40	42.54	36.22	33.20	29.11
	2018–19	39.88	42.15	39.94	41.14	33.40	36.58
	2019–20	55.71	52.62	45.00	47.80	39.80	43.39
Brijesh Nagar	2017–18	36.47	37.20	35.58	35.20	40.00	33.54
	2018–19	52.12	44.01	40.80	43.87	38.62	42.31
	2019–20	43.50	54.18	37.46	41.00	41.94	43.73
Dewadiya	2017–18	38.95	41.49	38.91	42.00	36.46	40.97
	2018–19	40.54	32.59	35.83	30.40	29.31	26.32
	2019–20	52.26	60.71	41.70	43.06	42.57	42.42
Balondiya	2017–18	47.89	49.86	42.96	40.00	47.06	44.09
	2018–19	48.11	52.30	40.68	38.61	38.21	43.05
	2019–20	51.11	48.44	46.20	49.11	47.51	45.15
Kheri	2017–18	37.41	43.59	42.49	36.29	36.51	37.44
	2018–19	39.10	40.07	41.08	41.53	33.09	33.24
	2019–20	46.52	46.00	42.00	45.71	45.40	43.24
Veerpur Dem	2017–18	37.9	37.65	34.62	37.12	37.01	44.81
	2018–19	45.40	48.44	59.89	53.64	42.02	38.51
	2019–20	63.00	58.43	58.80	52.42	54.80	47.80
Overall	2017–18	38.80	39.53	40.09	39.12	39.12	40.55
	2018–19	46.57	46.15	43.33	44.42	39.13	43.22
	2019–20	50.48	51.08	46.22	48.60	46.90	46.05

The results of Table 4 pertaining to the clusters, class and sex-wise (boys and girls) learning achievement of students in science subject for the years 2017–18, 2018–19 and 2019–20 reveal the following:

(i) Overall, in Ichhawar block, there is a continual increase in the percentage of learning achievement of students in the subject science among boys and girls both in all the classes in the year 2019–20 as compared to the previous years.

(ii) There is a continual increase in the percentage of learning achievement of Class VI students in the case of both boys and girls in Ramnagar and Veerpur Dem clusters; for boys in Semli Jadeed, Dewadiya, Balondiya and Kheri clusters, and for girls in Ichhawar and Balondiya clusters in the year 2019–20 as compared to the previous years. While in all other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iii) There is a continual increase in the percentage of learning achievement of Class VII students in the case of boys only in the cluster of Bhaukhedi and for girls only in the clusters of Ramnagar and Kheri in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iv) There is a continual increase in the percentage of learning achievement of Class VIII students in the case of both boys and girls in Ramnagar, Bhaukhedi and Semli Jadeed clusters; for boys only in Ichhawar and Veerpur Dem clusters and for girls only in Brijesh Nagar cluster in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(e) Cluster, Class and Sex-wise Learning Achievement of Students in Social Science Subject

The results pertaining to the clusters, class and sex-wise (boys and girls) in Classes VI to VIII for social science subject for the years 2017–18, 2018–19 and 2019–20 are presented in Table 5.

Table 5: Cluster, Class and Sex-wise Learning Achievement of Students in Social Science Subject

Cluster	Year	Class-wise Percentage of Achievement in Social Science					
		VI		*VII*		*VIII*	
		Boys	Girls	Boys	Girls	Boys	Girls
Ichhawar	2017–18	46.67	42.54	40.00	40.2	43.33	48.79
	2018–19	46.66	55.74	53.91	56.47	51.06	63.41
	2019–20	48.02	56.73	42.44	57.40	51.04	49.36

Semli Jadeed	2017–18	38.29	38.21	30.2	34.2	30.7	33.83
	2018–19	49.81	48.92	40.22	48.00	44.63	52.38
	2019–20	46.00	44.27	40.39	50.00	46.70	45.31
Bhaukhedi	2017–18	54.15	54.01	30.92	40.32	41.17	41.06
	2018–19	58.75	56.87	37.59	43.45	46.74	54.90
	2019–20	62.27	55.18	50.47	53.06	45.60	49.12
Dhamanda	2017–18	47.78	45.08	45.21	38.03	48.65	51.19
	2018–19	57.33	57.92	49.50	46.54	37.93	42.71
	2019–20	44.00	48.15	43.00	47.00	41.80	39.33
Ramnagar	2017–18	36.43	34.11	34.02	31.54	42.2	36.25
	2018–19	42.81	43.90	37.22	36.11	37.39	38.83
	2019–20	52.00	51.29	37.41	35.80	38.34	37.70
Brijesh Nagar	2017–18	45.96	47.27	33.58	35.88	38.01	33.94
	2018–19	55.74	50.17	36.91	42.32	34.55	37.68
	2019–20	46.16	43.04	37.18	35.34	47.00	46.17
Dewadiya	2017–18	42.28	43.64	34.49	39.19	37.28	36.83
	2018–19	31.41	32.29	32.65	29.38	30.42	27.61
	2019–20	61.42	60.26	41.80	46.90	41.00	47.60
Balondiya	2017–18	45.32	49.16	34.48	35.24	47.3	45.38
	2018–19	50.12	53.33	46.95	45.97	39.33	45.64
	2019–20	53.58	54.00	48.32	47.46	56.36	54.50
Kheri	2017–18	43.06	48.97	35.64	32.92	40.16	42.31
	2018–19	41.96	42.60	33.40	34.80	33.81	32.60
	2019–20	40.87	41.39	37.00	44.80	38.42	36.05
Veerpur Dem	2017–18	41.13	38.33	34.19	39.79	34.37	40.44
	2018–19	51.53	50.66	51.79	48.30	42.92	36.11
	2019–20	62.33	63.00	47.24	45.00	54.78	45.30
Overall	2017–18	42.78	42.95	35.48	36.68	39.94	40.79
	2018–19	48.49	48.80	41.80	42.77	39.73	44.33
	2019–20	52.55	53.15	43.00	45.80	46.00	44.33

The results of Table 5 pertaining to the clusters, class and sex-wise (boys and girls) learning achievement of students in social science subject for the years 2017–18, 2018–19 and 2019–20 reveal the following:

(i) Overall, in Ichhawar block, there is a continual increase in the percentage of learning achievement of students in the social science subject, among boys and girls both in all the classes in the year 2019–20 as compared to the previous years.

(ii) There is a continual increase in the percentage of learning

achievement of Class VI students in the case of both boys and girls in Ramnagar, Balondiya and Veerpur Dem clusters; for boys only in Bhaukhedi cluster, and for girls only in Ichhawar cluster in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iii) There is a continual increase in the percentage of learning achievement of Class VII students in the case of both boys and girls in Semli Jadeed, Bhaukhedi and Balondiya clusters; for boys only in Ramnagar and Brijesh Nagar clusters, and for girls in Ichhawar, Dhamanda and Kheri clusters in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

(iv) There is a continual increase in the percentage of learning achievement of Class VIII boy students in the clusters of Semli Jadeed and Veerpur Dem, and for girls only in Brijesh Nagar and Balondiya clusters in the year 2019–20 as compared to the previous years. While in the other clusters of Ichhawar block, for whole sample and also for boys and girls separately.

Educational Implications

Overall cluster-wise implications of analysis for future interventions are:

(i) The interventions provided in the form of teacher training during the academic sessions 2017–18, 2018–19 and 2019–20 are successful, and therefore, should be repeated in future.

(ii) Further training of teachers need to be undertaken after the identification of training needs in different subjects and cross-cutting areas, keeping in view the philosophy of NEP 2020.

(iii) In Ichhawar cluster, primary level teachers need training in the subjects of EVS and language, while at upper primary level, teachers need training in mathematics, science and social science.

(iv) In Semli Jaded cluster, there is a need of training the teachers in the subjects EVS and language of at primary level, and in mathematics and social science at upper primary level.

(v) In Bhaukhedi cluster, there is a need of training the teachers in the EVS subject at primary level, and in science and social science at upper primary level.

(vi) In Dhamanda cluster, there is a need of training the teachers in the EVS subject at primary level, and for all subjects at upper primary level.

(vii) In Ramnagar cluster, there is a need of training the teachers in all subjects at primary level, and in mathematics and science at upper primary level.

(viii) In Brijesh Nagar cluster, there is a need of training the teachers in the EVS subject at primary level, and in science at upper primary level.

(ix) In Dewadiya cluster, there is a need of training the teachers in the language subject only at both primary and upper primary levels.

(x) In Balondiya cluster, teachers need training in the EVS subject at primary level; and in science at upper primary level.

(xi) In Kheri cluster, there is a need of training the teachers in all subjects at primary level; and in science and social science at upper primary level.

(xii) In Veerpur Dem cluster, training needs to be provided to the teachers in the mathematics subject at both primary as well as upper primary levels.

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Achievement Test:
How it Can be a Reliable and Valid Tool in Educational Research?

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Abstract

The development of achievement test is a crucial part of experimental and developmental research in the field of education. A consistent and accurate achievement est can enumerate the certified outcome of participants. The present study deals with the construction of an achievement test in a systematic manner and logical technique for the pupils of Class VIII in geography. In the present investigation, objective type achievement test with blueprint was prepared and an enquiry was completed to find out the difficulty level and discriminative index of each item. The nature of questions for achievement test consisted of true or false or fill in the blanks and multiple choices. This study can be useful for analysts, educators and other related professionals to set up a reliable and valid achievement test. The study uncovered that the scholastic achievement test for segment instruction is consistent and appropriate.

INTRODUCTION

An achievement test is an assessment of acquired ability or understanding. The most well-known kind of achievement test is a standardised test created to identify the ability or understanding learned in a particular class, normally through strategic instruction or curriculum transaction. Achievement test is different from tests that measure inclination, a progressively broad and stable psychological trait. Scores of achievement test show the scholastic

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status of the individual learner in various subjects in a general or specific sense.

Achievement shows how much the students get benefited by a scholastic programme (Ozguven, 1998). In instructive investigations, numerous assessment devices like interviews, questions, idea maps, and achievement tests may be utilised to decide the degree of learners' comprehension of information and ideas. From qualitative point of view, achievement test can deal with less members, empowering more detailed research and from quantitative perspective a large number of students can deal with (Griffard, 2001).

