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Development of Unconventional Pedagogies: Integrating Mathematical Narrative in Upper Primary Grade Mathematics Education

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Abstract: *Mathematics has been viewed as an epistemological enterprise characterized by absolute truth, certainty and objectivity. This legacy of absolutism turned mathematics into a subject of study which was very distinct, highly specialised and an esoteric curricular action. Absolutism has been the dominant perspective that has informed teaching-learning of mathematics in school education. Elementary school mathematics teachers seldom attempt to relate to the student's psychological and social needs. This can happen by integrating the literary aspects with motivations which drive society to encourage learning of those concepts among young children. This research is a three-phase pedagogical study that aims to explore spaces within the present tightly structured primary mathematics curriculum for creative possibilities of its integration with other disciplines through mathematical narratives. It attempts to develop unconventional pedagogies for use of conversations, stories, and narratives within such pedagogical spaces while integrating affective, cognitive and cultural aspects of student's needs. It was conducted with a sample of 42 children studying in class V in a government primary school in New Delhi. This research demonstrates the roadmap of an unconventional possibility integrating mathematical narrative into the school mathematics classroom at the upper primary level.*

Keywords: *Absolutism. mathematics education, mathematical narrative, pedagogical studies, school curriculum.*

I. Introduction

The researchers' initiation in the field of mathematics education was through a liberal discourse of a four year initial teacher education programme Bachelor of Elementary Education (B.El.Ed). The mathematics education courses related to nature of mathematics, philosophy of mathematics education and pedagogy of mathematics; and their applications to practice in chronological order included titles 'Core Mathematics', 'Mathematics I', 'Mathematics II', 'Logico Mathematics Education', 'Colloquia: School Contact Programme', 'Block Teaching' task in Classroom Management and Material Development and Evaluation, 'School Internship Programme' and 'Pedagogy of Mathematics'. In these courses of study the focus was on re-visiting the core concepts of school mathematics with greater pedagogical awareness, appreciating varied philosophies of mathematics education, developing/ evaluating instructional material and learning about the current practices used and exploring innovative pedagogical practices in different socio-economic and cultural contexts. However the curricular and pedagogical discourses continued a separation of mathematics based courses with the other aspects of the curriculum. Each course was taught by a faculty with specialisation in mathematics; the examples, illustrations and readings for specified coursework, in the mathematics based courses mentioned above, were very unique to it (and disconnected from other courses of study). Material development and evaluation for mathematics was guided exclusively by a mathematics faculty to name a few elements of separation. While other courses had their own internal specialities too but these were overtly pronounced for the mathematics education curriculum and pedagogy even in a progressive curricular framework of a forward-looking, integrated B.El.Ed programme. The researchers' dominant anecdotal experience was that mathematics education was particularly isolated from other curricular areas. This shaped the present research problem aimed at attempting to integrate mathematics with other areas of curricular experience.

II. Absolutist philosophy underlying mathematics education

The epistemic starting point for mathematics pedagogy is a philosophy of mathematics education which rests on assumptions about the nature of mathematical knowledge. Since ancient times mathematical knowledge has been viewed as absolutely certain, knower-independent, unquestionable and *a priori*. It consists of propositions derived from reason alone without needing any reference to the empirical domain. 2,500 years ago when Euclid's *Elements* presented true basic statements (axioms) as the source of a deductive system of mathematics; deductive logic became central to the presentation of mathematics as well as to its validation procedure. This emphasis on an inviolable justification procedure, based largely on deductive thinking, used proofs to establish theorems; an important piece of mathematical knowledge. This certitude came to be recognised as the great accomplishment of mathematics as a discipline assembling a set of truths that stated various provable propositions. Mathematics came to be viewed as synonymous with absolute truth, certainty and objectivity. This absolutist view considers the nature of mathematics as representative of a 'unique realm of certain knowledge' (1) which has 'long been taken as the source of the most certain knowledge known to humankind.'(Ibid). Plato's theory of ideas was resurrected by later logicists supporting a Platonism which maintained that the objects, constituents and structures and their interrelationships of mathematics existed in an ideal realm (2) and were knower –independent of human beings (3). Mathematics is thus an autonomous body of knowledge with inner laws or logic of its own. The Oxford English dictionary (1933) in its definition of Mathematics re-states it as 'the abstract science which investigates deductively the conclusions implicit in the elementary conception of spatial and numerical relations'.

