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About the Journal

The Primary Teacher is a quarterly journal brought out by the National Council of Educational Research and Training (NCERT), New Delhi. It carries articles and research papers on educational policies and practices, and values material that is useful for practitioners in contemporary times. The journal also provides a forum to teachers to share their experiences and concerns about the schooling processes, curriculum, textbooks, teaching–learning and assessment practices. The papers for publication are selected on the basis of comments from two referees. The views expressed by individual authors are their own and do not necessarily reflect the policies of the NCERT or the views of the editor.

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EDITORIAL

"Don't limit a child to your own learning, for he was born in another time," said Gurudev Rabindranath Tagore. He, thus, emphasised that the learning of adults was motivated unlike those of children. Tagore envisioned the concept of holistic education, deeply rooted in indigenous culture and connected with the wider world. He could foresee the growth of a global community. This issue of *The Primary Teacher* presents an insight into these aspects.

In the first article, 'Language of Mathematics — A Corpus based Analysis of Textbooks', author, Ramanujam Meganathan, tries to explore the extent to which teaching–learning materials of mathematics recognise the importance of language in learning of the subject. A corpus analysis of NCERT's mathematics textbooks for Classes V, VI and VII, focussing on the inevitable relationship between mathematics and language, was conducted.

In the next paper, 'Ethnomathematics Approach — A Culture based Pedagogy', authors, Harish Pandey, Suryakant Kushwaha and Anjali Bajpai, highlight how 'ethnomathematics', as a subfield of mathematics education, encourages pupils from diverse socio-ethnic backgrounds to practise mathematical problems in their own conventional way. They also point out the relevance of ethnomathematics as a mathematical teaching–learning approach in the *Kumhar* community.

In the research paper titled 'Status of Developmental Readiness of Rural and Urban School Children', authors, Neha Joshi and Deepika Vig, discuss the school readiness of children at the pre–primary stage. The paper also analyses how locale affects their developmental readiness.

Sandhya Sangai, in the article titled 'Language Across Curriculum — Why Every Teacher should be a Language Teacher', draws the readers' attention towards language skills and how these help facilitate learning in all subjects. She argues that teachers, irrespective of their disciplines, must encourage appropriate language use by students while writing or discussing concepts.

Reetu Chandra, in her article, tries to analyse the socio-emotional readiness of children at the pre–primary stage. Studies suggest that students, who attend pre–primary education programme, adjust easily in formal school set-up. Thus, ensuring children's socio-emotional readiness before they start with formal schooling is crucial. As part of the study, the author surveyed 176 pre–primary students, studying in eight Municipal Corporation of Delhi (MCD) schools, in order to identify gaps in their levels of socio-emotional readiness.

Manish Kumar and Paran Gowda in their article titled 'Innovative Methods of teaching Yoga at the Primary Stage' argue that there is a need to teach yoga terms in simple and practical manner to students at the primary stage. This paper has been designed around the concept of the 'ABC of the Yoga Chart'.

In the article, 'Effectiveness of Bridge Programme at the Elementary Stage', authors, Neetu Yadav and Satpal Singh, describe how a bridge programme was conducted on 1,445 students, studying in 84 schools of Delhi, to analyse its effectiveness on pupil achievement in Hindi and mathematics for Classes VI, VII and VIII.

The issue also carries the Journal's regular features 'From the States', 'Book Review', 'Did You Know' and 'My page'.

In the 'From the States' section, Alpesh Pipaliya shares that the midday meal programme was introduced in a municipal corporation school of Gujarat in an innovative way by integrating it with music.

Satya Bhushan presents a review of UNESCO publication titled *Preparing Teachers for Global Citizenship Education — A Template*. The publication emphasises that Global Citizenship Education (GCED), which strives to promote peace, well-being and sustainability, must be integrated with content and pedagogy.

In the 'Did You Know' section, Varada M. Nikalje underlines the concept of *Vasudhaiva Kutumbakam* in Asian countries. She presents a glimpse of sociocultural patterns and education in India, China, Bhutan, Indonesia and Singapore, which contribute in the promotion of GCED.

In the last section of the issue, 'My Page', Anita Sharma presents a personal account of how Skype sessions between students of her school and those of other countries like Russia, Ukraine and the UK served as a cultural and educational bridge, promoting GCED.

— Academic Editors

1

Language of Mathematics — A Corpus based Analysis of Textbooks

Ramanujam Meganathan*

Abstract

This paper tries to explore how Teaching Learning Materials (TLMs) for mathematics, particularly, textbooks developed by the National Council of Educational Research and Training (NCERT), recognise the importance of language in and for learning of mathematics. This has been done through an analysis of mathematics textbooks for Classes V, VI and VII. The paper tries to explore the role of language in teaching and learning of mathematics as realised in the textbooks. Besides, it tries to find out if mathematics textbook developers understand the role of language in explaining mathematical concepts.

LANGUAGE OF MATHEMATICS

There is a close relationship between mathematics and language. Eminent scholars across centuries, starting from Aristotle to Chomsky, have tried exploring this relationship.

Aristotle, a famous Greek philosopher and polymath, used mathematics to 'see' the invisible patterns of sounds recognised as music. He also used mathematics to describe the invisible structure of a dramatic performance. Noam Chomsky, a well-known American linguist, philosopher, cognitive scientist, historian, social critic and political activist, used mathematics to 'see' and describe the invisible, abstract patterns of words recognised as grammatical sentences. He, thereby, turned linguistics from a fairly obscure branch of anthropology to a thriving mathematical science. Mathematics is applied to look into the future, such as the following (Keith Devlin, 1998).

- The probability theory and mathematical statistics help predict the outcome of elections, often with remarkable accuracy.

* *Professor,* Department of Education in Languages, NCERT, New Delhi.

- Calculus is used for weather forecast.
- Market analysts use various mathematical theories for predicting the behaviour of the stock market.
- Insurance companies use statistics and probability theory to predict the likelihood of an accident, and fix the premium accordingly.

These points are comprehensible only when displayed graphically, i.e., explained in a natural human language. The language of mathematics or mathematics register[1] explains abstract ideas, making it distinct from other registers but comprehensible to all.

Importance of Words and Word Chunks in Learning

Encountering a word several times in a textbook reflects the high frequency of that word, which in turn, indicates its importance in teaching and learning. There is a theory on the vocabulary required to be learnt by students, for whom English is the second language (ESL), as opposed to those for whom it is the first language (EFL). For example, knowledge of the first 2,000 words of General Service List (GSL) (West, 1953) together with the Academic Word List (AWL) (Coxhead, 2000) would provide about 95 per cent of the vocabulary required for the reading of academic texts, essential for ESL and EFL students (Nation, 1990, 2001).

A corpus based content analysis of a textbook helps make decision as regards to the selection of text easier for teachers.

However, the basic criterion in teaching and learning of vocabulary is the underlying purpose, i.e., whether the aim is to learn the words for general use, academic use (English for academic purposes) or specialised use (English for specific purposes).

Frequency Count — Recurrent Words in Mathematics Textbooks

Corpus analysis[2] has gained importance in understanding language use in social and academic contexts. It reveals the stand the writer or narrator of text(s) takes and also the nature or characteristic of the subject. For instance, many corpus based studies on interactions between doctors and patients reveal how their ailments were described, diagnosed, treated and cured over a period of time.

A corpus analysis of mathematics textbooks of Classes V, VI and VII was conducted in order to list out the most frequently used words. The top 25 such words could be listed in each book. Besides, the most frequently used words in the first unit of each of these books were also analysed.

[1]In language studies, the term 'register' is defined as the way a speaker uses language differently in different situations. Registers are used in all forms of communication, including written and spoken, and formal and informal. A mathematics register is made up of specific uses of language for mathematical purposes.

[2]Corpus analysis is a type of text analysis that allows one to draw comparisons between textual objects on a large scale.

Word	Freq.	%	Texts	%	Lemmas
#	1,882	9.76	15	100.00	
THE	913	4.73	15	100.00	
A	547	2.84	15	100.00	
OF	450	2.33	14	93.33	
TO	358	1.86	15	100.00	
AND	311	1.61	15	100.00	
IS	297	1.54	15	100.00	
IN	280	1.45	14	93.33	
HOW	261	1.35	15	100.00	
YOU	244	1.27	14	93.33	
IT	176	0.91	14	93.33	
THIS	164	0.85	15	100.00	
I	160	0.83	14	93.33	
FOR	155	0.80	14	93.33	
ARE	150	0.78	13	86.67	
CAN	145	0.75	14	93.33	
WILL	133	0.69	13	86.67	
FROM	119	0.62	14	93.33	
HE	116	0.60	13	86.67	
MANY	114	0.59	11	73.33	
YOUR	107	0.55	13	86.67	
CHILDREN	106	0.55	12	80.00	
ON	103	0.53	14	93.33	
WHICH	96	0.50	13	86.67	
ONE	93	0.48	13	86.67	

Figure 1: Frequency count of the top 25 frequently appearing words in Math-Magic, mathematics textbook for Class V

N	Word	Freq.	%	Texts	%	Lemmas	Set
1	THE	47	4.74	1	100.00		
2	A	38	3.83	1	100.00		
3	BRICKS	35	3.53	1	100.00		
4	OF	34	3.43	1	100.00		
5	#	26	2.62	1	100.00		
6	BRICK	24	2.42	1	100.00		
7	IN	22	2.22	1	100.00		
8	YOU	22	2.22	1	100.00		
9	IS	19	1.92	1	100.00		
10	HOW	17	1.71	1	100.00		
11	AND	15	1.51	1	100.00		
12	TO	15	1.51	1	100.00		
13	THIS	14	1.41	1	100.00		
14	ARE	13	1.31	1	100.00		
15	ONE	12	1.21	1	100.00		
16	HAVE	11	1.11	1	100.00		
17	CAN	10	1.01	1	100.00		
18	FOR	10	1.01	1	100.00		
19	LOOK	10	1.01	1	100.00		
20	MADE	10	1.01	1	100.00		
21	PATTERNS	10	1.01	1	100.00		
22	SEE	10	1.01	1	100.00		
23	THESE	10	1.01	1	100.00		
24	FROM	9	0.91	1	100.00		
25	IT	9	0.91	1	100.00		

Figure 2: Frequency count of the top 25 frequently appearing words in the first unit of Math-Magic, mathematics textbook for Class V

N	Word	Freq	%	Texts	%
1	#	12,887	17.28	14	100.00
2	THE	4,170	5.59	14	100.00
3	OF	2,783	3.73	14	100.00
4	A	2,117	2.84	14	100.00
5	AND	1,582	2.12	14	100.00
6	IS	1,574	2.11	14	100.00
7	TO	1,141	1.53	14	100.00
8	IN	1,040	1.39	14	100.00
9	NUMBER	879	1.18	14	100.00
10	WE	766	1.03	14	100.00
11	ARE	706	0.95	14	100.00
12	BY	545	0.73	14	100.00
13	NUMBERS	544	0.73	9	64.29
14	YOU	476	0.64	14	100.00
15	B	466	0.62	14	100.00
16	THAT	456	0.61	14	100.00
17	AS	436	0.58	14	100.00
18	CAN	414	0.56	14	100.00
19	IT	411	0.55	14	100.00
20	FOR	374	0.50	13	92.86
21	THIS	360	0.48	14	100.00
22	ON	350	0.47	13	92.86
23	TWO	347	0.47	14	100.00
24	BE	341	0.46	14	100.00
25	FIND	336	0.45	14	100.00

Figure 3: Frequency count of the top 25 frequently appearing words in NCERT's Class VI Mathematics textbook

N	Word	Freq.	%	Texts	%	mmas	et
2	THE	410	5.19	1	100.00		
3	TO	179	2.26	1	100.00		
4	IS	165	2.09	1	100.00		
5	AND	164	2.07	1	100.00		
6	IN	153	1.93	1	100.00		
7	OF	143	1.81	1	100.00		
8	A	133	1.68	1	100.00		
9	NUMBER	122	1.54	1	100.00		
10	NUMBERS	113	1.43	1	100.00		
11	WE	103	1.30	1	100.00		
12	DIGIT	72	0.91	1	100.00		
13	YOU	63	0.80	1	100.00		
14	ARE	50	0.63	1	100.00		
15	AS	50	0.63	1	100.00		
16	FOR	47	0.59	1	100.00		
17	OFF	46	0.58	1	100.00		
18	IT	45	0.57	1	100.00		
19	PLACE	44	0.56	1	100.00		
20	CAN	43	0.54	1	100.00		
21	THIS	41	0.52	1	100.00		
22	DIGITS	39	0.49	1	100.00		
23	AT	38	0.48	1	100.00		
24	GREATEST	38	0.48	1	100.00		
25	HOW	38	0.48	1	100.00		

Figure 4: Frequency count of the top 25 frequently appearing words in the first unit of NCERT's Class VI Mathematics textbook

N	Word	Freq.	%	Texts	%	Lem
1	#	20,004	23.23	17	100.00	
2	THE	4,374	5.08	17	100.00	
3	OF	2,991	3.47	17	100.00	
4	A	2,415	2.80	16	94.12	
5	AND	1,671	1.94	17	100.00	
6	IS	1,545	1.79	16	94.12	
7	IN	1,098	1.27	16	94.12	
8	TO	991	1.15	16	94.12	
9	WE	845	0.98	16	94.12	
10	ARE	725	0.84	16	94.12	
11	I	708	0.82	16	94.12	
12	B	699	0.81	16	94.12	
13	THAT	589	0.68	15	88.24	
14	FOR	574	0.67	16	94.12	
15	II	566	0.66	16	94.12	
16	YOU	566	0.66	16	94.12	
17	CM	515	0.60	10	58.82	
18	FIND	494	0.57	16	94.12	
19	TWO	458	0.53	16	94.12	
20	FIG	451	0.52	10	58.82	
21	BY	437	0.51	16	94.12	
22	CAN	435	0.51	16	94.12	
23	NUMBER	427	0.50	15	88.24	
24	THIS	401	0.47	16	94.12	
25	BE	396	0.46	16	94.12	

Figure 5: Frequency count of the top 25 frequently appearing words in NCERT's Class VII Mathematics textbook

N	Word	Freq.	%	Texts	%	mmas	et
1	#	2,086	27.71	1	100.00		
2	A	293	3.89	1	100.00		
3	THE	261	3.47	1	100.00		
4	AND	175	2.32	1	100.00		
5	IS	163	2.16	1	100.00		
6	INTEGERS	158	2.10	1	100.00		
7	OF	154	2.05	1	100.00		
8	B	127	1.69	1	100.00		
9	WE	127	1.69	1	100.00		
10	INTEGER	123	1.63	1	100.00		
11	FOR	113	1.50	1	100.00		
12	IN	85	1.13	1	100.00		
13	NEGATIVE	71	0.94	1	100.00		
14	THAT	71	0.94	1	100.00		
15	C	68	0.90	1	100.00		
16	ARE	52	0.69	1	100.00		
17	I	49	0.65	1	100.00		
18	BY	48	0.64	1	100.00		
19	POSITIVE	44	0.58	1	100.00		
20	ANY	43	0.57	1	100.00		
21	CAN	43	0.57	1	100.00		
22	FOLLOWING	40	0.53	1	100.00		
23	NUMBER	40	0.53	1	100.00		
24	PRODUCT	40	0.53	1	100.00		
25	FIND	37	0.49	1	100.00		

Figure 6: Frequency count of the top 25 frequently appearing words in the first unit of NCERT's Class VII mathematics textbook

Some of the most frequently used words in the mathematics textbooks for Classes V, VI and VII are depicted in Figures 1–6.

Hence, it may be inferred that the most frequently used words are 'function' words and not 'content' words. Function words like 'the', 'a', 'and', 'to', 'for', 'this', 'that', etc., appear more than content words, for example, 'product', 'number', 'find', 'greatest', 'digits', etc. For instance, the word, 'number', appears only twice in the top 25 words in Class VI textbook. However, in the Class VII textbook, fundamental mathematical terms like 'integers', 'positive', 'negative', etc., appear. The function words as indicated in the figures are articles (a, the), prepositions (to, into, for), demonstratives (this, that) and conjunctions (and, but).