The purposes of achievement test are:

(i) Achievement test estimates the present capability, authority and comprehension of general and explicit subject matters.

(ii) It endeavours to quantify what and how an individual has learnt, viz., the present standard of execution.

(iii) It assists with estimating some part of the scholarly skills of learners: what a learners know any be able to do.

(iv) It assists with discovering where every learner remains in different scholarly regions.

(v) It motivates the students before a new task is taken up.

(vi) By examining the consequences of the learners on achievement tests, the instructor can decide whether or not the learners are working as per their most extreme limit.

(vii) Achievement tests are utilised for assessing and improving the educational programmes meant for learners at different grade levels.

(viii) Achievement test is intended to recognise the a various categories of achievers, as consequence of which the instructors or guidance workers have the option to plan advancement programme for the learners.

(ix) Achievement tests are useful to recognise and characterise the learners in different groups based on their accomplishment.

(x) Achievement tests are expected to promote learners to the next higher classes or new courses considering the obtained result as a measuring stick for advancement of the structures.

(xi) Achievement tests are utilised to empower the guardians to know the strength and weaknesses of their children in academic accomplishments, by which they can have the option to give unique assistance and direction to their children.

(xii) It uncovers students' academic troubles which can be comprehended by the instructors.

(xiii) Achievement test scores are very useful indicators for professional direction since these are mostly related to aptitudes and interests.

In such circumstances, the achievement test should be based on efficient testing system in every school, by which administrators can undertake appropriate guidance service for every pupil.

Reliability is the level of precision by which an exam or accomplishment test measures, what it internals to measure with a given variable. An achievement test with good reliability implies that the test taker will get a similar test score over repeated testing as long as no external variable have influenced the score. The quality of an achievement test which estimates what it should measure is known as validity. An achievement test is legitimate when it produces reliable scores over time. It estimates what it internals expects to measure.

The study aims to construct an achievement test in which the consistency and accuracy are confirmed and the test can determine the accomplishments of Class VIII elementary school students during their study period and their self-assurance to learning for the 'Inside and Outside of the Earth' topic. The study was conducted at Radhanagar Junior High School, Howrah, West Bengal.

Rationale

The term 'achievement' signifies one's learning fulfilments, achievements and proficiencies, which are identified with the student's status of instructive improvement. It is a precise strategy for measuring students learning through instruction. Achievement test is a significant apparatus in assessment and has incredible importance in estimating instructional advancement.

Asamoah and Ocansey (2019) reported that in any event, when rules for building reasonable and efficient tests are followed, several items may go into students' impression of the test and cause mistakes in the appraisal. Item discrimination consequently assists the examiner in deciding what is inaccurate with the items. It is consequently clear that discrimination analysis offers empirical statistics which in turn shows how items and the entire tests are performing in genuine circumstances. Barakat (2019) accepted that achievement tests administered at national level asserts pressure and difficulty in the livers of test-takers. He encouraged that so as to cope with the question of fairness, it is crucial to really define and balance the construct of the items that affect the student's choice. Yazar and Nakiboglu (2019) built up a substantial and dependable test concerning the content of 'nature and chemistry' for Class IX. They proposed that achievement test can be utilised by instructors or the specialists to decide the learners' understanding levels or level of achievement. Khanum and Dange (2018) developed a solid and substantial achievement test in social science, which was institutionalised on the sample of 50 pupils from Class IX. They uncovered that achievement test can be utilised

by the educators to evaluate learners achievement in mindfulness about the essential 'Duties of Constitution' of Class IX. Kunwar (2018) uncovered that achievement test can be a useful instrument to quantify students' performance in Class X mathematics and an institutionalised achievement test can be prepared by setting up difficulty value, discrimination index, reliability, validity and norms. Parekh (2018) mentioned that achievement test assists with measuring the learners knowledge in science subject of Class VIII. Sener and Tas (2017) found that achievement test can assist students with organising their learning exercises as per their strength and weakness in the fifth grade biology subject. Anandharaja, Balakrishnan and Lawrence (2016) revealed that institutionalised and legitimate achievement test is a critical research device that assists with estimating the scholarly achievement of Class X students in social science. Kara and Çelikler (2015) reported that a powerful and dependable test including 32 inquiries with transitional difficulty level and differentiation quality were prepared in science subject. Bichi, Embong and Mamat (2015) found a noteworthy positive relationship between item difficulty and discrimination index of the achievement test in their study.

While reviewing the literature, it was found that studies related with achievement test with were carried out with Class V (Sener and Tas, 2017; Kara and Çelikler, 2015); Class VI (Inel, 2010); Class VII (Yildirim, 2012), Class VIII (Parekh, 2018); Class IX (Khanum and Dange, 2018; Yazar and Nakiboglu, 2019) and Class X (Kunwar, 2018; Anandharaja, Balakrishnan and Lawrence, 2016) and with the senior secondary stage (Bichi, Embong and Mamat, 2015). Achievement test is an important requirement for most of the educational research. Hence, it has to be important that a researcher is well acquainted with the procedure of conducting achievement test for any given grade of any given curriculum. Thus, this article details the way a test can be constructed and standardised in any given grade and subject or topic by taking a topic of Class VIII geography textbook.

Research Question

How to construct a reliable and valid achievement test for Class VIII students in geography subject for the topic 'Inside and Outside of the Earth'?

Objective of the Study

To construct a reliable and valid achievement test for Class VIII students in geography subject for the topic 'Inside and Outside of the Earth'.

Construction of Achievement Test

The investigators adopted the following steps to construct a genuine and appropriate achievement test in the present study:

1. Planning of the test
2. Preparation of the test items

3. Preparation of guidelines regarding the achievement test items
4. Preparation of guidelines for scoring and administration of the achievement test
5. Administration of the test (item analysis)
6. Standardisation of the achievement test

(1) Planning of the Test

In this stage, the investigator desires to priorities what actually needs to be measured, what are the indicators of fulfilment and which circumstantial factors may influence the consequences of the measurement. It is particularly imperative to characterise the reason behind the test since that expands the likelihood for accomplishing high validity. The investigator based on the review finding and experience, priorities the form of items to be used in the achievement. True or false, fill in the blanks, multiple choice questions were used for achievement test in the present investigation.

Following points are required to develop an achievement test:

- Purpose of the test
- Content of the test
- Development of the blueprint

(a) Purposes of the Test

In the present investigation, for the purpose of constructing achievement test, objectives were defined in behavioural terms focusing on knowledge, understanding, application and skill, from the selected sub-units of the chapter 'Inside and Outside of the Earth' of the Social Science textbook of Class VIII prescribed by West Bengal Board of Secondary Education.

(b) Content of the Test

In this level, the investigators need to decide the content area for achievement test. Following sub-units were used as content in the present investigation:

- Surface of the earth
- Seismic waves
- Layers in the earth's interior
- Earthquake
- Volcanism

(c) Development of the Blueprint

An objective-based achievement test with proper weightage to objectives, content area and forms of questions can be prepared by the investigators with the help of blueprint given in Table 1. Experts' views were taken into consideration to decide the weightage to be given to different content areas, objectives and different forms of questions.

Table 1
Blueprint of the Achievement Test

Objectives → Contents ↓	Cognitive Levels				Total
	Knowledge	***Understanding***	***Application***	***Skill***	
Surface of the earth	2	1	1	2	6
Seismic waves	1	2	2	1	6
Layers in the earth's interior	2	2	1	1	6
Earthquake	1	2	1	2	6
Volcanism	2	2	1	1	6
Total	8	9	6	7	30

(2) Preparation of the Test Items

The investigators prepared test items for achievement test after the development of blueprint. True or false, fill in the blanks, multiple choice questions were included as test items. Total 30 items were framed from the selected topic. Experts' opinion, subject teachers' views and literature reviews were taken into consideration to ensure satisfactory coverage in the test items to achieve the planned purpose. This permitted the investigators to create test items covering the entire topic. Test items were scrutinised by subject teachers and experts whose remarks about the content, construction and language of the items were taken into consideration and changes were made accordingly. Thus, the first draft of the achievement test was prepared.

Table 2
Number of Items in the First Draft of Achievement Test at Different Cognitive Levels of Objectives

Objectives → Contents ↓	Cognitive Levels				Total
	Knowledge	***Understanding***	***Application***	***Skill***	
Surface of the earth	1, 17 (2)	6 (1)	11 (1)	15, 28 (2)	6
Seismic waves	2, (1)	7, 18 (2)	14, 22 (2)	12 (1)	6
Layers in the earth's interior	3, 24 (2)	8, 19 (2)	13(1)	16 (1)	6
Earthquake	4 (1)	9, 20 (2)	29 (1)	23, 27 (2)	6
Volcanism	5, 26, (2)	10, 21 (2)	30 (1)	25 (1)	6
Total	8	9	6	7	30

Note: Figures in parenthesis shows number of questions.

(3) Preparation of Guidelines Regarding the Achievement Test Items

True or false, fill in the blanks and multiple choice questions are three sections used in this test. Pupils were required to write 'T' for true or 'F' for false in the first section. Pupils were asked to write the appropriate word in the blank in the second section. They were asked to tick (√) the right answer from the given options in the third section.

(4) Preparation of Guidelines for Scoring and Administration of the Achievement Test

Accurate guidelines were a given for administration of the test. scoring key was developed to facilitate the objectivity for the achievement test.

(5) Administration of the test (first try-out)

First try-out was administered on a sample of 40 pupils. This achievement test was administered to Class VIII pupils who had already studied the content. There was no time limit in the first try-out. After the first try-out the answer sheets were scored as per the scoring key and scoring guidelines already developed by the investigators. One mark was allotted for each right answer and zero for each wrong answer.

Item Analysis

An analysis was completed to find out the item difficulty value and discriminative index.

Item difficulty

According to Frank S. Freeman (1962), the following formula is used to determine the level for item difficulty:

$$DL = \frac{(Ru + Rl)}{(Nu + Nl)}$$

Where, DL= Difficulty Level

Ru= the number of students in the upper 27%, who answered the item correctly.

