Chapter-IV

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4.1 Introduction

Curriculum is of vital importance to decide the educational objectives first and then to frame the content, syllabus or course. It is the keystone of educational theory and practice. Objectives are important and a necessary step in the process of framing curriculum and imparting education. The objectives of curriculum should be clearly defined so that teachers can be helped to integrate the content with different activities. It means that objectives give direction to content coverage and content gives the direction to the teachers in terms of the activities, evaluation procedure and time-management for teaching. Appropriate objectives and content form a strong foundation for designing any curriculum. Hence, the need to critically analyze the existing mathematics textbooks at primary level in both the countries to judge whether or not they reflect the prescribed objectives by Bangladesh National Curriculum Textbook Board (BNCTB) and West Bengal Board of Primary Education (WBBPE). Also, it is very much necessary to critically analyze the objectives of teaching mathematics at primary level in Bangladesh and West Bengal of India as these objectives form the base for designing syllabi and textbooks.

This chapter analyses the mathematics curriculum mainly in two parts: namely, objectives and content-areas. Sections 4.2- 4.5 contain analysis of objectives and sections 4.6-4.9 contain analysis of content-areas of textbooks of grades I-V of both countries. Also, a comparative critical examination of objectives of mathematics curriculum at primary level of BNCTB and WBBPE has been done in these sections. Further, objectives of BNCTB and WBBPE have been compared and examined with standard set of objectives for primary education prescribed by the experts of the Regional Conference on Development of Integrated Curriculum in Mathematics for Developing countries of Asia (RCDICMDCA) – 1975. Also, a comparative picture of content areas covered by BNCTB and WBBPE textbooks has been drawn.

4.2 Objectives of Mathematics Curriculum at Primary Level: International Perspective

The explicit statements of objectives of mathematics education presented by the different countries in the UNESCO-NIER regional programme – 1983 were studied for commonalities. While a great variation in the manner of expression of the objectives by the different countries is observed, the essential points do not differ much. At the elementary level, most of the statements include:

(1) Basic knowledge and skills

(2) Ability to solve problems in daily life; and

(3) Ability for mathematical and/or logical thinking

The need to improve the quality of mathematics education has been felt for many years and for many considerations. Some of the important considerations are:

(i) To bridge the gap between the level of creation in mathematics and the level at which it is actually taught in the classroom, even at the highest level of education

(ii) To develop an appreciation for mathematics in the mind of a learner and to communicate to him the correct spirit of the subject, i.e., mathematics is a unified study, based on some fundamental concepts like set, structure, mapping and so on and not only a bag of skills for solving problems occurring in subjects like arithmetic, algebra, geometry, calculus and so on (unfortunately this is the impression that classical mathematics gives)

(iii) To acquaint the learner with the ever extending horizon of application of mathematics and mathematical way of thinking in almost all branches of knowledge and in almost all activities of human being, and

(iv) To prepare mathematically trained people with ability to create and handle confidently, new mathematical concepts if needed to meet the challenges provided by the needs of the society.

It is true that a considerable thinking has already been done in countries like the USA, USSR, UK, France and so on and the mathematics educators in these countries have evolved some tentative structures of mathematics education which are consistent with their national goals and objectives of mathematics education and which take account of the existing level of education, the socio-economic conditions of the people and the means that are available for implementing the proposed changes.

The prescriptions are different in different countries, for example, France and USA place more emphasis on abstraction and Japan and the USSR are more tilted towards application, while the UK adopts a middle course between abstraction and application. This is as it should be, as the national goals and needs are different in different countries, as are also the means of achieving them. But can a country adopt a system en bloc which has succeeded in another country? The answer to this question is clear from what has been written above. It is also clear that probably the countries having similar socio-economic conditions and standards of general education may jointly evolve some common pattern of education if they meet on a common platform. In this respect, the concept of regional conferences, proposed by Prof. Lighthill, assumes paramount importance. In fact, these regional conferences provide opportunity to the countries of a region to understand each other's difficulties as well as their strong points, to compare their experiences and to know about their needs, goals and objectives (Indian National Science Academy (INSA), 1975).

The conference feels that curriculum-development is the prerogative of individual countries in accordance with their needs, aspirations, goals and objectives and, therefore, it did not undertake to develop any curricula. The conference, on the other hand, applied itself to more fundamental issues, such as purpose of mathematics education and teaching strategies necessary to make it meaningful to the learner, which apply to all countries. It is the hope of the participants in the conference that the present report will assist the individual countries to develop mathematics education in a way that will increase its meaningfulness (INSA, 1975).

Panel of Regional Conference on Development of Integrated Curriculum in Mathematics for Developing Countries of Asia (RCDICMDA) – 1975 recognizes that in most of the developing countries in Asia, a large percentage of students do not continue beyond the primary education. Therefore, it is proposed to lay down the following minimal objectives which would meet the requirements of both the groups of pupils, i.e., those who will continue their studies beyond the primary stage and those for whom the primary education is the terminal stage.

The objectives for primary education prescribed by the experts of the Regional Conference on Development of Integrated Curriculum in Mathematics for Developing countries of Asia (RCDICMDCA) – 1975 may be considered as a standard set.

Here, it can be noticed that the investigator had tried to come across the latest documents (based on national/international conference/workshop/ seminar) which are

published by UNESCO or other agency on mathematics education at primary level. The investigator had come across many proceeding/documents on conference/workshop/ seminar. Some of them are 'National strategies for curriculum development (1979)', 'Goals and theories of education in Asia(1980)', 'Integrating subject areas in primary education curriculum (1981)', 'Training educational personal for integrated curriculum (1984)', 'Accent on quality, inter-regional seminar on primary education(1986)', 'Nurturing and identifying talents in mathematics, science and technology(1991)', 'Research in basic education and literacy (1991)', 'The universalizing primary education: enhancing learning achievement in primary education in Asia and the pacific(1992)', 'In-service teacher education in science, technology and mathematics(1993)', and " An international comparative study of school curriculum(1999)', which are published by UNESCO.

The above mentioned documents/proceeding of conference/workshop/ seminar are related to broad curriculum and policy aspects but nothing specific related to curriculum in mathematics(at primary level) or mathematics education (at primary level) for developing countries in Asia has been discussed in these documents/reports. The investigator did not come across a single document/proceeding on mathematics education from where standard set of objectives could be obtained / derived for comparison purpose.

From documents of RCDICMDCA (1975) it reveals that Indian states including West Bengal and some Asian countries including Bangladesh attended/participated in RCDICMDCA conference. Also, the investigator observed that this conference was held in 1975 while Government of West Bengal changed the curriculum and syllabus in 1981 and Government of Bangladesh reformed primary education curriculum in 1988. Hence considering the events of presence of both these countries in RCDICMDCA conference and soon then phenomenon of changing/modifying the primary curriculum took place in both the countries, the investigator decided to consider the objectives prescribed by the experts of RCDICMDCA as the standard set of objectives for the comparison purpose in this study .

Standard Set of Objectives Prescribed by the Experts of RCDICMDCA (1975)

(i) Development of numeracy and its application to daily life situations.

(ii) Development of manipulative skills in mathematics, particularly in basic arithmetic.

(iii) Ability to translate simple, real life situations into mathematical terms, thus acquiring an appreciation of the power of mathematics.

(iv) Development of intuitive geometrical notions, and

(v) Ability to draw appropriate inferences from patterns of numbers, reading and writing of pictographs, tables etc.

With this standard set of objectives, it was decided to compare the set of objectives of mathematics curriculum which is formulated by Bangladesh National Curriculum and Textbook Board (BNCTB) –1988 and West Bengal Board of Primary Education (WBBPE) –1981(which are practiced till today in both the countries), to judge whether the objectives of teaching mathematics at primary level are at par with this standard set of objectives given above.

It is a well known fact that 'what' (i.e. content) and 'how' (i.e. methods) of a subject are always governed by the 'why' (i.e. objectives)! In fact, the statements of objectives for teaching a particular subject direct the framing of the curriculum of that subject with respect to the content to be covered, depth of the content, area covered in the content, etc. Thus, stating of objectives of teaching a particular subject in the curriculum of that subject is the basic need which is to be satisfied; otherwise the content of curriculum will lose its direction (Patadia, 1983). Hence, it is required to study the objectives of mathematics curriculum at primary stage as considered by BNCTB and WBBPE.

4.3 Specification of Objectives in Mathematics Curriculum Prescribed by BNCTB

Bangladesh introduced integrated curriculum in 1977 based on the recommendations of the National Curriculum and Syllabus Committee. Curriculum integration has been understood as combining experiences for the children in relation to their natural and social environment. It involves organization of content from various related subject areas around the central theme of 'an introduction to environment'. Some subjects like population education, moral education, aesthetics, natural heritage and culture with general subjects such as language and mathematics are integrated in the curriculum of all the five grades at primary level. Bangladesh National Curriculum Textbook Board (BNCTB) reformed the primary education curriculum in 1988 based on universal primary education. In order to ensure the

qualitative standard of universal primary education, BNCTB adopted 53 terminal competencies. This reform of the primary education curriculum in Bangladesh (1988) has drawn up of 53 terminal competencies for all pupils completing the five year primary education cycle are expected to achieve these competencies. Out of 53 terminal competencies, there are 5 competencies for mathematics such as:

(i) To gain basic idea of numeracy and to be able to make use of numbers.

(ii) To know four fundamental operations and to be able to use them.

(iii) To apply the simple methods of computing/calculating in solving the day-to-day problems.

(iv) To know and to use the units of money, length, weight, square, measure, measurement and time.

(v) To know and understand the geometrical signs and figures.

In the context of primary education, the experts of Bangladesh National Curriculum and Textbook Board (BNCTB) first reviewed the objectives of primary education as laid down in the reports of previous Commission and Committee for redetermining the general objectives of primary education. They identified 19 objectives of primary education. Out of 19 objectives, there are 3 objectives for mathematics such as:

Objectives of Mathematics as Prescribed by BNCTB

(i) To help develop basic skills related to language, numeracy and counting.

(ii) To help develop learning skills and attitudes.

