THE DEVELOPMENTAL AND CULTURAL APPROPRIATENESS OF GRADE ONE MATHEMATICS TEXTBOOK OF TIGRAY REGION

BY:

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Abstract

The purpose of this study is to evaluate to what extent grade one mathematics textbook contents are developmentally and culturally appropriate to the Tigray Region Tigrinya speaking Grade one students. Descriptive and evaluative content analysis was used as the research method. A three-part questionnaire and two coding sheets were employed. Topics were selected as units of analysis for the matching of textbook contents with developmental sequence and the incorporation of preceding stages learning modes in the textbook activities. And subtopic was used as unit of analysis for the attainability of the level of conceptualization of the content. The whole textbook was analyzed. Forty-three grade one teachers (Rural = 15, urban = 28) from 16 schools (Urban=9 Rural=7) filled the questionnaire. Percentage scores, mean, standard deviation and independent samples t-test result were used to describe and analyze the findings.

The results about the degree of challenge of the breadth of textbook contents showed that 55 percent were compatible, 20 percent difficult to achieve and 80 percent attainable. Independent t-test results showed significant difference between rural and urban participant teachers' responses about the degree of challenge of the breadth of textbook contents to children of agrarian and non-agrarian families. All parameters of the socio-cultural context favored the relevance of the textbook contents to the socio-cultural context of the learners. t- test results between rural and urban teachers' responses regarding the relevance of the textbook contents to children of agrarian and non-agrarian families showed no significant difference. A very high percent (96.3%) of the breadth of textbook contents followed developmental sequence. 63 percent of the textbook activities incorporated learning modes of preceding stages and 100 percent of the level of conceptualization of the textbook contents was within the reach of the concrete operational learners. Therefore, the Regional Education Bureau needs to revise and improve the textbook in line with the findings of this study.

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

While the writer of this study was teaching at Adwa Teacher Training Institution (ATTI), he used to go with his trainees to the nearby first cycle primary schools for practicum observation. During the observation, the writer was also able to observe that Grade one students were less concentrated during mathematics instruction than any subject types and grade levels in the first cycle primary. Since then, the writer used to ask himself questions of the following type "Why are grade one students less concentrated during math instruction?", "Why is mathematics instruction less effective in grade one?"

While these questions were going in the mind of the writer of this study, he read a position statement of the National Association for the Education of Young Children (NAEYC) (1997). The position statement has a guideline, which addresses five interrelated factors that affect the effectiveness of educational program. These are creating a caring community of learners, teaching to enhance development and learning, constructing appropriate curriculum, assessing children's development and learning, and establishing reciprocal relationships with families. This implies "less concentration" during mathematics instruction and less effectiveness of mathematics instruction may result from lack of caring community, teacher's incompetence, inappropriate curriculum, inappropriate assessment method, and poor parent- teacher relationship. Grade one students are taught in a self-contained class by one teacher. The four factors, except curriculum construction, were more or less similar for all grade one students and subjects. Therefore, the writer of this study was interested in the appropriateness of the curriculum construction.

Curriculum is defined by Ornstein and Hunkins (2004, p. 10) as "---a written document that includes strategies for achieving desired goals or ends." Curriculum is also defined by

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Wiles and Bondi (2002, p. 30) broadly as, "All of the experiences that learners have under the auspices of the school." From the two definitions of curriculum, this study is concerned with the definition that considers curriculum as a written document. Among the curriculum documents such as syllabus, teacher's guide, lesson plan and textbook, classroom teaching depends heavily on the textbook (UNESCO, 1970 cited in Aggarwal, 1996). Textbook provides basic exposure to students and enables them to learn independently. It also helps teachers to narrow the gap in teachers' knowledge (Heyneman, 1981; Altbach, 1983 cited in Gizaw, 2001). However, these merits of the textbook could not be achieved unless the textbook is appropriate to the child's development; the strengths, interests, and needs of each individual child in the group; and the social and cultural context in which the learners live (NAEYC, 1997).

Decisions about the appropriateness of the textbook in this study, however, did not include what is known about the strengths, interests, and needs of each individual child in the group, but rather on the basis of what is known about human development, and knowledge of the social and cultural context.

Child development, which occurs in different ranges, has been studied after being grouped under few categories on the basis of some characteristics such as dimensions of development (physical, cognitive, social, and emotional). The cognitive dimension is the one that is widely used in the primary school academic areas (Gonzalez-Mena, 2001). This writer, too, has focused on the cognitive dimension. The cognitive dimension consists of function, content and structure (Philips, 1981; Hughes, Noppe & Noppe, 1988). According to Philips (1981) cognitive development is a change in structure. Harris (1993), on the other hand, defines cognitive development as the age related changes in the child's ability to think, remember, solve problems, and make decision Researchers in cognitive development have also categorized cognitive development in terms of stages. The pioneer cognitive psychologist Jean Piaget categorized cognitive development into four main stages:

1. Sensorimotor (birth to 2 years)

2. Preoperational (2 to 7 years)

3. Concrete operation (7 to12 years)

4. Formal operation (After 12 years) (Sarafino & Armstrong, 1986)

According to the Education Sector Strategy (1994) the legal age to enroll children to first grade is at their seventh year. In Tigray Regional State the number of students who were enrolled in grade one in 2007/8 in their seventh year was 131,189 (males = 65,885, females = 65,304) out of 156,744 (males=82,841 females = 73,903). About 84 percent of the students who attend grade one are of age seven (**ቢሮ ትምህርቲ ክልል ትግራይ,2000** E.C). The age of students at which this study was conducted is presented as follow:

Table 1.1 Newly Enrolled Age 7 and Total Grade One Students of Tigray Region in 2000 E.C.

Area	Total 7 Year Grade One Students			Total Grade One Students (age7 & above)			Percentage of age 7 Students to Total Grade One Student
	Males	Females	Total	Males	Females	Total	
Ketema Adwa	654	575	1229	654	575	1229	100
Geter Adwa	1993	1944	3937	2139	2025	4164	95

Source: Adwa Ketema 3rd Quarter Report 2000 E.C

Geter Adwa 2nd Quarter Report 2000 E.C.

Therefore, since most of the grade one students are in the concrete operational stage, the focus of this study is on the cognitive development of the concrete operational stage.

Concrete operational stage child is characterized by the ability to: understand the view points of others, focus on several aspects of a problem at one time, think logically, understand the operations (such as addition, subtraction, multiplication, division), and reverse their thinking mentally about real world or concrete experiences (Bredekamp and Copple, 1997). However, according to Harris (1993), concrete operational stage child is characterized by difficulties to use abstract concepts, hypothetical events, and deductive logic.

Most cognitive and developmental psychologists agree that what content a child learns is largely determined by the present stage of development (Print, 1988). According to Amare, Nardos and Mekuanent (2000, p. 156) content is defined as "the body of knowledge contained in a course". Moreover, Wortham (2002) recommends to curriculum planners to design a curriculum that is compatible with the developmental abilities of the learner. According to the National Association for the Education of Young Children (NAEYC) position statement (1997), compatible curriculum content is a content that is newly acquired or just beyond the present mastery level of the learner. The position statement also describes compatible curriculum content bases on the effort required and psychological consequences such as challenging, motivating and engaging. A curriculum content that is not challenging could not maintain the motivation and persistence of the learner and leaves the learner uninterested and bored. On the other hand, providing unattainable curriculum content does not promote development rather it leads children to frustration (NAEYC, 1997; Mahrens & Lehmann, 1991). Taking this into consideration, the National Council of Teachers of Mathematics (2000) cited in Wortham (2002, p.362) has established 10 standards for pre-kindergarten through grade twelve. The ten standards are:

1. Number and operation
2. Algebra
3. Geometry
4. Measurement
5. Data analysis and probability

6. Problem solving

7. Reasoning and proof

8. Communication

9. Connections

10. Representations

However, the compatible contents for pre-kindergarten through second grade do not include all the 10 but only the first five contents (Wortham, 2002). From the five contents for pre-kindergarten through second grade, the first (Number and operation), the second (Algebra) and the forth (Measurement) contents are the focus of this study.

In addition to the contents, the scope of the contents must also be compatible with the developmental level of the learner. Scope is a way of stating what *content is to be covered* and *what mental processes* are to be acquired. It is a means of determining both *breadth and the depth* of the content to be covered (Amare, et al., 2000)

The appropriateness of the breadth of the content is determined based on the knowledge of cognitive abilities of the learner (Print, 1988). However, in Ethiopia, the breadth of the contents to be covered in the textbook are determined from the experience of other countries.

The appropriateness of the depth of understanding and level of conceptualization (mental process) to be covered is also determined based on the knowledge of cognitive abilities of the learner, and Bloom's (1956) Taxonomy of Educational objectives and Anderson and Krathwohl's (2001) revised Taxonomy of Educational objectives. Educational objectives help to determine what content and activities to be included in textbooks (Taba, 1962). Equally, we can determine the mental process covered in the textbook from the activities (Mahrens & Lehmann, 1991).

Though Bloom (1956) and Anderson and Krathwohl (2001) have not connected the levels of cognitive objective to Piaget's cognitive stages, Sprinthal, et al. (1994) have connected the first three levels- knowledge, comprehension, and application to the reach of children in the concrete operations.

According to Anderson and Krathwohl (2001) analysis, evaluation and synthesis are higher order thinking and they require the student to think critically and in depth. Sprinthal, et al., (1994) relate higher order thinking (analysis, evaluation and synthesis) to Piaget's formal operational thought.

Furthermore, other than the content and scope of the content, sequence of the content may be coordinated with the sequence of intellectual development (Print, 1988). According to Piaget cited in Miller (2002) and Zigler and Finn-Stevenson (1987) cognitive development occurs in a relatively orderly sequence. That means the child has to undergo the sensorimotor, and preoperational period before he/she can progress to the concrete operation stage. Likewise, the learning sequence of the content should fallow this developmental rule. Sequence is "the arrangement of course topics in a defined order." (Amare, et al., 2000, p.105). Print (1988, p. 156), on the other hand, defined sequence as "the order in which content is presented to learners overtime". Sequence helps ensure vertical progress from one level to another and continuity in learning. It is also a critical variable in both learning and remembering information from text (Amare, et al., 2000; Print, 1988).

Moreover, according to cognitive stage theorists, development in each stage *incorporates thinking skills from all of the preceding stages*. That is, if A is a thinking skill of Abebe in the preceding stage and B is his new thinking skill then Abebe's new thinking skill (B) incorporates skills learned in stage A plus more. This could also apply to learning modes. That is to say later modes do not replace their predecessors but coexist with them and continues to grow both in power and complexity. Due to this a high school adolescent learns through both verbal discussions and sensorimotor explorations of materials. But the reverse is not true for infants, they must learn entirely through sensorimotor exploration (Seifert, 1991). This implies that the use of all the preceding stages learning modes including the latter one increases the rate of learning than the latter one only.

This study, therefore, is interested in determining to what extent grade one mathematics textbook contents, sequence of contents and scope of contents are developmentally appropriate

Researchers engaged in cognitive development have also seen the role of culture, practice, training, general intelligence, socioeconomic status on cognitive development and learning (Shepard, 1978).

Bronfenbrenner (1979, 1989, and 1993 cited in NAEYC, 1997) believed that development is influenced by multiple social and cultural contexts. Bowman (1994 cited in NAEYC, 1997), on the other hand, describes social context as the major source of development. For example, Mexican children from pottery-making families were found to conserve substance much earlier than children form non-pottery-making families (Dasen, 1972, 1977 cited in Zigler & Finn-Stevenson, 1987).

Culture is complex and is constantly undergoing reconstruction (Unruh's, 1975 cited in Woube, 2004). Culture constitutes three main elements a) symbolic forms which indicate people's individual experience (such as gesture) b) conventions of usage developed through interaction with social groups and c) systems, values and actions (Reynolds and Skilbeck, 1976 cited in Woube,2004). Woube (2004, p.16) defined culture as "the whole of humanity's intellectual, societal, technological, political, economical, moral, religious and aesthetic accomplishment."

In order to actively participate in the community the Education and Training Policy recommends incorporating the culture of the nation and nationalities in the curriculum. Incorporation of culture in the curriculum helps to contextualize learning (MOE, 1994).

Cordova and Lepper (1996) found that contextualization produced dramatic increase in the amount children learn in a fixed time, in their depth of engagement in learning, their perceived competence and level of aspiration. On the contrary, decontextualization would undermine children's intrinsic motivation for learning (Cordova & Lepper, 1996)

Althouse's (1994) findings on the effect of experience disclosed that children show more advanced modes of reasoning in the domains where they have rich experience, knowledge and competence (cited in Hong, 1999). Similarly, evidence from research showed that children learn more effectively in a familiar setting and in a context that is meaningful for them (Althouse, 1994 cited in Hong, 1999). This implies that the mathematics textbook content should be built in the context of children's everyday experience.

Moreover, the rate of cognitive development can also be influenced with the variation of social support through a zone of proximal development. That means training can vary the rate of cognitive development through the range of the actual capacity and the potential development (Santrock, 1998).