Rl= the number of students in the lower 27%, who answered the item correctly.

Nu= the number of students in the upper group

Nl= the number of students in the lower group

The maximum index of difficulty is 100 per cent. Nunnally (1972) recommended highest 25 per cent and lowest 25 per cent as difficult and easy, whereas SPSS (1999) used the highest and lowest 1/3rd as difficult and easy respectively. Items falling under 33 per cent and above 67 per cent were likely to be too difficult and too easy, respectively.

Table 3

Distribution of Difficulty Level of Items of First Draft of Achievement Test

Level of difficulty	Items	Total
High Difficult (<0.33)	3, 7, 9, 10, 14, 15, 16, 17, 19, 27	10
Medium (0.34-0.66)	1, 2,4, 5, 6, 8, 11, 12, 13, 18, 20, 21, 22, 23, 24, 25, 26, 28, 29	19
Easy (>0.67)	30	1

Discriminative Index

A genuine item has the ability to discriminate between those who score high (top 27% cases) and those who score low (bottom 27% cases) in the test. While there are several similar ways of measuring the discrimination index, the investigators followed the following steps in the present study to determine the discriminative index (Kelly, 1939):

- Scores obtained by different pupils were arranged in the descending order.
- The top 27% cases formed the highest group and the bottom 27% cases formed the lower group.

The following formula was used for Discriminative Index:

Where, DI = Discrimination Index

$$DI = \frac{(RU - RL)}{0.5N}$$

RU = Number of correct answers among the 27% of those with highest test scores

RL = Number of correct answers among the 27% of those with lowest test scores

N = Total number of students in both groups i.e., highest test scores and lowest test scores

Discrimination index has the ability to determine the difference between the highest and lowest test scores. Ebel and Frisbie (1986) developed the following guidelines for determining the quality of the test items on the basis of discrimination index. Table 4 highlights the values of DI and their corresponding explanation.

Table 4
Guidelines of Discrimination Index of the Test Items

DI	Quality	Recommendations
>0.39	Excellent	Retain
0.30–0.39	Good	Possibilities for improvement
0.20–0.29	Mediocre	Need to check or review
0.00–0.19	Poor	Discard or review in depth
<–0.01	Worst	Definitely discard

Table 4.1
Distribution of Discrimination Index of Items of First Draft of Achievement Test

Discrimination Index	Items	Total
>0.39	1, 2, 4, 5, 6, 8, 11, 12, 13, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30	21
0.30–0.39	7, 9, 17	3
0.20–0.29	3, 10, 15	3
0.00–0.19	14, 16, 19	3
<–0.01	————	0
Total		30

Table 4.2
Item Analysis Chart (First Try Out)

Level of Difficulty → Discriminating Index ↓	High Difficult (<0.33)	Medium (0.34-0.66)	Easy (>0.67)	Total
>0.39	27	1, 2, 4, 5, 6, 8, 11, 12, 13, 18, 20, 21, 22, 23, 24, 25, 26, 28, 29	30	21
0.30–0.39	7, 9, 17	——	——	3
0.20–0.29	3,10,15	——	——	3
0.00–0.19	14, 16, 19	——	——	3
<–0.01	——	——	——	0
Total	10	19	1	30

Second Try-Out

Achievement test was revised and administered on another group of 40 pupils of Class VIII after the first try-out. Same procedure (as in the first try out) was used to find out the difficulty value and discriminating index.

Table 5
Item Analysis Chart (Final Draft)

Level of Difficulty → Discriminating Index ↓	Medium (0.34-0.66)	Easy (>0.67)	Remarks	Total
>0.39	1, 2, 4, 5, 6, 8, 11, 12, 13, 18, 20, 21, 22, 23, 24, 25, 26, 28, 29	30	Excellent Items	20
0.30-0.39	——	——	Good Items	0
0.20-0.29	——	——	Mediocre	0
Total	19	1	——	20

Table 6
Item Selection (Final Draft) for Achievement Test

Item Number	Difficulty Level	Discriminating Index	Remarks
1.	0.45	0.70	Accepted
2.	0.50	0.78	Accepted
*3.	0.18	0.20	Rejected
4.	0.55	0.83	Accepted
5.	0.45	0.70	Accepted
6.	0.50	0.78	Accepted
*7.	0.23	0.30	Rejected

8.	0.41	0.64	Accepted
*9.	0.23	0.30	Rejected
*10.	0.18	0.20	Rejected
11.	0.55	0.83	Accepted
12.	0.45	0.70	Accepted
13.	0.50	0.78	Accepted
*14.	0.14	0.17	Rejected
*15.	0.18	0.20	Rejected
*16.	0.14	0.17	Rejected
*17.	0.23	0.30	Rejected
18.	0.50	0.78	Accepted
*19.	0.14	0.17	Rejected
20.	0.55	0.83	Accepted
21.	0.41	0.64	Accepted
22.	0.45	0.70	Accepted
23.	0.41	0.64	Accepted
24.	0.55	0.83	Accepted
25.	0.50	0.78	Accepted
26.	0.50	0.78	Accepted
*27.	0.27	0.44	Rejected
28.	0.55	0.71	Accepted
29.	0.64	0.76	Accepted
30.	0.68	0.45	Accepted

Note: *Items are rejected in the final draft of Achievement Test

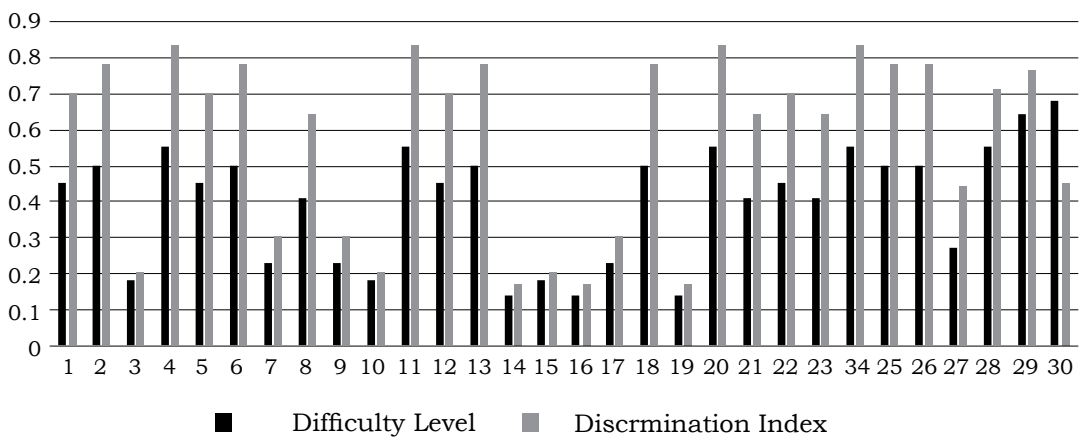

Figure 1: Item Difficulty Level and Discrimination Index

Figure 1 highlights the numerical values of difficulty level and discrimination index of all the 30 items in the achievement test. With the help of these values, accepted and rejected items for the final achievement test can be identified. Thus, 10 items were suggested to be rejected for the final drafting the of achievement test after the completion of item analysis.

Table 7 points out that there is a significant positive correlation [r (28) = 0.892, P=0.000, (P<0.05)] between Item Difficulty Level and Discrimination Index. This indicates that the test items on average have 0.40 Difficulty Level and 0.57 Discrimination Index. On the basis of this result, it can be mentioned that there is a significant positive correlation between two variables, with an increasing value of 'Difficulty Level', there is also an increase in the 'Discrimination Index'.

Figure 2 indicates scatter plot showing correlation between the Difficulty Level and Discrimination Index of items. The scatter plot shows that there is a significant positive correlation among the two variables.

Table 7
Correlation between Item Difficulty Level and Discrimination Index

Item Statistics	N	Mean	SD	r-cal	df	Sig. (2 tailed)
Difficulty Level	30	0.40	0.16	0.892**	28	0.000
Discrimination Index	30	0.57	0.25			

** Significant correlation at the 0.01 level (2 tailed)

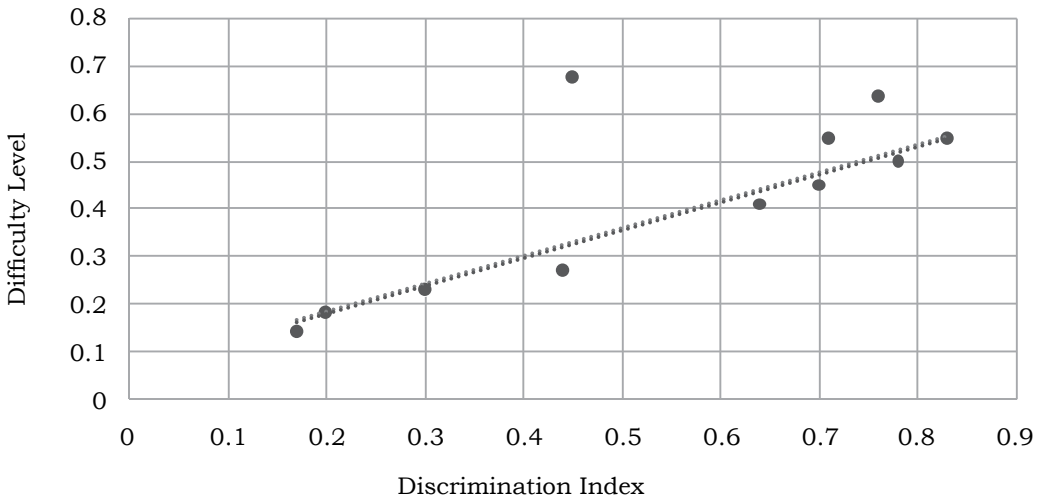

Figure 2: Scatter Plot Showing Relationship between Difficulty Level and Discrimination Index of Items

Table 8
Number of Items in the Final Draft of Achievement Test at Different Cognitive Levels of Objectives

Objectives → Contents ↓	Cognitive Levels				Total
	Knowledge	***Understanding***	***Application***	***Skill***	
Surface of the earth	1 (1)	6 (1)	11 (1)	28 (1)	4
Seismic waves	2 (1)	18 (1)	22 (1)	12 (1)	4
Layers in the earth's Interior	24 (1)	8 (1)	13(1)	------	3
Earthquake	4 (1)	20 (1)	29 (1)	23 (1)	4
Volcanism	5, 26 (2)	21 (1)	30 (1)	25 (1)	5
Total	6	5	5	4	20

Note: Figures in parenthesis shows the number of questions.

