



# Early Grade Mathematics in Ethiopia: Alignment of Contents in the Textbooks with the Corresponding Syllabuses

Aynalem Tesfaye Tsebella<sup>1</sup>   
Kassa Michael W/Yesus<sup>2</sup>   
Solomon Areaya Kassa<sup>3</sup>



<sup>1</sup>Science and Mathematics Education Department, Hawassa College of Teacher Education, Addis Ababa University, Ethiopia.  
<sup>1</sup>Email: [aynitesfu@yahoo.com](mailto:aynitesfu@yahoo.com)  
<sup>2</sup>Department of Science and Mathematics Education, Addis Ababa University, Ethiopia.  
<sup>2</sup>Email: [fkassa2010@yahoo.com](mailto:fkassa2010@yahoo.com)  
<sup>3</sup>Email: [solomonareaya@yahoo.com](mailto:solomonareaya@yahoo.com)

## Abstract

An alignment of textbooks with their corresponding syllabuses contributes to effective learning. This study examined the alignment of the Ethiopian early grade (grades 1-4) mathematics textbooks (EEGMTB) with their corresponding syllabuses. Four early grade mathematics teachers at Halaba Zone of South Nations and Nationalities Peoples Reginal State (SNNPRS) participated in this study. In addition, curriculum experts at the zone and the ministry of education (MoE) participated. Data were collected through interview and document analysis by using a content analysis protocol developed by reviewing different studies on textbook quality (Bhatti, Jumani, & Bilal, 2015; Fuchs, 2013; Hashmi, Hussain, & Shoaib, 2018; Sunday, 2014; Taye, 2011), and validated. The data were analyzed qualitatively and the percentage was used to summarize the findings. The findings of this study depict that EEGMTBs were not completely aligned with the corresponding syllabuses as expected. Therefore, the study recommends special focus to be given to the alignment of textbooks with the corresponding syllabuses, especially in considering the learning outcomes when developing the textbooks. The study also suggests further research on the adequacy of the contents of early grade textbooks to equip early children with the necessary knowledge and skills expected at the level.

**Keywords:** Alignment, Early grade, Learning, Mathematics textbook, Syllabus.

**Citation** | Aynalem Tesfaye Tsebella; Kassa Michael W/Yesus; Solomon Areaya Kassa (2022). Early Grade Mathematics in Ethiopia: Alignment of Contents in the Textbooks with the Corresponding Syllabuses. Asian Journal of Education and Training, 8(2): 34-42.

**History:**

Received: 10 February 2022  
Revised: 18 March 2022  
Accepted: 5 April 2022  
Published: 21 April 2022

**Licensed:** This work is licensed under a [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/)

**Publisher:** Asian Online Journal Publishing Group

**Funding:** This study received no specific financial support.

**Authors' Contributions:** All authors contributed equally to the conception and design of the study.

**Competing Interests:** The authors declare that they have no conflict of interest.

**Transparency:** The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.

**Ethical:** This study followed all ethical practices during writing.

## Contents

1. Introduction .....	35
2. Theoretical Framework .....	35
3. Research Problem .....	36
4. Objective of the Study .....	36
5. Method .....	37
6. Findings .....	38
7. Discussion.....	40
8. Conclusions and Recommendations .....	40
References.....	41

### Contribution of this paper to the literature

The study gives a significant contribution to the existing literature by providing valuable evidence on the criticality of agreement of curriculum materials to the effective attainment of educational objectives at the early grade level.

## 1. Introduction

Mathematics learning is crucial to improving students' success in other subjects (Claessens & Engel, 2013; Duncan et al., 2007; Romano, Babchishin, Pagani, & Kohen, 2010). Since early grade level (grades 1-4) is the foundation for all levels of education, having foundational and basic knowledge and skills at these level help to make students get ready for the next level of schooling and guarantee their success at that level as early knowledge of mathematics predicts their later success (Clements, Douglas, & Sarama, 2014; Geary, 2011). Therefore, improving students' mathematics learning at these levels is basic for the development of individuals and society (Khan, 2015; Miguel, 2005). To support students' learning of mathematics, educational inputs are crucial (MOE, 2015; Olasunkanmi & Mabel, 2012), and their quality determines the effectiveness of learning. The mathematics curriculum materials are of the important inputs in mathematics education, and carefully designed mathematics curriculum materials play a pivotal role in determining the quality of mathematics learning. The objectives of learning early grade mathematics are to enable students; (i) develop an understanding of number concepts and competence in solving problems by using mental and written strategies, (ii) to identify and quantify different features of objects, (iii) to learn about properties and representation of two - and three-dimensional objects and their application in everyday life, and (v) develop an understanding of the use of pictures and graphs to communicate information (MOE, 2009c). To achieve these goals, the role of educational inputs, and curriculum materials, is higher.