Furthermore, Slavin (1994) found that socioeconomic status affects cognitive development. Socioeconomic status is defined by sociologist in terms of an individual's income, occupation, education and prestige in society (Slavin, 1994). As well, research findings showed that mathematical knowledge vary across social classes. For example, middle class children performed at more advanced levels than working class children on tasks involving cardinality, numerical reproduction, and arithmetic (Saxe & Colleagues,1987 cited in Guberman, 1999)

In addition to the experience, culture, training and socioeconomic status the learners' language influences the rate of learning (NAEYC, 1995). Learning with one's own home language enables learners to understand the lessons easily and avoids problems associated with language barriers such as damage in individual esteem, feeling of abandonment (MOE, 2001; NAEYC, 1995)

Furthermore, community and parental expectation can also affect the rate of children's learning. If the community's or parental expectation are positive and match with the curriculum contents the acquisition rate of the learners will be higher (Bottle, 2005; Althouse, 1994 cited in Hong, 1999; Ornstein & Hunkins, 2004).

Among the different independent variables this study is interested in determining to what extent the textbook contents are relevant to the experience, culture, community expectation, language and social context of the learner.

1.2 Statement of the Problem

According to a study conducted by the World Bank (1989), developing countries have textbooks which are inappropriate to the learners' age level (cited in Gizaw, 2001). Fafunwa in Southern Nations and Nationalities and Peoples Regional Education Bureau (1997), on the other hand, described most African countries have textbooks inappropriate to the learners' culture.

Among the curricula of different levels, those of the early childhood period (including earliest years of formal schooling) curricula are known to have long-lasting influence on children's success or failure in their later schooling (Alexander & Entwisel, 1988; Slavin & Maden, 1989 cited in NAEYC, 1997).

The Education Sector Strategy (1994) of the Transitional Government of Ethiopia recommends conducting a periodic research on the appropriateness of the curriculum.

This study, therefore, tries to see to what extent Grade one Mathematics textbook scope ofcontents are compatible and attainable to the grade one students, to what extent the sequence of grade one mathematics textbook contents are developmentally sequenced, to what extent the grade one mathematics textbook activities incorporate learning modes of preceding stage and to what extent the textbook contents are relevant to the social and cultural context of the Tigrinya speaking grade one students of Tigray Region.

1.3 Research Questions

In order to achieve the aforementioned objectives, the following questions will be answered:

1. How many and to what extent are the mathematics textbook breadth of contents:

   a/ compatible with the cognitive development of grade one students of Tigray Region?

   b / attainable to grade one students of Tigray Region?

2. Is there significant difference between rural and urban teachers' responses regarding the breadth of textbook contents, degree of challenge to students of agrarian and non-agrarian families?

3. To what extent are the mathematics textbook contents socially and culturally relevant to the Tigrinya speaking grade one students of Tigray Region?

4. Is there significant difference between rural and urban teachers' responses regarding the relevance of textbook contents to students of agrarian and non-agrarian families?

5. To what extent are the grade one mathematics textbook activities' levels of conceptualization (depth of understandings) attainable to concrete operational children?

6. To what extent are the grade one mathematics textbook topics developmentally sequenced?

7. To what extent do the grade one mathematics textbook activities incorporate learning modes of the preceding stages to concrete operational stage?

1.4 Significance of the Study

As was explained in the statement of the problem students success or failure during the first years of school predicts the course of the later schooling. This again depends on the quality of the curriculum offered to the children. This study would, therefore, would provide information to curriculum designers, teachers and researchers.

1 Curriculum designers will find the investigation of this study helpful for their understanding of the quality of the existing grade one mathematics textbook.

2 Knowledge of the quality of the existing grade one mathematics textbook will help teachers make appropriate adjustment to the grade one mathematics textbook during instruction.

3 Researchers may use this study as a basis for further investigation.

1.5 Delimitation of the Study

This study focuses mainly on the appropriateness of grade one mathematics textbook contents, scopes of contents, sequences of contents and activities to the cognitive development of grade one students. It also focuses on the relevance of the textbook contents to the social and cultural context of the Tigrinya speaking grade one students of Tigray Region.

1.6. Limitation of the Study

Due to lack of adequate research findings and related literature, the writer of this study could not make a broad range of review on “number and operation”, "algebra", and “measurement”. Due to financial and time constraints the study could not cover the Kunama and Irop ethnicities in the region.

1.7 Definition of Important Terms

1. *Developmental appropriateness*- in this study refers to consideration of age related changes during the design of Grade One Mathematics textbook content.

2. *Curriculum*: in this study refers to textbook.

3. *Textbook:* in this study refers to grade one mathematics textbook of Tigray Region.

4. *Compatible*: refers to the extent to which contents are challenging, engaging, motivating enough and appropriate to the level of cognitive development of children.

5. *Attainable*: in this study refers to any content or scope that is with in the reach of the learner.

6. *Agrarian families:* refer to families whose livelihood is on agriculture.

7. Non-Agrarian families: refer to families whose livelihood is not on agriculture.

8. Culture: in this study refers to the Tigrinya speaking people's intellectual, societal, technological, political, economical, moral, religious and aesthetic accomplishment

CHAPTER TWO

2.0. Review of Related Literature

This chapter presents review of the relevant literature and research findings that are related to the research problems under consideration.

2.1. The Concept of Cognitive Growth

Piaget believed that cognitive growth comprises function, content and structure (Philips, 1981; Hughes, Noppe & Noppe, 1988).

2.1.1. *The Function of cognitive growth*: Function is a biologically inherited mode of interacting with the environment and is invariant. It involves organization and adaptation (Philips, 1981; Hughes, Noppe & Noppe, 1988)

Organization helps to make sense of our world by connecting one idea to another (Santrock, 1998) or integrating the self and the world in order to reduce complexity (Hughes, Noppe & Noppe,1988).

We also adapt our thinking to include new idea through the process of assimilation and accommodation. Assimilation is the process by which new information is incorporated or fitted into the existing knowledge. Whereas accommodation is the process of modifying existing schemes to account for new ideas (Gardiner & Kosmitzki, 2002; Harris, 1993; Santrock, 1998).

2.1.2 *The content of cognitive Growth:* Another component of cognitive growth is the content. It is the material what is known (Hughes, Noppe & Noppe, 1988). For example, if two children are asked to explain whether the amount of substance changes when a ball of clay is changed its shape and if one child answers, " No,it does not change" and another child answers, "Yes, it changes". These answers are the content.

However, Piaget's interest was not whether or not the child gave right or wrong answer to the question, but why he/she gave the answer he/she gave. To describe the underlying process of human thinking Piaget introduced the concept of cognitive structure.

2.1.3The structure of cognitive Growth: cognitive structure determines the way people deal with ideas or issues. For example, when a child and an adolescent watch an identical film the child sees the action and the adventure. On the other hand, the adolescent sees the story and the overall human relations. This difference is due to the difference in cognitive structure.

According to Philips (1981) development is change in structure. Hence, cognitive development is the change in cognitive structure. Piaget divided cognitive development into four main stages:

2.1.3.1 Sensorimotor (birth to 2 years),

2.1.3.2 Preoperational (2 to 6 years),

2.1.3.3 Concrete operations (6 to 12 years), and

2.1.3.4 Formal operations (12 years and older). (Gardiner & Kosmitzki, 2002).

2.1.3.1 Cognitive Development of Sensorimotor Stage (birth to 2 years)

Infants understand the world by coordination of sensory abilities and motor skills. They listen to, touch, taste, smell, and look at objects and people in their environment (Harris, 1993; Gardiner and Kosmitzki, 2002). According to Harris (1993), sensorimotor development is complete when the child can:

- Integrate information from the senses ,

- Recognize that objects and people continue to exist even when they can not be seen. (achievement of object permanence) ,
- Imitate the behavior of others ,
- Plan and carry out actions with an intended purpose.

2.1.3.2 Cognitive Development of Preoperational Stage (2 to 6 years)

This period is characterized by development of language, use of symbols and egocentric thinking (e.g. failure to distinguish between one's own point of view and that of other individual) (Harris,1993).

2.1.3.3. Cognitive Development of Concrete Operations

At about age 7, children enter the concrete operations (Wortham, 2002). As it is described in the introduction part, 84 percent of the students who attend grade one in Tigray Regional State are of age 7. Therefore, from the four cognitive structures, the focus of this study is on concrete operations stage.

2.1.3.3.1 Cognitive Advances of Concrete Operations

At the concrete operational stage children can perform mental operations to solve actual/ concrete/ problems. Although the child uses mental operations, he/she still needs concrete materials to understand new concepts. However, the child no longer has to rely on manipulating the object (Wortham, 2002).

Children in the concrete operational stage perform many tasks at a much higher level than they could in the preoperational stage. Some of the achievements of the concrete operational children are reversibility, decentration, conservation and classification.

Reversibility: children at the concrete operational stage can understand that change in physical appearance does not bring change in quantity and remains the same and can be returned back to the original shape (Santrock, 1998). In other words,they can understand that the arrangement of a number does not bring change in amount unless something is added or taken away. For example:

3+3= 6

2+4=6

4+2=6

Decentration: Decentration is the ability to focus on two or more attributes of an object at the same time (Zigler & Finn-Stevenson, 1987; Santrock, 1998). In other words the child in the concrete operational stage focuses on multiple features of an object at the same time and takes into account all relevant data. That is, the concrete operational child can understand that we can bring 6 by adding different numerals or subtracting from numerals larger than 6. For example,

3+3= 6, 2+4=6, 2+2+2=6, 2+2+1+1=6, 4+2=6, 1+5=6, 5+1=6,

Or 9-3=6

Conservation: conservation is an awareness of the idea that an amount stays the same regardless of how its shape or container changes (Santrock, 1998; Hughes, Noppe & Noppe, 1988). In other words, conservation refers to the ability to recognize that two equal quantities remain equal even if one is changed in some way, as long as nothing is added or subtracted (Papalia, Olds & Feldsman, 2001).

According to Copley (2000) cited in Wortham (2002) the child's ability to do mathematical problems using mental schema depends on his/her ability to decenter and reverse. For example, the child's understanding of conservation of number, that is, the number of objects remain the same regardless of the arrangement of the objects as long as nothing is added or taken away, helps the child to do mathematical operations such as decentration and reversibility.

1+5 = 6

Reversibility { 3+3 = 6 } decentration

2+4 = 6

9-3 = 6

Classification: Classification is the ability to divide or categorize things into sets or subsets and to consider their relationship (Zigler & Finn- Stevenson ,1987). Classification helps children think logically (Papalia, Olds & Feldsman, 2001). By the age of 5 or 6 children begin to sort objects by their logically defining properties (Hughes, Noppe & Noppe, 1988). For example, when children are given a group of circles, triangles, and squares, they can sort according to their shape.

According to Winer (1980) cited in Hughes, Noppe and Noppe (1988) a mature classification begins to appear after the age of 7 and in some children a little bit later. With respect to multiple classifications, they understand it around the age of 8 or 9. .Classification involves Seriation, transitive inference, and class inclusion (Papalia, Olds, & Feldsman, 2001)

Seriation: Seriation is the ability to arrange objects in a series according to one or more dimensions, such as weight /lightest to heaviest/. Children grasp seriation at about age 7 or 8 (Piaget 1954, cited in Papalia, Olds & Feldsman, 2001)

Class inclusion: class inclusion is “the ability to see the hierarchical relationship between a whole and its parts” (Zigler and Finn-Stevenson, 1987, p. 489). That is to say, it is the understanding that one number is included in another (Zigler & Finn-Stevenson, 1987;

absence of enough research findings, Ethiopia designs its curriculum based on the experience of other countries (see Table 2.1). Table 2.1 is taken from the "Table of International experience of content selection" prepared by the Institute of Curriculum Development and Research. This Table was given to all participants of mathematics curriculum designers on a workshop conducted at the end of 2007.

Table 2.1 International Experience of Content Selection

Content	England	Singapore	California	Japan	British Colombia	Qatar	Proposed for Ethiopia
Whole numbers							
Knows that if a set of objects is rearranged the number of objects remaining the same	R	-	K	Grade1		-	0
Count to 20	R/1	-	K	-	-	-	0
Numbers 0-20(read, Write, order, place value)	R/1	-	K	-	-	-	0
Count to 100	Year1	P1	Grade1	Grade1	K1	Grade1	1
Know and use ordinal numbers	Year1	P1	-	Grade1	Grade2/3	Grade1	1
Numbers 0-100	Year2	P1	Grade1	Grade1	Grade2/3	Grade1	1
Calculations: Addition and Subtraction							
Understand operations of addition and Subtraction	Year1	P1	K/1	Grade1	Grade2	Grade1	0/1
Add and subtract one-digit numbers supported by concrete materials and a number line	Year1	P1	K/1	Grade1	Grade2	-	0/1
Write expressions to represent addition and subtraction using+,-,=	Year1	P1	K/1	Grade1	-	-	1
Know addition and subtraction facts to 10	Year2	P1	Grade1	Grade1	Grade2	Grade1	1
Without crossing tens, add and subtract mentally: • Two-digit numbers and ones, e.g. 30+6,45+3 • Two-digit numbers and tens, e.g. 40+50,23+60	Year2	P1	-	-	-	-	1
Use mental methods for special cases of + and -	Year 2						1
Calculations: multiplication and division							
Understand operations of multiplication and division	Year 2	P1	Grade 2	Grade1/2	Grade 2/3	Grade2/3	2
Write expressions to represent multiplication and division using x,=	Year 2	P1	Grade 2	Grade 2	-	-	2
Multiply and divided small numbers(product/ dividend not greater than 30), using models or concrete objects	Year 2	P1	Grade 2	Grade 2	-	Grade 2/3	2
Know 2,3,4,5 and 100 times tables, and multiply and divided with in these tables	Year3	P2	Grade2	Grade2	Grade2/3	Grade 2	2
Know how the cumulative law applies to x but not	Year 3	P2	-	Grade 2			2
Know and use inverse relationship between multiplication	Year 3	P2	Grade 3	Grade 3	Grade 4	-	3

2.2.1.1.1. Number and Operation

Among the number and operations counting, ordering(number after),comparison, and the four arithmetic operations will be treated.