This has been the majestic logical structure; absolutist philosophy of mathematics which can be summarised as:

> Mathematical knowledge consists of a set of propositions together with their proofs. Since mathematical proofs are based on reason alone, without recourse to empirical data, mathematical knowledge is understood to be the most certain of all knowledge (4).

Absolutism received favour from philosophers of education no less than A.N.Whitehead and Bertand Russell who clearly established that all mathematical concepts were in the ultimate analysis reducible to logical concepts re-establishing the doctrine of absolute certainty within the disciplinary fold of mathematics as a branch of knowledge (5). Mathematics teaching-learning practices in educational institutions have been shaped by this absolutist philosophy. However this absolutism turned mathematics as a subject of study into a very distinct, highly specialised and esoteric curricular enterprise. Within formal educational systems are already characterised by a highly fragmented, tightly framed and disconnected array of disciplinary domains assembled in the name of school curricular knowledge (which educators in the Indian and western modern traditions ranging from Gandhi to John Dewey rejected). In the Indian elementary school context this official nomenclature is organised as: Mathematics, Environmental Studies (differentiating into science and social science) and the Languages. The progressive movement in education has emphasised the conscious unity of life, school education and curriculum according to the principle of radiation rather than that of concentration. This implies an opposition to the narrow fragmentation of school subjects into tightly defined subject boundaries. This fragmentation further imposes a heavy curriculum burden upon young children who develop fear, phobia and a load of non-comprehension particularly towards mathematics coupled with minimal understanding of how school mathematics textbook material (therefore even classroom instruction) is relevant to the world. American philosopher John Dewey writes that the 'subject-matter of the school curriculum should mark a gradual differentiation out of the primitive unconscious unity of social life' (6). While absolutism implicates the opposite for school mathematics, he refers to presentation of 'science' subjects in purely objective form', or treating it 'as a new peculiar kind of experience' as one of the greatest difficulties in the present method of teaching.

Thus absolutism has been the dominant epistemological perspective that has informed the teaching-learning of mathematics in school education as also educational policy. Our research interest in mathematics education originated from alarm at how much absolutist epistemology had naturalised in conventional teaching and learning of mathematics and the need for a deep critique to break the disconnection of mathematics with other areas of curricular inquiry in school curriculum.

Introspection over researcher's own teaching-learning experiences in school as well as college defined the research problem further. During undergraduate studies the overwhelming learning experience was that mathematics is observed and practiced as a subject in which the ability and the process of solving questions and reaching the 'right' answers following certain steps is appreciated much more than the curiosity to know the origin of those questions, the need of solving those questions, the challenges and errors which are encountered in the process of solving those questions from the different perspectives of the people who have thought or are thinking about those questions and their solutions. This key focus on solving problems correctly through mere procedural knowledge, aimed at production of the right answers (which is typically only one), does not even necessarily foster a deeper understanding of mathematical concepts in their wholeness as is evident by nationwide education surveys (7). These conventional practices of teaching and learning of mathematics and the way it is visualized by the mainstream school mathematics teaching-learning community has led to the mutual exclusivity and isolation of mathematics as a subject from other subject-arenas of knowledge namely Language and Environmental Studies in the context of primary school education. Mathematics as it is perceived in the contemporary school scenario by the collective consciousness of the teaching-learning community is separated from the literary aspects (8). The students are not encouraged to know the socio-economic and cultural aspects of the mathematical concepts. This practice of conceptual analysis considering a diversity of perspectives is highly encouraged in other subjects of study. Elementary school mathematics teachers seldom initiate attempts to relate the student's psychological and social needs. This can happen by integrating the literary aspects, for example detail about process through the concepts which are taught in the mathematics curriculum evolved in the society and the motivation which drives the society to encourage the learning of those concepts among its young children. This can happen by encouraging the children to know about the views of the people from diverse backgrounds about the situations and ways in which they use mathematics, collecting information from them about the practices which were encouraged in the earlier generations in which mathematics was used, encouraging children to write their own views or theories about mathematics which they experience or observe in their daily lives and surroundings, encouraging them to invent games related to those concepts, helping the children to imagine and talk about mathematics by encouraging them to write and read related literature and fictions about the concepts which they learn or even very simply to examine the words that name the mathematical concepts; practices that are non-existent in prevailing schooling practices.