(6) Standardisation of the Achievement Test

Twenty items were selected for the final achievement test after the item analysis. The achievement test was further standardised by experimental validation of the test that included establishing reliability and validity.

***Reliability of the Test*:**

The Test-retest method was used to calculate reliability. Reliability coefficient of the present test was 0.892 (Pearson Correlation Coefficient). The general guideline for reliability coefficient value is given in Table 9.Based on the above table, the achievement test is highly reliable.

Table 9
General Guideline for Reliability Coefficient Value

Reliability Coefficient Value	Interpretation
0.90 and above	Very high
0.80-0.89	High
0.70–0.79	Adequate
Below 0.69	May have limited applicability

Validity of the Test

Content validity was measured by scrutiny of test items, views of subject expert(s) and critical analysis of the actual subject-matter and instructional objectives against the blueprint of the test in the present investigation. This displays that achievement test has its content validity.

Discussion

The achievement test is an important measurement instrument in the evaluation programme. It helps in estimating the measure of accomplishment of a person. In school condition, it is utilised as an

instrument to measure achievement of a person (Parekh, 2018). Many researchers have developed achievement tests in the literature to quantify the accomplishment of learners. Through the present study, the investigator has made an attempt to establish the consistency and accuracy of the achievement test constructed in the Geography subject. The standardised achievement test is an assessment tool that can quantify all the accomplishments with adequate questions beneficial for elementary level students. Some researchers (Parekh, 2018; Sener and Tas, 2017; Kara and Çelikler, 2015; Yildirim, 2012; Inel, 2010) viewed that achievement test with high reliability and validity must have more effectiveness to assess students' potentialities and understanding at elementary level. Khanum and Dange (2018) reported that continuous evaluation process with standardised achievement tests has an effective impact on students' cognitive development.

This exceptional study addressed that achievement test has accurate and consistent results. The steps used for constructing achievement test in the present study can serve as an example for other researches. This is an original work in respect to the construction and standardisation of achievement test and is equivalent to the outcomes of other scientific studies.

Educational Implications

Effective teaching-learning activities are controlled by a standardised achievement test. It can be helpful in assessing the effectiveness of instructions giving feedback to both the teachers and students. Content coverage or course selection is the most crucial part of an achievement test. Objectives in teaching and learning process are the main focus in the achievement test. Periodical behaviour of the learner can also be evaluated by achievement test. There are several research studies regarding the construction and standardisation of achievement test to measure learners' academic potentialities and understanding. It is assumed that the evaluation tool used in the study can be helpful in determining the readiness level of Class VIII pupils and their deficiency in the understanding of sub-topics. With the help of obtained outcomes in the present study, the following educational implications can be made.

The standardised achievement test can be helpful in determining the level and lack of understanding of 'Inside and Outside of the Earth' chapter of the Class VIII pupils. It is possible to understand the misconceptions of learners through an accurate and genuine achievement test. Different learning activities can be organised with the help of standardised achievement test. The standardised achievement test of this kind can be utilised as a data

collection tool for investigation in the area of research in social science education.

Item analysis plays an important role in the construction as well as validation of assessment tools like achievement test. The present study viewed that an ideal achievement test should have moderate difficulty level and good positive discrimination index. However, an item having zero or negative discrimination power with very low or high difficulty estimates should be completely revised, improved or rejected.

Conclusion

All the instructional objectives, i.e., knowledge, understanding, application and skill, were given equal priorities during the test construction of achievement test. The effectiveness of social science teaching is assessed based on the assessment and evaluation process. Achievement test is a widely used assessment tool in the field of educational research. This investigation helps to prepare a valid and reliable achievement test consisting of 20 questions with acceptable difficulty level and discrimination index for 'Inside and Outside of the Earth' chapter in geography subject. The present study prepared an assessment tool with the help of item analysis. Thus, it can be recommended that systematic item analysis process should be used during the preparation of consistent and accurate achievement test to minimise the measurement errors. The teacher-made achievement test in geography that is utilised to measure the learners' accomplishment. The final examination should also be made to pass through all the processes of standardisation and validation. Item difficulty and discrimination indices can be used to judge the quality of the items. Hence, training on the development of achievement test should be regularly organised for instructors, by which they can be more skilful in test construction, and marking and grading of students' scripts.

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Development and Standardisation of Scale for Assessing Readiness towards Blended Learning

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Abstract

Blended learning approach has various advantages as it is an innovative instructional approach which integrates a variety of delivery strategies of online and face-to-face components. It allows the possibility to upgrade students' achievements, and offers the opportunities to increase the flexibility to access learning resources and enhance self-directed learning at any time and pace. After the Covid-19 pandemic, it has become as an essentiality to integrate the online component with face-to-face learning. The present research was planned before the pandemic and authors decided to know the reaction of various stakeholders towards using blended learning approach for internship of teachers training programme. For this purpose, investigators developed a readiness scale with 35 items distributed under eight different dimensions. The scale is reviewed by various subject experts. The reviewed and corrected scale was administered on 383 subjects for try out and calculating various statistical values. Item analysis was performed and feedback obtained from item analysis led to the item deletion, modification and item replacement. Cronbach's alpha is also computed to know the reliability of the scale. The development and standardisation procedure of readiness scale is described in the present paper in detail.

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Introduction

With the advent of rapidly changing internet technology, higher education institutions are currently embracing transformation in student-teacher interaction, planning and designing course content, and assessment for learners' progress (Ying and Yang, 2017). In fact, incorporating technology into education is important to address student diversity in terms of their educational background, abilities, culture and learning priorities. There has been a consistent demand for quality teachers in schools as well as in universities.

Higher education institutions must make every attempt to a teacher-centred approach with a more student-centred approach to facilitate quality learning (Livingstone, et al., 2011; Birbal, et al., 2018).

According to Graham (2006), there is no single definition of 'Blended Learning', as a blended course could fall anywhere in a spectrum of technology enhancement with onsite and online sessions. It depends on one's perspective that an online learning becomes blended as soon as it offers onsite, face-to-face learning. Mostly, online learning becomes blended when online teaching-learning activities are devised to replace face-to-face settings. Some institutions plan a certain portion of traditional onsite learning be replaced with online sessions, though these planned activities are generally arbitrary. Porter, et al. (2014) defined that blended learning is a combination of onsite with online experiences to provide effective, efficient and flexible learning. This pedagogical approach blends online (asynchronous or synchronous) and face-to-face engagement between teachers and students and/or between students (Graham, et al., 2013). It is an approach that effectively combines the right mix of online and onsite environments to strengthen the learning experiences. It facilitates learning to take place independent of time and place, and offers a learning situation that is student-centred, flexible, self-paced, and multidimensional (Garrison and Vaughan, 2013).

Furthermore, it can help students to develop a set of important skills of the 21st century, such as communication, creativity, information literacy, and collaboration. Students can learn to use digital technologies for a range of purposes (Zurita, et al., 2015). Blended learning is an integrated mode of learning where in online learning is integrated with the traditional classroom learning, in which computer based or internet based online learning competencies are employed, and where in students and teachers meet online meet virtually. On the other hand, Aldalalah and Gasaymeh (2014) argued that blended learning is an innovative methodology that is based on the

employment of learning-oriented technology requiring accuracy and mastery, and the selection of most relevant instructional means by which the problems that are related to classroom management are solved. Blended learning is a brilliant solution to cope with the contemporary educational challenges. It is a method of teaching, learning, and training that combines online learning with traditional classroom teaching-learning within a single framework (Aldalalah and Gasaymeh, 2014).

Blended Learning: Need of the Hour

On the basis of the above discussion based on blended learning, it can be reviewed that blended learning is a blend of both traditional learning where the student and teacher interact and communicates in classroom with the main elements of online learning as characterised by the use of advance technology to improve teaching, learning and training. It is important to make sure that students and teachers possess the skills to use online learning technology. In a blended learning pedagogy, the objectives, plans, implementation, and instructional strategies should be clearly defined; and the learning resources should be diversified to meet the educational needs of diverse learners. Teachers should be responsible for their availability at the right time to answer the students' doubts, whether online or face-to-face interaction in the classroom.

The interactive capabilities of information and communication technology (ICTs) help teachers to create an attractive environment for learners, and the student satisfaction also tends to be higher as compared to traditional lecture method (Badawi, 2009). The study showed that blended learning approach is greatly beneficial in terms of flexible time schedule, improving learning outcomes, creating open and flexible environment for development and continuous improvement. It also creates better opportunities for teacher-student interaction, permits learners to use modern technology, and increases students' involvement. It is necessary to develop a significant future perspective on how can we introduce blended learning approach efficiently to make teaching-learning an advanced and creative activity.

Rational of Readiness Scale

The reviews of the related research revealed that several studies were conducted to analyse the attitude and perceptions of teachers and learners towards blended and online learning. It was found that there is a positive attitude and perception towards blended learning (Chew, Jones and Turner, 2008; Gyamfi and Gyaase, 2015; Nordin and Alias, 2013; Qiang, 2016). Some of the studies revealed that learners enjoyed online learning, and additionally, some researchers

found that the learners believed they were more challenged through online learning, though they liked the flexibility provided (Sari, 2019). Some of the researches were conducted on the designs of online learning but no research was found study on blended approach for teacher education and specifically for internship programme (Milheim, 2006). In the present research, the investigators intended to explore the readiness of various stakeholders of teacher education towards using blended learning approach in teacher preparation (pre-internship activities), which is pre-requisite for creating a blended learning environment in internship. Hence, before creating a blended learning environment, it is required to assess the readiness of stakeholders towards implementing blended learning. For assessing readiness, a scale is required to know the actual level of acceptance towards blended learning.