Counting: By age 3, children enumerate four sets of objects (Baroody & Wilkins, 1999). Consequently, by age 5, most children can count to 20 or more and know the relative size of the number 1 through 10 (Papalia, Olds & Feldsman, 2001). Another finding by Greenes (1999, p. 154) states, "Kindergarten children, take great pride in being able to count to 100 by ones, by fives, by tens and even by twos. They can count up from any number and backward as well." This indicates us age 5 is the zone of proximal development to learn counting numbers up to 100.

According to Gelman and Gallistel (1978) and Sophian (1988) cited in Papalia, Olds and Feldsman (2001, p. 254), children in early childhood come to recognize five principles of counting:

1. The 1 – to – 1 principle say only one number name for each item being counted (" one --- two --- three --- ")

2. The stable order principles: Say number-names in a set order ("one, two, three ---" rather than " three, one, two --- ")

3. The order irrelevance principle: State counting with any item and the total count will be the same.

4. The cardinality principle: the last number name used is the total number of items being counted (if there are five items the last number-name will be "5")

5. The abstraction principle: the principles above apply to any kinds of object (seven buttons are equal in number to seven birds)

Order of numbers /Number after /: Fuson (1992) found that children of age 5 could automatically state the number after a given number (Baroody & Wilkins, 1999) without counting from one (e.g. after eight comes nine).

Counting up or down: By age 9 children can either count up from the smaller number or down from the lager number to get the required answer (Resnick cited in Papalia, Olds & Feldsman, 2001).

Comparing two numbers /Relational concepts/: By age three or four children have words for comparing quantities such as "more", and "less". They can understand that two fingers on one hand are fewer than three fingers on the other. (McClain & Cott, 1999; Papalia, Olds & Feldsman, 2001).

Addition and subtraction: Baroody and Wilkins (1999) found that preschoolers have some understanding that addition and subtraction are related operations. That is one can reverse the other. Reley, Greeno and Heller (1983) (cited in Baroody & Wilkins, 1999) also found many kindergarteners and many first graders can with little or no help solve problems in which the sum or difference is unknown, if they are allowed to use objects (blocks or fingers) or drawings (e.g. pictures, tally marks). By age 5, some children are able to do simple single digit addition and subtraction (Seigler, 1988 cited in Papalia, Olds, & Feldsman, 2001).

Division: Hunting (1999) found that even preschoolers could subdivide quantities into equal subunits. Some intuitive understanding of fraction seems to exist earlier by age 4 (Mix, Levine & Hutten cited in Papalia, Olds & Feldsman, 2001).

Place value: Due to the absence of sufficient hands on experience with the place value children do not understand place value until they reach the elementary grades (Shane, 1999, p. 139).

2.2.1.1.*2. Algebra*

Computing variables and word problems: An understanding of how a whole is related to its part is considered as an important conceptual basis for solving missing addend word problems such as $5 + x = 8$ .According to Sophia (1999) many first graders and kindergarteners can with little or no help solve problems in which the sum or difference is unknown.

Story problems: Children become more adept at solving simple story problems at about age 8 or 9 (Resnick, 1989 cited in Papalia, Olds Feldsman, 2001) such as:

Change problems: Abebe had 9 goats. He sold some of them. Now he has 6 goats, how many goats did he sell?

Equation: $9-x = 6$

Combine problems: Abebe and Almaz have 6 injera together. Two belongs to Abebe. How many injera belong to Almaz?

Equation: $x+2 = 6$

Compare problems: Abebe has 6 injera. Almaz has 4 injera. How many more injera does Abebe have than Almaz?

Equation: $6-4 = x$

2.2.1.1.3. Measurement

Length: kindergarten children use measuring tools to determine the height of objects and describe numerically (Greenes, 1999).

Money: kindergarten children can compute the total cost by counting by tens, and are able to count the changes given to them (Greenes, 1999)

This indicates there is certain stage of life span to learn certain kinds of information.

2.2.1.2. Depth of understanding of the Contents

Depth of understanding of the content is determined based on the knowledge of Bloom's (1956) Taxonomy of Educational Objectives (Sprinthal, et al., 1994).

Bloom (1956) identified three kinds of domains. These are cognitive, affective and psychomotor domains. Although the three domains are intertwined, as it is described in the background of the study, this study focuses only on the cognitive domain. Cognitive domain deals with intellectual processes, like knowing, perceiving, recognizing, and thinking, conceiving and reasoning (Gage & Berliner, 1988; Mahrens & Lehman, 1991; Wiles& Bondi, 2002)

Bloom (1956) classified cognitive domain into six levels. The six levels of cognitive domain are organized according to their sequence of development.

1. Knowledge

Knowledge involves the recall of specifics and universals, the recall of methods and processes, or the recall of patterns, structures or setting in somewhat the same form in which they learned it (Bloom, 1956).

Comprehension

Comprehension is defined as the ability to grasp the meaning of material (Bloom, 1956). This may be shown by translating material from one form to another (words to numerals, by interpreting materials explaining or summarizing), and by estimating future trends (predicting consequences or effects). In this level the learner can make use of the material without relating it to other material (Bloom, 1956). For instance, setting up the mathematical manipulation needed to solve a "story problems", describing in prose what is shown in graph form.

3. Application

Application refers to the ability to use learned material in new and concrete situations. This includes the use of rules, methods, concepts, principles, laws, and theories in particular and concrete situations (Bloom, 1956). That is, learners are expected to transfer information, apply rules, data, procedures, and principles to new problems. For instance, what is the value of the variable x in the equation x+4 = 9.

4. Analysis

Analysis is the breakdown of a situation into its component parts, so that its organizational structure may be understood. For example, identify the assumptions underlying a geometric proof. This includes the identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved. Learning outcomes here represent higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material (Bloom, 1956; Ayele, 1992)

5. Evaluation

Evaluation is concerned with qualitative and quantitative judgments about the extent to which material and methods satisfy criteria. The criteria may be those determined by the student or those, which are given to them (Bloom, 1956). For instance, given any research study, evaluate the appropriateness of the conclusions reached based on the data presented.

6. Synthesis

Synthesis refers to the ability to put parts together to form a new whole. It includes production of unique communication (e.g. skills in writing a plan) production of a plan (development of a plan of work) and derivation of a set of abstract relations (ability to make mathematical discoveries and generalizations)

The Bloom's Taxonomy of Educational objectives was revised in 2001. The revised taxonomy gives slightly different names to the six levels.

Remember (for knowledge)

Understand (for comprehension)

Apply (for application)

Analyze (for analysis)

Evaluate (for evaluation)

Create (for synthesis) (Anderson & Krathwohl,2001)

In addition to the change in naming synthesis and evaluation has been reversed and the verbs have also been clarified. Though Bloom (1956), and Anderson and Krathwohl (2001) have not connected the levels of cognitive objectives to Piaget's cognitive stages, Sprinthal, et al. (1994) have connected the first three levels – knowledge, comprehension, and application to the reach of children in the concrete operations.

2.3 Relationships of Bloom's Educational Objectives and Piaget's Cognitive Development

In order to evaluate the developmental appropriateness of the depth of understanding of the textbook contents the Relationships of Bloom's Educational Objectives and Piaget's

Cognitive Development are discussed under as follow.

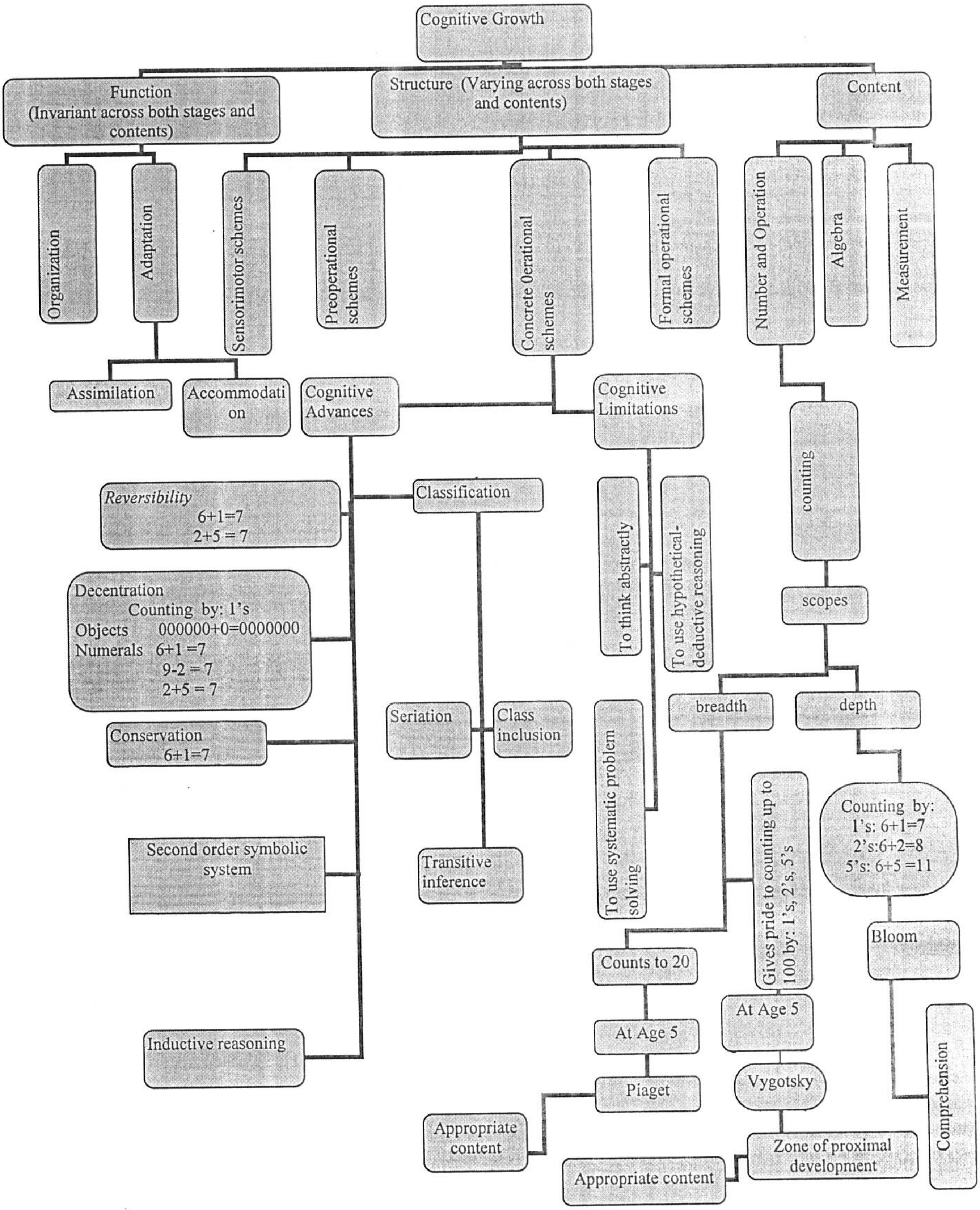
Knowledge: According to Bloom knowledge is the ability to recall specifics and universals (1956). Children develop the ability to recall at the sensorimotor stage (Harris, 1993). The cognitive development that is required to recall specifics and universals is object permanence. Object permanence is the ability to recognize that objects and people continue to exist even when they can not be seen. That means recall of specifics and universals requires the ability to recognize that objects and people continue to exist even when they can not be seen. In other words, the first level of Bloom's cognitive domain –knowledge- develops at Piaget's sensorimotor stage. Hence Bloom's cognitive domain –knowledge- is within the ability of the concrete operational stage.

Comprehension: As discussed above Bloom describes comprehension as the ability to translate a material from one form to another form. The cognitive development that is required to convert one form to another form is decentration. According to Harris (1993) decentration is the ability to focus on two or more features of an object such as converting a number into its addends. That means converting a material from one form to another form requires the ability to focus on two or more features of an object. As it is described in the cognitive advances of concrete operational stage, children develop decentration at the concrete operational stage. In other words, comprehension develops at the concrete operational stage. This implies comprehension is with in the reach of the concrete operational stage children.