(iii) To help develop the habit of solving problems through scientific methods as well as to develop a scientific outlook in life.

4.4 Specification of Objectives in Mathematics Curriculum Prescribed by WBBPE

In India, curricula are integrated around natural and social aspects of environment. There is a single subject of Environmental Studies covered in grades I and II. The same studies are presented in two different subject areas under the names of General Science and Social studies in grades III-V. Further intensive work on developing integrated curricula was done under the project, Primary Education Curriculum Renewal (PECR), where efforts were made to integrate various subjects as well as various aspects of children's environment – natural as well as social into

different areas of learning like languages, mathematics, environmental studies, productive work, health education and creative activities. Attempts were also made to integrate various subject areas partially or wholly. This project (PECR) has been emulated in most Indian states with varied experiences. Some other states are trying to implement this recommendation too.

The West Bengal Board of Primary Education (WBBPE) changed the old curriculum and syllabus in 1981. The renewal of pedagogic components, intensification of continuous and comprehensive evaluation system, effective implementation of the contents in non-scholastic areas, etc. have been given particular emphasis during post – 1986 period after implementation of National Policy and POA, both refined in 1992 (Government of West Bengal, 1999).

The list of objectives of teaching mathematics at primary level, as considered by WBBPE, is explicitly given in the curriculum prescribed by it. So the same list has been given here:

Objectives of Mathematics as Prescribed by WBBPE (1981)

(i) To develop the necessary understanding of basic concepts of mathematics at primary level and to apply those concepts in day-to-day life.

(ii) To develop the ability to perform computations with speed and accuracy.

(iii) To develop reasoning, analytical and problem solving abilities.

(iv) To develop the ability for accurate measurement.

(v) To develop the ability for divergent thinking and creativity.

(vi) To apply the above mentioned mathematical concepts appropriately towards increased efficiency of National productivity and manners and customs of democratic society and to develop this efficiency through necessary practice of the above mentioned objectives.

4.5 Comparative Analysis of Mathematics Objectives

Since objectives give direction to content coverage and depth of the content in curriculum, it is very much necessary to study the objectives, to judge the appropriateness of the content of the curriculum (Patadia, 1983). Hence, to judge the appropriateness of the mathematics content at the primary level, it is necessary to examine the appropriateness of the objectives prescribed by BNCTB and WBBPE. Technique of critical analysis in context of curriculum objectives and its comparison

with standard set of objectives (RCDICMDCA) have been utilized. Using the same technique, the investigator investigated aims and objectives stated in the curriculum and grade-wise content-areas of primary mathematics based on the documents and textbooks in both the counties for the realization of objective one of the present study. Here, appropriateness of objectives means that whether they fit into the list of standard set of objectives of teaching mathematics which is given in the section 4.2.

There are two groups of schools in this study following different countries, from two different countries (Bangladesh and West Bengal of India) with similar cultures and traditions. One group is affiliated to Bangladesh National Curriculum and Textbook Board (BNCTB) and another is affiliated to West Bengal Board of Primary Education (WBBPE) having different curricula. The investigator intends to compare the objectives of BNCTB and WBBPE with each other and then with the standard set of objectives of teaching mathematics given in the section 4.2. This comparative evaluation about objectives was carried out to judge the appropriateness of content/curriculum for mathematics at primary level.

To facilitate the comparison of objectives following table is drawn from objectives given in sections 4.2, 4.3 and 4.4.

Table - 4.1

Comparative View of Objectives of Mathematics at Primary Level Prescribed by BNCTB, WBBPE & RCDICMDCA

Objectives of BNCTB	**Objectives of WBBPE**	**Standard Set of Objectives prescribed by RCDICMDCA**
(i) To help develop basic skills related to language, numeracy and counting. **(ii)** To help develop learning skills and attitudes. **(iii)** To help develop the habit of solving problems Through scientific methods as well as to develop a scientific outlook in life.	**(i)** To develop the necessary understanding of basic concepts of mathematics at primary level and to apply those concepts in day-to-day life. **(ii)** To develop the ability to perform computations with speed and accuracy. **(iii)** To develop reasoning, analytical and problem solving abilities. **(iv)** To develop the ability for accurate measurement. **(v)** To develop the ability for divergent thinking and creativity. **(vi)** To apply the above mentioned mathematical concepts appropriately towards increased efficiency of National productivity and manners and customs of democratic society and to develop this efficiency through necessary practice of the above mentioned objectives.	**(i)** Development of numeracy and its application to daily life situations. **(ii)** Development of manipulative skills in mathematics, particularly in basic arithmetic. **(iii)** Ability to translate simple, real life situations into mathematical terms, thus acquiring an appreciation of the power of mathematics. **(iv)** Development of intuitive geometrical notions, and **(v)** Ability to draw appropriate inferences from patterns of numbers, reading and writing of pictographs, tables etc.

From the comparison of objectives of BNCTB and WBBPE given in table-4.1, it is obvious that the objectives (i) and (ii) of BNCTB and objectives (ii), (iii) and (iv) of WBBPE are comparable in meaning but differ in construction of statements to a great extent. In fact, objectives (i) and (ii) given by BNCTB are much broader while those given by WBBPE are more specific in terms of expectation of particular skill development. Objective (i) of BNCTB encompassed skills related to language, numeracy and counting collectively thereby affecting comprehension. Objective (ii) focused on learning skills and attitudes. These two objectives of BNCTB lack specificity in terms of expectation of particular skill development, hence it neither gives direction / hints to the textbook writers to introduce specific illustrations in context of skills development nor gives direction to the teachers of Bangladesh regarding how to develop certain skills and what is to be focused more while developing skills among their pupils. Objectives (ii) and (iii) of WBBPE mean developing of learning skills with specific abilities such as speed, accuracy involving children through processes such as reasoning and analyzing. Objective (iv) is specified for accurate measurement for practical application in day-to-day life. These objectives are giving direction to teachers of West Bengal to develop-skills among their pupils.

From the table-4.1, it is obvious that the objectives (iii) of BNCTB and objectives (v) and (vi) of WBBPE, are comparable in meaning to some extent but differ in construction to a great extent. It is obvious that objective (iii) of BNCTB is much broader and no specific direction for any particular content coverage is mentioned while objectives (v) and (vi) of WBBPE are more specific in terms of expectations of achievement. The objective (v) of WBBPE broad and focus on higher level cognitive development of pupils. On the other hand there is no such objective focusing on higher level ability like creativity is present in the list of BNCTB objectives. Objective (vi) is very specific, giving direction to the textbook writers to include a variety of content, learning experiences, exercises, etc. to be included in the textbooks.

As far as objective (i) of WBBPE is concerned, there is no such objective found in the list of BNCTB objectives (Refer table-4.1). This objective (1) of WBBPE talks of development of understanding of basic concepts of mathematics and then its application in day-to-day life.

On the other hand, set of objectives prescribed by BNCTB do not contain any objective which is related to the development of basic mathematical concepts at primary level. Objectives of BNCTB directly focus on the development of skills (mainly problem solving) and scientific attitudes among the students. From the comparison, it is also revealed that objectives of WBBPE are given in logical order and from simple to complex.

But, still it remains to be seen how far the objectives of BNCTB and WBBPE are at par with standard set of objectives (prescribed by RCDICMDCA) of teaching mathematics at primary level. Comparison of objectives (of both the countries) from table-4.1 with respect to the standard set of objectives given by RCDICMDCA shows that the objectives (iii), (iv) and (v) of standard set of objectives (given by RCDICMDCA) are not reflected in the set of objectives of BNCTB while objectives (iv) and (v) of standard set are absent in the list of WBBPE objectives.

Objectives (iv) and (v) of standard set help the pupils to learn exact geometrical forms from the learners' own environment and stimulate the development of spatial perception through intuition. These two objectives do not find the place in BNCTB and WBBPE curriculum.

As far as, objective (iii) of standard set is concerned, there is no such objective found in BNCTB set of objectives. The objective (iii) of the standard set talks of real life situation into mathematical terms and then appreciation of the power of mathematics.

A close observation from table 4.1, found that there is a great variation in the manner of expression (language) of objectives of BNCTB, WBBPE and objectives (i), (ii) and (iii) of standard set given by RCDICMDCA. But inherent meanings of these objectives are similar to the great extent; focusing skill development and understanding basic mathematical concepts with its application into day to day life of pupils.

4.6 Need of Analysis of Mathematics Content-Areas

Organizing curricular content requires the ability to classify knowledge, to utilize or to improvise a structure of knowledge, to organize activities around big points such as principles, concepts, and understandings (Das, et.al. 1984; 119). The content of the mathematics curriculum of any country is most likely to assist the

development of the skills of computation, measurement, problem-solving, estimation and approximation, organization and interpretation of data, and of quantitative communication (UNESCO – NIER, 1983; 38). The content of the curriculum is related to objectives of education at particular level for which curriculum is framed.

Merely stating appropriate objectives of teaching a subject will serve no purpose if the same are not reflected in the content of syllabus. So, to know whether the objectives are reflected through content of syllabus, one has to study and analyze the syllabus. Also, the analysis of syllabus of a subject is important from point of view of content of the textbook, which is always dependent on the content prescribed in the syllabus of that subject. The syllabus of a subject always directs and decides about the content of textbook, topics to be covered, area and depth of the topics to be covered etc. (Patadia, 1983).

To judge the content to which a textbook meets the needs of the pupils, the requirement of the subject and the teaching learning situation is essential for selection of textbooks. Hence, taking into consideration the importance of analysis of mathematics content-areas (grade-wise), as prescribed by Bangladesh National Curriculum Textbook Board (BNCTB) and West Bengal Board of Primary Education (WBBPE) are analyzed in next sections. Here, it is worth mentioning that content-areas of mathematics as prescribed by BNCTB and WBBPE are available in Bengali language but its copy in English language is not available. For the present study, the investigator has presented the English version of mathematics content-areas obtained from the original mathematics textbooks. Here analysis of grade-wise content areas of mathematics are given separately. It is necessary to study them before a thorough analysis is undertaken.