Scope of the Readiness Scale

The present scale is developed to explore the readiness of various stakeholders of teacher education (teacher educators, pupil teachers and research scholars) towards using blended learning approach in teacher preparation (pre-internship activities), since teacher educators and pupil teachers are directly involved in pre-internship activities and research scholars are indirectly associated with the same for earning their credits of teaching associateship.

Preparation of Initial Draft

To assess the readiness of teacher educators, research scholars of education discipline and trainees towards blended learning approach, a readiness scale was developed and standardised. Firstly, the investigators explored the research area and related reviews. It is found that there are eight dimensions of blended learning generally stated in the available literature. The primary draft of readiness scale comprised 45 items developed on Likert's 3-point scale. The initial draft of 'Readiness Scale towards Blended Learning Approach' was developed and applied on 383 respondents (details are given in Table 1) for standardisation, and establishing reliability and validity of the scale. The procedure of establishing reliability and validity has been presented under the following captions.

Table 1
Sample for Tryout

S.No.	Category	Number of Subjects
1.	Teacher Educators	86
2.	Research Scholars	76
3.	Pupil Teachers	221
Total		383

Table 2 presents the dimension-wise distribution of primary draft of readiness scale towards blended

learning approach. The dimensions were selected after rigorous review of literature and available scales. Initially, after observing Scree Plot (Figure 1), a total of 10 dimensions were selected, based on those having eigenvalue more than one but finally two overlapping dimensions were merged together.

Table 2
Initial Draft of Readiness towards Blended Learning Approach

S.No.	Dimension	Position of Items in Scale
1.	Flexibility in Learning	1–5
2.	Online Learning	6–10
3.	Learning Management and Classroom Learning	11–20
4.	Learning Resources	21–25
5.	Online Interaction	26–30
6.	Teaching-learning Environment	31–35
7.	Co-curricular Activities	36–40
8.	Evaluation	41–45

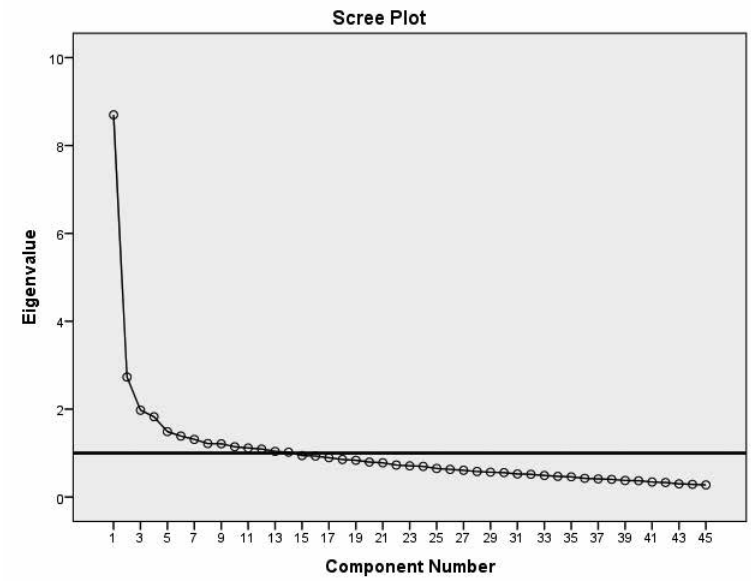

Figure 1: Scree Plot Showing Components of Readiness Scale

Examine the Adequacy of the Sample and the Suitability of Data: Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

Prior to the extraction of the constructs, there are various tests which are required to be conducted to examine the adequacy of the sample size and the suitability of data for Factor Analysis (Burton and Mazerolle, 2011). Sampling adequacy provides the investigator with information regarding the grouping of survey items. Grouping items into a set of interpretable factors can better explain the constructs under investigation. The measures of sampling adequacy evaluate how strongly an item is correlated with other items in the factor analysis correlation matrix (Burton and Mazerolle, 2011). The sampling adequacy can be assessed by examining the Kaiser-Meyer-Olkin (KMO) (Kaiser, 1970). KMO is suggested when the cases to variable ratio are less than 1:5. It ranges from 0 to 1, while according to Anderson, et al. (1995) and Tabachnick and Fidell (2001), 0.50 is considered suitable. On the other hand, Netemeyer, et al. (2003) stated that a KMO correlation above 0.60–0.70 is considered adequate for analysing the factor analysis output. Bartlett's test of sphericity (Bartlett, 1950) explained chi-square output that must be significant. It indicates that the matrix is not an identity matrix and, accordingly, it should be significant ($p<0.05$) for factor analysis to be suitable (Anderson, et al., 1995; Tabachnick and Fidell, 2001). Bartlett's test of sphericity indicates the item correlation matrix is not an identity matrix, then researchers can move forward (Netemeyer, et al., 2003).

Table 3
KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.859
Bartlett's Test of Sphericity	Approx. Chi-Square	4773.902
	Df	990
	Sig.	0.000

From Table 3, it is evident that the statistic value of Kaiser-Meyer-Olkin test is 0.859. This value is greater than 0.60, so the sample is considered adequate for analysing the factor analysis output. The statistic value of Bartlett's Test is 4773.902, its probability of significance with df (990) is 0.000, which is lesser than 0.05, i.e., it is significant at 0.05 level of significance. The statistic value is significant ($p<0.05$), so the sample is considered adequate for analysing the factor analysis output.

Item Analysis

For assessing the item analysis, bi-serial correlation was used to sharpen the scale. The responses were collected and scored. Individual item score was correlated with the total score of the tool. Item analysis was done for the 383 response sheets by using item vs component correlation

method. The sum of the scores on each dimension of the value was calculated. Then 'r' was calculated by correlating the individual item and the corresponding component score. The correlation coefficient at the 5% level of significance is 0.196, when the degree of freedom is 100 (Wani and Masih, 2016). So, the items having 'r' values 0.196 and above were selected. It was found that out of the total 45 items, there are 35 items which have had significant correlations with the total score of the scale, except 10 items which had no significant correlation with the total score of the tool. The correlation table with the decision about item selection is given in Table 4.

Table 4
R-Values of Each Item with the Total Score of the Scale and Decision about Selection of the Item

Item No.	Corrected Item-Total Correlation	Item Decision	Item No.	Corrected Item-Total Correlation	Item Decision
1.	0.308*	Selected	24.	*0.033*	*Deleted*
2.	0.371*	Selected	25.	0.209*	Selected (Improved)
3.	0.323*	Selected	26.	0.389*	Selected
4.	*-0.116*	*Deleted*	27.	0.345*	Selected
5.	0.311*	Selected	28.	*0.096*	*Deleted*
6.	0.392*	Selected	29.	0.469*	Selected
7.	0.256*	Selected (Improved)	30.	0.427*	Selected
8.	0.405*	Selected	31.	0.483*	Selected
9.	0.360*	Selected	32.	0.470*	Selected
10.	0.429*	Selected	33.	0.496*	Selected
11.	*-0.018*	*Deleted*	34.	*-0.006*	*Deleted*
12.	0.475*	Selected	35.	0.461*	Selected
13.	*-0.011*	*Deleted*	36.	0.482*	Selected
14.	*0.029*	*Deleted*	37.	0.426*	Selected
15.	*0.049*	*Deleted*	38.	0.504*	Selected
16.	0.226*	Selected (Improved)	39.	0.579*	Selected
17.	0.238*	Selected (Improved)	40.	0.465*	Selected
18.	0.414*	Selected	41.	0.456*	Selected
19.	0.344*	Selected	42.	0.393*	Selected
20.	*0.080*	*Deleted*	43.	0.517*	Selected
21.	0.329*	Selected	44.	0.410*	Selected
22.	0.282*	Selected (Improved)	45.	0.402*	Selected
23.	*0.071*	*Deleted*			

* Correlation is significant at 0.01

After item analysis, 35 items were remaining. For assessing the correlation of each item with their dimension, bi-serial correlation was used. Individual item score was correlated with the total score of each dimension. A rule-of-thumb is that these values should be at least 0.40 (Gliem and Gliem, 2003). If the correlation between item and the summated score is 0.40 or greater than 0.40, the item was selected for scale and if the correlation between item and the summated score is lesser than 0.40, the item was deleted from the scale. Then 'r' was calculated by correlating the individual item and the corresponding dimension score. It was found that all the 35 items were having significant correlations with the total score of the scale. The correlation table is given below.

Table 5
R-Value of Each Item with their Dimension and Decision about Selection of the Item

Dimension	Item Number	Correlation	Decision
Flexibility in Learning	1	0.532	Selected
	2	0.627	Selected
	3	0.671	Selected
	4	0.639	Selected
Online Learning	5	0.674	Selected
	6	0.480	Selected
	7	0.658	Selected
	8	0.708	Selected
	9	0.636	Selected
Learning Management and Classroom Learning	10	0.643	Selected
	11	0.613	Selected
	12	0.479	Selected
	13	0.608	Selected
	14	0.597	Selected
Learning Resources	15	0.790	Selected
	16	0.665	Selected
	17	0.470	Selected
Online Interaction	18	0.715	Selected
	19	0.519	Selected
	20	0.710	Selected
	21	0.666	Selected

Teaching-learning Environment	22	0.763	Selected
	23	0.763	Selected
	24	0.755	Selected
	25	0.721	Selected
Co-curricular Activities	26	0.726	Selected
	27	0.682	Selected
	28	0.750	Selected
	29	0.739	Selected
	30	0.737	Selected
Evaluation	31	0.742	Selected
	32	0.684	Selected
	33	0.695	Selected
	34	0.667	Selected
	35	0.602	Selected

Final Draft of Readiness Scale

After assessing the items, correction with the scale and dimensions, it is found that all the 35 items are having correlation value similar or greater than 0.40. Table 6 shows dimension-wise distribution of the final draft of readiness scale towards blended learning approach.

Face Validity and Content Validity

The content validity of the readiness scale towards blended learning approach was tested by eight experts of the field. They suggested that items of the test are directly related to the different dimensions of blended learning. They also suggested modification in the language, grammar and spellings.