Application: According to Bloom (1956) application is the ability to use rules, methods, concepts, principles, laws, and theories in particular and concrete situations. The cognitive development that helps to use rules and methods is inductive reasoning (Harris, 1993). Children develop the ability to use rules in particular and concrete situations in the concrete operations. This indicates the ability to apply rules develops at the concrete operational stage. In other words, application is attainable by the concrete operational stage children.

According to Anderson and Krathwohl (2001) analysis, evaluation and synthesis requires higher order thinking. That is, they require the student think critically and in depth. Accordingly, Srinthal, et al., (1994) relates higher order thinking to Piaget's formal operational thought. That is, the mental processes in level four, five and six- analysis, evaluation and synthesis- are connected to Piaget's formal operational thinking. In other words, analysis, evaluation and synthesis, are beyond the cognitive abilities of the concrete operational children.

Analysis: analysis is the breakdown of a situation into its component parts (1956). Children develop the ability to break down a situation into its component parts during the adolescence period. That is, the cognitive development required to deduce a situation into its component parts is deduction. Deductive reasoning requires going from general principles to specific behaviors. As discussed above deduction requires understanding of concepts that the child may have never experienced. Therefore, since deduction is beyond the reach of concrete operational children, analysis is unattainable to concrete operational children. Similarly, evaluation and synthesis requires children to integrate what they have learned in the past with the present knowledge and to combine information from different sources. These are beyond the capacity of concrete operational children. Therefore, evaluation and synthesis are beyond the capacity of concrete operational children. The relations among structures function and contents are summarized as follows:



Cognitive Growth
Function (Invariant across both stages and contents)
Structure (Varying across both stages and contents)
Content
Organization
Adaptation
Sensorimotor schemes
Preoperational schemes
Concrete 0erational schemes
Formal operational schemes
Number and Operation
Algebra
Measurement
Assimilation
Accommodati on
Cognitive Advances
Cognitive Limitations
counting
Reversibility 6+1=7 2+5 = 7
Classification
To think abstractly
To use hypothetical-deductive reasoning
scopes
Decentration Counting by: 1's Objects 000000+0=0000000 Numerals 6+1 =7 9-2 = 7 2+5 = 7
breadth
depth
Seriation
Class inclusion
Conservation 6+1=7
To use systematic problem solving
Gives pride to counting up to 100 by: 1's, 2's, 5's
Counting by: 1's: 6+1=7 2's:6+2=8 5's: 6+5 =11
Second order symbolic system
Transitive inference
Bloom
Counts to 20
At Age 5
At Age 5
Comprehension
Inductive reasoning
Piaget
Vygotsky
Appropriate content
Zone of proximal development
Appropriate content

2.4. Sequence of Contents

According to Piaget cited in Miller (2002) and Zigler and Finn-Stevenson (1987) cognitive development occurs in a relatively orderly sequence. That means, the child has to undergo the sensorimotor, and preoperational period before he/she can progress to the concrete operation stage. None of the periods is ever skipped.

Similarly, in mathematics, previous knowledge and learning is more critical than any other discipline (Reys,et al., 1998). For example, it is fruitless to try to add natural numbers if the child does not have counting experience (Baroody & Wilkins, 1999). In the same way, oral counting lays the groundwork for object counting.

Counting experiences is fundamental to the development of number order, which in turn is a basis for number comparison (Schaeffer, Egleston & Scott, 1974 cited in Baroody & Wilkins,1999)

Moreover, a fundamental understanding of addition and subtraction evolves from children's early counting experiences (Gelman & Gallistel, 1978; Ginsburg, 1977) (cited in Baroody & Wilkins, 1999)

Demetriou, Shayer, and Efkildes (1992) ordered the developmental sequences of addition, subtraction, multiplication and division as addition develops first and subtraction and multiplication are developed later in terms of their relation to addition. Division is mastered late.

Based on the knowledge of cognitive development of the learners, the National Council of Teachers of Mathematics (2000) cited in Wortham (2002, p. 362) has described standards for pre-kindergarten through second grade. The standards are also described in terms of instructional programs and expectations in a hierarchy of simple to complex. In some categories the first expectation must be mastered before working on the next expectation. In other categories the expectations can be engaged simultaneously (Wortham, 2002). The standards for number and operations, algebra, measurement are described in the following tables.

Table 2.2 Number and Operations Standard

Instructional programs from pre kindergarten through grade 2 should enable all students to	Expectations for grade pre-k2 in pre kindergarten through grade 2 all students should
Understand numbers, ways of representing numbers, relationships among numbers and number systems	Count with understanding and recognize "how many" in sets of objects Use multiple models to develop initial understanding of place value and the base-ten number system Develop understanding of the relative position and magnitude of whole numbers and of ordinal and cardinal numbers and their connections Develop a sense of whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers Connect number words and numerals to the quantities they represent using various physical models and representations Understand and represent commonly used fractions, such as ¼, 1/3, and ½
Understand meanings of operations and how they relate to one another	Understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations Understand the effects of adding and subtracting whole numbers Understand situations that equal multiplication and division, such as equal groupings of objects and sharing equally.
Compute fluently and make reasonable estimates	Develop and use strategies for whole-number computations, with a focus on addition and subtraction Develop fluency with basic number combinations for addition and subtraction Use a variety of methods and tools to compute, including objects, mental computation, estimation, paper and pencil, and calculators.

Source: Mathematics Standards for pre- kindergarten through grade 2 of the National Council of Teachers of Mathematics (2000) cited in Wortham (2002, p.362)

Table 2.4 Measurement Standard

Instructional programs from pre kindergarten through grade 2 should enable all students to	Expectations for grade pre-k2 in pre kindergarten through grade 2 all students should
Understand measurable attributes of objects and the units, systems, and processes of measurement	Recognize the attributes of length, volume, weight, area, and time Compare and order objects according to these attributes Understand how to measure using nonstandard and standard units Select an appropriate unit an tool for the attribute being measured
Apply appropriate techniques, tools, and formulas to determine measurements	Measure with multiple copies of units of the same size, such as paper clips laid end to end Use repetition of a single unit to measure something larger than the unit, for instance, measuring the length of a room with a single meter stick Use tools to measure Develop common referents for measures to make comparisons and estimates

Source: Mathematics Standards for pre- kindergarten through grade 2 of the National Council of Teachers of Mathematics (2000) cited in Wortham (2002, p.362)

2.5 Social and Cultural Context

Knowledge of widely held expectations of primary year children is only one dimension of knowledge to consider in making decisions about developmentally appropriate curriculum in the primary grades. Equally important is knowledge about the social and cultural context.

Vygotsky (1978) cited in Sophian (1999) believed that knowledge is inseparable from the context in which they use that knowledge. In other words, ones cognitive abilities are often dependent on the specific kinds of social context. Another social context that affects children's cognitive development and learning are parent's expectations and attitudes. If parents have high expectation and positive attitude to their children's school performance, children's enthusiasm and the effort they put into achieving understanding will be high (Kwok & Lytton, 1986 cited in Bottle Gill, 2005)

Besides, how children develop and learn depends in part on the value of their culture. For example, at age 4 and 5 Chinese youngsters learn counting between 11 and 20 better than United States youngsters due to Chinese more efficient number system which is based on tens and ones (10+1, 10+2 and so forth) (Miller, smith, Zhu & Zhang,1995 cited in Papalia, Olds & Feldsman, 2001)

In addition to social and cultural context, abilities such as conservation may also depend in part on the child's experience and interaction with the environment (Zigler & Finn-Stevenson, 1987). That means, children's everyday activities may affect the rate at which they acquire various cognitive concepts. For example, Mexican children who have extensive experience working with clay were found to conserve substance much earlier than other conservation concepts.

Many educators point out that in order for children to succeed in school there should be a connection between mathematics curriculum and:

1. Children's informal mathematical knowledge in everyday activities,
2. Social expectation,
3. Cultural values about mathematics and schooling. (Bottle, 2005; Althouse, 1994 cited in Hong,1999)

CHAPTER THREE

3. Methodology

The method used to achieve the stated objectives is descriptive and evaluative content analysis

3.1 Research setting

The research settings selected in this study are Geter Adwa and Ketema Adwa woreda. Woreda Geter Adwa and Ketema Adwa are located at the central zone of Tigray Region, Northern part of Ethiopia. The two woreda were selected purposely because the problem was observed in the two woreda and the researcher believes his acquaintance with the teachers who teach in the two woreda would be helpful in obtaining appropriate information.

3.2 Data Sources

The data sources for this study were the 1995 E.C version of grade one mathematics textbook of Tigray Region and grade one teachers of Geter Adwa and Ketema Adwa.

3.2.1 Textbook: Tigray Region grade one mathematics textbook was selected as data source purposely because a special problem was observed in grade one students of Geter Adwa and Ketema Adwa during mathematics instruction.

3.2.2 Participants: In addition to textbook, information about the breadth of textbook contents degree of challenge to grade one students of Tigray Region and the relevance of the textbook contents to the social and cultural context of the Tigrinya speaking learners of the region was obtained from grade one mathematics teachers of Geter Adwa and Ketema Adwa. Forty-three grade one teachers (urban=28, rural=15) who taught more than 15 years participated in this study.

Participant teachers were selected based on their length of experience, competence in teaching and their feelings of responsibility puposely. The information about the participant teachers was obtained from the director, deputy director, and unit leaders. Experience, competence in teaching and feelings of responsibility were used as selecting criteria because they were believed to have an influence on perceiving a wide range of problems and seeking solutions on the textbook contents. In order to investigate whether there is significant difference between children of agrarian and non-agrarian families on the degree of challenge of the breadth of textbook contents and the relevance of the textbook contents, the teachers' responses were classified into rural teachers' responses and urban teachers' responses respectively.

3.3 Selection of unit of analysis

The selection of unit of analysis depends on the purpose of the study and the kind of content being analyzed (Budd, et al., 1967). This study deals with different textbook qualities. Hence the selection of unit of analysis depends on this character.

Accordingly, the unit of analysis for the incorporation of preceding stages learning modes in the textbook activities and the match of textbook contents with the sequence of intellectual development is textbook topic and the unit of analysis for the attainability the levels of conceptualization of textbook contents is subtopic. The whole textbook topic and subtopic were analyzed.

3.4 Categories of Construction

Categories are variables which are linked to the problem and the theories on which the research is based (Budd, et al., 1967).

The textbook categories in this study are the incorporation of the preceding stages learning modes in the textbook activities, the match of the sequence of textbook contents with the sequence of intellectual development and the attainability of the levels of conceptualization of the textbook contents.

3.5 Instrument

To collect information about the textbook contents a three-part teacher-administered questionnaire and two coding sheets were developed.

The teacher-administered questionnaire has three parts. The first part asks about the degree of challenge of the breadth of textbook contents. This questionnaire is rated on a four-point scale (4= More challenge, 3= challenging, 2=less challenging, 1=not challenging). The second part asks about the relevance of the textbook contents to the social and cultural context of the learners. This part is rated on a five-point scale (0= strongly disagree 1= disagree, 2= partially Agree, 3= Agree, 4= Strongly Agree). And the third part is concerned with suggestions and comments about strengths and weaknesses of the textbook.

Regarding the coding sheets one coding sheet is concerned with the incorporation of preceding stages learning modes (to concrete operational) in the textbook activities and the match of textbook contents with the sequence of intellectual development. The second coding sheet is concerned with the attainability the levels of conceptualization of textbook contents.

3.6 Procedure

The minimum competency level outlined for grade one by the Ministry of Education of Ethiopia was the basis to prepare the questionnaire on the breadth of the textbook contents. The questionnaire concerned with the relevance of the textbook contents to the socio-cultural context of the learners were collected and prepared from the review of the literatures.

After the preparation of the first draft questionnaire and coding sheets, the questionnaire was distributed to seven grade one teachers of Geter Adwa and Ketema Adwa and the coding sheets to four instructors of Adwa College of Teacher Education for pilot test. Based on the result of the pilot study, some items were amended. Open-ended questions were also included to each parameter of the socio-cultural context.

After the amendment, the actual questionnaire was administered to 43 grade one teachers (Rural = 15, Urban = 28) and the coding sheets to four instructors (to two instructors on each coding sheets) of Adwa college of Teacher Education.

After the administration of the actual questionnaire and coding sheets, each part of the questionnaire and the coding sheets were analyzed. To test the reliability of the coding sheets Scott reliability index (Cited in Budd, et al., 1967) was used. Reliability index of 84 percent and above was achieved between the coders. According to Scott a reliability index of 75 percent is too low.

3.7 Data Analysis and Interpretation

The analysis and interpretation of the data was made as follows:

Based on the motivational effect the frequency of teachers' responses to the four scales of the degree of challenge questionnaire of each breadth of contents were regrouped and renamed as easy (for not challenging and less challenging), compatible (for challenging) and difficult (for more challenging). The frequency of teachers' responses to the four scales of the degree of challenge questionnaire were also regrouped and renamed based on their attainability as attainable (for scales not challenging, less challenging and challenging) and unattainable(for more challenging).