4.7 Analysis of Content-areas of Mathematics as Prescribed by BNCTB at Primary Level

In this section, first the list of content areas (grade-wise) of teaching mathematics is explicitly given as it is given in the textbooks published by BNCTB. Subsequently an analysis of the same is carried out in the following sections.

4.7.1 Mathematics Content Areas for Grades I-V Given in Textbook

Standard-I

Lesson – 1	:	Manipulation of concrete objects and counting
Lesson - 2	:	Numbers from One to Nine
Lesson - 3	:	Addition
Lesson - 4	:	Subtraction
Lesson - 5	:	Comparison
Lesson - 6	:	Concept of Zero
		Let's see how much we have learnt?
Lesson - 7	:	Numbers (10 – 19)
Lesson - 8	:	Ordering
Lesson - 9	:	Addition and Subtraction
		Let's see how much we have learnt?
Lesson - 10	:	Numbers (20 – 50)
Lesson - 11	:	Ordinal Numbers
Lesson- 12	:	Addition and Subtraction
Lesson - 13	:	Writing numbers in word (1 – 10)
Lesson - 14	:	Comparison
Lesson - 15	:	Bangladeshi coins and currency
Lesson - 16	:	Name of the seven days of week
Lesson - 17	:	Writing numbers in word (11 – 20)
Lesson - 18	:	Word problems relating to addition and subtraction
		Let's see how much we have learnt?

Standard-II

Lesson - 1	:	Numbers (51 – 100)
Lesson - 2	:	Place Value
Lesson - 3	:	Even and Odd numbers
Lesson - 4	:	Comparison of numbers: Determination Big – Small
Lesson - 5	:	Ordering of numbers
Lesson - 6	:	Ordinal Numbers
		What we have learnt

Lesson - 7	:	Addition
Lesson - 8	:	Subtraction
Lesson - 9	:	Relation between Addition and Subtraction
		What we have learnt
Lesson - 10	:	Multiplication
Lesson - 11	:	Division
		What we have learnt
Lesson - 12	:	Bangladeshi currency
Lesson - 13	:	Concept of Fraction
Lesson - 14	:	Mensuration
Lesson - 15	:	Week, days, month, second, minute, hour
Lesson - 16	:	Geometrical shapes
		What we have learnt

Standard-III

Counting, Reading and Writing

Place value

Even – odd numbers

Big – small numbers

Exercise-1

Addition

Subtraction

Relation between Addition and Subtraction

Exercise-2

Word problems relating to addition and subtraction

Exercise-3

Multiplication

Exercise-4

Division

Exercise-5

Problem solving (Addition, subtraction, multiplication, division)

Exercise-6

Bangladeshi currency

Exercise-7

Fraction

Exercise-8

Mensuration

Exercise-9

Time

Exercise-10

Calendar

Geometry

Exercise-11

Standard-IV

Unit - 1	:	Numbers
Unit - 2	:	Addition and Subtraction
Unit - 3	:	Multiplication
Unit - 4	:	Division
Unit - 5	:	Easy Problems (word problems)
Unit - 6	:	Simplifications
Unit - 7	:	Factors and Multiples
Unit - 8	:	Mathematical Sign
Unit - 9	:	Simple Fractions
Unit - 10	:	Decimals
Unit - 11	:	Mensuration
Unit - 12	:	Time
Unit - 13	:	Graph
Unit - 14	:	Geometry

Answers

Standard-V

Unit - 1	:	Largest and Smallest number
Unit - 2	:	Addition and Subtraction
Unit - 3	:	Multiplication and Division
Unit - 4	:	Word problems involving first four rule

Unit - 5	:	Unitary method
Unit - 6	:	Mathematical sign and verbal statement
Unit - 7	:	Simplification
Unit - 8	:	Mean
Unit - 9	:	LCM and HCF
Unit - 10	:	Fraction
Unit - 11	:	Decimals
Unit - 12	:	Percentages
Unit - 13	:	Mensuration
Unit - 14	:	Time
Unit - 15	:	Capital-Expenditure and Cash-memos
Unit - 16	:	Bar graph
Unit - 17	:	Geometry

Answers

4.7.2 Analysis of Mathematics Textbooks for Grades I-V

The textbook is one of the most widely used instructional aids to establish communication between the students and the teacher. The importance of the textbooks varies from country to country; still it is universally recognized as a basic teaching tool. Analysis of curricular content can be done by analyzing the communications in a textbook, and this is known as 'textbook analysis' which is very important in the evaluation of textbooks. The investigator had gone through the content of the textbooks for grades I-V prescribed by BNCTB thoroughly. This analysis leads to the following findings:

Standard-I

Manipulation of objects and counting (lesson 1, 8, 11, 15) provides ways of exploring such concepts as classification, order, and comparisons of quantity and length before children, presenting more symbolic content. Content (lesson3, 4, 5, 8,9,12, 18) stresses more upon the manipulative skills, and vocabulary (lesson 13, 17) related to numbers. For the early elementary school age (6 +) it is the strongest possible foundation for mathematics learning. Topics like addition, subtraction and word problems are introduced in the content for developing the computational skills,

imaginative power and logical thinking among children. Thus these topics help in fulfilling all the objectives i.e. (i) To help to develop basic skills relating to language, numeracy and counting. (ii) To help to develop learning skills and attitudes.(iii)To help to develop the habit of solving problems with scientific methods as well as to develop a scientific outlook on life. Even though no objective related to day to day life experiences is included in curriculum of BNCTB, topics related to coins, currency, week days are included in textbook which are very relevant to the day to day life of the children in Bangladesh. So it can be said that the content reflects, all objectives prescribed in curriculum and is quite comprehensive in relation to the objectives prescribed by BNCTB.

There was a general agreement among the Asian countries that at least in the lower elementary classes, mathematics should be taught in the mother tongue (UNESCO- NIER, 1983). It was found that the language (Bengali) of the textbook is very simple and easy to understand for children. The colourful pictures of the textbook (in all the lessons) have been labelled clearly and help in communicating the topic to the learner. It was found that to judge the ability of the children some activities like, fill in the blanks, insert the number in appropriate place, determining big-small, even-odd, ordering, addition, subtraction, word problems, count by tens, number writing in word, are given on p. 43-44,68-69 and 94-96 of textbook.

Standard-II

Working with numbers and their operations need little introduction, since this traditionally constitutes children's early elementary mathematical experience (Hohmann, 1991). It seems that content of numbers, place value, even-odd numbers, comparison, ordering, etc. make a basis or strong foundation in the pupils for developing skills for further four fundamental operations. Introduction of these topics help in fulfilling all the objectives (Refer 4.3) as considered by BNCTB. Topics like Mensuration (length, mass, capacity, currency, and time) and geometry shapes (sphere, cube, cone and cylinder) are very important for understanding everyday life experiences of children and helpful to identify the 3-dimensional objects. It seems that in spite of broader objectives prescribed by BNCTB, the textbook writers have taken enough care to encompass topics like mensuration and geometry, which are not specifically mentioned in the set of objectives.

Language is the most important for clarifying mathematical ideas. Some of the difficulties of slow learners in mathematics are due to language. However, it was found that grade-II textbook is free from language ambiguity. Contents are subdivided directly in lesson. It was found that colourful pictures are included only on p. 47 and 57 to clarify the concept of multiplication. Other topics of the textbook have been explained through illustrations of marble, sticks and abacus, etc. but without coloured picture. It was also found that to judge the ability of the children some activities like counting and writing number through picture, fill in the blanks, numbers' writing in figures and word, big-small numbers, ascending and descending numbers, ordinal numbers, addition , subtraction, word problems, multiplication and division, currency, time and geometrical shapes are included on p.28-31, 44-46, 63-65 and 83-84.

Standard-III

Topics of number aspects such as place value, even-odd, and comparison are mentioned in the textbook content for cognitive development of the pupils related to mathematical vocabulary, numeracy and counting. Thus this content reflects the objective (i) (Refer 4.3).Problem solving skills related to four fundamental operations (addition, subtraction, multiplication and division) are very much important in the daily life situations. Topics like addition, subtraction, multiplication and division and word problems based on these topics have been included in the textbook content appropriately and cover all objectives prescribed by BNCTB. Topics like mensuration (currency, length, mass, capacity, time), fraction, geometry are obviously important links between mathematics and everyday life. In spite of broader objectives prescribed by BNCTB, the textbook writers have taken enough care to encompass different mathematical skills related to mensuration (currency, length, mass, capacity, time) which are not specifically mentioned in the set of objectives. The textbook content also takes care of basic concept development related to fraction and geometrical shapes using picture wherever possible. It is also important to note here that no specific objective is prescribed by BNCTB related to development of basic mathematical concepts.

It was found that the content list of the textbook is not splitted into clear cut distinct units/lessons. Presentation of content does not include previous knowledge/entry behaviour of children and introduction to the topic. But, simple

language has been used in explaining each topic. It was also found that pictures (black and white) used in the textbook are relevant to the content i.e. place value, fraction, mensuration, time and geometry. An exercise is given at the end of each topic for developing communication skill with speed and accuracy.

Standard-IV

Topics viz. numbers, addition, subtraction, multiplication, division, word problems involving four fundamental operations, simplification, factors and multiples, fraction and decimals are included in the content of textbook. Through these topics pupils can develop understanding of mathematical concepts, and can develop rational and logical thinking. Thus these topics reflect all the three objectives (Refer section 4.3) as considered by BNCTB. Also topic mathematical sign is important to translate verbal statements in mathematical form using appropriate symbols. Thus this content reflects the objective (i) (Refer section 4.3).Even though objectives prescribed in BNCTB are broad and specifically not emphasizing on these skills, topics in mensuration, time, graph, geometry given in textbook are more inclined towards application of mathematical knowledge and help to meet the practical needs of day-to-day life. This is really the strong point observed of textbook which encompasses larger domain of relevant content that is not covered under the umbrella of objectives prescribed by BNCTB.