III. Research Problem

The present research aimed to problematise mathematics education beyond the prevailing absolutism in an alternative framework in which teaching-learning of mathematics is just like that of any other subject for example literature; which is viewed as a subject related to our lives; as reflection of the reality which is present around us, which is not too indifferent to our affective domain.

3.1 Research Aim

To develop pedagogy based on use of mathematical narratives within the primary school mathematics curriculum. This is based on a philosophy of mathematics education that includes language including narrative in the text to integrate mathematics with disciplines like literature, art and aesthetics. In order to integrate concepts from various themes and disciplinary domains with mathematics this research draws on the notion of the 'mathematical narrative'. In the present research the term is conceptualised as a representation of a process by a spoken or written account of connected events (or even stories, or varied modes of activity) or at a general cognitive and affective level quite simply: the curiosity to know. The epistemological absolutism framing the curriculum does not provide spaces for such intervention. The research focus thus was on developing pedagogy, albeit unconventional, which integrates mathematical narrative in teaching-learning of primary school mathematics. The interpretative framework for the present research thus cut across the sub-fields of philosophy of mathematics education, mathematical knowledge, mathematics teaching, mathematics learning, mathematics education and society, mathematics education and gender, mathematics education and history and the use of intrinsic and extrinsic knowledge of mathematics in building mathematical narratives.

3.2 Research Objectives

The research has four specific objectives. First to explore pedagogical spaces within the scope of the present tightly structured primary mathematics curricular framework for creative possibilities of its integration with other disciplines through mathematical narratives. Second to develop unconventional pedagogies for use of literary metaphors, historical contexts, stories, and narratives within such pedagogical spaces. Third, to integrate affective, cognitive and cultural aspects of students' needs in such mathematics pedagogy. Fourth to elaborate the processes involved in the use of such narratives as a meaning making activity.

3.3 The participants

The present research was undertaken in one of the primary schools in Central Delhi under New Delhi Municipal Council (NDMC). The school was established in 1995. The NDMC is a third tier of local level state government structure that runs school systems in some of the elite neighbourhoods of New Delhi metropolis. The particular school was part of the school internship programme of fourth year B.El.Ed coursework in the academic year 2019-2020. One of the researchers was allotted class V to teach in the school and the other researcher was her mentor. The 42 children of one of the sections of class V were the participants of this mini-research. The duration of this school internship was 48 days. This research is based on the pedagogical possibilities that emerged during the course of this internship programme with this group of participants who were the Grade V students of this school.

The school has an enrolment of around 500 children. The staff consists of eleven teachers (including the regular as well as ad hoc teachers, a music teacher, a physical education teacher, an art teacher, retired teachers who are invited on request and the headmistress), one office assistant for managing the administrative works, two gardeners, three housekeeping staff and one security guard who mans the entry gate. This school runs in a one storey building, surrounded with trees and a small farm owned by the residents of a nearby house. There are ten classrooms, one library, one room interestingly named as ‘Kant Laboratory’, an art room, a kitchen, separate room for headmistress’s office and separate room for administration office. The classrooms seem to be small according to the strength of students. The teacher student ratio in the classroom was 1:45. The school also has a playground with artificial grass and varieties of plants and trees. The children seem to come from relatively diverse socio-economic backgrounds. The school also has an SMC (School Management Committee) which works with active representation, participation and involvement of the parents.

IV. Research Design

The present study was a classroom based three phase research. It is a micro-study designed in the specific context of the particular school nestled in a specific locale of New Delhi metropolis. It was led by the following three phases.

4.1 Three phases of research methodology

In phase 1 a textbook analysis of Class V mathematics textbook (9) was undertaken to delineate the concepts, their nature, cognitive tasks prepared on them (questions, word problems, activities to perform). language used/ of presentation, continuity of a concept being developed both vertically and horizontally within the same class taught during internship and the spaces within these conceptual frameworks of providing the opportunity to integrate teaching-learning with mathematical narratives. This was limited to the five chapters that were allotted to the researcher-intern for teaching during her school internship programme. Such an analysis was meant to serve as the basis for exploring pedagogical spaces in which mathematical narratives could be ‘deployed’. These five chapters were interestingly titled from chapter nine to thirteen in the prescribed textbook as ‘Boxes and Sketches’, ‘Tenths and Hundredths’, ‘Area and its Boundary’, ‘Smart Charts’, and ‘Ways to Multiply and Divide’ (9). The underlying mathematical concepts were nets, perspective drawings, deep drawings, visualisation of the difference between three-dimensional and two-dimensional shapes, units of measurement (length), money concept, decimals (conversion of fractions to decimal equivalents, arithmetic, mensuration, data presentation using frequency tables (tally marks), pie-chart, bar graph, line chart and operations on whole numbers. This textbook analysis of the designated chapters constituted the first phase of the research.