The frequency of participant teachers' responses to each scale of each breadth of contents of the degree of challenge questionnaire, the coordination of textbook contents sequence with developmental sequence, the incorporation of preceding stages learning modes in the textbook activities, and the levels of conceptualization of the textbook contents were described using percentage scores. Teachers' responses to the effect of familial context on the breadth of textbook contents degree of challenge and to the relevance of the textbook contents to students of agrarian and non-agrarian families were tested using t-test. Alpha value 0.05 was used for all significant levels.

on perceiving a wide range of problems and seek solutions on the textbook contents.

4.2. Explanation of the Breadth of Contents' Degree of Challenge

The frequency of participant teachers' responses to each scale of each breadth of contents of the degree of challenge questionnaire are described using percentage scores in Table 4:2. This table could answer the questions the researcher raised in the statement of the problem as "How many and to what extent the textbook contents are compatible and attainable to grade one students of Tigray Region?"

Based on the motivational effect of each breadth of contents the frequency of teachers' responses to each scales of the degree of challenge questionnaire are regrouped and renamed as easy (for not challenging and less challenging), compatible (for challenging) and difficult (for more challenging). As the percentage scores of Table 4:2 show the most compatible breadth of textbook contents for both students agrarian and non-agrarian families were converting number-names of whole numbers up to 100 into numerals (79.07%), differentiating the relationship between Ethiopian coins (69.77%), counting natural numbers up to 100 (67.44%), adding three addends whose sum does not exceed 20 (62.79%), determining multiple of two whole numbers whose product doesn't exceed 20 (62.79%). Generally, eleven out of the 20 breadth of contents (with percentage scores 50 and above) are compatible to grade one students of Tigray Region. These account 55 percent of the breadth of contents.

Table 4.2. Percentage scores of Total Teachers' Responses on Easy, Compatible, Attainable, Unattainable against each Breadth of Contents

No.	Breadth of Contents	Degree of challenge			Attainability	
		Easy	Compatible	Difficult	Attainable	Unattainable
1	Counting natural numbers up to 100	13.95	67.44	18.6	81.4	18.6
2	Converting numerals of whole numbers up to 100 into number-names		37.21	62.79	37.1	62.79
3	Converting number-names of whole numbers up to 100 into numerals	4.65	79.07	16.28	83.72	16.28
4	Ordering whole numbers up to 100	2.32	60.47	37.21	62.79	37.21
5	Comparing two whole numbers up to 100	6.98	48.84	44.19	55.81	44.19
6	Converting digits of whole numbers up to 100 into their place value	2.32	27.91	69.77	30.23	69.77
7	Adding two whole numbers whose sum does not exceed 100.		58.14	41.86	58.14	41.86
8	Adding three addends whose sum does not exceed 20.	25.6	62.79	11.63	88.37	11.63
9	Determining the difference of two whole number not more than 100	6.98	55.81	37.21	62.79	37.21
10	Subtracting using two subtrahends from whole numbers not more than 20	14	46.51	39.53	60.47	39.53
11	Determining multiples of two whole numbers that do not exceed 20.		62.79	37.21	62.79	37.21
12	Dividing whole numbers up to 20		62.79	37.21	62.79	37.21
13	Computing equations with missed addends up to 20	6.98	55.81	37.21	62.79	37.21
14	Solving word problems involving addition (where the numbers do not exceed100).	30.23	55.81	13.95	86.05	13.95
15	Solving word problems involving subtraction (where the numbers do not exceed100).	34.49	39.53	25.58	74.42	25.58
16	Solving word problems involving multiplication (where the product does exceed 20)	4.65	41.86	55.49	44.51	55.49
17	Solving word problems involving division(where the numbers do not exceed 20)..	6.98	32.56	60.05	39.95	60.05
18	Measuring objects using local measurement of length	34.88	44.19	20.93	79.07	20.93
19	Describing sets using ordinal numbers up to 20	20.93	46.51	32.25	67.75	32.25
20	Differentiating the relationship among the Ethiopian "coins"	18.60	69.77	11.63	88.37	11.63

Moreover, 20 percent of the breadths of textbook contents (with percentage score below 50) are difficult (or hardly to achieve). The most difficult breadth of textbook contents are converting whole numbers less than 100 into their place value (20.23%), converting numerals of whole numbers up to 100 to number names (37.1%), solving word problems involving division (where the numbers do not exceed 20) (39.95%) and solving word problems involving multiplication where the product does not exceed 20 (44.51%) (See Table 4.2).

Children's ability to convert numerals into number names depends on the identification of digits and alphabets. Children develop accurate identification of digits and alphabets, and convert digits to number names at about age 5 (Baroody & Wilkins, 1999). That is, the conversion of numerals to number names depends on the knowledge of the Geez alphabet. However, according to the participant teachers' responses to the open-ended questionnaire the mathematics subject expects children to convert numerals to number-names before they learn alphabets in the Tigrinya subject. Therefore, the difference may originate from the lack of coordination between the mathematics subject and the Tigrinya subject.

The frequency of teachers' responses to each scales of the degree of challenge questionnaire are also regrouped and renamed based on their attainability as attainable (for scales not challenging, less challenging and challenging) and unattainable(for more challenging) (See Table 4.2).

Accordingly, the most attainable (which includes not challenging, less challenging, and challenging) breadth of textbook contents are differentiating the relationship between the Ethiopian coins (88.37%), adding three addends whose sum does not exceed 20

(88.37%), solving word problems involving addition where the numbers do not exceed 100 (86.05%), converting number-names of whole numbers into numeral (83.72%) and counting natural numbers up to 100 (81.4%). In sum, 16 out of the 20 breadth of textbook contents are attainable to most students. The attainable breadth of textbook contents (with percentage score 50 and above) account 80 percent of the total breadth of textbook contents.

In Baroody and Wilkins (1999) study of the development of informal counting, number and arithmetic skills and concepts counting experience was found as a prerequisite knowledge to addition. This shows inconsistency with the present finding. This difference may originate from the participant teachers casual observation or learners prior experience.

From the numbers of compatible and attainable breadth of textbook contents, we can understand that there are five breadth of textbook contents that are not compatible (that are not engaging and motivating) but that are attainable (within the reach of the learner). These are: measuring length of objects using traditional measurements (79.75%), solving word problems involving subtraction where the numbers do not exceed 100 (74.42%), describing objects using ordinal numbers (67.75%), subtracting using two subtrahends from whole numbers not more than 20 (60.47%), comparing two whole numbers up to 100 (55%). These breadths of contents were rated by many participant teachers as easy (breadth of contents which require no or less effort and support to achieve) (See Table 4.2).

4.3. Effects of Familial context on the Breadth of textbook contents' Degree of challenge

To analyze how the breadth of textbook contents degree of challenge were influenced by students' familial context(being children of agrarian families or children of non-agrarian families) rural and urban teachers' responses were tested using t-test. Significant deference on the rural and urban participant teachers' responses on breadth of textbook contents degree of challenge was obtained on four breadth of contents: subtracting using two subtrahends from whole numbers not more than 20 (0.05, 41) = -2.763, computing equations with missed addends (0.05, 41) = -2.584 and measuring objects using local measurement of length (0.05, 41) =2.256, converting whole numbers not more than hundred into place value (0.05, 41) = -2.042 (See Table 4.3). For each significance difference except for breadth of content 18 the means (which are all more than 3) of the rural teachers responses were higher – indicating that the breadth of contents are more challenging for students of agrarian families than for students of non-agrarian families.

The difference may be due to background experience. For example, in the agrarian families (rural dwellers) it is customary to see when people measure objects using traditional measurements. This may be due to the absence of modern measuring instruments and the agrarian families' inability to read the measurement units.

The reason for being less challenging for children of non-agrarian families on the other three breadths of contents- computing equations, converting digits of whole numbers into number-names, subtracting using two subtrahends- could be the availability of 14 kindergartens in the urban. In other words, though there is no recorded evidence of how many and which children came through kindergarten, the difference on computing equations, converting digits of whole numbers into number-names, subtracting using two subtrahends (which favors children of non agrarian families) may be the availability of the 14 kindergartens in the Adwa town (non agrarian families). That is, it may be due to good academic background in preschool and kindergarten or difference in parental help (difference in parents' educational background).

Table 4.3. Means, Standard Deviations, and t-test Results for the Urban and Rural Teachers' Responses on the breadth of contents' degree of challenge to Students of Agrarian and Non-Agrarian Families

No	Breadth of Contents	Area						t(0.05,41)= 2.021
		Both urban and rural (n= 43)		Urban (n = 28)		Rural (n= 15)		
		M	SD	M	SD	M	SD	t-value
1	Counting natural numbers up to 100	3.05	0.569	3.107	0.497	2.933	0.704	0.824
2	Converting numerals of whole numbers up to 100 into number-names	3.28	0.483	3.714	0.460	3.467	0.516	-1.507
3	Converting number-names of whole numbers up to 100 into numerals	3.116	0.442	3.107	0.416	3.133	0.516	-0.743
4	Ordering whole numbers up to100	3.349	0.2523	3.321	0.548	3.4	0.507	-0.743
5	Comparing two whole numbers up to 100	3.372	0.611	3.321	0.670	3.467	0.516	-0.773
6	Converting digits of whole numbers up to 100 into their place value	3.674	0.516	3.571	0.573	3.867	0.352	-2.042
7	Adding two whole numbers whose sum does not exceed 100.	3.419	0.493	3.357	0.488	3.533	0.516	-1.055
8	Adding three addends whose sum does not exceed 20.	2.837	0.644	2.786	0.686	2.933	0.594	-0.712
9	Determining the difference of two whole number not more than 100	3.302	0.592	3.321	0.612	3.267	0.594	0.273
10	Subtracting using two subtrahends from whole numbers not more than 20	3.233	0.742	3.036	0.793	3.6	0.507	-2.763

No	Breadth of Contents	Area						t(0.05,) =2.021
		Both urban and rural (n= 43)		Urban (n =28)		Rural (n= 15)		
		M	SD	M	SD	M	SD	t-value
11	Determining multiples of two whole numbers that do not exceed 20.	3.372	0.483	3.429	0.504	3.267	0.458	1.037
12	Dividing whole numbers up to 20	3.372	0.483	3.357	0.488	3.4	0.507	-0.261
13	Computing equations of variables of addends up to 20	3.302	0.592	3.286	0.659	3.333	0.488	-2.584
14	Solving word problems involving addition (where the numbers do not exceed100).	2.837	0.644	2.75	0.701	3.000	0.535	-1.272
15	Solving word problems involving subtraction (where the numbers do not exceed100).	2.907	0.772	2.821	0.772	3.067	0.799	-0.946
16	Solving word problems involving multiplication (where the product does not exceed 20)	3.488	0.586	3.393	0.629	3.667	0.488	-1.54
17	Solving word problems involving division (where the numbers do not exceed 20)..	3.535	0.623	3.464	0.693	3.667	0.488	-1.089
18	Measuring objects using local measurement of length	2.860	0.734	3.036	0.744	2.533	0.640	2.256
19	Describing sets using ordinal numbers up to 20	3.116	0.722	3.25	0.701	2.867	0.743	1.595
20	Differentiating the relationship among the Ethiopian “coins”	2.930	0.545	2.964	0.508	2.867	0.640	0.492

4.4. Relevance of Textbook contents to the Tigrinya Speaking Learners Socio-cultural Context

When we see the relevance textbook contents to the Tigrinya speaking learners in terms of the parameters of socio-cultural context, participant teachers (both rural and urban teachers) responded the naming (M = 3.744), the dialect (M= 3.512) and the exemplification used in the textbook (M = 3.070) as most relevant to the socio-cultural context of the Tigrinya speaking learners. Generally, all the parameters of the socio cultural context favor the relevance of textbook contents to students of agrarian and non agrarian families. According to Cordova and Lepper (1996) contextualization produced dramatic increases in students' motivation, depth of engagement in learning, the amount they learn in a fixed time, their perceived competence and their level of aspiration. The textbook contents of this study are relatively contextualized. This implies the textbook contents are more likely to be learned rapidly, retained for longer time and to engage the learners in reading it.

For both rural and urban teachers' responses, there is relatively much variation on the parameter "textbook contents meet the over all expectation of the society ". This may be due to ignorance of the participant teachers, what the society expects its children to achieve. Some respondents give examples in the corresponding open ended question as:

> *The society (parents) expects their first grade children to do the four arithmetic operations. This is observed when the child fails to do the operations; they said, "What are you then learning?" Therefore, from this we can know, the society expects its children to operate the four arithmetic operations. The grade one mathematics incorporates these four arithmetic*

operations. Therefore, we can conclude, 'the textbook content meets the overall expectation of the society.

When we see the participant teachers responses to the parameters of the socially and culturally appropriate textbook contents in terms of children of agrarian and non-agrarian families, urban participant teachers attributed the naming used (M= 3.821) and the dialect of the language used (M=3571) as more relevant to students of non-agrarian families'. Similarly, rural participant teachers attributed, the naming used (M=3.6) and the dialect of the language used in the textbook (M= 3.4) as the most relevant to children of agrarian families (See Table 4.4).