Table 6
Final Draft of Readiness Scale

S.No.	Dimension	Position of Items on Scale
1.	Flexibility in Learning	1–4
2.	Online Learning	5–9
3.	Learning Management and Classroom Learning	10–14
4.	Learning Resources	15–17
5.	Online Interaction	18–21
6.	Teaching-learning Environment	22–25
7.	Co-curricular Activities	26–30
8.	Evaluation	31–35

Construct Validity

In order to find out the construct validity, the researchers calculated correlation between the score each sub-scale and total score of the scale.

Table 7
Correlation between Each Dimension and Total Score

S. No.	Dimension	Cronbach's Alpha
1.	Flexibility in Learning	0.593*
2.	Online Learning	0.663*
3.	Learning Management and Classroom Learning	0.665*
4.	Learning Resources	0.485*
5.	Online Interaction	0.698*
6.	Teaching-learning Environment	0.700*
7.	Co-curricular Activities	0.740*
8.	Evaluation	0.715*

* Significance at 0.01 level

From the perusal of Table 7 above, it can be concluded that the correlation coefficient of all dimensions (0.593, 0.663, 0.665, 0.485, 0.698, 0.700, 0.740, and 0.715, respectively) are significant at 0.01 level of significance. This indicates that all dimensions of the scale have good construct validity.

Reliability of the Readiness Scale

The degree of consistency among test scores is called reliability. The scores of subjects on test were subjected to internal consistency (Cronbach alpha) reliability analysis. The values of reliability coefficients for each sub-scale and for the whole scale are shown in Table 8.

Table 8
Reliability Coefficient of Readiness Scale

S. No.	Description	Cronbach's Alpha
1.	Flexibility in Learning	0.457
2.	Online Learning	0.624
3.	Learning Management and Classroom Learning	0.516
4.	Learning Resources	0.319
5.	Online Interaction	0.557
6.	Teaching-learning Environment	0.740
7.	Co-curricular Activities	0.770
9.	Evaluation	0.707
	Full Scale	0.888

From the above table, it is evident that all the sub-scales and full scale have a good reliability index. All the sub-scales, except flexibility in learning and learning resources, show reliability coefficient as more than 0.50, which is close to the acceptable value.

Items in the Final Draft

The items in the final draft are presented in Table 9.

Table 9
Items in Scale

S.No.	Proposition
1.	With the help of blended learning approach, the learners can efficiently learn the pedagogical disciplines even from their homes, in addition to the classrooms.
2.	With the help of blended learning approach, the learners will make use of their different senses, which will influence the learning of new concepts.
3.	By means of blended learning approach, the learners will be able to make the choice of subject-matter independently.
4.	Through the blended learning approach, the learners shall have the freedom to learn according to my own pace and ability.
5.	I feel that the different platforms for online learning can make the teaching-learning process more effective.
6.	In online learning, the various study materials can be made available different learners in an easier and faster way.
7.	During online learning, I shall be able to accommodate my time schedules easily which will be helpful in my learning progress.
8.	In this era of technology, I would prefer to conduct my classes online rather than by traditional methods.
9.	Blended learning approach will provide easy access to the students for various activities including data collection.
10.	Learners can be made more aware of their study by means of online learning.
11.	By means of blended learning approach, learners will learn more than the learning done through face-to-face teaching-learning process in the classroom.
12.	With the help of blended learning approach, if the learners are provided an instant feedback in the classroom, there would be a positive growth in their learning.
13.	Implementing the blended learning approach in a traditional classroom would give the learners more opportunities to learn by collaborating with other learners.
14.	Implementing the blended learning approach in regular classes shall enable the learners to meet other learners and teachers directly and indirectly which, in turn, will prove helpful in the social development of learners.
15.	In blended learning approach, learners will get the freedom to choose the learning resources according to their own interests.
16.	In the process of blended learning approach, learners will be given the freedom to procure their learning equipment.
17.	My personal equipment like — mobile phone, computer, laptop, etc. Learners will be helpful for learning in the blended learning approach.
18.	I would prefer an online interaction during the teaching-learning process.

19.	I shall take the help of web-based technology to exchange information and for learning-related interaction by implementing the blended learning approach.
20.	While learning by means of the blended learning approach, it will be possible for the teacher to always remain available for interaction, which will prove helpful in learning.
21.	While learning with the help of blended learning approach, there will be ample opportunities for interaction amongst the learners.
22.	It will be possible to create an effective learning environment through the blended learning approach.
23.	In the environment of blended teaching-learning, it will be possible for learners to get ample opportunities to ask questions, to reason, to make their point, to resolve doubts.
24.	In the environment of blended learning, the learners will get ample opportunities to learn by making maximum use of their senses.
25.	In the environment of blended learning, the learners will get the freedom to take initiatives.
26.	By means of blended learning approach, it is possible to enable growth in the creativity of learners by increasing their divergent thinking by making them perform text-congruent activities.
27.	The blended learning approach will prove to be helpful in the progress of EPC (Enhancing Professional Capacities) in the learners.
28.	The text-congruent activities planned with the help of blended learning approach will be help find in developing the positive attitude and self-confidence among the learners.
29.	The text-congruent activities planned with the help of blended learning approach may prove to be a powerful medium to develop teaching values among the prospective teachers.
30.	The text-congruent activities planned with the help of blended learning approach will prove to be helpful in growing team spirit among the learners.
31.	By means of blended learning approach, the overall assessment of the learning skills of the learners will be possible.
32.	The blended learning approach will play an important role in the continuous and overall assessment of the learners.
33.	By means of blended learning approach, it will be possible to pursue remedial teaching by diagnosing the learning difficulties of the learners.
34.	An accurate evaluation of the learning skills of learners will be possible by means of innovative evaluation methods like e-portfolio, e-rubric, e-presentation etc.
35.	From the economic perspective of time, human labour and money, innovative electronic methods can prove to be more suitable for the assessment of the learning skills of learners in the blended learning approach.

Conclusion

Thus, the development and standardisation of scale for assessing the readiness towards using blended learning approach in pre-service internship activities is discussed and presented in this research article. Although, there are two different processes for scale development generally discussed in the available literature as exploratory and confirmatory, the investigators were not able to find out which one is a better option for such kind of scale, therefore, it was decided to use the best available process mentioned in the published literature. Finally, the developed scale is found reliable as all the sub-scales except flexibility in learning and learning resources show reliability coefficient more than 0.50, which is an acceptable value. Similarly, the correlation coefficient of all dimensions were found significant at 0.01 level of significance. This indicates that all the dimensions of the scale have good construct validity. This scale can be used to assess the readiness of different stakeholders including pupil teachers, research scholars and teacher educators towards blended learning.

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Inclusion of Children with Special Needs (CWSN) and School Leadership: A Review

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Abstract

Globally, a school entails diversity and is not situated within one kind of uniform structure of society. Diversity in schools could be due to differences in class, gender, socio-economic strata, race, disability, caste, region, language, ethnicity, and so on. At national and international levels both, the robust call for school reform led to their all governments to focus efforts on inclusive education. Children with special needs (CWSN) are no exception to exercising their right to avail themselves of educational provisions as per their individual needs. The focus of diversity in this paper, for inclusion in the school context, is CWSN. The school head as the vital stakeholder in the teaching=learning process has to constantly find pathways to meet these challenges daily in the school set up especially in post Covid-19 times. The paper reviews the interface of school leadership and inclusion of CWSN.

Introduction

Diversity has many shades of advantages for some people and disadvantages for some people, and could be vice-versa as per its nature in a particular social context. Diversity exists due to many reasons, it may be due to differences in caste, class, gender, socio-economic status, physical and mental well-being, race, language, habitation, and so on. Here we would delimit our focus of diversity arising on account of special needs due to different physical, mental, and both kinds of challenges in the school setup. The common terms

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used for people who face such kinds of challenges are termed as children with special needs (CWSN). They are sometimes also referred to as disabled or handicapped children. The paper is an attempt to study and understand how different elements of leadership influence educational provisions for the inclusion of children with special needs (CWSN).

India has been a signatory to various international educational reforms for equality and justice for providing optimum educational environments to all learners without practising any discrimination. With the enactment of various acts and schemes by our government, in particular, the Rights of Persons with Disabilities (RPwD) Act, 2016, the education of CWSN in mainstream schools has been slowly inclined towards their inclusion. The route to inclusive education has opened up pathways for catering to the diverse needs of learners. The need for inclusive education emerged more as a consequence of catering to the diverse needs of learners. When we talk about school, the stakeholder who in the most pivotal position is the school head or any the individual accountable and responsible, by initiation or voluntarism, to accomplish various tasks in the school. The school head as the vital stakeholder in the teaching-learning process, has to constantly find pathways to meet these challenges daily in the school setup. To give quality education to the diverse groups of learners, we need to adopt inclusive practices in schools. The underlying philosophy of inclusion is getting transformed by enhancing the capacities of each stakeholder. In providing equal opportunities to all learners irrespective of any kind of discrimination or disadvantage.

To on sure this we need to aim for a whole school approach for school improvement which is the overarching goal of inclusive education. To achieve this, the school heads play a pivotal role in transforming the school bring to be able to mainstream CWSN in the main stream fruitfully.

The everyday tasks may look similar for special needs children but the challenges to accomplish the tasks continue to increase with greater intensity due to the varying needs of special children. On the contrary, if pursued with consistent commitment, it is possible for the school leader to achieve these tasks in a gradual fashion. There are many factors responsible for successful inclusion and different leadership roles play important role at different points of time. In the present paper, various aspects of school leadership influencing the successful inclusion of CWSN, have been discussed.

The School Reform Agenda

Globally there has been a transition from mere school improvement to systemic reforms of Schools. In this context, Harris and Chrispeels (2008), as cited in Chapman,et al. (2011), have highlighted 'a shift in

the school improvement initiatives from an individual level to national or state-level impact'. Hopkins (2011), as cited in Chapman, et al. (2011), described the five phases of school and system improvement and the last phase was that of systemic improvement. A review of international school improvement experiences as noted by Datnow, et al. (2006), as cited in Chapman, et al. (2011), stated that there are two most important aspects for school reforms. The first aspect was to move from individual to national level approach. The second aspect was that we could learn about systemic change only by studying systems, their constituents, and the interactions among these constituents. The shift from school to systemic reform would lead to a change in the perspective of school leadership.