Each topic is presented in very simple language and in informal way. But no purpose is included in beginning of the lessons/units. The pictures/figures have been used mainly to describe the numbers (p.7, 49), fraction and decimals (p.69-102), measurement (p.104-117). Diagrams have been used in the textbook to convey the topics such as multiplication, division, factors and multiples (p. 25, 37, 54, 58). Graph has been used in unit 13 and the information conveyed effectively. A number of tables have been included in the textbook (p.18-20, 51-53, 57-58, 62-63, 89-100,105, and 121-124). These tables supplement the information given in the text. An exercise is given at the end of each topic. This contains various problems. But problems are not arranged in increasing order of difficulty level.

Standard-V

Topic viz. largest and smallest number, addition and subtraction, multiplication and division, word problems involving four fundamental operations, unitary method, simplification, Mean, LCM and HCF, fractions, decimals, percentages and capital-expenditure and cash memos are more inclined toward the knowledge, understanding and performance with speed and accuracy in solving problems of day-to-day life. Thus these content reflect all the three objectives (Refer section 4.3) as considered by BNCTB. Topics like mensuration, time and bar graph are very important for developing good approximations and estimate measurements and develop the power of interpretation and representation. The textbook writers have taken enough care to encompass different mathematical skills related to mensuration, bar graph which are not specifically reflected through the prescribed objectives. Geometry (different angle, quadrilateral, parallelogram, rectangle, square, rhombus and circle) helps the children to identify different shapes of objects and develop in them imagination and logical- mathematical intelligence. This content is related to objective (iii) (Refer 4.3) of BNCTB prescription.

Each topic is presented in simple language which is easy to understand. The pictures labelled in the textbook are very few such as found on p.39, 55, 61, 73, 75, 77,130-131 and 145.It is also found that none of the pictures are coloured .These were found to be relevant and enhanced the understanding of the content. It was also found that bar graph is given in chapter 16 with clarity and conveyed the information effectively. The exercises given at the end of the chapter are enough for practice.

4.7.3 Organization of Textbook Content for Grades I-V

There exist different methods of content organization. Topical method and spiral method of arrangement are the well known types of organizing the content.

By the topical method one means that – everything, about the topic which is included in the content of a particular standard is taught at a stretch in the same standard. By spiral method means that whenever a topic is introduced in a particular standard; everything about that topic is not taught at a stretch in the same standard but the topic is divided into some selected portions which are introduced in different standards taking into consideration the abilities of the children to which it is taught

(Kumar, 1993). According to these methods, the investigator investigated organization of content of textbooks for grades I-V.

The textbooks content of mathematics as prescribed by BNCTB seems to be a combination of topical method and spiral method; but more emphasis is given on the spiral method. Topics such as manipulation of concrete objects and counting are introduced in grade-I from 1 to 50, grade-II from 51 to 100 and grade-III from 101 to 10000 represent spiral method in the textbook.. Similarly, concept of numbers and numerals up to 50 in grade-I, 51 to 100 in grade-II, 101 to 10,000 in grade-III, and up to one crore in grade- IV has been spirally distributed. Similarly Four Fundamental Operations (FFOs), mensuration (length, mass, capacity, currency, time) are divided into some selected portions which are introduced in standard I to V. Geometry and fraction are spirally distributed among standard II to V. Mathematical sign, pictorial representation of data, simplification, decimals are covered from standard IV to V (vide flow chart from 4.1 to 4.5) representing spiral distribution. Rests of the topics have been organized in topical method. Topics like unitary 'method', 'mean', 'LCM & HCF', 'percentage', 'capital-expenditure' and 'cash-memos' are completely taught in standard-V.

4.7.4 Appropriateness of Content-Areas with Respect to Age and Ability of the Pupils

After going through the content-areas (vide section 4.7.1), curriculum and textbooks, it is clear that BNCTB has given emphasis on six learning areas such as (i) Manipulation of concrete objects and counting (ii) Number and numeration (iii) Four fundamental operations (iv) Life skill related problems (day-to-day life problems), (v) Pictorial representation of data (vi) Geometry, which is presented in detail in flow charts from 4.1 to 4.5.

It was observed that almost all the topics are well articulated according to grade and are quite suitable to the age and abilities of the pupils of standard (I-V). But chart-4.1 which refer that 'Manipulation of concrete objects and counting' and 'Number and numeration' from 1 to 50 are discussed in grade-I (6 + pupils). Some studies have shown that manipulation plays a supportive role in mathematics learning throughout all levels of elementary school learning (Hohmann, 1991). Jean Piaget points out that the logical concepts involved in grouping, sorting, comparing, ordering, and understanding part-whole relationships underlie children's understanding of countable or measurable quantity (ibid, 7). Numerals can be

expected to have a clear meaning to the child. So 'manipulation of concrete objects and counting' and 'number and numeration' should be arranged in the content properly, because it gives children the strongest possible foundation for subsequent mathematics learning as well as life-long involvement with mathematics and its applications.

Piaget demonstrated that the children's judgment of the number of objects in a collection, at the age of 6 years, can be strongly influenced by the physical appearance of the collection (ibid, 39). It is true that children have well developed ability in counting numbers up to 100 before they come to school. So it would be wise to include counting, reading and writing numbers up to 100 for standard-I pupils which is found only upto 50 in present textbook.

Also word problems involving addition and subtraction have been included in standard-I (vide chart-4.4). Standard-I children (6 +) learn counting, read and write number; use ordinal numbers as positional number, recognize numbers associated with a collection as a cardinal number and use cardinal number in various situations. It is not appropriate age(6) for children to solve problems independently, so word problems may be deleted from standard-I. It can be included in standard-II and onwards Density of the content coverage in grade-IV textbook is less than that of textbook of grade-V. The content covered in grade-IV textbook is also very easy compared to the age group of the pupils at this level. Also it is noticed that the topics such as mean, LCM &HCF are include in grade-V and are much easier then the topics unitary method, percentage and area (mensuration) included in grade-V textbook. Looking to the difficulty level of the topics in grade-V and density of content coverage it would be advisable to transfer topics such as mean, LCM&HCF to grade-IV. This would help in reducing the density of content coverage of pupils in grade-V. Also topics mean, LCM&HCF are not that difficult to introduce in grade-IV.

4.8 Analysis of Content-areas of Mathematics as Prescribed by WBBPE at Primary Level

Here the list of content areas (grade-wise) of teaching mathematics is explicitly given in the textbooks as published by Director of School Education, West Bengal. The following section contains same list of content for grades I-V. Subsequently an analysis of the same is carried out in the following sections.

4.8.1 Mathematics Content Areas as For Grades I-V Given in the Textbooks

Standard-I

Unit – I

Lesson – 1 : More-less, Tall-short, Heavy-light etc.

Lesson – 2 : Comparison, arranging side by side

Unit – II

Lesson – 1 : Introduction of Numbers

Lesson – 2 : Concept of Big-small Numbers

Lesson – 3 : Before, After and In Between

Unit – III

Lesson – 1 : Concept of equality

Lesson – 2 : Determination of exact idea of 'More' and 'Less'.

Unit – IV

Lesson – 1 : Concept of Addition and its Application

Lesson – 2 : Determining the technique of Addition and determining sum

Lesson – 3 : Discovering the facts related to addition

Unit – V

Lesson – 1 : Concept of subtraction and its Application

Lesson – 2 : Determining the technique of subtraction and determining difference.

Lesson – 3 : Discovering the facts related to subtraction

Unit – VI

Lesson – 1 : Translating word problems of Addition and Subtraction into numeric and solving them

Lesson – 2 : Converting numeric problems of Addition and Subtraction into statements and solving them

Unit – VII

Lesson – 1 : Equal from Unequal

Lesson – 2 : Solving the problem applying the concept of equality

Unit – VIII

Lesson – 1 : Concept of Zero and its sign

Lesson – 2 : Extend the concept of zero

Lesson – 3 : Addition and Subtraction with 'zero'

Unit – IX

Lesson – 1 : Read and Write numbers greater than 9 according to their Place value

Lesson – 2 : Concept of place value

Lesson – 3 : Addition and Subtraction of two digits numbers

Lesson – 4 : Read and Write the numbers from 41 to 70

Lesson – 5 : Addition and Subtraction of two digit numbers

Lesson – 6 : Read and Write the numbers from 71 to 99

Lesson – 7 : Addition and Subtraction of two digit numbers

Unit – X

Lesson – 1 : Introduction to Indian Currency (paisa) and its Addition and Subtraction

Lesson – 2 : Introduction to Indian Currency (Rupees) and its Addition and Subtraction

Unit – XI Hour, day and week

Unit-XII

Lesson – 1 : Translating word problem into numeric and finding Solution of Addition and Subtraction (Miscellaneous)

Standard-II

Unit – I : Recapitulation

Unit – II

Lesson – 1 : Before, After and In Between

Lesson – 2 : Big and Small Numbers

Unit – III

Lesson – 1 : Addition of one digit numbers

Lesson – 2 : Addition facts

Lesson – 3 : Addition of two digit numbers

Lesson – 4 : Determining the difference by subtraction

Lesson – 5 : Subtraction: one digit numbers from two digit number (10 – 18)

Lesson – 6 : Subtraction facts

Lesson – 7 : Subtraction of two digit numbers

Unit – IV

Lesson – 1 : Read and write three digit numbers

Lesson – 2 : Addition of three digit numbers

Lesson – 3 : Subtraction of three digit numbers

Lesson – 4 : Read and Write four digit numbers

Lesson – 5 : Addition of four digit numbers

Lesson – 6 : Subtraction of four digit numbers

Lesson – 7 : Problem solving involving both Addition and Subtraction

Unit – V

Lesson – 1 : Measures of Length

Lesson – 2 : Measures of Mass

Lesson – 3 : Measures of Capacity

Unit – VI

Lesson – 1 : Concept of Multiplication and its Application

Lesson – 2 : Arriving at multiplication facts

Lesson – 3 : Multiplying two or three digit numbers by one digit Numbers

Lesson – 4 : Solve the real-life problem involving multiplication

Unit – VII

Lesson – 1 : Concept of Division and its Application

Lesson – 2 : Division using multiplication tables

Lesson – 3 : Divide two or three digit numbers by one digit numbers

Lesson – 4 : Converting numeric problems of multiplication and division into statements and solving them

Unit – VIII

Lesson – 1 : Analyzing any number as a sum of two numbers

Lesson – 2 : Idea of fraction

Unit – IX

Lesson – 1 : Relationship of different coins and currencies

Lesson – 2 : Addition and Subtraction of currency

Unit – X

Lesson – 1 : Measures of Time

Lesson – 2 : Concept of Week, Month, Year etc.