## 2. Theoretical Framework

### 2.1. Alignment of Curriculum Materials

Multiple studies were conducted on the alignment of the curriculum however, the focus of the studies was varied based on the type of the curriculum and its components. To list some; alignment of textbooks with curriculum standards (Fan, 2010; Hashmi et al., 2018; Polikoff, 2015), alignment of objectives, instructional activities and assessments (Anderson, 2002; Martone & Sireci, 2009), curriculum standards and assessments (Webb, 2007), intended and implemented curriculum (Phaeton & Stears, 2016). The meaning of curriculum alignment is also dependent on the focus of alignment. For instance; alignment of curriculum is defined as "the degree to which expectations and assessments are in agreement and serve in conjunction with one another to guide the system toward students' learning what they are expected to know and do" Webb (2007), "agreement on both topic and cognitive demand" (Polikoff, 2015), "the degree of agreement between a state's content standards for a specific subject area and the assessment(s) used to measure students' achievement of these standards" (Bhola, Impara, & Buckendahl, 2003), constructive coherence between teaching-learning and assessment (Biggs & Tang, 2011).

In this study, alignment refers to the degree to which early grade mathematics textbooks (EGMT) and their corresponding syllabi are in agreement to attain the specified learning objectives at the level. Accordingly, the alignment of EGMT with their corresponding syllabi was evaluated based on (i) units and main topics, and (ii) learning outcomes. The alignment of curriculum is the focus for quality education in many countries. It plays a significant role in realizing learning objectives (Wijngaards-de Meij & Merx, 2018). A well-aligned curriculum is essential to provide opportunities for students' learning, understand the difference in the effects of schooling on students' achievement, create accountability, and recognize the effects of instruction on learning (Anderson, 2002). Hence, alignment of curriculum is pivotal for the quality of teaching (Biggs & Tang, 2011) because the attainment of educational objectives is not only determined by students' learning but also teachers' teaching.

Curriculum alignment includes the alignment of curriculum materials, hence a high degree of agreement of these materials and their components is fundamental. Poor alignment of the curriculum materials and their components leads to disagreement, confusion, and poor learning outcomes for students (Stabback, 2016). This shows its importance for improving learning outcomes, and hence assure the quality of education. Curriculum alignment can be used to see the specified requirements in pedagogical materials for students, and to see the alignment of teaching and assessment (Martone & Sireci, 2009). Therefore, the primary condition to have the encouraging outcome in a students' learning is the existence of a well-aligned curriculum.

### 2.2. Advantage of Studying Curriculum Alignment

Presently researchers have given a special focus to the alignment of curriculum because of its criticality for quality education. Therefore, studying curriculum alignment has many significances for the educational system of a given country. According to Martone and Sireci (2009), alignment studies enable researchers to work on the educational system in order to compare the contents and then to make decisions about their occurrence. This provides guidelines for reform and improvement (Leung, Leung, & Zuo, 2014). Therefore, alignment study in curriculum helps curriculum developers and educators by providing valuable information about the alignment of the existing curriculum and areas of inconsistencies in the curriculum that need improvement. It in turn contributes to the improvement of students' learning. Hence, evaluating the alignment of EGMTB with their corresponding syllabi may contribute to predicting the attainment of learning objectives and giving the required attention to the specified components. This is also helpful for improving students' learning of mathematics at the level.

### 2.3. The Importance of Syllabus and Textbook

In Ethiopia, curriculum materials are expected to align with the education and training policy launched in 1994 (MOE, 2009a). The core aim of Ethiopian education is to strengthen the individual's and society's problem-solving capacity and culture at all levels of education (Fdre, 1994). Therefore, curriculum materials in Ethiopia have to promote this aim at any level of the educational system. And the alignment of the curriculum materials is central to determine the attainment of educational objectives (Ornstein, 1994; Wijngaards-de Meij & Merx, 2018). Syllabus and student textbook are of these curriculum materials that support the teaching and learning of a given subject.

A syllabus is a curriculum material that describes contents to be learned in a given subject at different grade levels. The main purpose of a syllabus is to provide a coherent and consistent learning program (Stabback, 2016). A syllabus contains information about a single grade level. It has features; a general introduction of the teaching and learning of a given subject, general learning objectives, units and unit outcomes, time allotment for each unit and sub-units, contents and competencies for each content, teaching and learning approaches, activities, and resources, and assessment techniques. Hence, a syllabus contains more information that are useful for the teaching and learning process. It is also used as a guide for developing students' textbooks, and supervising the instructional process. Therefore, a syllabus is useful curriculum material for teachers, supervisors, and curriculum experts.