The second phase shifted the research focus to children’s thinking in school mathematics. Phase 2 thus involved exploring **c**hildren’s thinking related to the various topics/ mathematical concepts/ procedural knowledge underlying the five textbook chapters allotted to the researcher as ‘syllabus’ to be completed during the period of her internship. Informal discussions were held in the class with all the participants collectively as well as individually outside the specified classroom in so called class teacher’s period and other ‘free’ periods. Several children wrote short narratives after these discussions. This exploration was meant to serve as a meaning making activity based on which mathematical narratives were selected.

The third phase of the research involved actual teaching during the course of which pedagogical possibilities were developed. It consisted of 12 weeks of dedicated teaching-learning of school mathematics to grade V participants of this study. Some literary metaphors, conversations, stories, games, and narratives were integrated in the pedagogy of mathematics with reference to the teaching of specific mathematical concepts. The time allotted to mathematics classes in the school time table was utilised. Some of the extra time slots like class teacher’s period and absentee periods were also used for teaching-learning mathematics during phase 3.

V. Concept of Mathematical Narratives

The term mathematical narratives appear in mathematics education literature to refer to the literary genres in mathematical word problems that depict the author’s voice or narration (10). Another interpretation defines it in terms of the word problems created by children in the form of short stories related to their daily life experiences (11). Yet another view refers to it as teaching mathematics by drawing upon historical stories, problems, arguments and their solutions with the use of literary metaphors along with the freedom given to children to express their understanding by creating their own movies, poems, stories or games related to the mathematical concepts (12).

The present research defined the term mathematical narrative to denote use of: language be it spoken word or writing, literary devices like metaphors or story among others or simply the tendency to know mathematics through the lens of other disciplines in teaching-learning mathematics.

VI. Data Presentation and Analysis

6.1 Understanding nets

Mathematical concepts like nets, perspectives, and three dimensional shapes are a rich arena for encouraging children to explore the physical objects around them and then bring these explorations into the mathematics classroom. Yet a concept like nets as a 'sort of skeleton-outline in two-dimension, which when folded results in a three- dimensional shape' remains an enigma unless it is integrated with other curricular areas of study.

The three concepts were introduced in the class with paper folding activities. The first activity involved folding paper to make it into a cubical box (frequently sweets are packed in such a box). Some pictures were provided to the students which showed the dotted lines meant to be clues to the children about the number of folds which needed to be done to make the cubical box from the paper. Then the concept of open shapes is discussed by depicting the pictures of some of the nets along with the supporting questions to identify the nets which can be used to make the open cubical box. Similar activities related to three dimensional shapes like the pyramid, cone, prism, cylinder were taken up along with their constitutive nets, so that the children can match and identify the three dimensional shapes with their nets.

The prescribed textbook too follows this approach and incidentally the concept of nets ends in the book's chapter with this exercise. The concept of three dimensional shapes was now brought in with the introduction of floor maps and deep drawings along with the conventional ways of making the three dimensional shapes using paper-pencil drawing. Subsequently the introduction to the concept of perspectives is also given with some activities like making bridges with the match boxes and making its drawing from different vantage points providing views.

6.2 Visualising nets, perspectives and three-dimensions: Learning outcome assessment

After introducing the concepts in the classroom through the above mentioned paper-folding activities the children were asked to observe the different activities in which we use the concept of nets, deep drawings of three dimensional shapes and perspectives in the world around them. This did not elicit much response from the students.

In an attempt to connect the mathematics classroom with the outside world, talking points from outside the textbook like carpets, clothes, *gujiya* and trees were then introduced in the class. Children were briefed to informally discuss these ideas in general with their family members also to know more about it. It is after this that the classroom mathematics lesson opened up with responses of the children. The children shared their informal home narratives in the classroom (almost as formal presentations) which encouraged them in thinking more about these mathematical concepts. Several students presented examples of square or rectangular carpets which can be converted into the shape of a cylinder on rolling. Some children inquired about the shapes which can be formed on rolling a circular carpet, as many had seen circular carpets at their homes. There was an organic development of a paper folding teaching-learning activity in the classroom during the course of which the teacher-researcher suggested that they cut a circle from their notebooks and observe the shape obtained on rolling it. This was further compared with the shape obtained on rolling a square, rectangular and triangular paper.