Standard-III

Unit – I : Recapitulation

Unit – II

Lesson – 1 : Read and write five digit numbers

Lesson – 2 : Read and write six digit numbers

Lesson – 3 : Determination of Big and small numbers

Lesson – 4 : Addition and subtraction up to six digit number

Unit – III

Lesson – 1 : Multiplication and division of any numbers and zero

Lesson – 2 : Multiplication facts from 11 to 20

Lesson – 3 : Product and Quotient using by multiplication facts

Lesson – 4 : Multiplying by 10, 100, 1000 etc.

Lesson – 5 : Multiplication using factor analysis

Lesson – 6 : Simple Multiplication of two or more digit numbers

Lesson – 7 : Division by two digit number

Lesson – 8 : Division with remainder

Unit – IV

Lesson – 1: Converting successive word problems into numerical form and solve them

Unit – V

Lesson – 1 : Prime and Composite Numbers

Lesson – 2 : Factors and Multiples

Lesson – 3 : Determining the divisibility by 2, 3, 5 and 10

Lesson – 4 : Factorization

Unit – VI

Lesson – 1 : Fractional Numbers

Lesson – 2 : Comparison of fractional numbers

Unit – VII

Lesson – 1 : Decimals

Lesson – 2 : Addition and Subtraction of Decimals

Unit – VIII

Lesson – 1 : Indian currency

Lesson – 2 : Units of measures: length, mass and capacity

Unit – IX

Lesson – 1 : Days, Hour, Minutes, Seconds

Lesson – 2 : Addition, subtraction, multiplication and division using hour, minute, second

Lesson – 3 : Days, month and year

Lesson – 4 : Addition, subtraction, multiplication and division using days, month

Lesson – 5 : Measures of Time

Unit – X : Miscellaneous exercise

Standard-IV

Unit – I : Recapitulation

Unit – II

Lesson – 1 : Read and Write up to crore

Some statements regarding place value

Lesson – 2 : Some special properties of numbers

Unit – III

Lesson – 1 : More complex multiplication and division

Lesson – 2 : Multiplication by using factors

Division by using factors

Unit – IV

Lesson – 1 : Common factors and common multiples

Lesson – 2 : Highest Common Factors (HCF)

Lesson – 3 : Lowest Common Factors (LCF)

Unit – V

Lesson – 1 : Concept of Equivalent fractions

Determination big and small fractions

Lesson – 2 : Addition and subtraction of fractional numbers

Unit – VI

Lesson – 1 : Addition and subtraction of decimals

Lesson – 2 : Multiply decimal numbers by whole numbers

Expanded Division

Multiply decimal numbers by 10, 100 etc.

Divide whole numbers by 10, 100, 1000 etc.

Unit – VII

Lesson – 1 : Mean

Lesson – 2 : Number of numbers, sum of the numbers and relation

Unit – VIII

Lesson – 1 : Inter-relation among different Units

Lesson – 2 : Changing one unit from another unit

Lesson – 3 : Units for use in daily life

Addition and subtraction of measures

Multiplication and division of measures

Unit – IX : Geometry

Lesson – 1 : Surface

Lesson – 2 : Surface, plane surface, non-plane surface, curve surface

Lesson – 3 : Plane Figures

Standard-V

Mathematics

Recapitulation

Unit – I

Classification of fraction

Mixed fractions from Improper fractions

Complex addition and subtraction of fraction

Multiplication and division of fraction

Solving more than one step problems of fraction

From simple fractions to decimals

From Decimals to simple fraction

Multiplication and division using decimals

Solving more than one step problems of decimals

Unit – II

Unitary method

Create the problems of unitary method

Unit – III

Concept of Percentage

Percentage

Geometry

Unit – I

Line, Point

Angle

Triangle, Quadrilateral, Circle

Area

Unit – I

Length, breadth and perimeters

Area of rectangle

Bar graph

Unit – I

Graph

Miscellaneous

Answers

4.8.1 Analysis of Mathematics Textbooks for Grades I-V

The investigator had gone through the content of the textbooks for grades I-V prescribed by WBBPE thoroughly. This analysis leads to the following findings:

Standard-I

Comparison, comparative ideas are included through topics such as more-less, tall-short, heavy-light, big-small. The concept of numbers, reading and writing numbers, place value are included in the content of textbook for developing of an understanding of the numbers concepts. These contents help in fulfilling the objective

(i) to a great extent (i.e. (i) to develop the necessary understanding of basic concepts in day-to-day life). The objectives (iii) and (v) (i.e. (iii) to develop reasoning, analytical and problem solving abilities (v) to develop the ability for divergent thinking and creativity) are achieved to some extent. Topics such as addition, subtraction, word problems relating to addition and subtraction help the children to develop computation skills and problem solving abilities. These topics are appropriate in fulfilling the objectives (i), (ii) and (iii) (Refer section 4.4) as considered by WBBPE. Mensuration (currency, time) is the most important concept for daily life activities. This content helps in fulfilling the objectives (i) and (iv) (Refer 4.4) as considered by WBBPE.

The language used for the explanation of the topic should be simple and very informal (Patadia, 1983). It was found that each topic is presented in simple language. In spite of this, in unit-6, the topics of 'translating word problems of addition and subtraction into numeric and solving them' and 'converting numeric problems of addition and subtraction into statements and solving them' are beyond the grasping level of children of age group six studying at this level in grade-I. But at the same, it is also found that the list of 'contents' is not presenting the titles of the lessons appropriately e.g. title of lesson-1 is given as "more-less, tall-short, heavy-light, etc." the title of the lesson-II is given as "comparison, arranging side by side". But the presentation of the topic in every unit has been introduced properly. The purpose of the lesson is given in the left-top corner of every unit of the textbook. Below the heading of the topics, instruction is given to the teachers on how to introduce the lesson for better comprehension to the students. The pictures and photographs are the best medium of instruction to present the lesson for better clarity. It was observed that pictures and photographs are given in each unit of the textbook appropriately. All the pictures and photographs have clarity and convey the information effectively. An exercise is given at the end of each lesson of each unit. It was observed that suggested activities are helpful to achieve the purpose (which is written in left-top corner of each lesson) of the unit.

Standard-II

In unit-II, IV and VIII the topics such as before-after-in between, big-small, reading and writing numbers, elementary ideas of fraction are included in the content

for understanding the basic concept of mathematics and mathematical vocabulary. These contents help in fulfilling the objectives (i) (Refer 4.4) as considered by WBBPE. Topics on four fundamental operations (addition, subtraction, multiplication and division) and word problems involving four fundamental operations are reflected in the textbook content from its usefulness point of view in practical life situation. These contents help in fulfilling the objectives (i) and (ii) to great extent and objectives (iii) and (v) to some extent (Refer in 4.4) as considered by WBBPE. Topic Mensuration, Currency, Time are included for application of mathematical knowledge in the real-life problems. Thus, it helps in fulfilling (i), (iii) and (iv) objectives (Refer section 4.4) as considered by WBBPE.

Every topic in the textbook is presented in informal way using simple language. The pictures (colour and 'black and white') are used at appropriate places to explain the concerned topic. Heuristic approach is used in presenting most of the topics to develop thinking power of students. But some of the topics' contents are not suitable with respect to age of the children e.g. Converting numeric problems of multiplication and division into verbal statement and solving them. But each lesson of the textbook has been introduced very systematically. The purpose of the topic is given in left-top corner of the lesson. An exercise is given under unit-VI (multiplication) and unit-VII (division). It is found that miscellaneous exercise is included on p.70, 82-83. It is also found that exercises are not given under every unit except under the units VI (multiplication) and VII (division). In the units other then units VI and VII, some activities for pupils are suggested under the units with heading 'Do yourself'.

Standard-III

Reading and writing numbers, big-small, factors and multiple, fractional numbers, comparison of fractional numbers are included in the content for developing mathematical concepts, learning skills for applying in day-to-day life. Thus objectives (i), (iii) and (v) (Refer section 4.4) are fulfilled. It seems that content of the four fundamental operations, word problems involving four fundamental operations, addition and subtraction of decimals stress upon the knowledge, computational skills and the understanding aspect of mathematics. Also, they stress upon the analytical reasoning and logical thinking. Thus, through these topics the objectives (i), (ii), (iii),

(v) and (vi) of WBBPE can be fulfilled. Topics namely currency, mensuration and time are included in the content for developing the life-skills in day-to-day life. This content helps in fulfilling the objectives (iii), (iv) and (v) to some extent.

Each topic is presented clearly using simple language with specific purpose of the lesson (which is given in left-top corner of the unit). The pictures (black and white) are used at appropriate places to explain the topics such as division with remainder, fractional number and time. An exercise is given at the end of each topic.

Standard-IV

It seems that topics on numbers, factors and multiples, fractional and decimal numbers are included in the content for providing basic knowledge and the understanding aspect of mathematical sign, definitions, concept etc. Also topics on multiplication and division, four fundamental operations of decimals, 'LCM and HCF', mean and mensuration are included for application of mathematical knowledge, developing computation skills and logical thinking. Thus these contents reflect all the six objectives of WBBPE (Refer section 4.4).In Geometry, different kind of objects, plane and curved surfaces are included in the textbook, which is helpful to learners to identify objects having different shapes of common solids. Thus, this topic helps in fulfilling the objective (i) and (v) of WBBPE.

Each topic is presented in very simple and understandable language. The purpose of the lesson is included in left-top corner of the unit. Illustrations depicted in the textbooks have been clearly labelled and it helps in communicating the content to the learner. The illustrations used in the textbook are very few. The figures have been included in unit-V and photographs in unit-VII for clarity of fraction and mean. An exercise is given at the end of each topic. Also it is important to note here that each exercise contains variety of problems ranging from simple to complex; maintaining the logical increasing order of difficulty level suiting to the age group of pupils of grade-IV.