Foremost among the useful curriculum materials that play a vital role in preparing students for learning the given subject and examination is students' textbook (Bhatti, Khurshid, & Ahmad, 2017). Textbooks are the most common resources in the classroom which are used by both the teachers and students, and were considered as the major sources of instructional process Mahmood (2010). Saeed and Rashid (2014) added that for most of the teachers in major countries textbook is an authentic material to be presented in the classroom. In a Global Education and Monitoring Report 2016 also it was mentioned that textbooks are essential materials to improving learning outcomes in low-income countries which have a high proportion of unqualified teachers, large class sizes, and a shortage of instructional time. Fredriksen and Brar (2015) support this claim and added that in sub-Saharan Africa many teachers have little training, classes are large, and school years are short. The challenges of current Ethiopian education stated in Ethiopian Education Development Roadmap (2018-30) (MOE, 2018a) also consistent with the aforementioned issues. This shows the importance of quality textbooks for students' effective learning and encouraging outcomes in low-income countries. Therefore, the alignment of a textbook with curriculum should be considered as a basic step in developing a quality textbook (Bhatti et al., 2017; Fan, 2010), since it determines the alignment of instruction and assessment (Bhatti et al., 2017).

#### **2.4. Characteristics of Quality Textbooks**

One of the most important inputs that contribute to effective mathematics learning is student's textbook. A textbook is a useful material that contributes to the advancement of a curriculum (Okeeffe, 2013). It is an important tool in the teaching and learning process hence, it plays a vital role in improving students' learning and attaining the learning objectives (Hadar, 2017; Mithans & Grmek, 2020). It also contributes to addressing the quality challenges in educational system (Fredriksen & Brar, 2015).

Poor quality of textbooks was mentioned in different studies as the main influencing factors of student learning and hence their achievement in the given subject (Oakes & Saunders, 2002). A quality textbook is students' most important source of knowledge (Mithans & Grmek, 2020) and it encourages students to learn independently. Developing a quality textbook enables to improve students' learning by allowing them to get the required contents that were specified in the standard for students to learn in a given subject.

According to Fuchs (2013) a quality textbook is expected to cover all contents, objectives, and outcomes of the main curriculum of the given subject. This shows the importance of agreement of contents and objectives in a student's textbook and the main curriculum. Poor alignment of a textbook with the corresponding curriculum contributes to a weak standard implementation (Polikoff, 2015; Spillane, 2005), and hence it badly affects the whole educational system (Saeed & Rashid, 2014). In addition to that, Fan (2010) has suggested six principles for textbook development based on the studies (Fan & Zhu, 2000; Fan & Zhu, 2007; Lee & Fan, 2002; Ng, 2002). These are; curriculum principle, discipline principle, pedagogy principle, technology principle, context principle, and presentation principle. The curriculum principle suggests a textbook to be aligned with its corresponding syllabus so as to realize the intended curriculum. If a given textbook is well aligned with the corresponding curriculum, then it contributes to the improvement of students' learning (Bhatti et al., 2017). Moreover, a well-aligned textbook supports an effective teaching-learning process and valid assessment (Bhatti et al., 2015), hence determine the attainment of learning objectives specified in the curriculum. This shows that the alignment of the textbook with the curriculum is one of the main indicators for a quality textbook. Many literatures showed the importance of stating learning outcomes in students' textbook for students, teachers, and even parents (MOE, 2018a; Stiggins, Arter, Chappuis, & Chappuis, 2004). In addition, it is mentioned in the Ethiopian Ministry of Education (MoE) guideline for preparing and evaluating teaching-learning materials that listing learning targets/outcomes at the beginning of the given unit in a student's textbook is one of the main activities in developing a quality textbook (Taye, 2011).

### **3. Research Problem**

The quality of instructional materials is one of the main influencing factors of students learning (MOE, 2015; Sunday & Adebawale, 2013). Active learning and competency-based learning were the main focus of the Ethiopian education system (MOE, 2009a). For this, carefully prepared textbook is important. Students' textbooks in Ethiopia have been criticized by educators, teachers (Gove, Dombrowski, King, Pressley, & Weatherholt, 2018) and other communities who were using them (MOE, 2016; Tilaye, Emanuel, & Ermias, 2018). One of the criteria for a quality textbook is its alignment with the corresponding curriculum. However, most of the local studies in Ethiopia focused on the adequate distribution of textbooks than their quality, and hence it is difficult to get studies that focused on the quality of mathematics textbooks, especially at the early grade levels. Early grade level is the basis of all levels and giving the necessary attention for this level can have more advantage in securing the quality of students learning in the next levels (Gove et al., 2018). Therefore, evaluating the quality of the textbooks at this level helps to improve students' learning. Hence, this study was aimed to see the quality of EGMTB based on its alignment with the corresponding syllabuses.