So, mathematics textbooks and mathematics teachers have as much responsibility as language teachers in teaching mathematical concepts. It is important for mathematics as a subject to realise the functions through a formulae or theorem. The function words (Figures 1, 2, 3, 4, 5 and 6) serve as placement words (prepositions) — words determining finiteness (determiners) or anonymity ('a' or 'the') and connectives (and, but, if). The most frequent use of the word, 'the', denotes how the subject of mathematics tries to drive home the point of definiteness, i.e., solution to a problem posed or arriving at a point of definite decision (solution) through problematisation.

Use of simple present tense and present time

The textbooks analysed mostly use present simple tense and present time. If a learner is working towards solving a multiplication problem, then one needs to keep oneself updated on how numbers get values as they are added. Another dimension is that it reveals the 'universal' element of mathematics, as in case of mathematical thinking and logical reasoning. This is because universal truths are reported in the present tense and time. There cannot be subjectivity in mathematics.

An example from *Mathematics* textbook for Class VI (NCERT, 2006c; Reprint, 2015) that uses simple present tense is as follows.

> What is the capacity of a bucket to hold water? It is, usually, 20 litres. Capacity is given in litres. But, sometimes, we need a smaller unit, it is millilitres...Note that in all these units, we have some common words like kilo, milli and centi. You should remember kilo is the largest and milli is the smallest (p. 16).

Use of 'can' (can you do mathematics?)

Mathematics is about solving mathematical problems. It involves active thinking and reasoning. There is no scope for 'passivity'. So, words like 'can' and 'find' are frequently used in the Class VI textbook to denote the aspect of 'capacity building' in the doer, in this case, learners. 'Can', as a verb, is found the maximum number of times in the textbook, along with imperative verbs like 'find', 'find out' and 'list'. Given are a few examples from the textbook.

- Can you find the difference in distance from C to D and D to E?
- Find out the time taken by the bus to reach (a) A to B (b) C to D (c) E to G (d) total journey (NCERT, 2006c; Reprint, 2015;p. 17).

Coherence markers[3]

Language is evolutionary in nature. The language used in mathematics textbooks needs to reflect on this aspect so as to enable the learners to understand and solve mathematical problems. The *Mathematics* textbook for Class VI addresses the learners directly, reducing the use of coherence markers. The content is presented in a way that no paragraph is longer than four sentences, except the introduction to each unit. Moreover, most of the sentences used are simple sentences.

Use of simple sentences and inference condition

A few compound and complex sentences have been used in NCERT's *Mathematics* textbook for Class VI. Coordinating conjunctions like 'and' and 'but' are also used to add an item or aspect. The following examples elucidate this point.

- The first, i.e., Fig. 4.11(i) is an open curve and the second, i.e., Fig. 4.11(ii) is a closed curve (p. 93–94).
- Draw five simple curves and five curves that are not simple (complex sentence) (p. 93).

[3]Coherence markers are words and phrases that denote a link between thoughts contained in a sentence(s) and a paragraph(s). These help a reader or listener to tie the sentences in the text together.

Another type of complex sentence frequently used in the textbook is the 'if' clause with 'then'. The following examples may be referred to.

- If each angle is less than 90°, then the triangle is called an acute angled triangle.
- If any one angle is a right angle, then the triangle is called a right angled triangle.
- If any one angle is greater than 90°, then the triangle is called an obtuse angled triangle (p. 130).

The use of 'if' clause enables one to understand the 'state of a condition', i.e., this is what exists or is possible. There are different types of conditional sentences and clauses in English language, viz., real and unreal, generic, habitual, inference, hypothetical and counterfactual conditional. All NCERT mathematics textbooks at the elementary stage use inference conditional clauses extensively. The Class VI *Mathematics* textbook is no exception.

Grammarian Cowan (2008:451) says: "In inference conditionals, the proposition in the result clause is inferred from the proposition in the 'if' clause. That is, inference conditionals say, 'If x, then y follows'. Of course, x may or may not be true, (i.e., as with other conditionals, it may or may not be fulfilled), but if x is true, the speaker says, then so is y, since it can be reasonably inferred from x."

This (the use of 'if' followed by 'then' in the same sentence) reveals the two essential characteristics of mathematics. Firstly, the aspect of problematisation or mathematisation, and secondly, the aspect of mathematicality. 'Mathematicality' refers to mathematical quality and formal accuracy to solve a problem. According to NCERT's *Position Paper on Teaching of Mathematics*, "What are the main goals of mathematics education in schools? Simply stated, there is one main goal — mathematisation of the child's thought processes. In the words of David Wheeler (1982), it is 'more useful to know how to mathematise than to know a lot of mathematics' (emphasis added)" (NCERT, 2006a:1).

Rubrics

The *Mathematics* textbook, like other textbooks, tries to interact with the learners through rubrics[4], which introduces a unit, provides additional information, and directs the information in exercises and student activities. Rubrics directly address the learners in the following ways.

- Can you recall a polygon with the least number of sides?
- Do you see that each one of them is greater than one–fourth of a revolution but less than half a revolution?
- What have we discussed?
- Think, discuss and write.

Imperatives

Instructive or imperative verbs like 'find', 'list', 'look', 'draw', 'choose' and 'identify' are found in all units and

[4]Rubric is a scoring tool that explicitly describes the instructor's performance expectations for an assignment or a piece of work.

all pages of the textbook for Class VI. This shows how mathematics actually helps the learners reach a solution or solve a problem logically. Given below are a few examples.

- Find ten situations where the angles made are acute.
- List five other situations where reflect angles may be seen.
- Look around and identify edges meeting at corners to produce angles. List ten such situations.
- Draw two perpendicular lines, one vertical and one horizontal.
- Choose a suitable scale along the vertical line.
- Find the LCM of the following numbers, in which one number is the factor of the other.
- Identify the measure of the fold which would be 90°+45° =135°

Personal pronouns

Pronouns like 'you' and 'we' are more frequently used than others. Some of the examples are as follows.

- Do you find a shortcut to multiply a number by number of the form 9,99,999...?
- Does this pattern help you add or subtract numbers of the form 9,99,999...?

As the book addresses the learners directly, it uses pronouns — 'you' and 'we'. Such language usage will enable the learners gain confidence.

Concord (collocations)

It refers to how a key word collocates, i.e., gets along with other words or phrases. Some of the examples are as follows.

- Articles — 'a' and 'the'
- Personal pronouns — 'you' and 'we'
- Present tense and time verb — 'be', 'is' and 'are'
- Content words — 'number' and 'numbers'

Collocation of 'a' and 'the'

Figures 7 and 8 present how the articles — 'a' and 'the' — collocate with other words. An analysis of the figures reveals that both 'a' and 'the' appear before content words. Supposition in the use of 'a' and definiteness in the use of 'the' is noticeable. This makes mathematicality, i.e., mathematical accuracy clearer to the learners.

Collocation of 'be', 'is' and 'are'

Usage of basic verb forms signifies the use of simple present tense and present time.

The language of mathematics is neutral, unambiguous and devoid of emotion. Also, there is no past and future in mathematics, only 'present'. To establish the 'is' of mathematics requires a lot of conditions (we can notice the use of 'if'...'then' in many definitions or formulae), which explain the reasons, effects and inferences. This becomes more difficult when abstract ideas are conveyed. Figures 9 and 10 show this phenomenon of 'neutral present'. The verb 'be' is used to state a fact of being, a condition or an expectation of some happening (say, change in the angle, multiplication, etc.). Modals like 'can', 'would', 'should'

and 'could' also appear before 'be' to ascertain the outcome. 'Be' is used as the main verb to caution the learners. So, it says, 'be careful'. The verbs — 'is' and its plural form 'are' — go along with the word 'perpendicular'. 'Is' is followed by words like 'observed', 'graduated', 'equal', and so on, while 'are' is followed by the main verb in passive voice like 'are given'.

N	Concordance	et	ag	Word #	Sent. #	nt. Pos	. #	Pos.	. #
1	etryGeometry We see a number of shapes with which we are			13	0	62%	0	0%	
2	has 8 bananas. Sunita has to go for a picnic with her friends. She wants to			28	1	64%	0	1%	
3	wants to arrange them in rows in such a way that each row has the same			45	1	52%	0	1%	
4	In our daily life, many a times we compare two quantities of the			35	0	80%	0	1%	
5	which we are familiar. We also make a lot of pictures. These pictures include			25	1	63%	0	1%	
6	sIdeas Geometry has a long and rich history. The term			32	0	89%	0	1%	
7	y Symmetry is quite a common term used in day to day life.			21	0	72%	0	1%	
8	Similarly, you must have also seen a cricket score board. Two score boards			47	1	73%	0	1%	
9	and seen so many line segments.A triangle is made of three, a			82	6	8%	0	1%	
10	(Fig. 10.1). You can make them with a wire or a string. If you start from the			62	4	67%	0	1%	
11	segments.A triangle is made of three, a quadrilateral of four line segments. A			88	6	58%	0	1%	
12	You can make them with a wire or a string. If you start from the point S in			65	4	92%	0	2%	
13	for development of Mathematics and as a result Mathematics grew further and			122	7	73%	0	2%	
14	overs Runs given Wickets taken A 10 2 40 3 B 10 1 30 2 C 10 2 20 1 D			70	2	42%	0	2%	
15	a quadrilateral of four line segments. A line segment is a fixed portion of a			94	7	18%	0	2%	
16	We know that the dot represents a decimal point. In this chapter, we will			74	6	80%	0	2%	
17	allow us to write rules and formulas in a general way. By using letters, we can			131	9	88%	0	2%	
18	of four line segments. A line segment is a fixed portion of a line. This makes it			98	7	55%	0	2%	
19	A line segment is a fixed portion of a line. This makes it possible to measure			102	7	91%	0	2%	
20	can talk about any number and not just a particular number. Secondly, letters			146	10	88%	0	2%	
21	line. This makes it possible to measure a line segment. This measure of each			110	8	80%	0	2%	
22	left was with all the 6 marbles in a row. Number of rows = 1 Total number			164	3	94%	0	2%	
23	This measure of each line segment is a unique number called its "length". We			120	9	64%	0	2%	
24	reach the point S. You have made a complete round of the MATHEMATICS			93	6	26%	0	2%	
25	to compare the lengths of an ant and a grasshopper, taking the difference			136	6	59%	0	2%	

Figure 7: The article, 'a', in collocation with other words

N	Concordance	et	ag	ord #	Sent. #	t. Pos	ra. #	a. Pos	. #	s
1	corner coincides with P. Step 5 Hold the set-square firmly in this position.			1,517	115	50%	0	41%		
2	firmly in this position. Draw PQ along the edge of the set-square. PQ is			1,526	116	56%	0	41%		
3	Step 4 Slide the set-square along the edge of ruler until its right angled			1,502	114	45%	0	41%		
4	right angled corner is in contact with the ruler. NCERTnot Step 4 Slide the			1,493	113	97%	0	41%		
5	with the ruler. NCERTnot Step 4 Slide the set-square along the edge of ruler			1,499	114	30%	0	41%		
6	position. Draw PQ along the edge of the set-square. PQ is perpendicular to l.			1,529	116	89%	0	42%		
7	use another set-square in the place of the 'ruler'? Think about it. Method of			1,563	120	92%	0	42%		
8	Method of ruler and compasses As is the preferred practice in Geometry, the			1,575	122	24%	0	43%		
9	at P. Can we use another set-square in the place of the 'ruler'? Think about it.			1,560	120	67%	0	42%		
10	is perpendicular to l. (How do you use the . symbol to say this?). Verify this by			1,540	118	55%	0	42%		
11	to say this?). Verify this by measuring the angle at P. Can we use another			1,550	119	67%	0	42%		
12	aligned edge of the ruler such that the right angled corner is in contact with			1,485	113	73%	0	40%		
13	us mark a point P anywhere on l. Fold the sheet such that l is reflected on itself;			1,366	104	13%	0	37%		
14	such that l is reflected on itself; adjust the fold so that the crease passes			1,376	104	54%	0	37%		
15	such that the lines on both sides of the fold overlap each other. Tracing			1,326	100	80%	0	36%		
16	to l through P. We can simply fold the paper such that the lines on both			1,316	100	30%	0	36%		
17	We can simply fold the paper such that the lines on both sides of the fold overlap			1,320	100	50%	0	36%		
18	on itself; adjust the fold so that the crease passes through the marked			1,380	104	71%	0	38%		
19	set-square with one of its edges along the already aligned edge of the ruler			1,476	113	45%	0	40%		
20	along the already aligned edge of the ruler such that the right angled			1,481	113	61%	0	40%		
21	a point P are given. Note that P is on the line l. Step 2 Place a ruler with one			1,445	110	78%	0	39%		
22	fold so that the crease passes through the marked point P. Open out; the			1,384	104	88%	0	38%		
23	through the marked point P. Open out; the crease is perpendicular to l. Think,			1,390	105	44%	0	38%		
24	ruler fixed. Slide the set-square along the ruler till the point P touches the other			1,854	139	33%	0	50%		
25	Slide the set-square along the ruler till the point P touches the other arm of the			1,857	139	50%	0	50%		

Figure 8: The article, 'the', in collocation with other words

N	Concordance	ef	ag	Word #	Sent. #	ent. Pos	#	ara. Pos	#	s
1	7. Repeat Question 6, if AB happens to be a diameter. 8. Draw a circle of radius			2,573	209	83%	0	70%		
2	if we take the length of radius to be smaller than half the length of AB?			2,681	220	77%	0	73%		
3	circle. The radius of your circle should be more than half the length of AB . Step			2,308	183	53%	0	63%		
4	Step 1 Let l be the given line and P be a point outside l. Step 2 Place a			1,803	135	84%	0	49%		
5	Do This Fold a sheet of paper. Let AB be the fold. Place an ink-dot X, as			2,075	157	67%	0	56%		
6	a 15° angle? Therefore, it can be constructed as follows : Step 1 Draw			3,267	287	23%	0	89%		
7	the following constructions can be made: (i) A circle, when the length of			3,576	313	19%	0	97%		
8	as B and C. BC? half the length be smaller than take radius to happen if			3,032	266	17%	0	82%		
9	the rays OA and OB coincide. Let OC be the crease of paper which is			2,952	251	27%	0	80%		
10	and compasses Let an angle, say, .A be given. Step 1 WithA as centre and			2,999	261	67%	0	82%		
11	(An optional activity) Step 1 Let l be the given line and P be a point			1,797	135	60%	0	49%		
12	in the exterior of the circle. 5. Let A, B be the centres of two circles of equal			530	42	21%	0	14%		
13	and compasses A better method would be to use compasses to construct a line			702	54	48%	0	19%		
14	compasses slowly to draw the circle. Be careful to complete the movement			392	32	18%	0	11%		
15	and compasses, only to draw arcs. Be careful while doing these			208	18	29%	0	6%		
16	we want the centre of the circle to be. Name it as O. Step 3 Place the			367	28	100%	0	10%		
17	paper or any transparent paper could be better for this activity. Let us take			1,338	101	69%	0	36%		
18	the dropping of a perpendicular can be achieved through the			1,586	122	53%	0	43%		
19	lines (or rays or segments) are said to be perpendicular if they intersect such			1,177	89	53%	0	32%		
20	CD . A second approach would be to use a transparent sheet and trace			995	73	30%	0	27%		
21	results. A better approach would be to use ruler and compasses for			1,023	75	40%	0	28%		
22	If you move towards image appear to be? where does your front of a mirror, If			1,559	125	100%	0	67%		
23	of the complete figure that would be seen when the design is cut off. 13.5			1,488	121	68%	0	64%		
24	that his walking distance AP + BP will be least? You can use reflectional			1,969	153	94%	0	84%		
25	A figure hasline symmetry if a line can be drawn dividing the figure into two			2,216	177	58%	0	95%		

Figure 9: Collocation of the verb, 'be'