6.3 Data vignettes

One of the participants remarked,

> On rolling any type of shape they obtained the cylindrical shape but the cylinder obtained on rolling the squares and rectangles can stand on the desk but the cylinder obtained on rolling the triangle or circle cannot stand on the desk.

Another participant responded,

> It is similar to the stretching exercise which we had done in the previous period of physical education when it is hard to stand on toes for a long time but they can stand for a long time on their feet and can run also.

Another one said during the class,

> In the morning we read about earthquakes in which ma'am showed that the buildings which are thick and short are in less danger than the buildings which are thin and long.

Provoking the comment,

> It is similar to the trees. Recently in my colony, the trees fell down due to heavy rainfall and winds. Not all the trees fell. Only one. That too from the middle of its bark. It had a very thin bark. The other trees which had thick bark are strong. They did not fall down.

Knowledge was constructed and reconstructed in the classroom by children on their own as the teacher had stepped aside from formal instruction integrating mathematics with everyday life narratives. Common aspects of life outside school were folding and unfolding of the clothes and the bed sheets; rolling of dough into preparing *gujiya* (an Indian sweet) and envelope making were brought into the classroom. The students spoke some of their observations about shapes obtained during these everyday tasks. These discussions made it possible for students to visualise by drawing examples from video games in which the players observe the buildings from the side view and can also observe the whole town from the top view. One of the students commented,

> When I go to the terrace then I can see the top view of the houses which are shorter in height than the house where I live.

Another student retorted,

> Have you people sat in an aero plane yet? I think from the window of the aeroplane we can see the terrace view of the city and the rocket is much more advanced than a plane, we can see the terrace view of the whole earth from the rocket.

The student's remarks encouraged the teacher-researcher to organize a Kant Lab session the following day in which pictures of the earth, as viewed from the aeroplane and the rocket; were shown. There was discussion about the popular software application 'Google Earth' software with them and that showed students the satellite view of the area in which the school is located and clearly revealed the boundary of the school along the walls, by using the specified tools from the 'Google Earth' software. A student expressed her curiosity,

> How did we come to know about the shape of India using the 'Google Earth' software?

A reply came up,

> I don't think that there was software or rockets in earlier times which could help the people to know about the boundaries of their countries or states. People would have travelled from one place to another and would have drawn the map.

Another one came up,

> This is like the game we play. My friends often make a rough drawing of our house depicting the details about the rooms and objects which are placed in the house.

These classroom conversations provided a contextually powerful link to introduce the concepts of floor maps, perspectives and deep drawings. The students were asked to draw the rough drawing of their own homes (as detailed as possible) and encouraged the student to explain the representations they drew. When the students had completed their drawings then I told them that these are called 'floor maps'. The details mentioned in their textbook were then referred to.

The pedagogic finding in the teaching of topic nets was that mere concretising of classroom teaching-learning experiences does not lead to the development of knowledge of mathematical concepts based on spatial reasoning. The condition of learning is that the classroom teaching of such abstract concepts be linked or even integrated with objects in children's everyday world, their experiences, their narratives, games and even the technology they use.