India, in its efforts to move towards school reforms and achieve the goal of inclusive education, has made consistent efforts to initiate the policies and programmes to bring about change at the systemic level to benefit all children with the aim of providing better educational opportunities nearest to their homes. Thus, we have many government legislations, of which the recent and significant once are the Right of Children to Free and Compulsory Education Act (RTE Act, 2009) which gives every child the right to set admission in a neighbourhood school, and the Rights of Persons with Disabilities Act, (RPwD Act, 2016) dignifying CWSN for all rights which are rendered to others. The latest Government of India policy— for the education sector, National Education Policy, 2020 in coherence with the internationally accepted Sustainable Development Goals (SDGs), has explained socioeconomic disadvantage in terms of 'gender identities (particularly female and transgender individuals), socio-cultural identities (such as Scheduled Castes, Scheduled Tribes, OBCs, and minorities), geographical identities (such as students from villages, small towns, and aspirational districts), disabilities (including learning disabilities), and socio-economic conditions (such as migrant communities, low income households, children in vulnerable situations, victims of or children of victims of trafficking, orphans including child beggars in urban areas, and the urban poor)'. The Policy further 'recognises the importance of creating enabling mechanisms for providing Children With Special Needs (CWSN) or *Divyang*, the same opportunities of obtaining quality education as any other child'.

Ainscow, et al. (2006) as cited in Florian (2013), wrote that 'inclusion is essentially about attempts to embody particular values in particular contexts as people build up their view of inclusion, related to their experience and values. This is done when they work out what policies and practices they wish to promote or discourage'. They called this approach 'school improvement with attitude'. Inclusive

education can be realised with concerted efforts to improve schools. 'Cultural change is directed towards a transformative view of inclusion, in which diversity is seen as making a positive contribution to the creation of responsive educational settings' (Ainscow, et al. 2006, as cited in Ainscow and Sandill, 2010).

The advocates of inclusive education have proposed Universal Design of Learning (UDL), in which a flexible learning environment is created through curricular materials, pedagogic strategies, and other resources that offer alternatives considering the unique needs of each child in an inclusive classroom. However, there is a dearth of studies on what school leaders should do to enable inclusive education but Sujatha (2011) observed that most of the past research has school effectiveness and highlighted the major characteristics of successful schools.

School Leadership

Let me not dwell more on the theories or models of leadership, but on how these have been conceptualised. There are a variety of ways in which the term 'leadership' has been explained in the educational context. Hemphill and Coons, 1957 (as cited in Miller, 2016) defined leadership as 'the behavior of an individual when he is directing the activities of a group toward a shared goal'. Several research studies have been conducted in the past to understand school leadership in the Indian context. Mythili (2015) portrayed school leader as 'a person who leads school change by transforming oneself and working effortlessly with all stakeholders while navigating through the hierarchical system by understanding one's functional position within the larger system; innovating methods to create collaboration to achieve the goals by bringing about a shift in attitudes, knowledge, skills and beliefs; who converts pressure into opportunities; who responds to crisis and accepts limitations; negotiates between paradoxes of certainty and commitment and conservation and change.' The 'process of leading change in school is called school leadership'. Chugh, (2016) described in her article on review of research in school leadership as the 'process of identifying, tapping and guiding the talents and energies of teachers, pupils and parents toward achieving common education purpose.' Her study focussed on different themes researched under school leadership in the Indian context, namely—,. Role of Head Teachers in School Management, School-based Management, and Leadership¡ Knowledge Creation¡ Teachers' Perception on School leaders¡ Professional Preparation of School Leaders¡ Leadership Behaviour¡ Leadership and Job Satisfaction. Subitha (2016) explained that 'school leadership had been in the shadows of educational administration and management until now but is slowly

emerging out of its confines to establish itself as one of the de facto forces behind school improvement.' Mythili (2017) added in tune with this fact and wrote 'there was no distinction between the role of a school head and that of other teachers till secondary school stage in India and only in senior secondary schools, principals are seen to be spending more time on management, administration, staff management, finances, etc.' Saravanabhavan, et al. (2016) noted that 'empirical studies on school principals and their impact on student outcomes are limited in India'. There are a handful of researches on school leadership considering the Indian context. A few to mention are by Diwan (1996) who investigated the leadership styles of school principals in their specific school situations and in another work, Diwan (2000) highlighted that the leadership behaviour of school heads play an important role in determining successful school management.

Leadership roles and characteristics are quite similar in all kinds of organisations. Marzano, et al., 2005 (as cited in Miller, 2016), delineated the following characteristics of school leadership:

- School mission and goals
- Climate of a school and individual classrooms
- Attitudes of teachers
- Classroom practices of teachers
- How a curriculum is organised
- Opportunities created for students to learn
- Development and capacity-building among staff

Miller (2016) proposed that 'an effective principal is thought to be a necessary prerequisite for an effective school'. Mythili (2015), in her review study on school leadership, found that leadership is critical for quality student learning. According to Chaudhary, 2002 (as cited in Mythili, 2015), 'It has become a faith that the capacity of schools to improve teaching and learning is strongly mediated by the quality of leadership by the head teachers.'

Who Are CWSN?

The issue of education of CWSN has been highlighted both at national and international forums all across the world. Miller (2016) has pointed out that all the countries have tried to bring about changes to the deficit and associated practices through the enactment of laws and policies for children with special educational needs. Therefore, children with special needs (CWSN) have been labelled, named, and categorised in numerous ways like handicapped, disabled, impaired, differently-abled, physically challenged, mentally challenged, dumb, moron, and so on. The term most commonly used in government documents and otherwise is children with special needs (CWSN), as used in this paper in tune with the terminology used in the latest government legislature,

the RPwD Act, 2016. There are 21 categories of disabilities listed and defined in the RPwD Act, 2016 which have been used in this paper.

What is Inclusion?

In India, the education of handicapped children has been emphasised since the Kothari Commission report in 1964–66 at the government level. This issue has been more actively delineated in major government documents as in the National Policy on Education 1986, the Rehabilitation Council of India Act (RCI Act) 1992, the Persons with Disabilities Act (PWD Act) 1995, the National Curriculum Framework (NCF) 2005, the Right of Children to Free and Compulsory Education Act (RTE Act) 2009 and recently the RPwD Act, 2016. Our government has also been a signatory to several international efforts at Salamanca, 1995; World Education Forum, Dakar, 2000 and many others, where in inclusive education has been recognised as the need of the hour to educate and mainstream special needs individuals.

Inclusion refers to making provisions for all children and not excluding anybody in alignment with the goals of the RTE Act, 2009 and RPwD Act, 2016. The purpose is to welcome and celebrate diversity and improve the quality of education for all. The children should be enabled to learn with dignity and develop self-confidence to effectively deal with the situations they are in. In order to actualise the above-mentioned aspects, the school and all stakeholders need to realise that inclusive learning tasks and collaborative pedagogical practices should be selected to teach CWSN by removing physical, social, and attitudinal barriers.

Armstrong, et al., 2011 (as cited in Miller, 2016), wrote that 'inclusion is contested within and across educational systems and in theory and practice in countries of the North and of the South' and thus the meaning of inclusion is framed according to the context. The basic idea of inclusion is education for all individuals irrespective of caste, creed, special needs, ethnicity, language barrier, regional disparities, or any kind of specific need or disadvantage.

Inclusion and School Leaders

Inclusion has been at the heart of the school reform agenda since the nineties in the education sector at different levels. Inclusion has also been seen as an emerging challenge for educational leaders with diverse children on the rise in the school system. Leithwood, et al. (1999) suggested that 'with continuing diversity, schools will need to thrive on uncertainty, have a greater capacity for collective problem solving, and be able to respond to a wider range of pupils'. Fullan (2001) described five mutually dependent components necessary for effective leadership in times of change, namely, 'moral purpose, understanding the change process, relationship building,

knowledge creation and sharing, and coherence making'. Riel, 2000 (as cited in Florian, 2013) developed 'a comprehensive approach to school administration and diversity', with an intent to educate school principals to attend to three broad tasks, which are: 'fostering new meanings of diversity, promoting inclusive practices within schools and building connections between schools and communities.' She goes on to consider how these tasks could be accomplished, exploring how the concept of practice, especially discursive practice, could contribute to a fuller understanding of the work of school principals.

Diwan (2009) suggested, 'some workable propositions by which schools in spite of functioning in a bureaucratic framework can become learning organizations'. She delineated commitment creating enabling conditions; some simple changes for operating the school like collective inquiry, training and professional development activities; and practitioner research. Adopting a similar perspective, Lambert, et al., 1995 (as cited in Florian, 2013) argue for a 'constructivist' view of leadership and defined it as 'the reciprocal processes that enable participants in an educational community to construct common meanings that lead toward a common purpose about schooling'. From their perspective, leadership involves interaction initiated by both students and teachers. Consequently, there is a need for collaborative leadership, with the principal seen as the leader of leaders.

Sider, et al. (2017) wrote in their exploratory study 'to identify the types of special education training and daily issues experienced by the school principals in order to support students with special education needs'. They found five key themes including 'personal values in shaping inclusive school culture, variety in professional learning experiences, similarities in day-to-day experiences and the importance of being accessible for students and staff, the importance of leadership in fostering inclusive school culture, and the effect of critical incidents in shaping principals' leadership roles'.

In this purview of inclusion, we are looking at the transformation of schools operating within a network of systems. Our focus is on schools where school heads face challenges on account of catering to the special needs of children. The NEP 2020 proposed school complexes to be set up for providing 'improved support for children with disabilities in academic/ sports/arts/crafts events across school complexes; incorporation of art, music, language, vocational subjects, physical education, and other subjects in the classroom through sharing of teachers in these subjects.'