N	Concordance	ef	ag	Word #	ent. #	Pos	ra. #	Pos	#	s
1	on l. Fold the sheet such that l is reflected on itself, adjust the fold so			1,371	104	33%	0	37%		
2	marked point P. Open out, the crease is perpendicular to l. Think, discuss and			1,392	105	67%	0	38%		
3	and write How would you check if it is perpendicular? Note that it passes			1,406	106	92%	0	38%		
4	sheet and a point P lying on the line. It is easy to have a perpendicular to l			1,302	99	25%	0	35%		
5	of AB . Step 1 Given AB whose length is not known. A B 278 PRACTICAL			1,045	77	80%	0	28%		
6	that cuts l at a point, say, D. Now CD is a copy of AB . EXERCISE 14.3 1.			1,115	84	50%	0	30%		
7	PQ such that the length of PQ is twice that of AB . 14.4 Perpendiculars			1,158	88	85%	0	31%		
8	l and a point P are given. Note that P is on the line l. Step 2 Place a ruler with			1,443	110	56%	0	39%		
9	each other. Open out. The crease is perpendicular to l and passes through			1,776	134	36%	0	48%		
10	and accurate method, of course, is the ruler-compasses method. Step 1			1,899	141	83%	0	52%		
11	suur Step 4 Join PQ. Thus, PQ is perpendicular to l. EXERCISE 14.4 1.			1,972	146	57%	0	54%		
12	suur Step 4 Join PQ. Then PQ is perpendicular to l. suur We write PQ .			1,662	126	31%	0	45%		
13	ruler such that the right angled corner is in contact with the ruler. NCERTnot			1,489	113	85%	0	40%		
14	along the edge of the set-square. PQ is perpendicular to l. (How do you use			1,532	117	50%	0	42%		
15	it. Method of ruler and compasses As is the preferred practice in Geometry,			1,574	122	21%	0	43%		
16	is the figure obtained? What figure is obtained if the diameters are			473	39	31%	0	13%		
17	mark points A, B and C such that (a) A is on the circle. (b) B is in the interior of			504	41	45%	0	14%		
18	C such that (a) A is on the circle. (b) B is in the interior of the circle. (c) C is in			510	41	61%	0	14%		
19	join the ends of these diameters, what is the figure obtained? What figure is			467	38	79%	0	13%		
20	the ruler in your instruments box is graduated into centimetres along one			130	12	39%	0	4%		
21	here. Every point on its boundary is at an equal distance from its centre.			278	21	50%	0	8%		
22	Construction of a circle when its radius is known Suppose we want to draw a			313	24	45%	0	9%		
23	B is in the interior of the circle. (c) C is in the exterior of the circle. 5. Let A, B			519	41	84%	0	14%		
24	to draw a line segment whose length is equal to that of a given line segment			946	71	70%	0	26%		
25	AB . A quick and natural approach is to use your ruler (which is marked			961	72	19%	0	26%		

Figure 10: Collocation of the verb ,'is'

Collocation of personal pronouns 'I' and 'we'

Personal pronouns like 'you' and 'we' have frequently been used in the Class VI *Mathematics* textbook. Figures 11 and 12 depict that 'you' is preceded by modal verbs, 'can' and 'will', and conditional 'if' to prompt or trigger thinking in the learners or to pose a condition for inferring a solution. The modals 'can' and 'will' are used to denote capability and prediction (the learners would do), respectively. 'You' is followed by action verbs like 'construct, 'list', 'find', 'do', 'join', 'check', and so on. This makes a learner connect with the problem. The use of the pronoun, 'we', makes the students feel that they have someone to depend on. This 'someone' may be the textbook, the teacher, the parent, or anyone working with the learners in solving the problem. The use of personal pronouns ensures the feeling of 'being with the learner', which is important for a teacher. The use of personal pronouns in the book, thus, makes it 'interactive' and 'participatory' in nature.

Conclusion

Recognising that all teachers are language teachers would, thus, enable material developers become language sensitive. Hence, the perspective of Language Across Curriculum (LAC) is evident. Teacher education courses, which address the issue of LAC

N	Concordance	eTag	Word #	ent. #	t. Pos	#	Pos	#	s.
1	l. Think, discuss and write How would you check if it is perpendicular? Note		1,402	106	62%	0	38%		
2	PQ is perpendicular to l. (How do you use the . symbol to say this?)		1,538	118	36%	0	42%		
3	Do This NCERTnot Where else do you see perpendicular lines around		1,226	92	62%	0	33%		
4	do you see perpendicular lines around you? Take a piece of paper. Fold it		1,231	92	100%	0	33%		
5	If M is the mid point of XY , what can you say about the lengths MX and XY?		2,496	201	73%	0	68%		
6	measure is 120°. NCERTnot How will you construct a 150° angle?		3,374	293	56%	0	92%		
7	This is the required 90° angle. How will you construct a 45° angle? EXERCISE		3,406	296	50%	0	93%		
8	initial point, draw two rays OA and OB . You got AOB . Fold the sheet through O		2,935	248	67%	0	80%		
9	but twice of an angle of 60°. How will you construct a 15° angle? Therefore, it		3,259	286	50%	0	89%		
10	twice that of AB . 14.4 Perpendiculars You know that two lines (or rays or		1,165	89	13%	0	32%		
11	Here are some tips to help you. (a) Draw thin lines and mark points		220	19	16%	0	6%		
12	an equal distance from its centre. Can you mention a few such objects and		287	22	27%	0	8%		
13	in earlier chapters as well. Why don't you list those shapes that you know		49	4	27%	0	1%		
14	Why don't you list those shapes that you know about alongwith how they		54	4	60%	0	1%		
15	and write How many circles can you draw with a given centre O and a		410	33	48%	0	11%		
16	copy of a given line segment Suppose you want to draw a line segment whose		937	71	40%	0	25%		
17	some line segment AB , whose length you do not know, construct PQ such that		1,146	88	41%	0	31%		
18	a circle and any two of its diameters. If you join the ends of these diameters,		459	38	21%	0	12%		
19	perpendicular to each other? How do you check your answer? 4. Draw any		485	40	57%	0	13%		
20	the reflection of the English letter M. You can imagine that the mirror is		1,525	124	8%	0	65%		
21	of symmetry. (Hint : It will be helpful if you first draw the lines of symmetry and		1,388	116	45%	0	59%		
22	where does your front of a mirror, If you are 100 cm in Do This NCERTnot		1,568	126	32%	0	67%		
23	image move? the mirror, how does If you move towards image appear to be?		1,553	125	54%	0	66%		
24	pattern known as Koch's Snowflake. (If you have access to a computer, browse		1,157	100	17%	0	49%		
25	everywhere! . Many road signs you see everyday have lines of		1,065	88	50%	0	45%		

Figure 11: Collocation of the personal pronoun, 'I'

N	Concordance	eTag	Word #	ent. #	Sent. Pos.	ra. #	. Pos. #
1	to measure its length with a ruler. If we know the length of a line segment, it		600	47	16%	0	16%
2	it by a diagram. Let us see how we do this. 14.3.1 Construction of a line		621	48	75%	0	17%
3	want to draw a circle of radius 3 cm. We need to use our compasses. Here		326	25	29%	0	9%
4	Mark a point with a sharp pencil where we want the centre of the circle to be.		359	28	60%	0	10%
5	line segment of a given length Suppose we want to draw a line segment of length		635	49	57%	0	17%
6	at the measuring device. Otherwise we will get an incorrect value. Use of		687	53	38%	0	19%
7	to have a perpendicular to l through P. We can simply fold the paper such that		1,312	100	10%	0	36%
8	draw a line segment of length 4.7 cm. We can use our ruler and mark two		646	50	11%	0	18%
9	AB . While marking the points A and B, we should look straight down at the		677	52	53%	0	18%
10	of shapes with which we are familiar. We also make a lot of pictures. These		22	1	25%	0	1%
11	pictures include different shapes. We have learnt about some of these		34	3	14%	0	1%
12	tryGeometryGeometry We see a number of shapes with which		11	0	52%	0	0%
13	see a number of shapes with which we are familiar. We also make a lot of		19	0	90%	0	1%
14	how they appear? In this chapter we shall learn to make these shapes. In		64	5	45%	0	2%
15	89101112139876543 21 We are going to consider "Ruler and		187	17	23%	0	5%
16	when its radius is known Suppose we want to draw a circle of radius 3 cm.		316	24	59%	0	9%
17	these shapes. In making these shapes we need to use some tools. We shall		75	6	55%	0	2%
18	shapes we need to use some tools. We shall begin with listing these tools,		81	7	12%	0	2%
19	this by measuring the angle at P. Can we use another set-square in the place		1,555	120	25%	0	42%
20	measure we do not know) is given and we want to make a copy of this angle.		2,765	227	75%	0	75%
21	to make a copy of this angle. As usual, we will have to use only a straight edge		2,776	228	27%	0	75%
22	and compasses, what would happen if we take the length of radius to be smaller		2,674	220	55%	0	73%
23	Suppose an angle (whose measure we do not know) is given and we want to		2,758	227	53%	0	75%
24	be smaller than take radius to happen if we wouldwhat In Step 2 above,		3,040	266	43%	0	83%
25	its supplementary angle. What have we discussed ? This chapter deals with		3,530	310	80%	0	96%

Figure 12: Collocation of the personal pronoun, 'we'

through concepts, need to intertwine language and mathematics.

The corpus based analysis of the language of mathematics textbooks reveals the importance of the use of functional aspect of language in mathematics. In the textbooks analysed, the most frequently used words are not content words but function words. According to Jamison (2000), "Once students understand HOW things are said, they can better understand WHAT is being said, and only then do they have a chance to know WHY it is said." Jamison is talking about how, what and why because these are not only related to the concepts of mathematics but language as well.

It is found that the textbooks mostly use simple sentences with only one verb. Further, some sentences using the construction—'if' and 'then'—are also found in mathematical problems. Moreover, the usage of present indefinite or present time in the textbooks indicates that mathematics is 'universal', i.e., neutral present, in nature.

The textbooks are interactive and address the learners directly, which is evident from the usage of personal pronouns 'you' and 'we'.

Therefore, it may be concluded that NCERT mathematics textbooks for Classes V, VI and VII are presented in a language appropriate to the age groups of the learners.

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2

Ethnomathematics Approach — A Culture based Pedagogy

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Abstract

Ethnomathematics refers to the relationship between mathematics and culture. Different cultural and ethnic groups have their specific ways at practical mathematics. People, belonging to these groups, unconsciously apply varied mathematical skills in their daily lives without realising their importance. The Position Paper of the National Focus Group on Teaching of Mathematics published by the National Council of Educational Research and Training (NCERT), New Delhi, states that in Indian villages, it is common that people, who do not attend formal school, apply different mathematical practices or modes (mental maths) in their day-to-day lives. These mathematical practices at the local level may be treated as indigenous, oral (Vedic), hidden (frozen) and folk in nature. This paper provides a conceptual framework of 'ethnomathematics'. It discusses how ethnomathematics, as a sub-field of mathematics education, deals with cultural diversity. It underlines the relevance of ethnomathematics as an approach of teaching–learning of mathematics through traditional activities performed by people, belonging to the Kumhar community (who traditionally practise pottery).

Introduction

The word 'ethnomathematics' was coined by Ubiratan D'Ambrosio, a Brazilian educator and mathematician, in the year 1977, after launching his ethnomathematical programme as a methodology to track and analyse the processes of generation, transmission, diffusion and institutionalisation of mathematical knowledge in diverse cultural systems or groups (D'Ambrosio, 1990). In contrast to 'academic mathematics', i.e.,

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the mathematics that is taught, practised and learned in schools and universities, D'Ambrosio explained ethnomathematics as "mathematics which is practiced among identifiable cultural groups, such as national–tribal societies, labor groups, children of a certain age bracket, professional classes, and so on" (D'Ambrosio, 1985). He added that a number of children fail in mathematics due to "the mechanism of schooling that replaces these practices by other equivalent practices, which have acquired the status of mathematics, which have been expropriated in their original forms and returned in a codified version".

Every classroom is characterised by gender, social, cultural, ethnic and linguistic diversity. Researchers point out that general, as well as, mathematics teachers have to deal with the existing cultural diversity as mathematics is defined as a human and cultural knowledge. Ethnomathematics has, thus, become a common practice globally. Dealing with cultural diversity in classrooms is universal.

India is a country with a rich sociocultural diversity, and hence, mathematical practices. Indian ethnic groups comprise *Kumhars*, *Dharikars* (who traditionally make craft items with ropes and bamboos), carpenters (who traditionally make furniture), etc. In this paper, the researchers elaborate on the traditional activities practised by *Kumhars* and point out the relevance of ethnomathematics as an approach of teaching and learning of mathematics.

Etymology of Ethnomathematics

The word 'ethnomathematics' is composed of two Greek words — *ethno*, meaning 'race' or 'culture', and *manthanein*, meaning 'mathematics', which implies knowledge, study, learning, science and arts.

All humans study to learn, develop their own techniques and sort knowledge so as to improve their applicability in order to survive. This, etymologically, manifests that mathematics is universal in nature. However, the word, *ethnos*, which may be construed as 'belonging to a particular social or ethnic group', has a meaning of changeability or relativity, meaning it cannot be interpreted as universal like mathematics. So, 'ethnomathematics' refers to mathematics related with diverse social groups. This seems to be an oxymoron as it is contradictory to use *ethno* along with mathematics etymologically. But this is only an etymological description. Practically, the word, *ethno*, refers to a specific working process to solve a problem and 'mathematics' is the logic applied to arrive at the solution.

'Mathematics education' refers to the teaching and learning of mathematics. 'Vedic mathematics' is the mathematics based on the 16 selected formulas given in the *Vedas* (Agrawal, 2013). 'Hidden mathematics' may be defined in

the words of Gerdes (2000) as, "Although, probably, the majority of mathematical knowledge of the formerly colonized peoples has been lost, one may try to reconstruct or 'unfreeze' the mathematical thinking that is 'hidden' or 'frozen' in old techniques, like that of basket making". 'Folk mathematics' (although often not recognised as such) develops in the working activity of each of the peoples and may serve as a starting point in the teaching of mathematics (Mellin-Olsen, 1986).

Relevance of Ethnomathematics as a Teaching Approach

Many people unconsciously apply mathematical skills in their daily life without realising their importance. There is a probability that such skills, if merged with school education, could advance the teaching and learning of mathematics. The main reason behind teaching mathematics in schools is to sharpen children's acumen as regards to real-life practices, such as counting, ordering, sorting, measuring, weighing, etc., (Ascher, 1991). Therefore, the skills of those applying mathematics in their cultures, without receiving formal training, may contribute towards the better performance of learners in classrooms.

The *Position Paper of the National Focus Group on Teaching of Mathematics* (NCERT, 2006) also advocates the multicultural and ethnomathematical aspects of learning mathematics with the help of few examples. In South India, one may spot *kolams* (complex designs drawn on the floor using a white powder, somewhat similar to North India's *rangoli*, which is made in different colours) at the entrance of houses. The designs, patterns and symmetries used in *kolams* are some of the points that mathematics education in schools may address. Similarly, art and architecture, and music offer intricate examples that may help children appreciate the cultural grounding of mathematics.

Also, the *National Curriculum Framework* (NCF)–2005 advocates the need for developing the ability of mathematisation in children. The *Position Paper of the National Focus Group on Teaching of Mathematics* (NCERT, 2006) indicates many problems as regards to the teaching–learning of mathematics, i.e., students' fear of failure, phobia, boring classroom setting, monotonous curriculum, conventional ways of teaching mathematics, etc., and provides several recommendations to solve these. One of the recommendations is to enable the children learn about the relevance of mathematics in real life. The Position Paper, further, states that in Indian villages, it is commonly observed that people, who are not formally educated, use many modes of mental mathematics. It may be called 'folk algorithms'.

It, therefore, shows that this culture based approach is relevant and must be used in the classrooms as 'ethnomathematical' approach of teaching.

Researchers point out that ethnomathematics creates a specific teaching environment for teachers and a special learning environment for students. So, they fail the applicability and practicality of mathematics in concrete situations. It amplifies the knowledge of the content being studied and helps the students, as well as, teachers to understand, explain and reflect upon their own thinking processes and reality.

As a culture based pedagogy

The structure and curricula of mathematics in schools do not often recognise the students' pre-school knowledge of mathematics. Moreover, they do not mention much about the history, formation, origin or culture of mathematics. They, in turn, are directed towards solving the problems by applying certain techniques and giving examples. As a result, many students fail to draw connections between academic mathematics and the real world. They view mathematics as something taught and practised only in the classrooms, schools and as home assignments.

However, if a teacher uses ethnomathematics and its principles in a classroom, the scenario will change. Unodiaku (2013), who conducted studies in a Nigerian region, found that the mean achievement scores of the students taught with ethnomathematics teaching materials were significantly higher than those taught only with conventional approach.