Table 4.4. Means, Standard Deviations and t-test Results for Urban and Rural Teachers' Responses on the Relevance of the Textbook Contents to Children of Agrarian and Non-Agrarian Families.

No	Parameter	Area						t(0.05,41) =2.021
		Both urban and rural (n= 43)		Urban (n = 28)		Rural (n= 15)		
		M	SD	M	SD	M	SD	t-value
1	The textbook emphasizes content that is connected to the child's informal mathematical knowledge in everyday activities	2.721	0.667	2.821	0.723	2.533	0.516	1.470
2	The textbook respects the dialects of the learner	3.512	0.631	3.571	0.573	3.4	0.737	0.758
3	The exemplification used in the textbook are related to the learners social conditions	3.070	0.669	2.964	0.693	3.267	0.594	-1.461
4	The textbook content meets the over all expectation of the society	2.791	0.773	2.893	0.875	2.6	0.507	1.356
5	The naming used on the textbook are related to the community	3.744	0.493	3.821	0.390	3.6	0.632	1.196

4.5. Effects of Familial Context on the Relevance of Textbook Contents

Rural and urban participant teachers' responses on the parameters of relevant textbook contents to children of agrarian and non-agrarian families were analyzed using t-test. From the five parameters of socio-cultural context, no significant difference was observed (see Table 4.4). This indicates the textbook contents are relevant to both children of the agrarian and non-agrarian families.

4.6. Attainability of the Levels of Conceptualization of the Contents

Textbooks are prepared for a particular maturity level; hence the levels of conceptualization of the textbook contents must be compatible with the corresponding maturity level. The targets of this study are children in the concrete operational stage. According to Sprinthal et al., (1994) children in the concrete operational stage could not mentally process beyond Bloom's (1956) application level of the cognitive domain. In other words, analysis, evaluation and synthesis require higher order thinking and are beyond the here and now thinking of the concrete operational children.

Table 4.5. Percentage Scores of the Levels of Conceptualization of the Textbook Contents

Level of Conceptualization	Percentage of Levels of Conceptualization
Knowledge	12.6
Comprehension	73
Application	14.4
Analysis	-
Evaluation	-
Synthesis	-

According to Mahrens and Lehmann (1991) the levels of conceptualization of the textbook contents can be identified from the learning activities (test items). Based on this knowledge the levels of conceptualization of the textbook activities were examined and found: knowledge (12.6%), comprehension (73%) and application (14.4%)(See Table 4..5). Since the levels of conceptualization of the findings are within and below application level, we can conclude that 100 percent of the levels of conceptualization of the contents are within the reach of the concrete operational child.

4.7. Sequence of the Textbook Contents

Since development and learning occur in an orderly sequence, textbook writers must arrange the sequence of the contents of the textbook, so as the reader of the textbook make sense, learn more rapidly, and retain much longer according to the sequence of the intellectual development of the learner. To examine whether the textbook topics sequence match with the developmental sequence, the whole textbook topics were investigated and very high agreements were found. Over ninety-six (96.3) percent of the textbook topics match with the developmental sequences. This implies the textbook contents are more likely to be learned much rapidly and to be retained much longer.

4.8. Incorporation of Preceding stages Learning modes

Since development in each stage incorporates development from all of the preceding stages, the modes of learning in the later stages should combine the modes of learning in the earliest stages (Seifert, 1991). Though the concrete operational child is able to mentally operate about concrete objects without physically manipulating, the concrete operational child learns more and retains much longer if the learning activities incorporate the earliest stages modes of learning (Seifert, 1991). That is, the concrete operational child learns more when the learning activities incorporate, in addition to logical thinking, sensory operations and symbolic representations. The examination of grade one mathematics textbook learning activities showed that 63 percent of the learning activities proceed from symbolic representation to abstraction and 37 percent of the learning activities were presented in abstraction without concrete or symbolic representations. From this we can conclude that there is a need of the incorporation of the sensorimotor stage modes of learning (sensory operations of concrete materials) for all learning activities.

CHAPTER FIVE

5. Summary, conclusions and Recommendations

5.1. Summary

It has been found that the developmental and cultural appropriateness of textbook contents have an impact on the rate of learning and the amount of retention. Thus, the theme of this study is to find out to what extent the Tigray Region grade one mathematics textbook contents are developmentally and culturally appropriate to grade one students of Tigray Region.

The following questions have been formulated as basic targets of the study: how many and to what extent the textbook contents are compatible and attainable to grade one students of Tigray Region? Is there significant difference between rural and urban teachers' responses on the textbook contents' degree of challenge to children of agrarian and non-agrarian families? To what extent are the textbook topics developmentally sequenced? To what extent do the textbook activities incorporate learning modes of the preceding stages? To what extent are the textbook activities' levels of conceptualization attainable to the concrete operational children? To what extent are the textbook contents relevant to the socio-cultural context of the learners? Is there significant difference between rural and urban teachers' responses on the relevance of the textbook contents to children of agrarian and non-agrarian families?

To answer the above questions data were collected from grade one teachers with a three-part questionnaire and from the textbook with two coding sheets.

The first part of the teacher-administered questionnaire focuses on degree of challenge of the breadth of textbook contents, the second part focuses on the relevance of the textbook contents to the socio-cultural contexts of the learners and the third part focuses on the strengths and weaknesses of the textbook contents.

Regarding the coding sheets, one of the coding sheets is concerned with the coordination of the sequence of textbook contents with the developmental sequence, and the incorporation of the learning modes of the preceding stages in the textbook activities. The second coding sheet focuses on the attainability of the levels of conceptualization of the textbook activities.

. The first part of the questionnaire has been rated on a four point scale from not challenging (1) to more challenging (4) and the second part has been rated on a five-point scale from strongly disagree (0) to strongly agree (4)

The instruments were pilot tested. Accordingly, some amendments were made and final instruments were prepared.

After this the questionnaire was administered to 43 grade one teachers (Rural = 15, Urban = 28) and the coding sheets to four instructors (two instructors on each).

After the administration of the questionnaire and the coding sheets, each part of the questionnaire and the coding sheets were analyzed.

To see to what extent each breadth of contents was compatible, the frequency of teachers' responses to the four scales of the first part questionnaire have been regrouped based on their motivational effect as easy, compatible and difficult, and was described using percentage scores. Accordingly, converting number-names of whole numbers up to 100 into numerals, adding three addends whose sum does not exceed 20, determining multiples of two whole numbers whose product does not exceed 20 were the most compatible contents with the cognitive abilities of the learners. That means these are the most engaging, and motivating contents to most of the grade one students of Tigray Region. Generally, percentage scores of participant teachers' responses (50 and above) on challenging scale showed 11 out of the 20 breadth of contents are relatively engaging and motivating.

The frequency of teachers' responses to the breadth of textbook contents degree of challenge was also treated in terms of attainability. Thus, the most attainable breadth of textbook contents are differentiating the relationship between the Ethiopian coins, adding three addends whose sum does not exceed 20, solving word problems involving addition where the sum does not exceed 100, converting number-names into numerals, and counting natural numbers up to 100. In general, 16 out of the 20 breadth of contents are within the reach of the grade one students of Tigray Region.

The study results also showed that there are four breadths of contents that are unattainable, to the grade one students of Tigray Region. These breadths of contents according to their degree of difficulty to achieve are converting digits up to 100 into their place value, converting numerals up to 100 to number-names, solving word problem involving division where numbers do not exceed 20, solving word problems involving multiplication where the product does not exceed 20 respectively.

Concerning the role of socio-cultural context on the breadth of textbook contents' degree of challenge t-test results between rural and urban teachers' responses have shown significant difference on four breadth of contents: subtracting using two subtrahends from whole numbers not more than 20, computing equations with missed addends, measuring objects using traditional measurement, and converting digits of whole numbers not more than 100 into place value.

Regarding the relevance of the textbook contents to the socio-cultural context of the learners, all urban and rural teachers' responses to the parameters of the socio-cultural context favored the relevance of the textbook contents to the socio-cultural context of the learners. Among the parameters of the socio-cultural context, the naming, dialect, and exemplifications used in the textbook are more related to the context of both children of agrarian and non-agrarian families.

t-test result between rural and urban teachers' responses on the relevance of the textbook contents to children of agrarian and non-agrarian families showed no significant difference. This indicates that the textbook contents are equally relevant to both children of agrarian and non-agrarian families.

The examination of the attainability of the levels of conceptualization of the textbook contents showed that the levels of conceptualization of the textbook contents are 100 percent attainable.

Examination of the sequence of textbook contents showed that 96.3 percent match with the developmental sequence. This implies the textbook contents can be easily and rapidly learned and retained much longer.

Investigation of the textbook activities showed that most of the activities incorporate the learning modes achieved before the concrete operational stage. This implies the child can learn more than he/she learns with only the learning mode achieved during the concrete operational stage.

5.2. Conclusions

It was beyond the purpose of this study to go through all measures of textbook qualities except evaluating the developmental and cultural appropriateness of textbook contents. Bearing this in mind, the developmental and cultural appropriateness of the textbook contents was evaluated. Accordingly, based on the findings it can be concluded that:

1. The frequency of teachers' responses to the four scales of the degree of challenge questionnaire of each breadth of contents were regrouped and renamed based on their motivational effect as easy, compatible and difficult. Accordingly, out of the 20 breadth of contents 5 are easy, 11 are compatible and 4 are difficult. In other words, out of the 20 breadths of contents 5 are more likely to be boring or uninteresting, 11 are more likely to be engaging and motivating, and 4 are more likely to be frustrating to most of the grade one students of Tigray Region.
2. The frequency of teachers' responses to the breadth of textbook contents degree of challenge was also treated in terms of attainability. Sixteen out of the 20 breadth of contents are attainable to most grade one students of Tigray Region. In other words, 16 out of the 20 breadth of contents are within the reach of grade one students of Tigray Region.
3. Concerning the role of familial context on the breadth of textbook contents' degree of challenge t-test results between rural and urban teachers' responses have shown significant difference on four breadth of contents: subtracting using two subtrahends from whole numbers not more than 20, computing equations with missed addends, measuring objects using traditional measurement, and converting digits of whole numbers not more than 100 into place value. The difference may not be due to variation in cognitive

capacity rather it may be a difference in familiarity with the contents, difference in academic background in preschool and kindergarten, difference in parental help, difference in parents' educational background, difference in the time available to study.

4. Regarding the relevance of the textbook contents to children of agrarian and non-agrarian families, all rural and urban teachers' responses to the parameters of the socio-cultural context favored the relevance of the textbook contents to the socio-cultural context of the learners. Among the parameters of the socio-cultural context, the naming, dialect, and exemplifications used in the textbook are more relevant to the context of both children of agrarian and non-agrarian families. From this we can conclude that, if other measures of textbook qualities are generally good, the textbook contents are motivating and interesting. This contradicts the problem observed during the practicum observation. This again invites interested researchers to conduct further research on the other criteria of textbook qualities

5. t-test result between rural and urban teachers' responses on the relevance of the textbook contents to children of agrarian and non-agrarian families showed no significant difference. This indicates that the textbook contents are equally relevant to both children of agrarian and non-agrarian families.

6. Textbooks are prepared for a particular maturity level. Hence the levels of conceptualization of the textbook contents must be compatible with the corresponding maturity level. The targets of this study are children in the concrete operational stage. Children in the concrete operational stage could not mentally process beyond Bloom's application level of the cognitive domain. The examination of the attainability of the

levels of conceptualization of the textbook contents showed that the levels of conceptualization of the textbook contents are 100 percent attainable.

7. Development and learning occur in an orderly sequence. So as the readers of the textbook make sense, learn more rapidly, and retain much longer, textbook writers must arrange the sequence of the textbook contents according to the sequence of the intellectual development of the learner. Investigation of the sequence of textbook contents showed that 96.3 percent match with the developmental sequence. This implies the textbook contents can be easily and rapidly learned and retained much longer.
8. Development in each stage incorporates development from all of the preceding stages. Hence, children learn best if the textbook activities incorporate the learning modes of the preceding stages. That means the modes of learning in the later stages should include the modes of learning achieved in the earliest stages. Investigation of the textbook activities showed that most of the activities incorporate the learning modes achieved during the preoperational stage but not the learning modes of the sensorimotor stage. This implies the child can learn more than he/she learns with only the learning mode achieved during the concrete operational stage. The child could also learn more if the learning modes of the sensorimotor stage are included.