Leadership Preparation Programmes

Reviewing the research to assess the pedagogical effects of leadership

preparation programmes espousing social justice, Brown, 2006 (as cited in Young, et al., 2009) found that transformative learning strategies had a positive effect on candidates' attitudes towards the issues of diversity in education. It was concluded that administrators should be aware and open to the issues of diversity before being prepared to lead for social justice and equity. Skrla, McKenzie and Scheurich, 2009 (as cited in Young, et al., 2009) have introduced tools for examining inequities, such as equity audits in leadership preparation programmes. Young, et al. (2009), have found that not much research has been done on preparation programmes, for example, instilling dispositions like social justice orientations in leader candidates.

Looking at the Indian scenario, a school head is appointed in a government-run school having five or more teachers to teach the students. In most states, the post of school head is filled based on the seniority of teachers. There is no formal training or orientation for the prospective school heads for building the vision of their schools. Generally, it takes a long bureaucratic procedure to fill the position of school head or it remains vacant. Thus, many-a-times, the senior-most teacher in the school has to perform the tasks of a school head willingly or unwillingly along with her/his teaching load with or without promotion. Except for very few states in India, there is no cadre for principals at the school level for professional development. School heads also need a lot of motivation continuously to sustain willingly in this profession for a long time, especially while educating CWSN with diverse individual needs. Efforts at various levels are required to institutionalise and professionalise school leadership roles to sustain good school leaders and groom prospective school leaders.

The school leadership development at the national level in India is not as old as 2012 after its inclusion in the 12th Five-year Plan, in which the Ministry of Human Resource Development (MHRD) had mandated the National University of Educational Planning and Administration (NUEPA) to establish the National Centre for School Leadership (NCSL). Every year as a policy initiative, the NCSL conducts online and offline school leadership programmes and research on school leadership across the country. There are a few states like Gujarat, Delhi, West Bengal, and Rajasthan that have initiated to train, recruit, select, induct and evaluate school heads with varied criteria and mechanisms. Still, there are many irregularities in terms of criteria and processes for appointing a school head even in these states. A few non-governmental organisations, alone or with government agencies, conduct school leadership development programmes at the micro level but the focus of CWSN was not much visible. This aspect was substantiated

by Mythili (2015) as: 'with the help of non-governmental organisations, Departments of Education in some states (Chhattisgarh, Karnataka, Gujarat, Rajasthan, Uttar Pradesh, Andhra Pradesh, and Maharashtra) had initiated school leadership development since 2007–08'.

NEP 2020 proposed the way forward in order to achieve SDG 4 a 'school heads have to be trained on whole-school approaches, so as to adopt a more distributed leadership style.' The process to develop a distributed leadership model in school is to focus on enhanced learning to develop a shared school community, increasing the participation of both learners and their parents in school life and in formal and informal decision-making processes. In this regard, Chugh (2016) emphasised that the idea of 'distributed leadership', which carries a number of factors essential for the improvement of School Functioning has still not taken off in India. It has been well documented that 'collaborative leadership builds capacity for academic improvement of teachers (Hallinger and Heck, 2010, 2011, as cited in Mythili, 2017) whereas distributive leadership contributes to school improvement' (Gronn, 2000 and Spillane, 2006, as cited in Mythili, 2017),. Jain and Jeppesen (2014) have noted that 'Distributed Leadership (DL) has emerged as a new perspective on leadership and received considerable attention from the field of management as well as education in the past two decades'.

The focus to prepare good school leaders should be on building the capacity of school heads rather than giving only routine training to them. There is a widespread shortage of qualified future candidates as progressive school heads in the school system. An ample amount of efforts are required for building capacities of school heads in the entire country and adequate research to inform the policy for immediate action steps to be taken to traverse this journey to generate effective school leaders in the country.

Challenges for School Leaders

There is no denying the fact that inclusive practices pose many unforeseen challenges for all the stakeholders, more so for the school leaders. The school head's facilitating role could prove to be a boon in such a scenario, where in all the stakeholders are trying hard to actualise the true spirit of inclusion. Ainscow and Sandill (2010) have found that 'including all children in education is the major challenge facing educational systems around the world, in both developing and developed countries'. School leaders set an environment that either embraces or discriminates against CWSN. Thus, a culture is created where in parents are either confident to engage with the school or feel that as an imposed activity. Leithwood, et al. (1999) suggested that, 'with

continuing diversity, schools would need to thrive on uncertainty, have a greater capacity for collective problem solving, and be able to respond to a wider range of pupils'.

In India, there is a lot of adhocracy as mentioned in the previous section on the procedure to become a school head as there is no standardised guideline or policy to recruit school heads or Head Masters or Head Mistresses (HMs) or Principals. As Mythili 2017 pointed that 'the role of a school head was not seen distinct from that of teachers' in India until recently.' Mythili (2015) quoted from the research conducted by Govinda (2002) and NUEPA (2010), who analysed the various systemic constraints that hinder the effective functioning of the head teacher were: 'HMs have to function in a constrained environment; the manner of their appointment; absence of designated HMs in a large number of elementary schools; no difference between the qualifications and salary structures of HMs and teachers; lack of freedom and authority of school heads'.

Govinda (2002) further reiterated the complexities of the role of an HM and wrote that 'the other systemic constraints faced by the HM, in a situation where the school is at the lowest level of a multi-layered system with its hierarchical nature, are that a substantial part of their academic role and mentoring leader role and mentoring have been transferred to Block Education Officers who operate through Block Resource Centres and Cluster Resource Centres, their limited role in academic management due to centralisation of curriculum and public examination; lack of rewards and recognition linked to performance; lack of academic support to HM from the system above'. Some states have taken the lead to streamline their administrative process to appoint school heads but there are loopholes in them too. This attitude lowers the motivation and lucrativeness in this profession for prospective school heads. School heads face umpteen challenges as found by GV (2016) in her research study on practitioners' perceptions of challenges for the school heads which "included inability to work as a team, develop interpersonal skills, reflective practice, distributed leadership, and communication skills'. It was added that 'improved understanding of these barriers and the school heads' perception would help create an empowering environment for the learners and also figure out important guidelines for ensuring program sustainability and effective program implementation'.

Reviewing the literature on research studies conducted in India on school leadership in relation to CWSN in mainstream classrooms, it was found that not much research work has been accomplished in this area. Chugh (2016) concluded in her review of research on school leadership and wrote that 'there is lack of evidence-based research in India'. However, in the West, there have

been some research studies (Miller, 2016, Ainscow and Sandill, 2010) that have shown that a Principal, through his or her leadership, had a critical role in promoting inclusive practices at school. Ofsted, 2004 (as cited in Miller, 2016) wrote that 'where central ethos was centered on inclusion, students achieved more and showed better results, and where this occurred, leadership was shown to be a significant factor'. Consequently, more administrator preparation programmes had been initiated in order to meet the demand for increased accountability for the academic performance of diverse subgroups, as well as greater institutional commitments to equity and social justice.

It is a well-known fact that no two special needs children of the same special need display the same challenges during the teaching-learning process, which multiply with differing special needs. The complexities of each special need vary on account of different aspects related to the special need, the socio-economic background, age, previous learning of the child, and many other hidden or spontaneous aspects involved during the educational process. Thus, the challenges posed due to the specificities of special needs even within each special need area call for different leadership styles and practices for CWSN to actualise the inclusion practice. In the Indian context where diversity on account of the strong factors of caste, language, socio-economic strata, and gender are deep-rooted in the social milieu, creates greater diversities leading to more complexities and thus further increased challenges for school heads to actualise inclusive education.

The pandemic has further compounded the matter to create a new situation in order to effectively educate CWSN. Thus, the situation has increased challenges manifold for the smooth functioning of its beneficiaries in the education system, and school heads are by no means left behind. They are required to be more caring, empathetic, and aware of the new specific needs of children, in particular CWSN, their parents, teachers, staff, and system-level officials. Lawton-Misra and Pretorius (2021) have concluded that 'leaders need to be aware of their own behaviour and its influence on others, recognise individual differences among their followers (characteristics and motivations), understand the structures available to perform specific tasks, and analyse the situational variables that impact the ability of followers to complete tasks'.

What Do We Learn from the Above Discussions?

Transformative teaching-learning strategies are essential for effective school leadership with a constructivist approach to deal with the challenges faced by school leaders. They need to learn about system change by studying systems, their

constituents, and interaction among these constituents. Chugh (2016) stated that 'research on contextual differences between schools and how that influences the forms of leadership that seem to operate within these schools is required to be taken up if want to improve and transform our schools'. She added that 'the researches do not take into account the diversity in the school system and also the different contexts in which the schools are situated. The very concept of leadership is not well understood and little attention has been paid to the capacity building of school leaders both at institutional and system level.' Further, they have to work with more innovative responses to the challenges faced while including CWSN in regular classrooms.

The school leaders need to develop necessary skills and knowledge through leadership preparation programmes to be sensitive enough to understand the usage of different leadership practices imparting inclusive education. It may be possible that for some pedagogical practices, teacher leadership has to be facilitated by the school head. In some situations and contexts, teachers, instead of principals, should take the lead role for decision making, especially involving the participation of the community in goal formation for the school to impart inclusive education, for example, by distributed leadership, and pedagogical leadership. Consequently, the directions and pathways for good school leaders have to be backed by a strong research base lacking in the Indian context. In addition, Lawton-Misra and Pretorius (2021) strongly proposed that pandemic has 'forced us to sit up and take note of how we approach our responsibilities of leadership, which may have been built upon the concept of hierarchy where leaders lead, and followers follow'. It was further emphasised that school leaders need to 'unlearn old behaviours, teachings, and philosophies, and relearn skills and attitudes from scratch'.

Conclusion

Reviewing the recent developments concerning school leadership and inclusive practices, school leaders need to have a shared vision in order to facilitate inclusive education. Despite many unique and unexpected challenges posed before school heads who play pivotal roles for the wholesome education of children, we need to praise their accomplishments and routine work. Effective leadership pathways lead to infinite ways to achieve smiles for each child and each school. Finally, due to the dearth of existing literature on school leadership, consistent focus is required for thorough and extensive research, which would pave the way for many more explorations in the field of school education and give directions for school improvement.

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