Ethnomathematics practised by *Kumhars*

On the basis of these pedagogies, the researchers tried to study the traditional activities practised by the *Kumhar* community and figure out the relevance of ethnomathematics as an approach to teaching and learning of mathematics.

It was observed that the *Kumhars* used a number of mathematical concepts to carry out their traditional work, i.e., pottery making. Some of them as observed and analysed by the researchers through interview and observation techniques are presented in Tables 1, 2 and 3.

Table 1: Observations on ethnomathematics as practised by *Kumhars*

Tools	Concepts	Elaboration	Activities and demonstration	Framing mathematical word problems
• *Fawda* (spade) • *Khanchi* (bucket or basket) • *Mungri* (mallet) • *Patiya* (slab) • *Pitan* (pestle) • *Chaak* (wheel)	• Angle • Supplementary angle • Circle • Rectangle • Cylinder • Disc • Hemisphere • 0° to 360° angle • One figure — two shapes • Perpendicular	• Inclination of two lines • Concept of supplementary angle • Explanation of the concept of rectangle, height, base and area • Circular disc and angle formed on it by rotating the *chaak* • How many mathematical shapes are embedded in a figure (explanation of its structure)? • Meaning of perpendicular on a plane	• Angle between the base and height of the tools used • Supplementary angle with the rotation of *fawda* or any other angle • Concept of area by spreading soil on the slab • Comparing the shape of the tools used with identical mathematical shapes • Angle formed on a circular disc by rotating the *chaak*, and making circle on the *chaak*	• What is an angle? • If 'angle' is symbolised as A=60, then supplementary angle will be ____? • Find area= l×b, for the given length and breadth. • Make different type of shapes and identify mathematical shapes formed in them, if any. • Find acute, obtuse and other type of angles (formed on a circular plane, i.e., *chaak*).

Table 2: Commonly practised ethnomathematical activities

Activities	Concepts	Elaboration	Demonstration	Mathematical problems
• Preparing the soil for kneading • Making pots • Cutting pots using a *chaak* • Making colour paste • Carving	• Examples of commutative or associative laws • Ratio or fraction (proper, improper and mixed) • Logic used • Truncation of conic section • Counting (forward and reverse) • Reversibility • Symmetry • First in last out	• Mixing soil and water, and colour making (natural number with different operations) • Explanation of A+B = B+A, and A+ (B+C) = (A+B)+C, etc. • Knowledge of the amount of water to be mixed with soil; making pots out of a given lump and fractional representation of it (1/10, 1/40, etc.); explanation of the procedure of conic section • How to make the frustum of a cone? • Arrangement, reversibility, counting and dislocating the things	• Making clay lumps (video presentation of the procedure, for example, number and type of *kulhad* pots made out of a lump) • Cutting or frustum of conic activity • Colouring • Arrangement of smaller pots in larger pots (putting *kulhad* and *deepak* in a *matki*)	• Problems on commutative and associative laws • Problems on rational fractions • Problems on circumference using paint • Arrangement of the things`
Outcome (pots) • *Kulhad* (tea cup) • *Gamla* (flower pot) • *Matki* (pot for water) • *Deepak* (clay lamp) • *Naad* (trough)	• Examples of three-dimensional shapes like cone, frustum cone, sphere, etc.	• Explanation of three-dimensional shapes (edge, vertex, side, face, circumference, volume, etc.)	• Videographical presentation of the pot making procedure as practised by the *Kumhars*	• Identification of the problem of side, face, vertex, surface area and volume

	Measures of different mathematical shapes and volume (relationship between the volumes of a cone and cylinder)	• How to construct the frustum of a cone? • How to measure height, latent height, radius, diameter, etc.? • Practical meaning of larger and smaller volume (for different things)	• Activities for the identification of different concepts of three-dimensional shapes (edge, vertex, side, face, volume and circumference) • Measurement of height, latent height, radius, diameter, etc. • Activity for water containing efficiency of the pots, i.e., volume	

Table 3: Marketing activities practised by *Kumhars*

Inventory control	Concepts	Elaboration	Activities	Mathematical problems
• Taking orders • Deciding or estimating the price • Calculating the rate (profit or loss)	• Examples of order taking • Strategy, price decision, and profit or loss • Examples of preserving techniques of the pots — unitary method	**Taking the order** • Logic used to decide the rate of the pots • Profit or loss calculation • Controlling inventory (future planning, business purpose) • Using the unitary method of calculation to fix the rate of each pottery item	• Works like taking the order, preparing pots, delivering and price calculation may be performed in class based on the activities practised by *Kumhar*s.	• Problem of business planning • Problem of deciding the price, profit or loss calculation, etc. • Problems based on unitary method

Tables 1, 2 and 3, thus, present a description of the tools used and the activities performed by *Kumhars*. They also show the mathematical concepts embedded in their traditional activities.

Traditional Activities and Working Procedures

The researchers have used terms like kneading of the soil, making paste and carving to give a glimpse of the working patterns of the *Kumhars*.

Figure 1 shows kneading of the soil to make a paste for making pottery items. Kneading involves using soil and water in appropriate proportions. Kneading of the soil is, generally, done by children or women members of a family. But only an experienced person adds water to it. Different families knead the soil differently. However, one thing commonly observed is if a *Kumhar* needs to prepare one *khanchi* (bucket) of clay, one would add approximately one–fourth water to one bucket soil. This means that the ratio between soil and water is maintained at 4:1.

It has also been observed that *Kumhars* have an inherent knowledge about ratio. But they are not aware of the mathematical concept.

The respondents shared they would add more soil, if there was excess water, or more water, in case there was more soil, so that the outcome remains unchanged. This shows they practise 'commutative law' (for a defined operation).

After making and baking the pots, the *Kumhars* prepare colours for painting them. They, generally, prepare a colour paste using soil, water and bark of catechu (*kathha* or *khair*). The bark of catechu is first boiled, and then, filtered. The filtered liquid is used for making the colour. Therefore, only three things are mixed (soil, water and *khair*) for colouring.

However, a *Kumhar* family, having a bigger pottery business, prepares

Figure 1: Kneading of the soil for making pottery items

Figure 2: Kumhars, generally, use brown for painting a pot and white (lime or chuna) over the carving.

colours differently. For preparing colour for 500 *matkis* of two–litre capacity, one would, usually, mix 100 gm *khair*, 50 gm caustic soda, 250 gm mango tree bark powder with 2 kg soil.

The researchers found that the practices in both the cases were based on commutative and associative laws, for example, soil + (water + *khair*) =(Soil + water) + *khair*.

It was found that the *Kumhars*, generally, used brown for painting and white (lime or *chuna*) over the carvings (Figure 2). The intensity or saturation of the colour depends on the amount of *khair* and water added to the mixture. *Kumhars* draw indigenous designs and patterns on the pots. Most of the designs are simple and circular. The line at the bottom of a *matki* is circular; in the middle, it is curvy; and on top, it is again similar and parallel to the bottom.

Further, on top of the *matki*, the design may look like a peacock feather. If a line is drawn through the mid of the *chaak* (potter's wheel), it is observed that the structure is divided into two symmetrical parts. Figure 3 brings out the concept of symmetry as in the shape of the *chaak*.

Figure 3: Chaak (potter's wheel)

Classroom Practice and Observations

The researchers demonstrated these procedures in Class VI to impart three basic concepts of mathematics — commutative and associative laws, and symmetry. The researchers used group, pre– and post–test designs, i.e., pre–experimental design (o1-x-o2) on a group of 36 students of a local government school in Varanasi, Uttar Pradesh. For the pre–test, an achievement test with 10 items based on the concept of commutative and associative laws, and symmetry was used. The mean score of the students in the pre–test was 5.88 with the Standard Deviation (SD) recorded at 1.96. After that, classroom practice sessions based on the ethnomathematics approach that the *Kumhars* adopted was held for six days. At last, the post–test observations were recorded. The post–test mean was 8.47 and SD 1.29. The mean difference was calculated through t–test and the calculated t–value (6.57) was found significant at 0.05 level of significance. The researchers also found that the mean achievement score of the students significantly increased after using the ethnomathematics approach. So, it may be recommended that teachers can also use the ethnomathematics approach for teaching and learning

of mathematics rather than only following the conventional way of teaching the subject.

Conclusion

From the cultural practices as adopted by the *Kumhar* community for the teaching–learning of mathematics, it may be concluded that there are many other ethnic groups, whose traditional practices may prove useful in the teaching of mathematics and other subjects. However, there is a need to modify the traditional activities as practised by different ethnic groups so that they may be used in the teaching–learning process in classrooms. Researches relevant to the area need to be conducted. Moreover, the identity and dignity of students coming from diverse ethnic backgrounds should be endorsed in classrooms, making it truly inclusive.

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3

Status of Developmental Readiness of Rural and Urban School Children

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Abstract

This study aims to assess the status of developmental readiness of 200 students (100 boys and 100 girls) enrolled in Class I of private schools in rural and urban areas of Ludhiana district in Punjab. It also tries to find out locale difference in the developmental readiness of the students. The sample was selected through the random sampling method and the data were collected using self-structured developmental readiness checklist. Locale differences revealed that rural boys and girls showed significantly better socio-emotional skills and overall readiness than those living in urban areas.

Introduction

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), "Early childhood, defined as the period from birth to eight years old, is a time of remarkable growth with brain development at its peak. During this stage, children are highly influenced by the environment and the people that surround them."

Therefore, early childhood years lay the foundation of an individual's life. Early experiences, relationships and emotional support provided to a child influence the development of one's brain by creating and reinforcing neural connections that help in the development of motor and cognitive skills, and socio-emotional well-being. The transition from informal learning environment to formal school signifies a major step in early childhood years (Chan, 2012).

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Smooth transition and successful entry to formal school environment require the school readiness of children.

School Readiness

This indicates a learner's readiness to enter the formal education environment. It involves developmental readiness of the child, apart from academic readiness. Hence, it has a long-term effect on the child's academic performance and achievement. However, there is no single indicator to measure school readiness in young children.

Physical well-being, cognitive, motor and socio-emotional skills are essential domains for developmental readiness. They have a positive effect on the performance of young children in the formal school set-up. Also, quality early learning experiences are important to acquire the required level of developmental readiness in school (Zyl, 2011).

'Physical readiness' is an important parameter of the child's school readiness. It involves physical well-being and motor development. Motor skills cover two aspects — gross and fine motor skills. Gross motor skills refer to the involvement of larger body muscles (like torso, legs and arms) in performing physical activities like running, swimming, etc. Fine motor skills involve smaller muscle movements, for example, movement of the wrist. Sherry and Draper (2012) stated that lack of motor skills in children cause poor academic outcomes, apart from behavioural problems.

Another aspect is 'cognitive readiness'. Cognition is referred to as inner processing and products of the mind, and covers various mental activities, such as memory, problem solving, symbolisation, categorisation, reasoning, etc., (Singh and Singh, 2013). According to Bierman, et al., (2008), two aspects of cognitive readiness are important for formal schooling. One of these aspects covers the children's academic knowledge, while the other involves executive functions.

'Social readiness' is the child's ability to understand instructions and follow them, develop healthy relations and behavioural regulation, whereas, 'emotional readiness' is the individual's ability to deal with, regulate and express one's emotions, as well as, understanding others' feelings (Bai-barin, et al., 2008). Independence, responsibility and self-regulation are the key skills of socio-emotional readiness for formal schooling (McClelland and Morrison, 2003).

Hence, self-help readiness of young children refers to their ability to perform everyday tasks, such as eating, drinking, going to the toilet (toilet trained), dressing up, etc. This, thus, acts as a precursor to performing school related tasks required for easy settlement in a formal education set-up.

School children, equipped with foundational competencies and skills, tend to have better experience of school transition and have success in later academic achievement (Duncan, et al., 2007). Hence, early and strong learning foundation helps achieve both personal and academic success.

Assessing the developmental readiness of preschoolers as they enter Class I, i.e., formal schooling, is important, and a matter of concern for parents, preschool teachers, policy makers and other stakeholders.

Objectives of the Study

- To assess the developmental readiness of urban and rural private school children
- To find out locale differences in their developmental readiness

Sample

The study was conducted in eight private schools of Ludhiana (four rural and four urban) affiliated to the Punjab School Education Board (PSEB). Two hundred students of Class I — equally distributed across both the locales, i.e., rural (n_1= 100) and urban (n_2= 100) — were selected through random sampling. The sample consisted of equal number of boys and girls.

Tool

Self-structured developmental readiness checklists were used to conduct the study. It consisted of the following.

- Cognitive readiness checklist
- Physical readiness checklist
- Gross motor readiness checklist
- Fine motor readiness checklist
- Socio-emotional readiness checklist
- Self-help readiness checklist

Statistical Analysis

The collected data were classified and tabulated as per the objectives of the study in order to arrive at meaningful and logical inferences by frequency, percentage, arithmetic mean, Standard Deviation, Z–test and t–test methods.

Table 1 reveals that most rural and urban children had a high level of skills in all domains of developmental readiness. The data regarding the overall developmental readiness show that most children from both the locales entered formal schooling with a high level of readiness.

Kiernan, et al., (2008) identified that children's experiences, and home and neighbourhood conditions influenced their school readiness. This is in stark contrast with the findings of the present study.

Table 2 depicts that no significant locale difference exists between rural and urban girls in skills of various domains of developmental readiness, except socio-emotional skills. Rural girls had a greater level of socio-emotional readiness (skills) than urban girls.

Table 1: Percentage wise distribution of rural and urban school children across different domains and their levels of developmental readiness

Domains and levels of developmental readiness	Rural (n_1=100)		Urban (n_2=100)	
	Frequency	**Percentage**	**Frequency**	**Percentage**
	(f)	(%)	(f)	(%)
Cognitive skills				
High	74	74	71	71
Average	26	26	29	29
Low	0	0	0	0
Physical skills				
(a) Gross motor skills				
High	82	82	83	83
Average	18	18	17	17
Low	0	0	0	0
(b) Fine motor skills				
High	85	85	68	68
Average	15	15	18	18
Low	0	0	0	0
Socio-emotional skills				
High	86	86	68	68
Average	14	14	18	18
Low	0	0	0	0
Self-help skills				
High	76	76	66	66
Average	24	24	34	34
Low	0	0	0	0
Overall developmental readiness				
High	90	90	82	82
Average	10	10	18	18
Low	0	0	0	0

Table 2: Locale wise difference in developmental readiness among girls across different domains and levels

n= 100

Domains and levels of developmental readiness	Rural (n_1=50)		Urban (n_2 = 50)		Z-value
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)	
Cognitive skills					
High	38	76	42	84	1
Average	12	24	8	16	1
Low	0	0	0	0	NA**
Physical skills					
(a) Gross motor skills					
High	40	80	38	76	0.48
Average	10	20	12	24	0.48
Low	0	0	0	0	NA**
(b) Fine motor skills					
High	43	86	40	80	0.8
Average	7	14	10	20	0.8
Low	0	0	0	0	NA**
Socio-emotional skills					
High	44	88	36	72	2*
Average	6	12	14	28	2*
Low	0	0	0	0	NA**
Self-help skills					
High	40	80	35	70	1.16
Average	10	20	15	30	1.16
Low	0	0	0	0	NA**
Overall developmental readiness					
High	44	88	43	86	0.3
Average	6	12	7	14	0.3
Low	0	0	0	0	NA**

*0.05 level of significance
**Not Applicable

An analysis of the overall developmental readiness of rural and urban girls again depicted no significant difference. In line with the finding, Gan, et al., (2016) reported non-significant difference in the overall developmental readiness of rural and urban children.

Table 3 shows non-significant difference in the mean scores among girls across all domains of developmental readiness, except in case of socio-emotional skills. A significant difference ($p<0.05$) was found in the mean scores of socio-emotional skills, wherein, rural girls scored higher mean value than urban girls. The non-significant difference in the overall developmental readiness concluded that the developmental readiness of girls from both the locales was equal.

Table 4 shows that non-significant difference was found in cognitive, gross motor, fine motor and self-help skills between rural and urban boys. A significant difference was found between rural and urban boys as regards to socio-emotional skills and overall readiness. Rural boys showed high levels of these skills as compared to urban boys. Punia and Sangwan (2011) also reported that a majority of children from both rural and urban areas had high levels of social adjustment. However, rural children were found to have slightly better socio-emotional skills as compared to urban children.