Standard – V

Topics namely fraction, decimals, four fundamental operation of fractions and decimals and its word problems, unitary method, percentage are included in the content for developing concepts of mathematics, computation skills, estimation and

logical thinking. Thus, these contents help in fulfilling the objectives (i), (ii), (iii), (v) and (vi) (Refer 4.4) as considered by WBBPE. In Geometry unit, lines, point, angle, triangle, quadrilateral and circle are included in the content for developing the logical and abstract thinking which reflects objectives (i), (iv) and (v) (Refer section 4.4) as considered by WBBPE.

The topic Mensuration emphasizes upon the practical use of mathematics in daily life. Thus, it helps in fulfilling all the objectives (Refer section 4.4) as considered by WBBPE. Each topic is presented in very simple language and in an informal way. The pictures/figures have been used to describe fraction and decimals (p.8, 11, 18, 20, 23), geometry (p.87-106) and mensuration (p.101-106).Diagram has been used in unit-II (p.64). Graphs depicted in the textbooks have been clearly labelled and help in communicating the content to the learner. A Graph appears in standard-V. The graph in standard-V has been used mainly to describe/compare the information. An exercise is given at the end of each topic which contains various problems/numerical. Thus the content, language, pictures, exercises contained in the textbook are quite suitable for the learners at the level.

4.8.3 Organization of Textbooks Content for Grades I-V

The Mathematics content-areas prescribed by WBBPE are a combination of topical and spiral methods. e.g. 'Number and Numeration', Mensuration are kept in the content of standard-I to standard – V divided into small portions, which are appropriate for the abilities of the pupils of standard-I, II, III, IV and V respectively. Similarly, four fundamental operations are included through standard-I to standard – IV keeping in mind the ability of pupils at that particular level. Topic 'Fractions' is kept in the content of Standard-II to V. Geometry is included in Standard-IV and V content. Also Recapitulation is kept from Standard-II to Standard-V which may help the learners to link/bridge the previous knowledge. While topics of LCM and HCF, mean are fully covered in Standard-IV; unitary method and percentage topics are fully covered in Standard-V (Refer charts 4.1 to 4.5).

Thus, it is clear that more emphasis is given on spiral type of organization. Also topical method is used at some places. Thus textbook content is organised in accordance with the age and ability of the pupils studying grades I to V.

4.8.4 Appropriateness of Content-areas with Respect to Age and Ability of the Pupils

After going through the content-areas (vide section 4.8.1),curriculum and textbooks, it is found that WBBPE has emphasized on five learning areas such as (i) number and numeration (ii) four fundamental operations (iii) life skill related problems (day-to-day life problems) (iv) pictorial representation of data (v) geometry which is presented in charts, given on pp. 36-40.

It is clear that almost all topics are suitable for the average pupils of the age groups 6 + to 11. But if we look at standard-I children with respect to age, it is appropriate for the children to learn mathematical concepts through manipulation of objects and understanding the concepts through reading, writing and vocabulary of numbers. It is not the appropriate to develop the pupil's ability to acquire knowledge independently through problem solving. Also, UNESCO-NIER regional programme-1983 pointed out that manipulative and computational skills and other techniques are necessary as a background to problem solving (P. 40). So the topic on problem solving involving addition and subtraction may be deleted from standard-I and manipulation of concrete objects and accounting may be added in detail at this level.

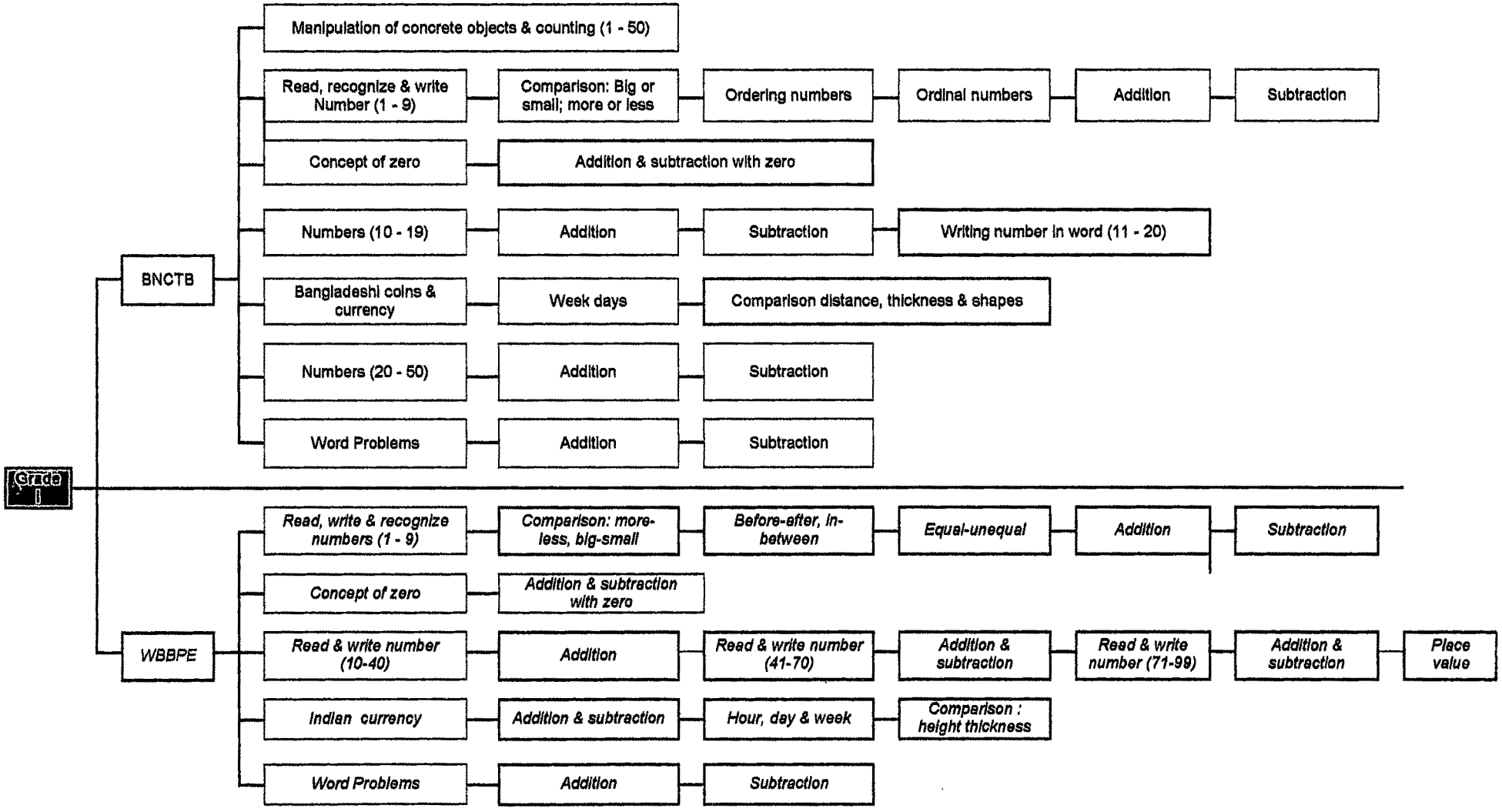
Geometry is included in the curriculum both in standard-IV and standard-V only i.e. for the age group of 9+ to 11. Whereas children aged 5, 6 and 7 take note of shape characteristics (such as whether objects are square or round) (Hohmann, 1991). In UNESCO-NIER regional Programme-1983, most countries agreed that geometry in elementary schools should be informal, descriptive and exploratory. They pointed out that geometry is an important component of mathematics at all levels. They have given following reasons for including geometry in the mathematics curricula of schools. (i) It stimulates the development of spatial perception; (ii) It provides the acquisition of knowledge of properties of geometric figures, many of which have practical use; (iii) It fosters the development of geometric reasoning, both inductive and deductive; and (iv) It promotes the use of inquiry method and the use of geometrical techniques in problem solving.

So geometry should be included in syllabus at all levels for covering the simple two and three dimensional figures found in the pupils' environment.