6.4 Does the word come before the concept?

After the paper-folding activities collapsed the term nets was introduced as the shape obtained after unfolding a three dimensional object. It was interesting that children responded to the word 'net' not the concept of a net as a shape of reduced dimensions. Some of the children related it to the short form of the word 'internet', some related it to the 'net' used while playing badminton, some related it to the fishing net, some children related it to the mosquito net while other children also related it to the fabric in net form. This highlights that instead of directly introducing the term 'nets' and expecting the children to understand it as a mathematical concept; a more useful pedagogic approach is to refer to the different contexts in which children use the particular 'word' before they relate to it as a mathematical concept. The ambiguity in the usage becomes a spigot with which to integrate the concept to the world outside the classroom as well as to other subjects. In this regard it has been argued that to ensure that the students are able to understand the meaning of the particular words in the right context we must consciously present the words which can cause ambiguity because of being homonyms (words having same pronunciation and same spellings but different meanings like volume, high, mass, odd etc.) or homophones (words having different spellings but same pronunciations like hole or whole, route or root, one or won etc.) or polysemy (words which have different meanings in different contexts like product, base etc.) in nature (13). Selection of words and the use of language in the pedagogy of mathematics can lead to improved results and learning outcomes. As there are some words in the text which are similar to other words used in common language in appearance and sound (for example; 'angel' and 'angle', 'minutes' and 'minus', 'tenth' and 'tens', 'hundred' and 'hundredth', 'teen' and 'tee' which are used s suffixes in the number counting etc.), words which are specifically used in mathematics (for example; hypotenuse, parallelogram, coefficient, multiply etc.), words which are commonly used in spoken language and mathematics and hold the same meaning in both contexts (for example; between, more, longer etc.), words which are commonly used in spoken language and mathematics and hold different meanings in both contexts (for example; difference, volume, count, odd, prime, power, mean, product, parallel, into, improper etc.) and some words whose meanings can be understood with the concrete stimulation from the teacher for example; plus, product, division, square meter, square number, decimal, radius, perimeter, reflection etc. (14). The teacher must emphasize on these words to terminate the possibilities of confusion about these words among the students by addressing these differences and similarities about different words in different contexts in the classroom while introducing any new concept.

VII. Conclusion

This research indicates that notwithstanding the tight absolutist framing of school mathematics curriculum there is pedagogical scope for creative possibilities of its integration with other disciplines. This breaks the fragmentation of school mathematics from the affective, cognitive and cultural aspects of students. Mathematical narratives provide a useful pedagogical tool to do so. This research developed an unconventional pedagogy in which the use of literary metaphors, everyday conversation and participants' daily life realities turned into mathematical narratives. These were integrated into mathematics education processes in the classroom as a meaning making activity. So while mathematics is visualized as the vehicle to train a child to think, reason, analyse and articulate logically, policy too recommends that apart from being a specific subject it should be treated as a concomitant to subjects involving analysis and meaning (15). This research demonstrates the way forward with one such unconventional possibility of integrating mathematical narrative into the school mathematics classroom at the upper primary level.

References

[1]. (Ernest, P. 1991. *The Philosophy of Mathematics Education*, New York London: Routledge, pp. 4-7.

[2]. Hardy, G.H. 1967. *A Mathematician's Apology*, Cambridge, Cambridge University Press.

[3]. Russel, B. 1919 *Introduction to Mathematical Philosophy*, London, George Allen and Unwin.

[4]. Ernest, P. 1994. 'Constructing Mathematical Knowledge: Epistemology and Mathematics Education' in Ernest, P (Ed.), *Studies in Mathematics Education Series*: *4*. London Washington D.C.: The Falmer Press

[5]. Whitehead, A.N. and Russell, B. 1910-1913 *Principia Mathematics*, (3 Vols), Cambridge, Cambridge University Press.

[6]. Dewey, J 1897. *The School*, Volume LIV, Number 3 (January 16, 1897), pp. 77-80.

[7]. Pratham Annual Status of Education Report (ASER) Various years. Mumbai: Pratham Resource Centre.

[8]. National Council for Educational Research and Training 2017. *National Achievement Survey* (NAS). New Delhi: NCERT.

[9]. National Council for Educational Research and Training. 2018. *Maths Magic: Book 5: Textbook in Mathematics for Class V*. New Delhi: NCERT.

[10]. Dietiker, L. 2013. 'Mathematical Text As Narrative: Rethinking Curriculum', *For the Learning of Mathematics*, 33(3), 14-19.

[11]. Tem L. Kurz. B.B. (2013). Conceptualising Mathematics Using Narratives and Art. In NCTM, Mathematics Teaching in the Middle School. Reston: NCTM, pp. 552-559.

[12]. Yi-Wen Su, a.-S. H.-W.-F. (2016, July). Mathematical Narrative: From History to Literature. *Hal 01349267.* Retrieved from HAL archives-ouvertes.fr: https://hal.archives-ouvertes.fr/hal-01349267,

[13]. Dole, R.J. 2011 'Language and Mathematics', In Dole, R.J. *Teaching Mathematics in Primary Schools* Australia: Allen and Unwin, 2nd edition, pp. 33-46.

[14]. Dickson, L., Margaret Brown and Olwen Gibson. 1984. *Children Learning Mathematics: A Teacher's Guide to Recent Research*. New York: Holt Rinehart and Winston.

[15]. Government of India 1986. *National Policy on Education*. New Delhi: Ministry of Human Resource Development, GoI.