Table 5 elucidates non-significant mean difference in cognitive, fine motor and self-help skills of both rural and urban boys. A significant mean difference was found in gross motor and socio-emotional skills, and hence,

Table 3: Locale difference in the mean scores (±SD) of girls across different domains of developmental readiness

n= 100

Domains and levels of developmental readiness	Rural (n_1=50)	Urban (n_2 =50)	t–value
	Mean ±SD	Mean ±SD	
Cognitive skills	35.12 ± 4.71	34.96 ± 4.62	0.17
Physical skills			
(a) Gross motor skills	23.48 ± 3.29	22.72 ± 2.98	1.21
(b) Fine motor skills	22.72 ± 2.70	22.12 ± 3.10	1.03
Socio-emotional skills	21.14 ± 2.30	20.24 ± 2.77	1.97*
Self-help skills	20.01 ± 2.89	18.98 ± 2.35	1.95
Overall developmental readiness	122.54 ± 13.76	119.02 ± 11.93	1.37

*0.05 level of significance

Table 4: Locale difference in the developmental readiness of boys across different domains and levels

n= 100

Domains and levels of developmental readiness	Rural (n_1=50)		Urban (n_2 = 50)		Z-value
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)	
Cognitive skills					
High	36	72	29	58	1.49
Average	14	28	21	42	1.49
Low	0	0	0	0	NA**
Physical skills					
(a) Gross motor skills					
High	42	84	45	90	0.89
Average	8	16	5	10	0.89
Low	0	0	0	0	NA**
(b) Fine motor skills					
High	42	84	42	84	0
Average	8	16	8	16	0
Low	0	0	0	0	NA**
Socio-emotional skills					
High	42	84	32	64	2.28*
Average	8	16	18	36	2.28*
Low	0	0	0	0	NA**
Self-help skills					
High	36	72	31	62	1.06
Average	14	28	19	38	1.06
Low	0	0	0	0	NA**
Overall developmental readiness					
High	46	92	39	78	1.96*
Average	4	8	11	22	1.96*
Low	0	0	0	0	NA

*0.05 level of significance
**Not Applicable

Table 5: Locale difference in the mean scores (±SD) of boys across different domains of developmental readiness

n= 100

Domains and levels of developmental readiness	Rural (n_1=50)	Urban (n_2 =50)	t-value
	Mean ±SD	Mean ±SD	
Cognitive skills	33.95 ± 5.52	32.24 ± 5.51	1.55
Physical skills			
(a) Gross motor skills	24.08 ± 3.20	22.76 ± 2.40	2.33*
(b) Fine motor skills	22.60 ± 3.22	21.98 ± 3.09	0.98
Socio-emotional skills	21.44 ± 2.68	19.90 ± 2.59	2.92**
Self-help skills	19.28 ± 3.21	18.42 ± 2.65	1.46
Overall developmental readiness	121.65 ± 12.83	115.20 ± 12.65	2.53*

**0.01 level of significance
*0.05 level of significance

the overall developmental readiness, with rural boys scoring higher than urban boys, highlighting that the former were more developmentally ready than the latter. According to Shi, et al., (2008), a rural set-up provides an environment, where parents and children develop attachment, which leads to increased opportunities for physical activities, thereby, promoting the development of gross motor skills.

Conclusion and Recommendations

Thus, to conclude, it may be stated that developmental readiness is a multidimensional construct and has the potential to predict school readiness of young children. Some recommendations formulated to promote school readiness in young children are as follows.

- Parent and teacher training provides a better environment to promote school readiness among young children.
- Stimulating the parent–child relationship and the environment at home ensure smooth transition to formal schooling.
- Developmentally appropriate programmes need to be designed for preschoolers.
- The school curriculum should be responsive to meet the individual needs of young children, including Children with Special Needs.
- Primary school teachers must be equipped with basic knowledge regarding developmental readiness and should plan activities to promote the school readiness of children.

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4

Language Across Curriculum — Why Every Teacher should be a Language Teacher

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Abstract

Use of language is essential in the teaching–learning process. Learners assimilate new concepts through language. Ideas and content get conveyed and understood through language. Therefore, competent language skills facilitate learning in all subject areas. The Language Across Curriculum (LAC) approach emphasises how using Teaching Learning Materials (TLMs) available in different languages enhance the learners' learning pace and quality of learning. So, all subject teachers must encourage correct use of language by the learners while reading, writing or discussing concepts, and in classroom processes related to their respective subjects. Input rich classroom and activity based teaching–learning process induce student–student and student–teacher interactions. Such an environment facilitates the use of different words by students. Also, the teachers can help the students choose appropriate words, according to the subject and context. This implies that content and language are interrelated, irrespective of the subject the learners are studying. Therefore, in order to promote centrality of language in learning, every teacher needs to be a language teacher.

Introduction

According to the *National Curriculum Framework* (NCF)–2005, "It is important to view language education as everybody's concern at schools and not as a responsibility of the language teacher alone."

Language is a means of communication. It is used to share ideas, convey messages, and express emotions or desires. Some scholars opine that thinking develops only because of language as it helps process thoughts. One acquires a language by

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the way of imitation. But to become proficient in it, persistent practise is a must. That is why, 'language' is said to be a 'skill subject', comprising four skills — Learning, Speaking, Reading and Writing (LSRW). The acronym SWIRL, which denotes five skills — Speaking, Writing, Interacting, Reading and Listening — is also popularly used to describe language and communication skills.

Language is Pervasive

In all school subjects, knowledge and skills, to a large extent, are gained through language. During the teaching–learning process of any subject, say science, social studies or even mathematics, teachers teach and learners read, write, interact and listen to the content. It is, therefore, necessary for the learners to be proficient in the language in which the subjects are being taught so that they are able to understand the concepts better. Equal focus on the language of the subjects provides the learners with new possibilities and opportunities.

Reading and writing are also referred to as 'learning strategies'. So, the teachers must encourage the students to read, write and speak in all subject areas. They must use all opportunities that the curriculum offers in order to develop language skills in the students, for example interpreting, comprehending and analysing, discussing, classifying, problem solving, etc.

Keywords and concepts transcend easily from one subject to another. However, it may be noted there are instances when the same word in one subject may mean something completely different in another, for example, 'cell'. The meaning of this word is different in different subjects or contexts. The word 'cell' denotes a vessel, containing electrodes for current generation, as in a battery. In biology, it means an enclosed cavity in an organism, whereas, in social science, it is used for a small active political group. 'Cell' also means a small room in a prison.

Hence, helping the students understand such words and concepts in varied contexts or subjects, and their usage while communicating makes every teacher a language teacher. However, it is important to note that every teacher need not be a language expert but an expert of the language used in one's subject.

In social sciences, field report writing is an important skill, while in mathematics, reading and comprehending word problems is essential. This holds true for other subjects also. If teachers help students understand important words and language structuring in a subject (for example, lessons, units, assessments, etc.), they develop awareness and are able to use appropriate words while communicating. Hence, the understanding of the students in the subject becomes faster and better.

Language Across Curriculum — Concept and Need

According to the Language Across Curriculum (LAC) approach, language learning must occur throughout the school hours in language, as well as, other subject classes. The approach integrates language and content learning, irrespective of the subject the learners are studying. The learners assimilate new concepts through language. Even while studying in a non-language class, they still use language in the way of listening and talking, and reading and writing. Hence, they enhance their linguistic skills as they learn new concepts in non-linguistic classes.

It is being realised that using course relevant source materials in other languages would prepare the students for cross-cultural and multilingual demands of the emerging society. But the LAC approach is hardly practised in classrooms, majorly due to the pressure of completing the syllabus on time, and lack of flexibility to embrace new teaching methodologies and approaches on the part of teachers. The LAC approach helps the learners in the following ways.

- Improve communication skills
- Learn and understand the content and concepts easily
- Expand their horizon
- Know technical terms and jargon related to various subjects
- Carry out effective self and reference study

NCF–2005 and LAC

Language education is not confined to language classroom alone. A science, social science or mathematics class is also *ipso facto* (by that meaning) a language class. Learning the subject means learning the terminology, understanding the concepts and being able to discuss and write about the concepts learnt.

The LAC approach is of particular relevance at the primary stage, when children are more adaptive and active. It bridges the gap between 'language as a subject' and 'language as a medium'. However, the foundational role of the skills associated with language is reinforced in school education and continues through life.

Strategies for implementing the LAC Approach

A conventionally trained teacher gives more importance to pronunciation and diction in speech than expression of ideas. If students' talk is treated as a resource rather than as noise, then the cycle of resistance and control may change to that of expression and response. Pre– and in–service teacher education programmes must, therefore, try to introduce such an understanding. Some strategies for promoting the LAC approach are as follows.

- Input rich communication environment (textbooks, other related texts of children's choice, class libraries, TLMs in more than one language and subject)

- Use of multimedia and Information and Communication Technology (ICT)
- Formal training for both pre– and in–service teachers at regular intervals (for example, seminars, workshops, capacity building programmes — face-to-face and online, conferences, field visits, internship programmes, etc.)

Challenges in implementing the LAC approach

Introducing LAC requires a thorough change in the mindset of teachers. They must be trained in integrating language with the subject while carrying out classroom teaching.

- The attitude of subject teachers, resisting and objecting to this approach, is a major impediment.
- Many subject teachers do not want to be identified as language teachers. They feel by adopting LAC, they may be identified merely as language teachers.
- Many teachers are reluctant to encourage a cross-curricular approach.

Conclusion

Therefore, it may be concluded that for promoting centrality of language in learning, every teacher needs to be a language teacher. Language plays a significant role in the teaching and learning of content and subjects. Language learning takes place while learning other subjects as well like science, environmental studies, social science, mathematics, etc. Ideas and content get conveyed and are understood solely through the use of language. The relationship between language and cognition is fundamental to the LAC approach. Hence, it may be said that language:

- is more than merely being a communication skill.
- is linked with the thinking process, and thus, helps shape thoughts and concepts.
- is a tool for conceptualising and linking the acquired information.
- supports precision in cognition.
- helps develop analytical and problem solving skills.

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5

Socio-emotional Readiness of Pre–primary Students

Reetu Chandra*

Abstract

Early childhood is a period that lays the foundation for later development. Studies indicate that children, who attend pre–primary education programme, are likely to have better learning ability at the age of six years than those who do not. Besides, they adjust better in the school set-up socially and emotionally, which in educational terms, is referred to as 'school readiness'. On the contrary, children, who do not attend a pre–primary education programme, may not be socially and emotionally ready to start formal school education, and eventually, drop out. Thus, ensuring a child's socio-emotional readiness is crucial. This paper tries to assess the socio-emotional readiness of pre–primary students, studying in eight Municipal Corporation of Delhi (MCD) schools. One hundred and seventy-six pre–primary students were surveyed as part of the study. It was found that both experimental and control group students had low socio-emotional readiness in all five components — self-concept, self-control, controlling emotions, approach to learning and interactions with others. The study also tries to identify gaps in the socio-emotional readiness levels of the students and offer ways to address them.

Introduction

Pre–primary education is considered as an important element in achieving Sustainable Development Goals (SDGs). It aims to foster physical, socio-emotional and cognitive maturity in children. Literature suggests that pre–primary education makes the children ready for formal learning, improves their academic performance and checks early dropout. This, eventually, increases learning and educational attainment later in life [Council of Economic Advisers, 2016; Consortium for Research on Educational Access, Transitions and

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Equality, 2010; Elliot, 2006). Therefore, quality pre–primary education programme aims to encourage thinking and problem solving skills in children in order to ensure that they have the required cognitive and socio-emotional capacity to optimise learning in successive formal education years. Thus, countries are committed to ensure that all children, irrespective of gender and social group, get access to quality pre–primary education that enables them to attain necessary skills, knowledge, values and attitude (Chandra, 2016).

The socio-emotional skills of children increase rapidly during the pre–primary years. Their school experience is more positive and productive when they have a sense of personal well-being established through constant compassionate associations in the early years of life. Most of their socio-emotional behaviour is influenced by observations. Their socio-emotional readiness is affected by how well they communicate with others. The ability to get along with other children contributes to all aspects of their development.

Studies suggest that children are more likely to have a better mental health, forge stronger relationships and be more successful at school and work, if they get opportunities to strengthen their socio-emotional competence. Participating in games and sports, and interactions and discussions with peers and adults enable them to enhance their learning activities, and thus, forge better relationships. Learning readiness develops when children engage in multiple social experiences with competent peers and adults (Blaustein, 2005). Therefore, socio-emotional readiness is considered as an integral part of the pre–primary education system globally.

Students, who are aggressive, unable to maintain close relationships with other children and create a peer group, are, generally, disliked. Such students are considered 'at risk'. Researches suggest that children, who do not have basic social skills till the age of six years, may face difficulty with relationships when they grow up into adults. Moreover, children, who are unable to interact with others, may possess poor mental health, low academic achievement and other problems.

Studies indicate that there is a likelihood that children with low cognitive and socio-emotional readiness, entering early primary grades, have a higher absenteeism rate. Besides, there are chances of class repetition and early dropout. These children often face significant disadvantages in life like poverty and marginalisation. Further, most government pre–primary education centres do not provide adequate and systematic stimulation for the socio-emotional readiness of children. There is less focus on interaction and doing group activities (Chandra, et al., 2017). Hence, participation of children in educational activities is found to be low (Kaul, et al., 2014).

Pears, et al., (2014), in a study, pointed out that socio-emotional intervention improves understanding, reduces aggressive responses to peer provocation and increases self-regulation skills in children. Similarly, the results of Head Start REDI (Research-based, Developmentally Informed) program revealed significant differences favouring children in enriched intervention classrooms on measures of emotional understanding, social problem solving and social behavior (Bierman, et al., 2008). Therefore, socio-emotional intervention, at the pre–primary stage, helps ensure the socio-emotional readiness of children.

Objectives

- To identify gaps in the level of socio-emotional readiness of pre–primary students
- To implement the intervention to improve the socio-emotional readiness of pre–primary stage students
- To evaluate the effect of the intervention on the socio-emotional readiness of pre–primary students

Sample and Method

A total of 176 students from pre–primary classes of eight MCD schools (one pre–primary class from each school) in South district of Delhi were selected as sample. The sample, consisting of students from eight pre-primary classes, was randomly divided into two groups — experimental and control group (four classes in each group).

The data were collected using the observation schedule and rating scale. The study was carried out in three stages. In the first stage, i.e., pre–test, all 176 students were assessed to identify gaps in the level of their socio-emotional readiness. In the second stage, a socio-emotional readiness intervention was designed and implemented in the experimental group for two months to address the gaps. In the third stage, i.e., post–test, the socio-emotional readiness levels of both experimental and control group students were reassessed to ascertain the effect of the intervention.

Findings and Discussion

Gaps in socio-emotional readiness

Gaps were identified based on 33 aspects under five components of the socio-emotional domain — self-concept, self-control, controlling emotions, approach to learning and interactions with others. The results, in terms of component wise difference in percentage expected and obtained by the students, are illustrated in Figure 1.

Figure 1 demonstrates gaps in the socio-emotional readiness level of the students in all five components. However, the magnitude of gaps varied component wise, ranging from 36.3 to 42.7 per cent. The results indicate that the maximum gap was identified under self-concept

Figure 1: Gaps in the level of socio-emotional readiness of students (in %)

(42.7 per cent), followed by controlling emotions (40.1 per cent), interactions with others (39.9 per cent), approach to learning (39 per cent) and self-control (36.3 per cent).

These results, further, suggest that the level of socio-emotional readiness of the students, both in the experimental and control groups, was low in all five components. The gaps are indicative of the fact that the students were unaware of self-concept, weak in controlling emotions and expressing their feelings. They interacted less with others. Besides, their approach to learning was inappropriate and they did not have much ability to exercise self-control in diverse situations.

The results, therefore, are in harmony with other studies conducted in this area. Kaul, et al., (2014) and the National Institute of Public Cooperation and Child Development (2006) discuss the rare occurrence of socio-emotional development activities, especially, self-expression in the country.

According to Bhise (2016), opportunity for expression, helping children frame sentences and patience to listen to their explanations were also missing in pre–primary centres of Maharashtra.