5.3 Recommendations

Based on the findings the following recommendations are forwarded:

1. Teachers' responses to the degree of challenge questionnaire have shown that grade one students of Tigray Region have difficulties on converting digits into their place value, converting numerals to number-names, solving word problem involving division and multiplication. In addition, the participant teachers have also suggested that the difficulty to convert numerals to number-names is due to lack of integration between the Tigrinya and the mathematics subjects. Thus, the Regional Education Bureau needs to revise and improve the textbook in line with the findings of this study.
2. Significant difference was observed between rural and urban teachers' responses regarding the textbook contents degree of challenge to children of agrarian and non-agrarian families on subtracting using two subtrahends from whole numbers not more than 20, computing equations with missed addends, measuring objects using traditional measurement, and converting digits of whole numbers not more than 100 into place value. Except for measuring objects using traditional measurement of length, the three breadths of contents are more challenging for children of agrarian families than for children of non-agrarian families. According to the participant teachers' suggestion, the degree of challenge of the textbook contents depends on the parental support and control to their children, the attendance of pre-school and kindergarten. So, the regional government needs to facilitate the establishment of pre-school and kindergarten both in rural and urban

areas. And a strong parent-teacher relationship needs to be established so as to support and control the children.

3. Children learn best when the learning modes of the preceding stages are incorporated with the learning modes of the present stages. This study showed that the learning modes of the sensorimotor stage (sensory operations of concrete material) are not included in the textbook activities and 37 percent of the activities are presented in abstraction. Thus, the Regional Education Bureau needs to revise and incorporate all the learning modes achieved up to the concrete operational stage in the textbook activities.

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ቢሮ ትምህርቲ ክልል ትግራይ (2000 ኣ.ኢ.) ህፁፅ ሓበሬታ ትምህርቲ 2000 ዓ/ም.

መቐለ፡ መምርሒ ፕላንን ፕሮጀክትን ጉጅለ ትልምን ስርዓት መረዳእታ ትምህርትን

ክፍሊ ትምህርቲ ወረዳ ከተማ ዓድዋ (2000 ኣ.ኢ.). ፀብፃብ 3ይ ርብዒ ዓመት .ዓድዋ

ጉጅለ ትልምን ስርዓት መረዳእታን

ክፍሊ ትምህርቲ ወረዳ ገጠር ዓድዋ (2000 ኣ.ኢ.) ፀብፃብ 2ይ ርብዒ ዓመት. ዓድዋጉጅለ ትልምን ስርዓት መረዳእታን

Appendix A

Addis Ababa University
School of Graduate studies
Faculty of Education
Department of Developmental Psychology

I. General Instruction

The purpose of this questionnaire is to collect information about the degree of challenge and cultural appropriateness of Grade One mathematics textbook contents. Your response will be used only for research purposes and all information will be kept confidential. So, please fill it genuinely by devoting your time and exerting effort. Thank you.

II. Demographic Information of the participant

Please, complete the following demographic Information.

Sex __________ Mother tongue ______________

Qualification _________ Major __________ minor ___________

Length of time in teaching_________________________________

Years of service in teaching grade one mathematics _______________

Please, indicate the time you began and completed to fill the questionnaire

Date and time started_______________________

Date and time completed____________________

Part I

Instruction: The CONTENTS in the following table are taken from Grade One mathematics textbook. Rate the degree of challenge for each by marking a tick "√" under "not challenging" if students mastered the CONTENT before the lesson, "less Challenging" if they achieved it with less effort and support, "Challenging" if most students achieve it with adequate effort and support, and "more challenging" if it is hardly to achieve or few students achieved it with adequate effort and support. The number under each degree of challenge stands:

1 = Not challenging, 2 = Less challenging, 3 = Challenging, 4 = more challenging

No	Contents	Degree of challenge			
		1	2	3	4
1	Counting natural numbers up to 100				
2	Converting numerals of whole numbers up to 100 into number-names				
3	Converting number-names of whole numbers up to 100 into numerals				
4	Ordering whole numbers up to100				
5	Comparing two whole numbers up to 100				
6	Converting digits of whole numbers up to 100 into their place value.				
7	Adding two whole numbers whose sum does not exceed 100.				
8	Adding three addends whose sum does not exceed 20.				
9	Determining the difference of two whole number not more than 100				
10	Subtracting using two subtrahends from whole numbers not more than 20				
11	Determining multiples of two whole numbers that do not exceed 20.				
12	Dividing whole numbers up to 20				
13	Computing equations with missed addends up to 20				
14	Solving word problems involving addition (where the numbers do not exceed100).				
15	Solving word problems involving subtraction (where the numbers do not exceed100).				
16	Solving word problems involving multiplication (where the product does not exceed 20).				
17	Solving word problems involving division (where the numbers do not exceed 20).				
18	Measuring objects using local measurement of length				
19	Describing sets using ordinal numbers up to 20				
20	Differentiating the relationship among the Ethiopian "coins"				

Part II

Instruction: Evaluate Grade One Mathematics textbook to what extent they are, relevant to the socio-cultural context of the Tigrinya speaking learners. Rate each item based on your observation when you teach the respective grade and give examples from the textbook and comments for each questions.

1. The textbook emphasizes contents that are connected to the child's informal mathematical knowledge in everyday activities

a/ Strongly Disagree b/ Disagree c/ Partially Agree d/ Agree e/ Strongly Agree

Example from the textbook____

Comment____

2. The textbook respects the dialects of the learners

a/ Strongly Disagree b/ Disagree c/ Partially Agree d/ Agree e/ Strongly Agree

Example from the textbook____

Comment____

3. The exemplification used in the textbook are related to the learners living conditions

the society in which the learners live.

a/ Strongly Disagree b/ Disagree c/ Partially Agree d/ Agree e/ Strongly Agree

Example from the textbook____

Comment____

4 The textbook contents meet the over all expectation of the society.

a/ Strongly Disagree b/ Disagree c/ Partially Agree d/ Agree e/ Strongly Agree

Example from the textbook____

Comment____

5. The naming used on the textbook are related to the naming used in community

a/ Strongly Disagree b/ Disagree c/ Partially Agree d/ Agree e/ Strongly Agree

Example from the textbook____

Comment____

Instruction III: Write the strengths and the weakness of grade one mathematics textbook

Strengths____

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Weakness____

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Appendix B

ኣዲስ ኣበባ ዩኒቨርሲቲ

ክፍሊ መፅናዕቲ ድሕረ ምረቓ

ፋከልቲ ስነ ትምህርቲ

ዲፖርትመንት ዴቨሎፕመንታል ሳይኮሎጂ

ዕላማ ናይዚ ቅጥዒ መጠይቕ ናይ ቀዳማይ ክፍሊ መምህሪ መፅሓፍ ሒሳብ ዘለዎ ክብደትን ቅለትን መነባብሮ ተምሃሮ ኣብ ግምት ዘእተወ ምኳኑን ሓበሬታ ንምእካብ ዝተዳለወ እዩ።

ግዜኦም ሰዊኦም ንዝገብሩለይ ምትሕብባር ኣቐዲመ የመስግን።

ቅጥዒ መላኢ መምህር ዝምልከት ሓበሬታ

ፆታ ________ ኣፍ መፍትሒ ቋንቋ _______ ደረጃ ትምህርቲ ________________

ዝሰልጠንኩምሉ/ክናሉ ሙያ _______ ዓብዪ _______ንኡስ ______________

ኣብ ምስትምሃር ክንደይ ዓመት ኣሕሊፎም/ፈን ____________________________________

ቀዳማይ ክፍሊ ሒሳብ ንኽንደይ ዓመት ኣምሂሮም/ኣምሂረን_____________

እዚ ቅጥዒ ምምላእ ዝተጀመረሉ መዓልትን ሰዓትን __________________________

እዚ ቅጥዒ ተመሊኡ ዝተወደአሉ መዓልትን ሰዓትን __________________________

<u>መምርሒ I</u>

እዞም ኣብ ታሕታይ ኣብ ሰደቓ ተዘርዚሮም ዘለው ሕቶታት ካብ ቀዳማይ ክፍሊ መምህሪ መፅሓፍ ሒሳብ ዝተዋፅኡ ኮይኖም ተመሃሮ ክጭብጥዎም ትፅቢት ዝግበረሎም እዮም። ኣብ ክፍሊ ክተምህሩ ከለኹም ተመሃሮኹም ቅድሚ ምስትምሃርኩም ቀዲሞም ንዝፈልጥዎ “ብጣዕሚ ቀሊል” ብውሑድ መብርሂ ንዝጭብጥዎ “ቀሊል” ብማእኸላይ መብርሂ ንዝጭብጥዎ “ማእኸላይ” ዝለዓለ መብርሂን ፃዕርን ተገይርሉ ብዙሓት ተመሃሮ ክጭብጥዎ ንዘይኽእሉ “ከቢድ” ብምባል ኣብ ኣንፃር ሕድሕድ ሕቶ ናይ “√ “ ምልክት ብምግባር ኣመልክቱ።

ተቁ	ትሕዝቶ	ደረጃ ክብደት			
		ብጣዕሚ ቀሊል	ቀሊል	ማእኸላይ	ከቢድ
1	ክሳብ 100 ዘለው መቑፀሪ ቁፅርታት ምቑፃር				
2	ክሳብ 100 ዘለው ሙሉእ ቁፅርታት ብፊደላዊ ስሞም ምግላፅ				
3	ክሳብ 100 ዘለው ሙሉእ ቁፅርታት ብኣሃዝ ምግላፅ				
4	ክሳብ 100 ዘለው ሙሉእ ቁፅርታት ብቅደም ሰዓብ ምስራዕ				
5	ክሳብ 100 ዝርከቡ ክልተ ሙሉእ ቁፅርታት ምውድዳር				
6	ክሳብ 100 ዘለው ሙሉእ ቁፅርታት ብዓድታቶም ምግላፅ				
7	ድምሮም ልዕሊ 100 ዘይመፅእ ክልተ ሙሉእ ቁፅርታት ምድማር				
8	ድምሮም ልዕሊ 20 ዘይመፅእ ሰለስተ ተደመርቲ ምድማር				
9	ካብ 100 ዘይበልፁ ክልተ ሙሉእ ቁፅርታት ምጉዳል				
10	ጉዳሎም ካብ 20 ዘይበልፅ ሙሉእ ቁፅርታት ብክልተ መጉደልቲ ምጉዳል				
11	ርባሖም ልዕሊ 20 ዘይመፅእ ክልተ ሙሉእ ቁፅርታት ምርባሕ				
12	ክሳብ 20 ዘለው ተመቀልቲ ሙሉእ ቁፅርታት ምምቓል				
13	ዋጋ ተተካእቲ ምድማር ምስላሕ (ካብ 20 ዘይበልፁ ሙሉእ ቁፅርታት)				
14	ቃል ግድል ምድማር ምስላሕ(ድምሮም ካብ 100 ዘይበልፅ ሙሉእ ቁፅርታት)				
15	ቃል ግድል ምጉዳል ምስላ(ካብ 100 ዘይበልፁ ሙሉእ ቁፅርታት)				
16	ቃል ግድል ምርባሕ ምስላሕ(ርባሖም ልዕሊ 20 ዘይመፅእ)				
17	ቃል ግድል ምምቃል ምስላሕ (ክሳብ 20 ዘለው ሙሉእ ቁፅርታት))				
18	ብባህላዊ መዐቀኒ ንውሓት ምዕቃን				
19	ተርታዊ ቁፅርታት ተጠቒምካ ቅደም ሰዓብ ነገራት ምግላፅ				
20	ኣብ ሞንጎ ሳናቲም ዘሎ ዝምድና ምግላፅ				

መምርሒ II

ቀጺሎም ንዝቐርቡ ሕቶታት ቀዳማይ ክፍሊ ሒሳብ እንተምህሩ ብዝተዓዘብዎ መሰረት እቲ መምሃሪ መፅሓፍ ነቶም ሕቶታት ክንደየናይ ዝኣክል ከምዘማልኦም "ፈጺመ ኣይስማዕመዐሉን" "ኣይስማዕመዐሉን" ፣ ፍርቃ ፍርቂ እስማዕመዐሉ እየ" ፣ "እስማዕመዐሉ እየ" ወይከዓ "ሙሉእ ንምሉእ እስማዕመዐሉ እየ":: ብምባል ምስ መለሱ ንሕድሕድ ሕቶ ካብ መምሃሪ መፅሓፍ ኣብነትን ሪኢቶን ይፅሓፉ

1. ትሕዝቶ መምሃሪ መፅሓፍ ተምሃራይ ኣብ ዕለታዊ ተግባራቱ ዘዋህለሎ ሒሳብ ተንከፍ ፍልጠታት መሰረት ዝገበረ እዩ::

ሀ. ፈጺመ ኣይስማዕመዐሉን ለ. ኣይስማዕመዐሉን

ሐ.ፍርቃ ፍርቂ እስማዕመዐሉ እየ መ. እስማዕመዐሉ እየ

ሰ. ሙሉእ ንምሉእ እስማዕመዐሉ እየ

ኣብነት ካብ መምሀሪ መፅሓፍ____

ሪኢቶ ____

2. ኣጠቓቕማ ቋንቋ መምሃሪ መፅሓፍ ምስ ናይ ተምሃራይ ኣዘራርባ ዝጠዓዓም እዩ::