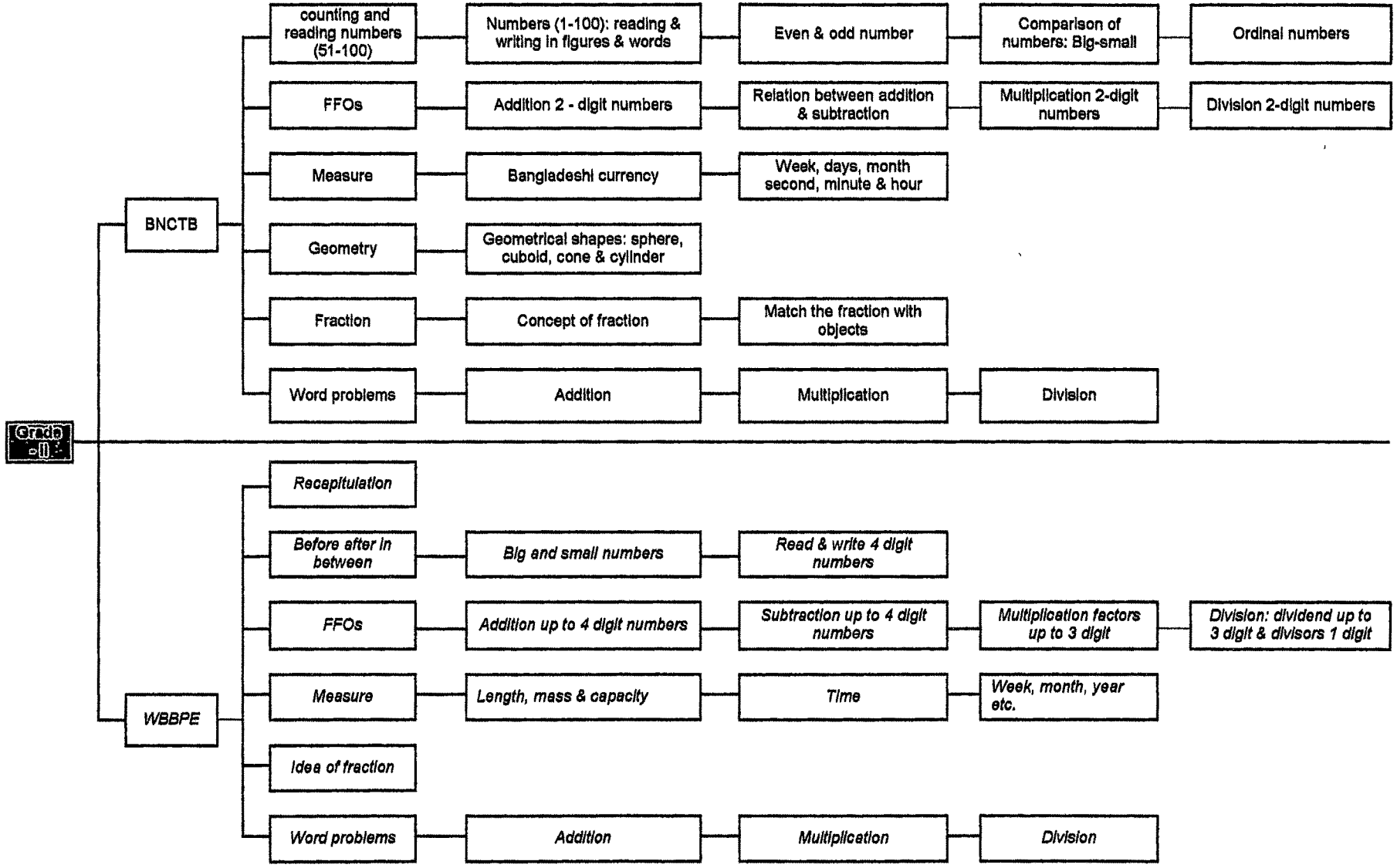
4.9 Comparative Picture of Content-areas Covered by WBBPE and BNCTB Textbooks

Under 4.7 and 4.8 details of content areas of mathematics as prescribed by BNCTB and WBBPE at primary level are given respectively based on those details (given section 4.7 and 4.8) following flow charts are prepared to have more clarity of the comparative picture of these content areas.

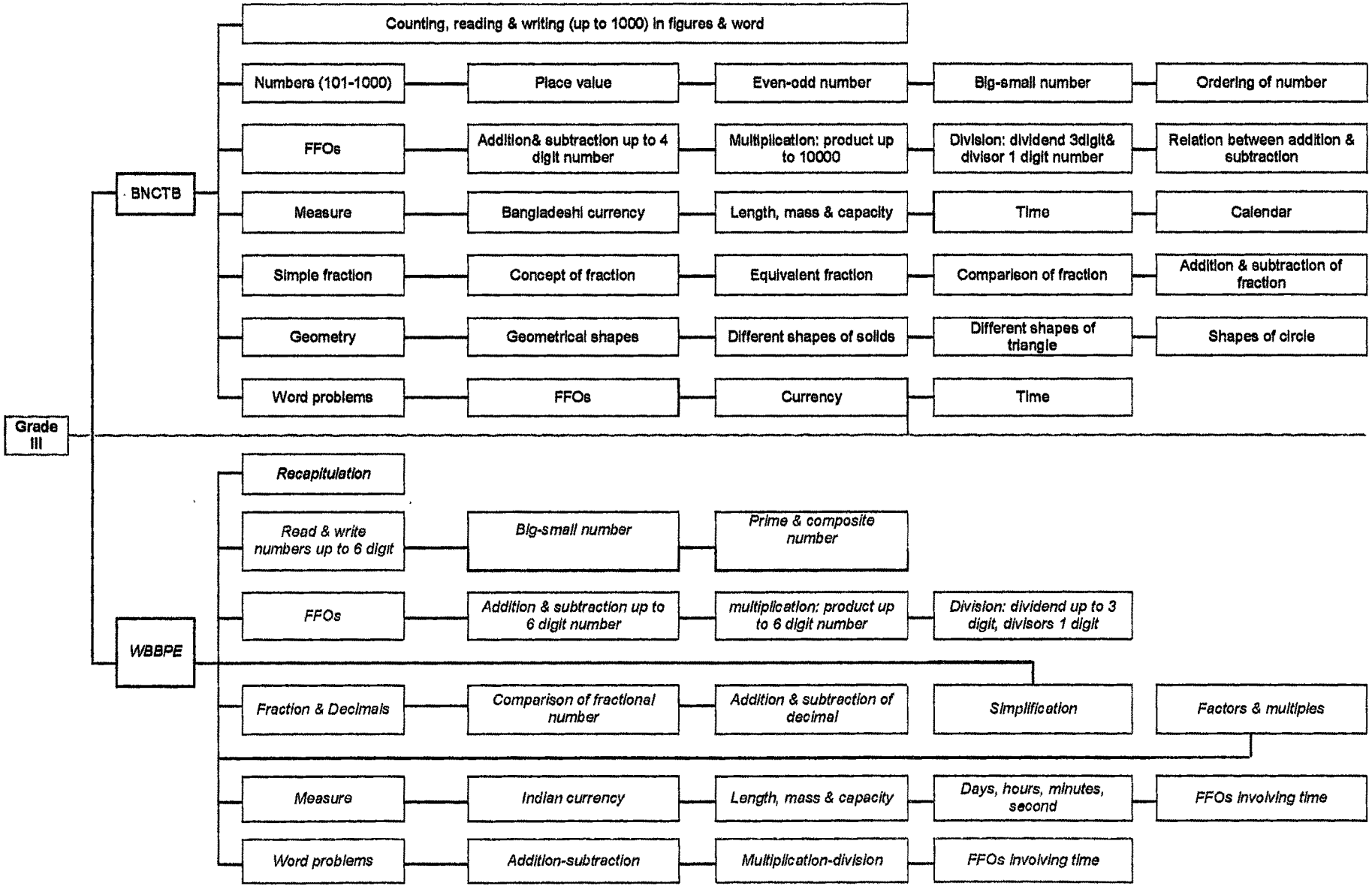
Flow chart - 4.1: Presentation of Textbook Content for Grade - I



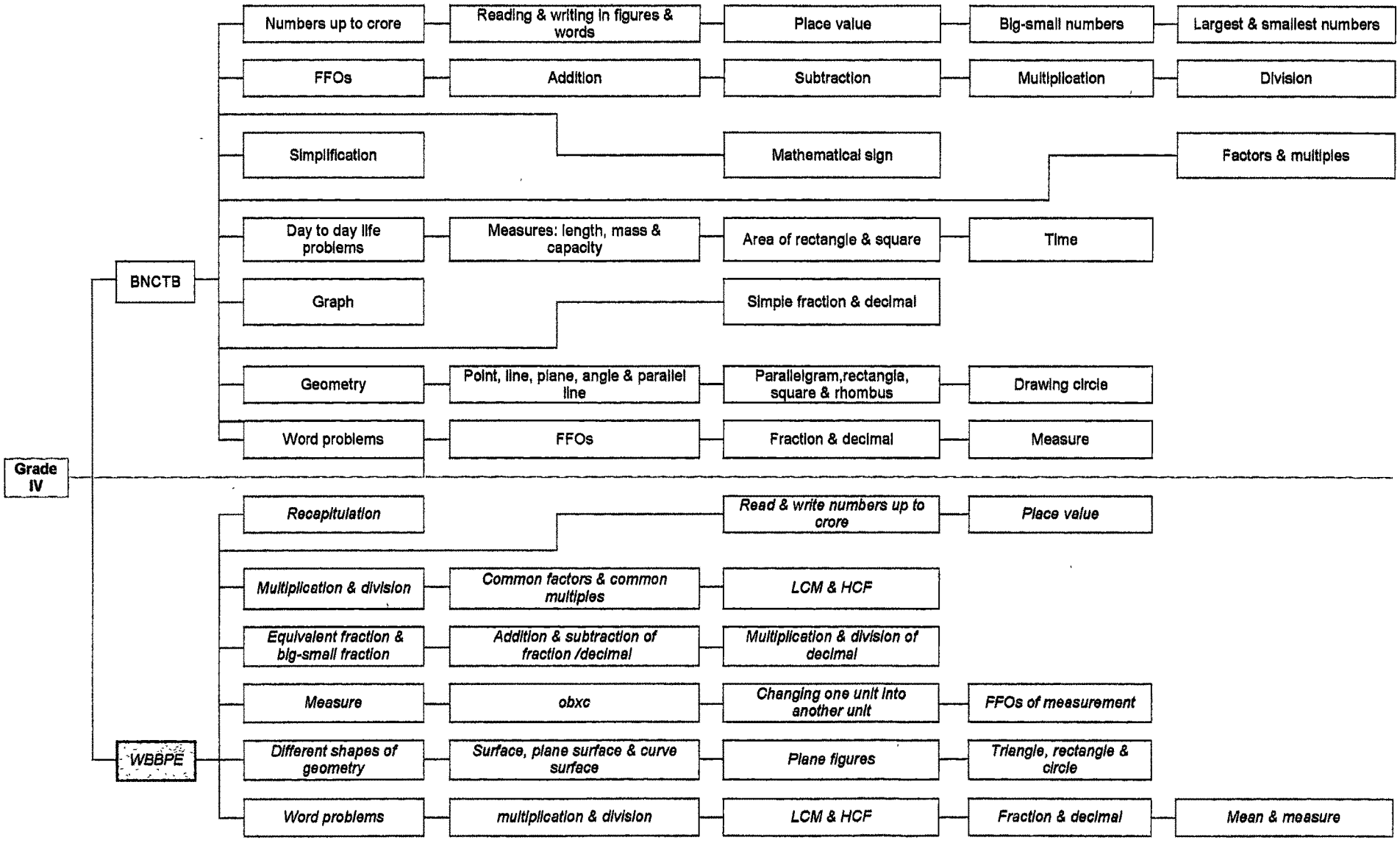
Flow chart - 4.2: Presentation of Textbook Content for Grade II