Kaul, et al., (2014) also found that pre–primary classes followed a restrictive approach, where children were made to sit an one place without doing anything much, except rote learning. This situation confirms the need for socio-emotional readiness stimulation in students of pre–primary classes in all 33 aspects under the five components. Hence, the intervention was designed and implemented in the experimental group classes for two months and its effects were analysed.

Effects of the intervention

The socio-emotional readiness levels of the students, both in the experimental and control groups, on pre–test (before intervention) and post–test

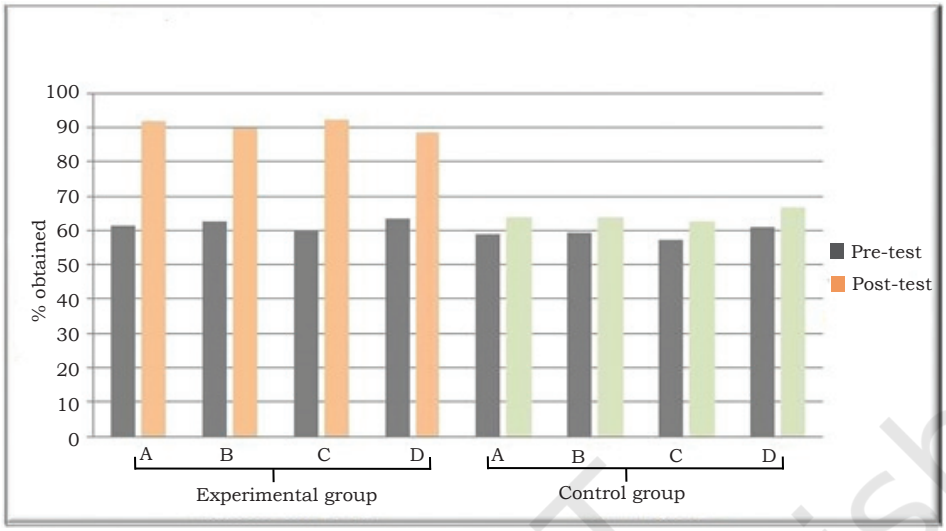

Figure 2: Pre– and post–test comparison of experimental and control group students in their socio-emotional readiness levels

(after intervention) were compared. The results are illustrated in Figure 2.

The pre– and post–test results, as illustrated in Figure 2, confirm that initially, the socio-emotional readiness level of both the experimental and control group students was more or less the same, whereas, after receiving the intervention, it improved. In the beginning, the performance of all experimental group students was below 65 per cent. After receiving the intervention, it improved to more than 90 per cent. In case of control group students, the level improved but not considerably, i.e., less than 65 per cent at the time of pre–test to less than 70 per cent after post–test.

Conclusion

The results revealed that initially, there were huge gaps in the socio-emotional readiness levels of the students. So, an intervention to provide socio-emotional stimulation was needed. A comparison of pre– and post–test socio-emotional readiness levels of the students shows that after the intervention, the performance of the experimental group students had improved. Hence, it may be inferred that there was a positive effect of the intervention on the socio-emotional readiness level of experimental group students. Hence, short-term and domain specific interventions may be administered to improve the socio-emotional readiness of students at the pre–primary stage, as and when required.

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6

Innovative Methods of teaching Yoga at the Primary Stage

Manish Kumar*
Paran Gowda**

Abstract

Students, at the primary stage of education, may not be aware of common yoga terminology. Therefore, there is a need to teach yoga terms to them in simple and practical manner. This paper has been designed around the concept of the 'ABC of the Yoga Chart'. The efficacy of the chart was tested on 58 students of Classes I–III, aged between five and eight years, at a primary school in Kurukshetra, Haryana. The pre– and post–tests were conducted using paired t–test. The data obtained were analysed using the Statistical Package for Social Sciences (SPSS) technique and the results were found to be significant at p<0.001. The study will be useful for policy makers and educationists, and help carry out further research in the area, especially, at the primary stage.

Introduction

Students at the primary stage need to be familiarised with various common yoga terms and concepts so that they may develop into healthy human beings. But most researches focus on practical intervention and ignore theoretical knowledge (Mendelson, et al., 2010; Sethi, et al., 2013; Bothe, et al., 2014; and Frank, et al., 2014). Therefore, it is imperative to understand both the theoretical and practical aspects of yoga. The study focuses on educating students at the primary stage about basic yoga terminology and postures.

This paper gives a glimpse of the 'ABC of the Yoga Chart', designed and developed for primary stage students, studying in Classes I–III. It highlights that yoga terms may be simplified so that they are easily comprehensible to the students in the age group of

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five to eight years, and hence, easy to recall. The chart introduces basic yoga terminology through attractive illustrations, using each letter of the English alphabet.

These yoga terms, along with their meanings and illustrations, need to be included in the curriculum at the primary stage of education. Although yoga is taught in schools, the focus is only on teaching *asanas*. Not much importance is paid to the meaning and importance of each *asana*. It is, therefore, important to develop a simple module by which a young learner may learn and understand the basic terms used in yoga.

A module was developed to test the efficacy of the chart on students at the primary stage.

Methodology

A sample of 60 students of Classes I–III (20 students from each class) was selected randomly from a primary school in Kurukshetra district of Haryana. Initially, a pre–test was conducted. In the pre–test, the students were asked to look at the pictures printed on the yoga chart. They were, then, asked to fill in the blanks with 26 common yoga terms. The marks scored by each student were treated as pre–test data.

The students were taught different postures and exercises with the help of the yoga chart for half-an-hour. They were asked to practise the Lotus posture (*padmasana*), chant 'Om', Quiet breathing, *Hasya* Yoga (laughing exercise), *Trataka* (gazing) and Prayer for the half-an-hour daily for the next five days, after which a post–test was conducted. In the post–test, Class I students were asked to match the pictures with the corresponding yoga terms (Figure 2), whereas, the students of Classes II and III were asked to fill in the blanks with yoga terms and match the pictures corresponding with those terms (Figure 3). The marks obtained were treated as post–test data for 58 students as two students were absent on the day the post–test was conducted.

The data, thus, obtained were analysed, using the SPSS version 25.

Design

The chart depicts common yoga terms (based on the 26 letters of the English alphabet), along with corresponding illustrations (Figure 1).

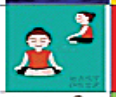
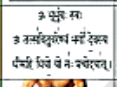
A	ASANA		Stable and Blissful Yogic Posture	Web Reference I	H	HASYA YOGA		Laughing Internally	Web Reference VIII
B	BODY		1 Gross 2. Subtle 3. Causal	II	I	IEESHWER PRARIDHANA		Surrender to Almighty	IX
C	CHAKRA		Seven Power Points in the Body	III	J	JALA NETI		The Process of Cleansing Nasal Passage	X
D	DHYANA		Deeper stage of Concentration	IV	K	KAPAL BHATI		A type of Cleansing Process	XI
E	EAGLE POSE		Pose like Eagle (Garurasana)	V	L	LOTUS POSE		Pose Like Lotus (Padamasana)	XII
F	FIVE SENSES		Eyes, Ears, Nostrils, Skin & Tongue	VI	M	MANTRA		Sacred Chanting	XIII
G	GYAN MUDRA		Pose in which Knowledge is increased	VII	N	NAULI		A type of Cleansing Process	XIV
O	OM		The holy word to address God	Web Reference XV	U	UPNISHADS		Receiving wisdom by sitting near to guru/ by sacred texts	Web Reference XXI
P	PATANJALI		An author sage of Yoga philosophy	XVI	V	VEDAS		Oldest sacred Texts	XXII
Q	QUIET BREATHING		Breathing in a quiet way	XVII	W	WHEEL POSE		Pose Like wheel (Chakrasana)	XXIII
R	RISHI		A sage, who discovers internal Truths	XVIII	X	X-RAY VISION		The third eye vision	XXIV
S	SWADHYAYAE		Self-Study or study of scriptures	XIX	Y	YAMAS		Duties of a Yoga aspirant	XXV
T	TRATAKA		A Cleansing as well as Meditation technique	XX	Z	ZAZEN		Meditative Practice	XXVI

Figure 1: Yoga terms as depicted in the 'ABC of the Yoga Chart'

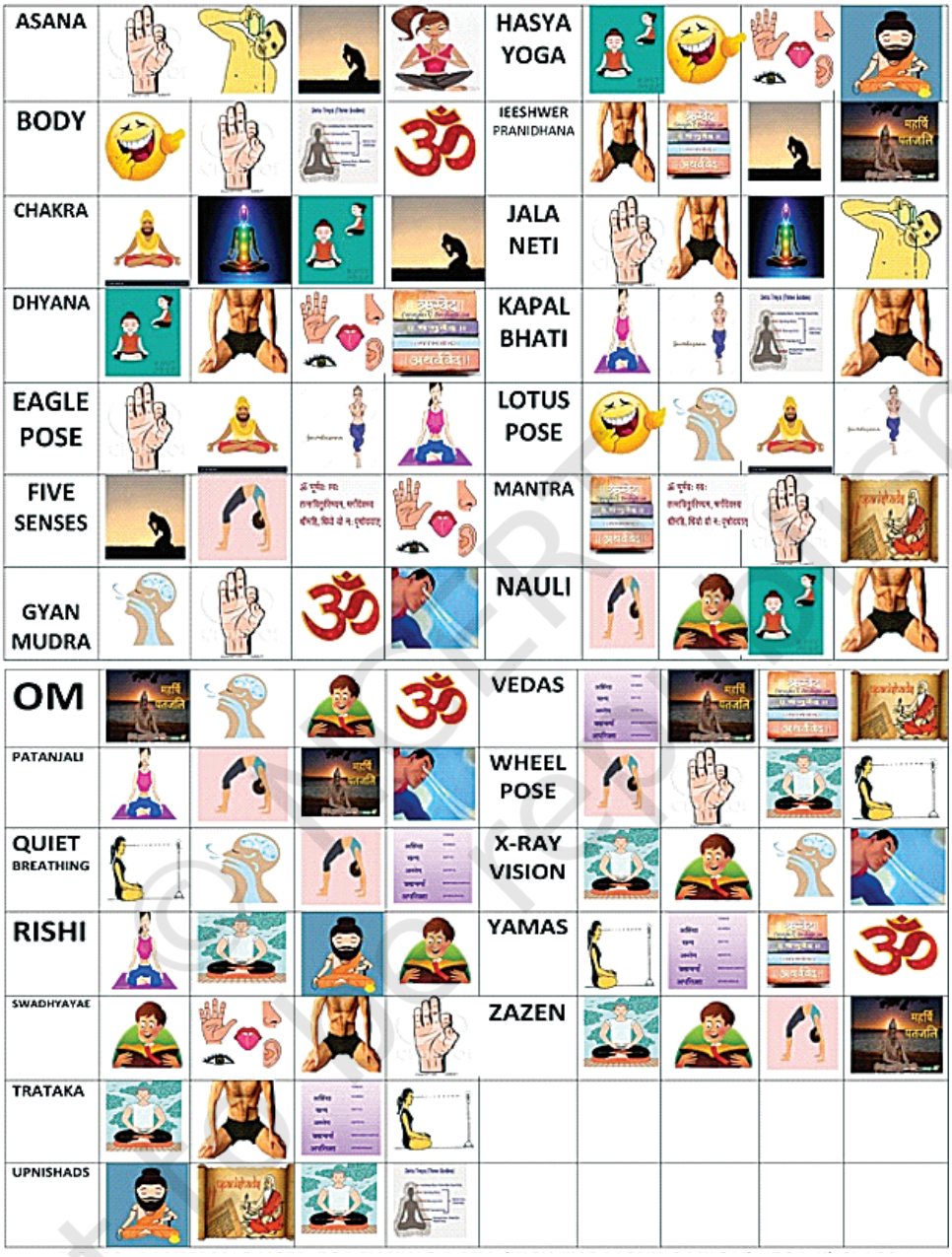


Figure 2: A sample of the test for Class I

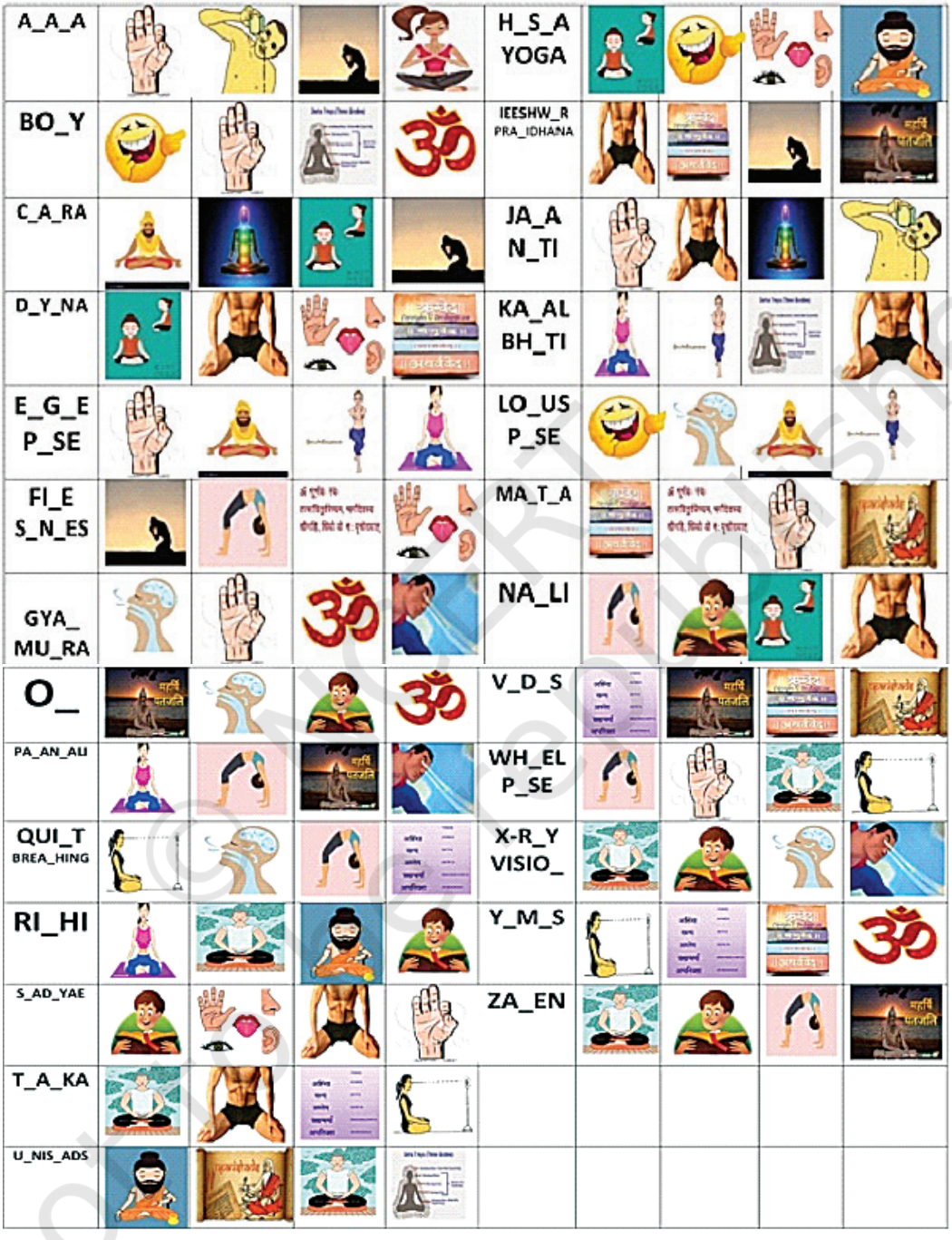


Figure 3: A sample of the test for the students of Classes II and III

Results

Descriptive statistics and paired sample 't–test' results are given in Table 1 and 2.

The calculated absolute value of paired 't' statistic was found to be 10.55 when compared with the table value of 3.29 at df 57, which was significant at p <0.001 level of significance. As the calculated value of 't' was greater than the table value, so it may be argued that the media developed in the present study is significant and may be used as a teaching aid for students at the primary stage.