ሀ. ፈጺመ ኣይስማዕመዐሉን ለ. ኣይስማዕመዐሉን

ሐ.ፍርቃ ፍርቂ እስማዕመዐሉ እየ መ. እስማዕመዐሉ እየ

ሰ. ሙሉእ ንምሉእ እስማዕመዐሉ እየ

ኣብነት ካብ መምሀሪ መፅሓፍ____

ሪኢቶ ____

3. ኣብ መምሃሪ መፅሓፍ ዝተውሃቡ ኣብነታት /ሕቶታት/ ወድዓዊ ኩነታት ሕብረተሰብ መሰረት ዝገበሩ እዮም::

ሀ. ፈጺመ ኣይስማዕመዐሉን ለ. ኣይስማዕመዐሉን ሐ.ፍርቃ ፍርቂ እስማዕመዐሉ እየ መ. እስማዕመዐሉ እየ

ሰ. ሙሉእ ንምሉእ እስማዕመዐሉ እየ

ኣብነት ካብ መምሀሪ መፅሓፍ____

ሪኢቶ ____

4. ትሕዝቶ መምሃሪ መፅሓፍ ሓፈሻዊ ትፅቢት ሕብረተሰብ ዘማልአ እዩ::

ሀ. ፈጺመ ኣይስማዕመዐሉን   ለ. ኣይስማዕመዐሉን

ሐ.ፍርቃ ፍርቂ እስማዕመዐሉ እየ መ.እስማዕመዐሉ እየ

ሰ. ሙሉእ ንምሉእ እስማዕመዐሉ እየ

ኣብነት ካብ መምህሪ መፅሓፍ____

____

____

ሪኢቶ ____

____

5. እቲ መምሃሪ መፅሓፍ ዝጥቀመሉም ኣሽማት ተምሃራይ ዝነብረሉ ሕብረተሰብ ብሰፊሑ ዝጥቀመሉም እዮም።

ሀ. ፈጺመ ኣይስማዕመዐሉን   ለ. ኣይስማዕመዐሉን

ሐ.ፍርቃ ፍርቂ እስማዕመዐሉ እየ   መ. እስማዕመዐሉ እየ

ሰ. ሙሉእ ንምሉእ እስማዕመዐሉ እየ

ኣብነት ካብ መምህሪ መፅሓፍ____

____

____

ሪኢቶ ____

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መምርሒ III

መምህሪ መፅሓፍ ቀዳማይ ክፍሊ ሒሳብ ዝምልከት ጥንኩርን ድኹምን ጐኒ ግለፅ

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Appendix C

Coding Sheet for the Attainability of the Textbook Contents

I. General information

a) **Curriculum:** Grade one mathematics textbook

b) **Sample unit:** the whole textbook subtopics

c) **Unit of analysis**: textbook subtopics

d) Coder 1) name __________________ 2) qualification __________

3) Subject, a) major ______________ b) minor _______________

e) Date and time coding started____________________________________

f) Date and time coding completed________________________________

Instruction: Read each units, topics and subtopics of grade one mathematics textbook of 1995 E.C. version and determine whether each units, topics and subtopics are similar with the following lists of units, topics and subtopics. If you agreed their similarity, determine whether the level of conceptualization of the contents under each topics corresponds to knowledge, comprehension, application, analysis, evaluation, or synthesis

Mark a tick "√" in front of each subtopics (with three digits e.g., 1.1.1, 1.2.1, etc...) under the appropriate category of construction.

The number under the category of construction stands for:

1= knowledge 2= comprehension 3= application

4= analysis 5= evaluation 6= synthesis

No	Units of analysis	Category of construction					
	Subtopics	1	2	3	4	5	6
1	The Natural Numbers up to ten						
1.1	Identifying Natural Numbers up to five						
1.1.1	Count sets up to five		√				
1.1.2	Convert the numerals of natural numbers up to five into number- names		√				
1.1.3	Convert the number- names of natural numbers up to five into numerals		√				
1.1.4	Describe sets up to five using numerals		√				
1.1.5	Describe sets to five using of number- names		√				
1.1.6	Describe sets up to five using tallies		√				
1.1.7	Describe numerals up to five using dots		√				
1.2	Ordering the numerals of natural numbers up to five						
1.2.1	Order the numerals of natural numbers up to five small to large		√				
1.2.2	Order the numerals of natural numbers up to five large to small		√				
1.2.3	Determine successors of natural numbers up to five		√				
1.3	Comparing numbers up to five						
1.3.1	Compare the numbers by comparing the corresponding set up to five		√				
1.3.2	Differentiate the symbols " < ", ">", " = "		√				
1.3.3	Compare the numerals of natural numbers up to five		√				
1.4	Adding sets up to five						
1.4.1	Add sets up to five		√				
1.4.2	Identify the symbol "U"	√					
1.4.3	Add sets representing with numerals		√				
1.4.4	Identify the symbol " +"	√					
1.4.5	Add natural numbers whose sum is not more than five		√				
1.5	Identifying Natural Numbers six t to ten						
1.5.1	Count sets six to ten		√				
1.5.2	Convert the numerals of natural numbers six to ten into number- names		√				
1.5.3	Convert the number- names of natural numbers six to ten into r numerals		√				
1.5.4	Match sets, six t to ten, to names of numbers		√				

No	Units of analysis	Category of construction					
	Subtopics	1	2	3	4	5	6
1.5.5	Match sets, six t to ten, to numerals		√				
1.5.6	Match sets, six t to ten, to tallies		√				
1.5.7	Match set of tallies, six t to ten, to numerals		√				
1.6	Ordering the numerals of natural numbers up to ten						
1.6.1	Order the numerals of natural numbers up to ten		√				
1.6.2	Count back natural numbers to ten		√				
1.7	Comparing natural numbers up to ten						
1.7.1	Compare natural numbers up to ten		√				
2.	Addition and subtraction of natural numbers not more than ten						
2.1	Adding natural numbers not more than ten						
2.1.1	Relate sets up to ten to numerals		√				
2.1.2	Add sets six to ten		√				
2.1.3	Add natural numbers whose sum is not more than ten horizontally		√				
2.1.4	Add natural numbers whose sum is not more than ten vertically		√				
2.1.5	Add natural numbers whose sum is not more than ten using grids		√				
2.2	Adding three addends whose sum is not more than ten						
2.2.1	Add three sets whose sum is not more than ten		√				
2.2.2	Add three addends whose sum is not more than ten		√				
2.2.3	Solve word problems of addition to ten			√			
2.3	Subtracting from natural numbers up to ten						
2.3.1	Subtract from sets up to ten		√				
2.3.2	Identify the symbol " -"	√					
2.3.3	Distinguish the difference between "addends" minuend" and "difference"		√				
2.3.4	Justify the relationship between addition and subtraction		√				
2.4	Understanding the concept of zero						
2.4.1	Identify the numeral of zero	√					
2.4.2	Explain the concept of zero		√				
2.4.3	Add sets with another set with zero number of elements.		√				
2.4.4	Describe sets using numerals.		√				

No	Units of analysis	Category of construction					
	Subtopics	1	2	3	4	5	6
4	Adding and subtracting whole numbers 0 to 20						
4.1	Converting whole numbers up to 20 into their place value						
4.1.1	Convert sets of whole numbers up to 20 into their place value		√				
4.1.2	Convert digits of whole numbers up to 20 into their place value		√				
4.2	Adding whole numbers whose sum not exceeding 20		√				
4.2.1	Compute the value of a variable in an equation using addition			√			
4.2.2	Compute the value of a variable in an equation using subtraction			√			
4.2.3	Match addends with numerals that look different (whose sum not exceeding 20)			√			
4.2.4	Add horizontally whole numbers 0 to 20 whose sum not exceeding 20	√					
4.2.5	Add vertically whole numbers 0 to 20 whose sum not exceeding 20		√				
4.2.6	Add whole numbers up to 20 using grid whose sum not exceeding 20		√				
4.3	Adding three addends whole numbers whose sum is not more than 20						
4.3.1	Add three addends whole numbers whose sum is not more than 20 horizontally	√					
4.3.2	Add three addends whole numbers whose sum is not more than 20 vertically		√				
4.3.3	Match addends and with whole numbers to 20 that look different.		√				
4.4	Subtracting from whole numbers 0 to 20						
4.4.1	Match the minuend and subtrahend with whole numbers to 20 that look different		√				
4.4.2	Subtract from whole numbers 0 to 20		√				
4.4.3	Solve word problems using addition and subtraction			√			
4.4.4	Compute the value of the missed number (from whole numbers to 20)			√			
5	Multiplication and Division of whole numbers to 20						
5.1	Multiplying of whole numbers to 20						
5.1.1	Add two equal sets whose sum is not more than 20		√				
5.1.2	Multiply two equal sets whose product is not more than 20		√				
5.1.3	Identify the symbol " × "	√					
5.1.4	Distinguish the concept of "factor", "multiplication", and "product"		√				

No	Units of analysis	Category of construction	
	Topics	1	2
3.2.1	Order whole numbers 0 to 20 using number line		
3.2.2	Determine predecessors and successors of whole numbers 10 to 20		
3.2.3	Order whole numbers 0 to 20 using grids		
4	Adding and subtracting whole numbers 0 to 20		
4.1	Converting whole numbers up to 20 into their place value	X	√
4.1.1	Convert sets of whole numbers up to 20 into their place value		
4.1.2	Convert digits of whole numbers up to 20 into their place value		
4.2	Adding whole numbers whose sum not exceeding 20	√	X
4.2.1	Compute the value of a variable in an equation using addition		
4.2.2	Compute the value of a variable in an equation using subtraction		
4.2.3	Match addends with numerals that look different (whose sum not exceeding 20)		
4.2.4	Add horizontally whole numbers 0 to 20 whose sum not exceeding 20		
4.2.5	Add vertically whole numbers 0 to 20 whose sum not exceeding 20		
4.2.6	Add whole numbers up to 20 using grid whose sum not exceeding 20		
4.3	Adding three addends whole numbers whose sum is not more than 20	√	X
4.3.1	Add three addends whole numbers whose sum is not more than 20 horizontally		
4.3.2	Add three addends whole numbers whose sum is not more than 20 vertically		
4.3.3	Match addends and with whole numbers to 20 that look different.		
4.4	Subtracting from whole numbers 0 to 20	√	X
4.4.1	Match the minuend and subtrahend with whole numbers to 20 that look different		
4.4.2	Subtract from whole numbers 0 to 20		
4.4.3	Solve word problems using addition and subtraction		
4.4.4	Compute the value of the missed number (from whole numbers to 20)		
5	Multiplication and Division of whole numbers to 20		
5.1	Multiplying of whole numbers to 20	√	√
5.1.1	Add two equal sets whose sum is not more than 20		

No	Units of analysis	Category of construction	
	Topics	1	2
5.1.2	Multiply two equal sets whose product is not more than 20		
5.1.3	Identify the symbol " × "		
5.1.4	Distinguish the concept of "factor", "multiplication", and "product"		
5.1.5	Justify expressions of addition with expressions of multiplication		
5.1.6	Add each unit by skipping equal distance in a number line		
5.1.7	Multiply each equal units of skip by the number of skip whose product is not more than 20 in a number line		
5.1.8	Multiply sets of dots using rows and columns		
5.1.9	Convert statements of multiplication into numerical expressions		
5.1.10	Convert expressions multiplication into expressions of addition		
5.1.11	Compute the value of variables of multiplication of equations 2		
5.1.12	Solve word problems using multiplication		
5.2	Dividing whole numbers to 20	√	√
5.2.1	Divide sets up to 20 by 2		
5.2.2	Identify the symbol " ÷ "		
5.2.3	Justify expressions of division with expressions of multiplication		
5.2.4	Divide whole numbers up to 20 by 1		
5.2.5	Divide whole numbers up to 20 by itself		
5.2.6	Divide whole numbers up to 20 by itself using grids		
5.2.7	Solve word problems of division		
5.2.8	Compute the value of a variable using division		
6	The whole numbers from 0 to 100		
6.1	Identifying the multiple of ten whole numbers from 0 to 100	√	√
6.1.1	Counting multiple of 10 sets up to 100		
6.1.2	Convert the numerals of multiple of 10 whole numbers up to 100 into number- names		
6.1.3	Convert the number- names of multiple of 10 whole numbers up to 100 into numerals		
6.2	Ordering whole numbers up to 100	√	X

No	Units of analysis	Category of construction	
	Topics	1	2
6.2.1	Order whole numbers up to 100		
6.3	Comparing whole numbers from 21 up to 100	√	X
6.3.1	Compare whole numbers from 21 up to 100		
6.4	Identifying ordinal numbers up to 20	√	√
6.4.1	Identify ordinal numbers up to 20		
6.4.2	Describe sets using ordinal numbers up to 20		
6.5	Identifying the Ethiopia "coins"	√	√
6.5.1	Identify the Ethiopia "coins"		
6.5.2	Differentiate the relationship between the Ethiopian "coins"		

DECLARATION

I, the undersigned declare that this thesis is my original work and has never presented for the degree in any other university and that all sources of material used for the thesis have been duly acknowledged

Name Goitom Woldelibanos

Signature ____________

Date 07/11/2000 ዓ.ም

This thesis has been submitted for examination by my approval as a university advisor

Name ____________________________

Signature ________________________

Date of submission ________________