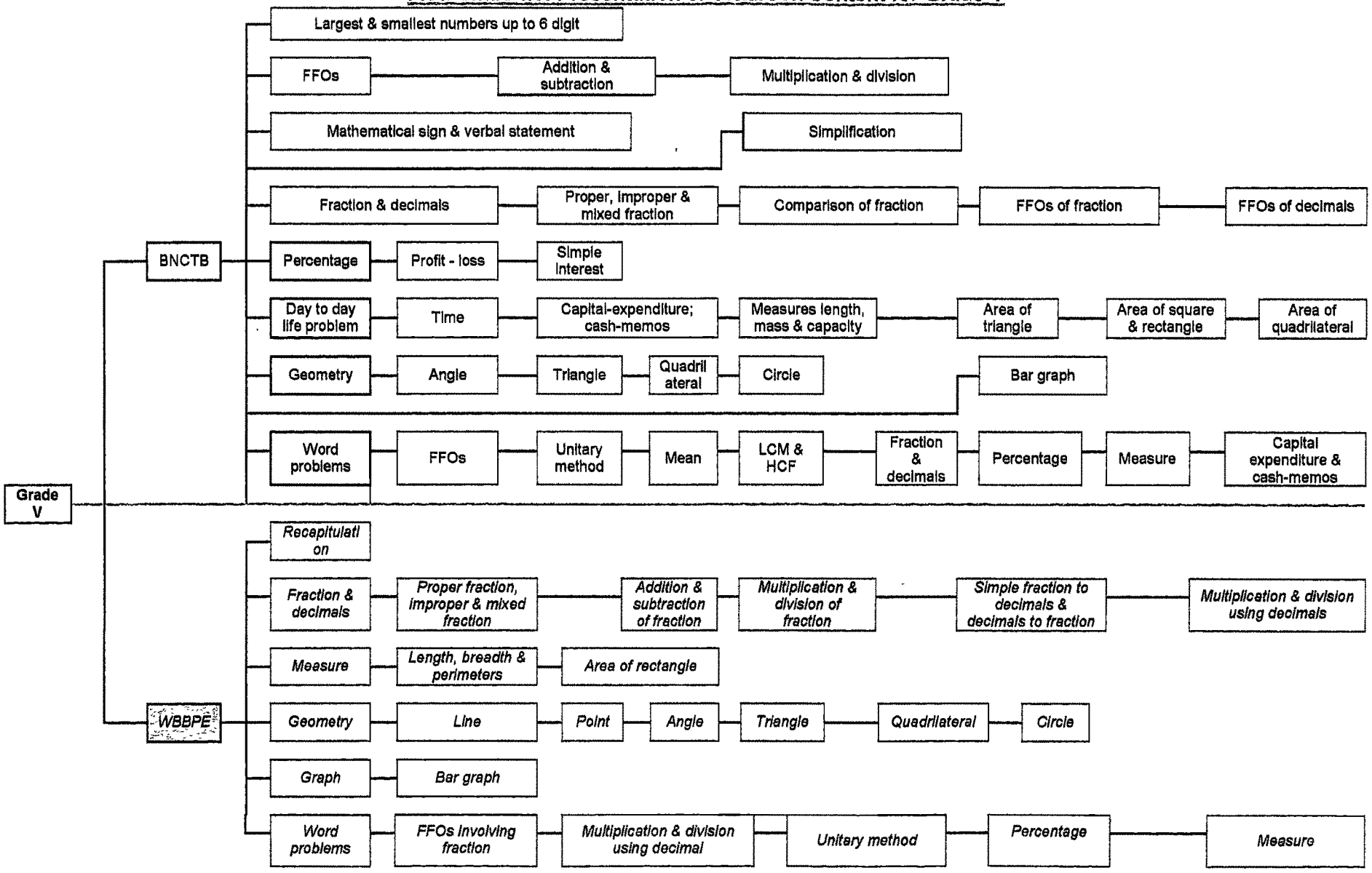
Flow chart 4.3: Presentation of Textbook Content for Grade-III



Flow Chart 4.4: Presentation of Textbook Content for Grade-IV



Flow chart 4.5: Presentation of Textbook Content for Grade-V



From above flow chart, and details given under setting 4.7 and 4.8, following findings are derived

(i) Mathematics curriculum as prescribed by BNCTB is available in English as well as in Bengali language. But mathematics textbook as prescribed by BNCTB are available only in Bengali language at all levels (Grade I-V) while mathematics curriculum and textbook as prescribed by WBBPE are available only in Bengali language at all level (Grade I-V).

(ii) No specific objectives are prescribed by BNCTB related to the topics such as 'mensuration', 'graph' and 'geometry', in spite of this; these topics find place in the textbook at appropriate place. Objectives related to the topics mensuration, graph and geometry are given in the WBBPE curriculum and are reflected through the content given in the textbook of west Bengal of India.

(iii) Contents' for grades I-V prescribed by BNCTB and WBBPE are given in the beginning of the textbook of the respective grades in the both countries.

(iv) Grades I-II content lists of the textbooks of BNCTB are divided directly into lessons. Grade-III textbook contents do not include the total spread of topics with corresponding unit/lesson. Grades IV-V content lists of textbooks of BNCTB are divided into unit only i.e. BNCTB do not maintain any uniformity to organize the content lists. On the other side, contents list of the textbooks (grades I-V) of WBBPE are divided into unit and then subdivided into lesson i.e. WBBPE has maintained the uniformity to organize the content lists.

(v) Five learning areas such as 'number and numeration'; 'Four Fundamental Operations'; 'day-to-day life problems'; 'pictorial representation of data' and 'geometry' are common areas included in the textbooks of both the countries for grades I to V. The content related to 'manipulation of concrete objects and counting' is more emphasized and spirally distributed (in grades I to III) in the textbooks prescribed by BNCTB while manipulation of counting is not highlighted the textbook of WBBPE even though the topics related to counting numbers are present the textbooks of West Bengal.

(vi) Four fundamental operations are distributed spirally by BNCTB from standard-I to standard-V. Same are distributed spirally by WBBPE in standard I-V.

(vii) Day-to-day life problems such as word problems involving four fundamental operations and mensuration in standard I-V; fraction and decimal in standard II-V are included spirally as prescribed by BNCTB. Mensuration in standard I-V; word problems involving FFOs in standard I-IV; fraction and decimals in standard II to V are distributed spirally as prescribed by WBBPE.

(viii) Unitary method, mean, 'LCM and HCF', percentage, 'capital-expenditure' are included in standard-V in the textbook content of BNCTB through topical method. 'LCM and HCF', 'Mean' in standard-IV, Unitary method and percentage in standard-V are included through topical method in the textbooks contents of WBBPE.

(ix) Graph is included in the textbook content of standard-IV and standard-V as prescribed by BNCTB while the same topic is included in the textbook content of Standard-V mathematics as prescribed by WBBPE. Thus topic 'graph' is spirally distributed in Bangladesh textbooks which the same is given by topical method in West Bengal textbook.

(x) Geometry has been distributed spirally in grades II to V textbook content of Bangladesh while the same topic is distributed spirally in grades IV to V textbooks of West Bengal.

(xi) Content of standard-V mathematics textbook of BNCTB is much heavier than the content of standard-V mathematics textbook of WBBPE. It is also found that content of standard-V is much heavier than the content of standard-IV as prescribed by BNCTB.

(xii) Word problems are given in the content of standard-I mathematics textbook of BNCTB in which verbal statement is to be changed into numeric form. On the other hand word problems are given in the content of standard-I mathematics

textbook of WBBPE from verbal statement to numeric form and numeric form to verbal statement. After this, they have to be solved.

(xiii) Revision units are included in the Mathematics textbooks of WBBPE from standard II to Standard V but the similar units do not find place in Bangladesh textbooks.

(xiv) It was found that organization of content in the textbooks of BNCTB and WBBPE are a combination of both topical method and spiral methods. At the same time it is also observed that textbooks of West Bengal have given more emphasis on spiral method compared to the textbooks of Bangladesh.

(xv) Arrangement of almost all the topics in the mathematics textbooks at the primary school level as prescribed by BNCTB and WBBPE are suitable to the age and abilities of average group of students.

(xvi) Introduction to each topic in the text books of WBBPE is made lively than that in the textbooks of BNCTB.

(xvii) Language used in the textbooks of BNCTB and WBBPE are quite simple and informal.

(xviii) Purpose of the lesson/unit has been written in the left-top corner of the textbooks (except grade-V) of WBBPE while same is not written for lesson/unit prescribed by BNCTB.

(xix) More pictures, diagrams, graphs, tables are included and labelled in better way in the textbooks of BNCTB than that of WBBPE.

(xx) An exercise is given at the end of each topic in the textbooks of grades III to V as prescribed by BNCTB whereas, an exercise is given at the end of each topic in the textbook of grades I to V (exercise is given for grade-II under two unit only) as prescribed by WBBPE.

(xxi) BNCTB suggested some activities of grade-I and grade-II textbooks under the common heading 'Let's see how much we have learnt?' WBBPE suggested some activities of grade-II textbook under common heading 'Do yourself'.

(xxii) Topics such as 'factors and multiples', decimals are included in content of standard -IV textbook as prescribed by BNCTB while the same is considered by WBBPE in content of standard-III textbook. Thus it is seen that topics 'factor and multiples' and 'decimals' are included at higher level (grade-IV) in Bangladesh textbooks while same topics are introduce at lower level (grade-III) in West Bengal textbook.

(xxiii) Topics 'simplification', and 'mathematics sign and verbal statement' are included in the textbook content of grade – IV and V spirally as prescribed by BNCTB but the same topics are not included in the content of WBBPE. e.g.
(a) under the topic simplification items such as 16 x 25 ÷ 5 x 27 ÷ 9 are included in Bangladesh textbooks which are absent in West Bengal textbooks.
(b) under the topic 'mathematical sign and verbal statement' the items such as □ + 3 =15 are included in Bangladesh textbooks while the similar items are absent in West Bengal textbooks.