Discussion and Limitations

The study and the statistical 't–test' show the efficacy of the yoga chart in making the students understand the ABC of yoga. Some of the limitations, generally, pointed out in the study are methodological limitations, including lack of randomisation, small samples, limited detail regarding the intervention and statistical ambiguities that curtail the ability to provide definite conclusions or recommendations (Serwacki and Cottone, 2012). However, these could be overcome by adopting an innovative means of teaching yoga.

Conclusion

Thus, it may be concluded that the yoga chart is innovative and capable of arresting the attention of young learners. The chart may also help enhance the learning and usage of basic yoga terminology in schools, *balwadis* and *anganwadis*. Even the *National Curriculum Framework* (NCF)–2005 lays impetus on the importance of yoga and physical fitness in the school curriculum.

Table 1: Descriptive statistics

	N	Mean	SD	Standard error
Pre–test	58	26.7931	11.94837	1.56890
Post–test	58	42.9224	6.21035	1..81546

Table 2: Paired sample 't–test'

Mean	SD	Lower	Upper	t	df	Sig. (two tailed)
-16.12931	11.63840	-19.18947	-13.06915	-10.554	57	<0.001

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7

Effectiveness of Bridge Programme at the Elementary Stage

Neetu Yadav*
Satpal Singh**

Abstract

A bridge programme was conducted in 84 schools of Delhi. An experimental study was carried out examine the effectiveness of the programme on pupil achievement in Hindi and mathematics in Classes VI, VII and VIII. A total of 1,445 students were surveyed. Three separate questionnaires for parents, teachers and principals were administered to know their perception about the utility of the bridge programme. Pre– and post–tests were conducted, and 't–value' was calculated to find out the significant difference on the academic achievement of the students. The findings reveal significant difference between the pre– and post–test scores. The results indicate a significant increase in the achievement levels of the students in both the subjects. Hence, the pedagogical interventions were found to be highly significant, in terms of contributing to pupil achievement, in both the subjects.

Introduction

The *National Policy on Education* (NEP)–1986 as revised to the *Programme of Action* (POA)–1992 emphasises the need for substantial improvement in the quality of education. The POA–1992 stresses the need to lay down the Minimum Levels of Learning (MLLs) at the primary and upper primary stages. This need emerged from the basic concern that irrespective of caste, creed, sex and region, all children must be given access to equal and quality education. Quality at the elementary education level, therefore, must address the quality of infrastructure and support services, teacher characteristics and teacher motivation, pre–service and in–service teacher education, curriculum, teaching–learning materials, classroom

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processes, pupil evaluation, monitoring and supervision. Decentralisation and community involvement in planning, monitoring and supervision ensure quality in elementary education.

However, the achievement in MLLs, particularly, at the primary stage in government or corporation run schools, still remains a distant dream for a majority of students. According to a report published by the Ministry of Human Resource Development (MHRD), Government of India, in 2013–14, out of 20.79 crore children in the age group of 6–14 years, 3.5 crore do not attend school.

Researches indicate that low levels of learning continue to persist. Over the past decade, there have been many researches on effective teaching methods. The present study was carried out to examine the effectiveness and utility of a 'bridge programme' introduced in 84 schools of Delhi, in terms of pupil achievement and perception of parents, teachers and principals.

A few teachers teaching in government schools of Delhi, presume that students coming to Class VI after passing Class V from Municipal Corporation of Delhi schools do not possess the required MLLs to cope with the content of Class VI.

Bridge Programme

The Government of NCT of Delhi, along with the State Council of Educational Research and Training (SCERT), Delhi, designed and launched a 'Bridge Programme' with the help of the Society for Equity Research and Vision in Education (SERVE) to provide quality elementary education to students of Classes VI, VII and VIII in Hindi and mathematics. The programme was conducted in 84 schools of Delhi during the summer vacation, i.e., 15 May to 28 June 2012. A total of 1,445 students were surveyed. Three separate questionnaires for parents, teachers and principals were administered to find out their perception about the utility and effectiveness of the programme. Besides, NGOs and local communities were also involved under the *Bhagidari Yojna* to bridge the gap between the school and the community. Thus, it was a partnership that connected organisations and individuals committed to equity in education.

An innovative pedagogical approach (quiz method), under the bridge programme, was used to conduct the study. Fifty sessions in Hindi and mathematics were conducted for the students of Classes VI, VII and VIII. These sessions were based on cooperative learning. Macaulay and Gazelles (1996) have characterised cooperative learning as the instructional use of small groups so that learners are able to work together in a manner that enhances both group and individual learning. Therefore, cooperative learning provides a joyful learning environment for interaction between students, enhancing their cognitive abilities.

The pedagogy is based on effective teaching approaches, in which small

teams, consisting of students with different levels of ability, use a variety of learning activities. Each team member is responsible for not only learning what is taught but also helping one's teammates learn, thus, creating an environment of achievement. This method is based on maintaining identity and dignity of the students by encouragement and appreciation.

The programme was designed on the assumption that with innovative pedagogical practices and encouragement, students can make substantial progress in basic mathematics and language skills within two months. The important strategic interventions undertaken during the programme were as follows.

- NGOs were allotted schools to conduct the programme.
- Teachers were appointed by NGOs, in consultation with SCERT, Delhi, on contract basis to conduct the programme.
- They were given 11 days' training on content development, pedagogy, use of Teaching Learning Materials (TLMs) and classroom management by the concerned District Institute of Education and Training (DIET).
- A unique 'hexagonal' seating arrangement was made in the classrooms.
- Quiz method was used as an important pedagogical intervention.
- Parents were involved in the classroom teaching–learning process. They were asked to ensure that their wards attended the school regularly.
- They were encouraged to visit the schools and interact with the teachers.
- Regular supervision and academic inputs were provided to the teachers by faculty members in the DIET and the SCERT, and heads of the concerned schools.

Objectives

- To study the effectiveness of the bridge programme in terms of pupil achievement in Hindi
- To study the effectiveness of the bridge programme in terms of pupil achievement in mathematics
- To compare the achievement levels of both boys and girls in Hindi
- To compare the achievement levels of both boys and girls in mathematics
- To study the perception of parents, teachers and principals about the efficacy of the bridge programme

Hypotheses

The hypotheses formulated are as follows.

- There is no significant difference in the achievement levels of

pupils in Hindi taught through the bridge programme.

- There is no significant difference in the achievement levels of pupils in mathematics taught through the programme.

Methodology

Experimental method of research was used to conduct the study. Pre– and post–test methods were used to find out the effectiveness of the pedagogy in teaching Hindi and mathematics. The study not only assessed the effectiveness of the programme and achievement of the students but also the perception of parents, teachers and students. Centralised standard test items were designed and administrated in all schools of North-east and Central districts of Delhi.

Sample

A total of 1,445 students (769 boys and 676 girls) were taught under the bridge programme in North-east and Central districts of Delhi. The class wise distribution of students was 466, 487 and 492 from Classes VI, VII and VIII, respectively. However, the study was conducted only on 941 students in Hindi and 906 in mathematics, as other students could not appear in both the tests. The opinions of 11 principals, 27 bridge teachers and 250 parents were sought to know their perception about the utility of the bridge programme.

Statistical Techniques

To measure the efficiency and efficacy of the bridge course, paired t–test was applied; t–test was also employed to ascertain the difference in the academic achievement levels between boys and girls.

Tools

Test papers, comprising 25 items each in Hindi and mathematics validated by SCERT, Delhi, were used. The study was conducted in three phases, i.e., collection of pre–treatment data, administration of the treatment and collection of post–treatment data.

Variable involved

The test papers were used for pre–test and post–test. Treatment levels — comprising no treatment, treatment I, i.e., training and orientation of teachers, and treatment II, i.e., actual conducting of classes — were used as independent variables. The sex of the students, schools and their localities were used as moderate variables.

Data Collection and Analysis

The pre– and post–tests were administrated under the supervision of the concerned DIET. The evaluation of the answer scripts was done by teachers of the concerned school under the guidance of DIET faculty members. Data analysis involved evaluation of the test scores for Hindi and mathematics, and computation of

mean and Standard Deviation (SD) for each of the classes and subjects. T–test was applied to find out the significant difference.

Findings and Discussion

Table 1 shows that the number of students, who attended the bridge programme, was more in North-east district than Central district. However, it was found that girls outnumbered boys in Central district.

Table 2 shows that of the 466 Class VI students, who attended the programme, 63.5 per cent were boys and 36.5 per cent girls. In Class VII, 57.2 per cent boys and 42.7 per cent girls, and in Class VIII, 39.4 per cent boys and 60.6 per cent girls participated in the course. The table further indicates that the participation rate of boys was higher than girls, except for Class VIII.

Table 3 shows the difference in the mean value and SD in Hindi. Before treatment, the mean value was 31.27, 27.58 and 29.58 for Classes VI, VII and VIII, respectively. However, it was much higher after treatment, i.e., 65.49, 63.71 and 56.45, for Classes VI, VII and VIII, respectively. Similarly, SD was much higher in the post–treatment test, i.e., 20.19, 21.26 and 23.42, as compared to the pre–treatment test, i.e., 13.28, 14.59 and 13.35 for Classes VI, VII and VIII, respectively.

Table 1: Gender and district wise distribution of students, who attended the bridge course

District	Boys	Girls	Total
North-east	470	332	802
Central	299	344	643
Total	769	676	1,445

Table 2: Gender and class wise distribution of students, who attended the bridge course

Classes	Boys	Girls	Total
VI	296	170	466
VII	279	208	487
VIII	194	298	492
Total	769	676	1,445

Table 3: Difference in the mean scores of pre– and post–test in Hindi

Classes	N	Post–test		Pre–test		t–Value
		Mean	SD	Mean	SD	
VI	283	65.49	20.19	31.27	13.28	27.19
VII	319	63.71	21.26	27.58	14.59	30.15
VIII	339	56.45	23.42	29.58	13.35	22.16

The mean value in post–test was higher than that of the pre–test. Further, to test the significance of difference between the mean values of these two tests, the t–value calculated was found to be 27.19, 30.15 and 22.16 for Classes VI, VII and VIII, respectively, which was significant at 0.5 or 1 per cent, favouring the pedagogy used. As there is substantial increase in the post–treatment achievement levels in Hindi for all three classes, it may be concluded that the pedagogy was effective for all three classes. Hence, the hypothesis that there is no significant difference in the achievement levels of pupils in Hindi taught through the bridge programme is rejected.

Table 4 shows increase in the students' achievement level in mathematics taught through the bridge course. It indicates the post–test mean value at 50.82, 50.18 and 40.15, and SD at 18.4, 17.16 and 19.26 for Classes VI, VII and VIII, respectively. The pre–test mean value was recorded at 18.86, 13.62 and 14.43, and SD at 16.09, 9.82 and 10.82 for Classes VI, VII and VIII, respectively.

The mean value after treatment was higher than that recorded in the pre–test for all classes under observation. Further, to test the significance of difference between the mean of pre– and post–test scores, the t–value calculated was found to be 20.46, 36.28 and 25.48 for Classes VI, VII and VIII, respectively, which is significant at 0.5 or 1 per cent. Hence, it was found that the course was effective in mathematics for all three classes. Therefore, the hypothesis that there is no significant difference in the achievement levels of pupils in mathematics taught through the programme is also rejected.

Perception of parents

- Almost all parents were satisfied with the course and the bridge teachers.
- They shared that their wards made a productive use of the summer vacation.
- However, some parents were not satisfied with the civic amenities and TLMs provided during the course.
- All parents shared that it should become a regular school activity and the duration of the course be increased.

Table 4: Difference in the mean scores of pre– and post–test in mathematics

Classes	N	Post–test		Pre–test		t–Value
		Mean	SD	Mean	SD	
VI	284	50.82	18.4	18.86	16.09	20.46
VII	317	52.18	17.16	13.62	9.82	36.28
VIII	305	40.15	19.26	14.43	10.82	25.48

Perception of teachers

- Most teachers perceived that the students were weak in basic mathematical concepts.
- The hexagonal seating arrangement was a problem in the classrooms.
- The training programme for bridge teachers could be of a longer duration.
- Academic supervision should preferably be done by the concerned subject faculty.
- Moreover, few teachers perceived that there was a lack of coordination among NGOs, SCERT and schools.

Perception of principals

- The course was useful for the students. However, it should be need based.
- The duration of the course could be increased.
- Bridge programme should be made a regular annual feature as it is participatory in nature.
- Arrangements should be made for the required support staff during the programme.

Conclusion

Thus, it may be concluded that the bridge course method is useful and effective at the elementary stage. The pedagogy ensures smooth and joyful learning experience by learners. Hence, learning may be made into an engaging experience. The course provides tools to structure activities that maximise learning. The study shows substantial gain in academic achievement in both Hindi and mathematics as more than 80 per cent students secured high scores in the post–test.

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Midday Meal with Music

Alpesh Pipaliya*

Midday meal constitutes a significant part of the diet of children, studying in primary and upper primary classes (Classes I to VIII) in all government and government-aided schools of the country. The meal is freshly cooked and served warm to the students. The Mid Day Meal Scheme (MDMS), one of the largest school children feeding programmes in India, caters to their nutritional needs.

The National Programme of Nutritional Support to Primary Education (commonly known as the Mid Day Meal Scheme) was launched on 15 August 1995. The programme was formally started at the Kavishreekalapi Primary School in Dahyapark, Varachha, Surat, Gujarat, in January 2015.

However, it was distressing for teachers and other staff members to note that the programme was not being implemented the way it was conceived. The students moved about in a haphazard manner during recess. It was difficult to control them or direct them back to their respective classrooms after the recess. A discussion with the teachers helped identify the problems. Some of the problems identified were as follows.

- Lack of discipline
- Dislike for the food served
- Lack of appropriate and adequate infrastructure
- Time mismanagement

A solution had to be found. A meeting was organised, in which all school teachers and staff members participated. It was decided that a music system would play a hand wash song and relevant *shlokas* for 30 minutes during the recess.

TEAMS FORMED

For the effective implementation of the midday meal programme, three teams (namely, 'Annapurna', 'Anasuya' and 'Arundhati'), consisting of all school

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students, were formed so as to ensure that everybody gets the meal during recess. Students of Classes I–III were part of the Annapurna team, Classes IV and V of the Anasuya team and Classes VI–VIII of the Arundhati team.

Each team was allotted a place in the playground, where they would sit and eat the meal. All team leaders had to make seating arrangements, ensure that members of their respective teams washed their hands appropriately and keep the meal distribution counters ready before recess.

Maintaining Cleanliness

It was ensured that, as per the guidelines of the Ministry of Human Resource Development, food distributors wore apron, headgear and gloves while serving the meal. Besides, the vehicles and containers, in which the food was supplied, had to be clean. A water purifier was also installed in the kitchen area and the water quality was tested quarterly.

Figure 1: Food distributors, wearing apron, headgear and gloves, ready to serve the meal

Prayer Recitation

The playing of the hand washing song indicated the beginning of the recess. As the song played, the students washed their hands with soap and water. They, then, queued near the food counters with their plates. After taking the food, they would sit down in a line meant for their respective teams, recite a short prayer and eat the meal. After finishing the meal, they washed their hands and plates. All through the process, the teachers would be standing in the playground and at the food counters. They would supervise the food distributers, and help the student team leaders make seating and water arrangements, etc.

Figure 2: Students standing in a queue near a food counter to collect their meals

Maintaining Discipline

The students were given the following instructions to maintain discipline.

- Move in a line.
- Do not push each other.
- Wait for one's turn patiently.
- Wash the hands before taking and eating the food.
- Throw the litter in dustbins and not in washbasins.

- Do not waste water and food.
- Wash the plate, after finishing the food.

Washing Arrangements

The Ministry has advised all schools to have adequate water facilities for washing purposes. But many States cannot afford this. This school, too, had less number of taps. To overcome this problem, water tubs were used. In order to check overcrowding of students and wastage of water, there were only three dishwashing counters. Each counter had three tubs. The first tub contained water for rinsing the used plates; the second, soapy water to wash the plates; and the third, water to clean the plates of soapy water.

Observations

After music, indicating the recess and serving time of midday meal, was introduced, the following changes were observed.

- All children became alert to the music, as it indicated the recess time.
- In 30 minutes, 540 children would eat the meal.
- The children willingly maintained discipline, stood in queues and did not jostle.
- Minimal wastage of time was observed contrary to the chaos that existed earlier.
- The children got nutritious and sufficient food. So, they were less inclined towards eating junk food.

Conclusion

As a result of this innovative move, the school gained recognition. This programme was selected by the District Institute of Education and Training (DIET), Surat, for the District Innovation Fair, and also for the State Level Innovation Fair by the Gujarat Council of Educational Research and Training (GCERT). The school stood first in the Surat District Innovation Fair. Moreover, it was selected by the Akshaypatra Foundation, New Delhi, for a documentary film. The documentary, titled *Best Kitchen, Best Transportation and Best School Environment* was released in the year 2016. The District Regulatory Board suggested the management of each school to emulate and implement the innovative programme in their respective schools. As a result, the programme was started in more than 10 government schools run by the Surat Municipal Corporation on a voluntary basis.

Book Review

Preparing Teachers for Global Citizenship Education — A Template

Satya Bhushan*

Title of the Book : *Preparing Teachers for Global Citizenship Education — A Template*

Publication : UNESCO, Paris and Bangkok

Year of Publication : 2018

Language : English

Price : Unpriced

Globalisation has brought about many positive changes, including democratisation, awareness of human rights and a greater flow of information. However, it has also led to some negative impacts like spread of prejudice and misinformation. There are probably more conflict zones in the world at present than ever before. Yet, hope for a better future lies in education, particularly, Global Citizenship Education (GCED), which strives to promote peace, well-being and sustainability.

The importance of GCED was reaffirmed in the vision of the *Incheon Declaration on Education*–2030, which states that nations must work towards inclusive and equitable quality education, and lifelong learning. It emphasises that although foundational literacy and numeracy are essential, they are not enough.

The book titled *Preparing Teachers for Global Citizenship Education — A Template* presents a conceptual framework for GCED. It stresses that

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GCED nurtures learners not only in cognitive skills, enabling them to think critically, systematically and creatively, but also in non-cognitive areas like empathy, conflict resolution and communication skills. The book suggests a range of pedagogical approaches that teachers need to explore in order to incorporate GCED in their teaching practices.

In the past few decades, various fields of transformative education have been formulated — education for fostering international understanding, human rights education, education for promoting a culture of peace, value education, education for the four pillars of learning, intercultural and multicultural education, citizenship education, education for gender equality, education for sustainable development, education for the twenty-first century skills and competencies, education for preventing violence and extremism, etc. All these have been encapsulated in the book, which gives an account of the efforts made to develop and promote diverse transformative education towards promoting a culture of inclusion, equality and peace.

GCED, as a transformative education practice, covers a range of twenty-first century skills that enable students to do in-depth learning, and engage their minds to integrate and apply knowledge across disciplines. Implementing GCED in curriculum needs new approaches, keeping in mind the curriculum design and delivery of the content. This may be done in two ways either by studying GCED in isolation or integrating it across existing subject areas at all levels.

Some of the pedagogical practices suggested in the book are peace education, storytelling, design thinking and project based learning. Yet, in implementing GCED, in addition to the efforts of individual teachers, the support of the entire school system is required to make a lasting impact on learners. The 'whole school approach' is critical to promote education in many areas. It involves all stakeholders related to school education — students and their families, teachers, principals, school staff at every level and community members. Some examples of the whole school programme followed around the globe are also given, which may help teachers contextualise, adopt or adapt to the pedagogical approaches.

The book carries a section on 'exemplars', which includes examples on how GCED may be integrated with the curricula and teaching–learning practice, along with activities from different sources and pedagogical suggestions that may help enhance students' cognitive, socio-emotional and behavioural development. The exemplars are in four subjects, i.e., social studies, science, mathematics and language across different levels of education.

Assessment and evaluation in GCED should include not only content but also effective ways of assessing

and evaluating teaching–learning outcomes in non-cognitive areas, such as socio-emotional skills and behavioural changes. For measuring achievement in GCED, one needs to look into limitations of standardised achievement testing.

One such initiative is Learning Metrics Task Force (LMTF), which emphasises the necessity for youth to form values and gain skills of the twenty-first century beyond literacy and numeracy skills that would help them succeed as global citizens. The book also presents an account of some recent developments, such as inclusion of global competency in Programme for International Student Assessment (PISA)–2018 and International Civic and Citizenship Study.

The book also carries a number of proposed measurement tools or instruments for global citizenship indicators. However, a more holistic conception of global citizenship would enhance the relevance and quality of these instruments as they seem to lack dimensions, such as learning outcomes in non-violent conflict resolution, human rights, awareness of alternative paradigms of development, globalisation and critical political literacy.

The book also talks about *Global Education First Initiative* (GEFI) by UNESCO, which has identified barriers to GCED implementation. The main barrier is the lack of teachers' understanding of GCED. The book, therefore, addresses the need for building teachers' capacity in order to meet the challenge of GCED. It directs teacher–educators and teachers towards useful GCED related material — integrating GCED with the curriculum and teaching–learning practices with examples. Further, it covers a broad range of issues and pedagogies from existing resources. Integrating GCED with pre–service education is the need of the hour to lay the foundation for future teachers in order to become global citizens.

The Concept of Global Citizenship in Asian Countries

Varada M. Nikalje*

The concept of citizenship has changed over time. In fact, many enlightened people have thought beyond the narrow confines of kingdom, empire and nation, and liberated their minds to think universally. The ancient *Vedas* speak of *Vasudhaiva Kutumbakam,* meaning, 'the world is one family'. Oliver Goldsmith, a well-known British writer, envisaged himself as a 'Citizen of the World'. The Red Cross, an international organisation, provides succour to those who need it, irrespective of their nationality.

In this highly interconnected and interrelated world, it is all the more imperative to heed the call for global citizenship that goes far beyond national boundaries. Values, such as acceptance and respect for diversity, peaceful coexistence and development of scientific temper are the need of the hour, and hence, must be inculcated in young minds so as to enable them to grow into global citizens, who think and work for a more just, peaceful and sustainable world.

One of the values that global citizenship endorses is respect for diversity. Since most Asian countries are multilingual and multicultural, the concept of global citizenship is identical to them. An overview of the global landscape as regards the philosophy embedded in various countries is elaborated as follows.

INDIA

The word, *Vasudhaiva,* as in *Vasudhaiva Kutumbakam,* is composed of two words — *vasudha* (meaning 'the Earth') and *iva* (meaning 'is'), while *kutumbakam* means 'family'. Together it means 'the world is one family'. The origin of *Vasudhaiva Kutumbakam* may be traced to the *Maha Upanishada.* The translation of the excerpts from the *Maha Upanishada* is as follows.

"The World is a Family
One is a relative the other, stranger
Say the small-minded.
The entire word is a family,
Live the magnanimous."

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Considering none as a stranger, but welcoming each person as one would welcome a relative is the gist of the deeply embedded philosophy practised in the Indian way of life. This excerpt from the *Maha Upanishada* best expresses the concept of the enlarging circle in human relationships as reflected in day-to-day life through care and empathy for people, animals and plants. It, thereby, goes on to expand the 'circle of the mind' to the fact that all human beings share the same home, same air, same Sun, and hence, should equally care for 'mother Earth'.

Vasudhaiva Kutumbakam holds even greater significance in today's times, considering the multi-faceted challenges faced by humanity in search of peaceful coexistence, contentment and prosperity. The three notions of Global Citizenship Education (GCED) — 'solidarity', 'respect for diversity' and 'shared sense of humanity' — are deeply embedded in the concept of *Vasudhaiva Kutumbakam.*

Jawaharlal Nehru, the first Prime Minister of India, promoted 'unity in diversity' as an ideal essential to national consolidation and progress. Concepts, such as secularism, coexistence and celebrating diversity are found in the curriculum, syllabus and textbooks in schools all over the country.

Indonesia

An archipelago nation, Indonesia, is composed of thousands of islands with distinct religious beliefs, cultures, languages and traditions. After casting away the yoke of colonialism, the country adopted *Bhinneka Tunggal Ika* as the national motto. It is an old Javanese phrase, which literally translates into 'out of many, one'. It is similar to India's 'unity in diversity'. It is enshrined in Article 36A of the *Constitution of Indonesia*, and is inscribed in the Indonesian national symbol — the *Garuda*.

In the process of nation building, many leaders recognised that such a diverse nation would need to have certain principles in order to unite people. Indonesia adopted *Pancasila* (five principles) on 1 June 1945. The *Pancasila* articulates five interrelated principles that represent Indonesia's liberal democracy. They are as follows.

- Belief in one and only God
- A just and civilised humanity
- The unity of Indonesia
- Democracy
- Social justice

The five principles are integrated in school education as they form the basis for the rights of the people of Indonesia.

Bhutan

A Buddhist nation, Bhutan houses a diverse ethnic population composed of *Ngalops*, *Sharchops* and *Lhotshampa*. With 53 languages of the Tibeto-Burman family, the country is rich in multingualism. It is also known for its culture of respecting the elders. The government recognises education as the basic right of the citizens. So, it accords high priority to improving the quality of learning in primary schools and expanding access to secondary education. The *Bhutan Education Blueprint* (BEBP) 2014–24 focuses on transforming the country's education system.

Education is a prerequisite for achieving the country's social, cultural and economic goals. This is in consonance with the concept of Gross National Happiness (GNH) Index followed by the country. Bhutan is the first country in the world to use the GNH Index to measure the happiness and growth of its people. The idea is to balance one's time between work, leisure and rest. This has an impact on community vitality, cultural diversity, psychological well-being and making the best use of time.

This, therefore, reflects the Asian view of life — identity is significant within diversity.

China

Being the largest Asian country, China is rich in cultural diversity. Yet the Chinese share the idea of 'Great Unity'. This concept is found in classical Chinese philosophy, which gives a utopian vision of the world, where people are selfless, living together harmoniously, trusting and helping each other, having others' best interests at heart, taking care of the elderly and children, whether related or not. Those who are widowed, orphaned, childless, handicapped and diseased, would all be taken care of. The concept finds a mention in the *Book of Rites*. This fosters solidarity among people and encourages a shared sense of humanity. The philosophy of the Great Unity is also found in school education, public relations and sports. School education in China, keeping with its ancient cultural values, aims to foster mutual respect and support for global development and prosperity.

Singapore

The country, comparatively, has a short history. However, its commitment is to being 'one united people', regardless of race, language or religion, which is enshrined in its 'National Pledge'. The concepts of democracy, peace, progress, justice and equality are enshrined as stars in its national flag.

In Singapore, harmony and multiculturalism form the basic concepts of governance since the country's Independence in the year 1965. The official languages of Singapore are Malay, Mandarin, Tamil and English, and everyone is free to use, teach and learn any language as one desires (Article 153A).

Education in Singapore is bilingual. English is the main medium of instruction and students are also taught a second language, which may be Malay, Mandarin, or Tamil.

The three principles that ensure social harmony in Singapore are multiculturalism, secularism and meritocracy.

Inclusivity and respect for other cultures permeate the society through education, celebrations of important festivals and promotion of heritage sites.

Conclusion

Values like acceptance, diversity, hospitality to guests and strangers, respect for elders, etc., are common to all Asian countries. Therefore, they are universal in nature and the education system of all these countries try infusing the concept of *Vasudhaiva Kutumbakam*, i.e., 'global citizenship', in students.

Skype Sessions in School

Anita Sharma*

Skype gives students and teachers an opportunity to interact with students from other countries and cultures, through the online mode.

As a school principal, I was keen to usher in interesting educational initiatives. Our school signed for the 'Skype in Classroom' programme, which aimed at fostering empathy and compassion, and generating environmental awareness among students. The programme allowed virtual travel and experiences to both students and teachers.

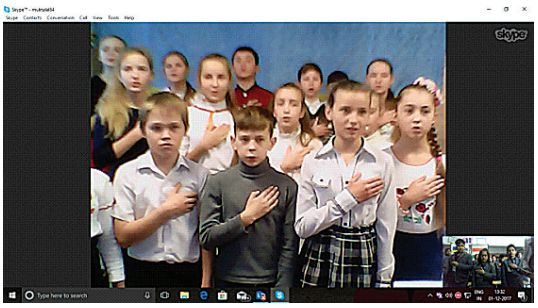
Connecting with a classroom of a different country virtually provides an educational experience that cannot be attained in a traditional classroom set-up. For the Skype sessions, selected students and teachers from the school were seated in a hall, and interactions with students and teachers of other countries were initiated. The sessions were projected live on the big screen.

Session with Ukraine Students

The students were thrilled to meet children of their own age group, belonging to Ukraine. The Skype session was for students and teachers of the primary classes from both the countries, in which 90–100 (both Indian and Ukrainian) students participated. More sessions, each spanning 45 minutes, were held after this. Initially, students, on both the sides, were a bit hesitant while interacting with each other, but later, they seemed curious to know about each other. The students sang the national anthems of their respective countries at the end of each session. It was an enriching experience for both the students, as well as, the teachers.

I could feel the concept of *Vasudhaiva Kutumbakam* (meaning, 'the whole world is one family') being reinforced during the sessions.

* *Principal*, S. D. Public School, Pitampura, New Delhi.



(a)

(b)

Figure 1(a and b): Indian and Ukrainian students bonding through Skype

Figure 2(a): Indian and Russian students interacting through Skype

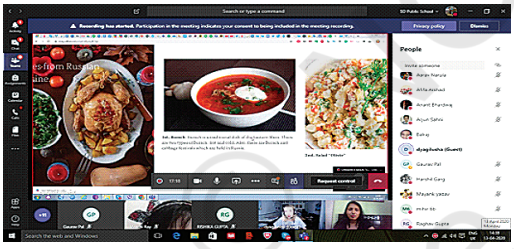


Figure 2(b): Some authentic Russian recipes shared by students on Skype

Some of the upper primary students, who were also watching the session, shared, "We, and people of all religions, need to put our differences aside and look at our similarities…If we take time to get to know religions other than our own, we will understand that we can get along happily."

Session with Russian Students

Students of Class VI got an opportunity to interact with their Russian counterparts. They had completed a chapter on food and were curious to know more about Russian cuisine. During the session break, they talked about the cuisines of their respective countries.

Session with UK Students

After completing a chapter titled 'Fibre to Fabric', the students were provided with an opportunity to interact on the theme with their counterparts in the UK. They learnt not only about some of the traditional Indian attires but also about those worn in the UK.

Programme Outreach

Apart from making our own students a part of the Skype sessions, we also invited underprivileged children, studying in Navjyoti Foundation, an NGO, to participate in the digital activity.

One of the virtual activities was 'Mystery Skype', which allowed the students to connect with students

of another country for cultural exchange. A game of 'Mystery Skype' was played, wherein, the students had to guess the nationality of their virtual counterparts. This activity interwined knowledge with fun.

In a Nutshell..

The Skype sessions provide unlimited opportunities for teaching and learning, allowing exploration beyond the four walls of a classroom. Even a school with limited resources can participate in such an activity. The Skype activities conducted by the school reflect an approach that aims at fostering sensitivity to languages and cultures other than one's own. As teachers opened up to the idea of Skype as an educational tool, they realised that these elements helped constitute the idea of Global Citizenship Education, ingrained in the Indian culture as *Vasudhaiva Kutumbakam*.

To the Contributors

The Primary Teacher invites you to write articles, field notes and reports that impact elementary education. The focus may be on issues and concerns that you are sensitive to, which you feel should be shared with other teachers working at the grass-roots level.

- Each article should be about 1500 to 3000 words.
- Each article should have a short abstract in about 150 words.
- Use simple and non-technical language, keeping the clientele in mind, who are primary teachers.
- The articles should have a friendly and communicative tone.
- The articles must be sent in two copies, along with the soft copy (CD/e-mail).
- The photographs and illustrations should be sent in JPEG format, having a resolution of at least 300 dpi.

The papers may be sent to:

Academic Editor
The Primary Teacher
G. B. Pant Building, NCERT
Sri Aurobindo Marg
New Delhi – 110016
e-mail: primaryteacher.ncert@gmail.com

MY PAGE...

This column would contain your letters and feedback, where you can put forward your responses, suggestions and expectations from the articles, papers and columns presented in *The Primary Teacher*. You may have issues, concerns and doubts related to teaching–learning processes, classroom practices, syllabus, textbooks, evaluation patterns, research pursuits, etc. These could also reflect the concerns of many others working in this area. Please feel free to raise these issues in this column. You could also ask specific questions that would have baffled you.

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