### **4. Objective of the Study**

Realizing the attainment of educational objectives is the main target of any country in the education system. And alignment of curriculum materials in the given subject contributes to the realization of the specified objectives in the given subject. Thus, the objective of this study was to evaluate the alignment of early grade textbooks with the

corresponding curriculum by focusing on the existence of units and main topics, and unit outcomes of the syllabus in the textbooks.

Based on this objective the following questions were formulated:

- i. To what extent are the units and main topics of the early grade mathematics syllabuses (EGMS) considered in their corresponding textbooks?
- ii. How are the unit outcomes in EGMTB aligned with the unit outcomes in the corresponding syllabuses?
- iii. Is there any rationale for the textbooks to be developed the way they are?

## 5. Method

The aim of this study is to evaluate the alignment of Ethiopian EGMTB with their corresponding syllabuses. This study was conducted at a particular site named Halaba Zone of South Nations and Nationalities Peoples Regional State (SNNPRS). Four early grade mathematics teachers at Halaba Zone of South Nations and Nationalities Peoples Regional State (SNNPRS) participated in this study. Zone and a curriculum expert at MoE, who were selected purposely, participated in this study. The teachers were selected purposely based on their field of specialization, experience in teaching mathematics for early grade children, and their efficiency in teaching. All the selected teachers have a diploma in mathematics teaching, above five years of experience in teaching mathematics at the level, and they were model teachers at the Zone.

**Table 1.** Alignment of units between early grade textbooks and the corresponding syllabus.

Grade	Unit	Topic	
		In Syllabus	In Textbook
1	1	The natural numbers up to 9	Yes
	2	Addition and subtraction up to 9	Yes
	3	The whole numbers from 0 to 20	Yes
	4	Addition and subtraction up to 20	Yes
	5	Measurement using non-formal units	Yes
	6	Fractions	Yes
	7	Multiplication and division up to 20	Yes
	8	Lines and simple shapes	Yes
	9	The whole numbers up to 100	Yes
	10	Ethiopian currency	Yes
	11	Time	Yes
	12	Data Handling and pattern	Yes
2	1	Addition and subtraction up to 100	Yes
	2	Multiplication and division up to 100.	Yes
	3	Measurement	Yes
	4	Fractions	Yes
	5	Whole numbers up to 1000.	Yes
	6	Points, lines and shapes	Yes
	7	Money	Yes
	8	Time	Yes
	9	Data handling and pattern	Yes
3	1	The whole numbers up to 10,000 and their order	Yes
	2	Measurement	Yes
	3	Fractions	Yes
	4	Addition and subtraction of whole numbers up to 10,000	Yes
	5	Multiplication and division up to 10,000	Yes
	6	Lines and shapes	Yes
	7	Money	Yes
	8	Time	Yes
	9	Data handling	Yes
4	1	The whole numbers up to 1,000,000	Yes
	2	The four operations on whole numbers up to 1,000,000	Yes
	3	Fractions and decimals	Yes
	4	Measurement	Yes
	5	Shapes and solids	Yes
	6	Time	Yes
	7	Data handling	Yes

A qualitative approach has been used for this study. Data were collected through interview and document analysis by using content analysis protocol. The contents analysis protocol was developed by reviewing different studies on textbook quality (Fuchs, 2013), national guideline prepared by the MoE (Taye, 2011), mathematics textbook analysis (Sunday, 2014) and alignment of textbook with the corresponding curriculum (Bhatti et al., 2015; Hashmi et al., 2018). The protocol was validated by two curriculum and assessment experts for their face and content validity. The tools were piloted as exemplars and orientation about the protocol was given for the textbook evaluators (teachers). They practiced evaluating with the protocol that was used as a means for inter-evaluator reliability, and ensured

their preparedness for the valuation. After ensuring their preparedness, the teachers have evaluated the textbooks based on the given protocol. The collected data were analyzed qualitatively based on the core themes (i) the existence of units and main topics, and (ii) the existence of unit outcomes stated in the syllabus, and (iii) mapping of the alignment. In addition, the data analysis was summarized by means of percentages for some of the themes.

## 6. Findings

### 6.1. Units and Main Topics in the Early Grade Textbooks

The aim of developing Ethiopian early grade mathematics syllabi is to ensure that students at the level has got the required knowledge, skills and attitude by learning the specified topics in the given strands, and hence the attainment of educational objectives at the level. For this, the strands (Number, Measurement, Geometry, and Data handling and pattern) were classified into 12 units for grade 1, 9 units for grade 2, 9 units for grade 3, and 7 units for grade 4 in the syllabi. In all grade levels (grades 1- 4), units and main topics under each unit in the textbooks are similar to the corresponding syllabus Table 1.

### 6.2. Unit Outcomes in the Textbooks

For all units in grade 1 mathematics syllabus learning outcomes are stated, but none of them are stated in the corresponding textbook. That is; the grade 1 mathematics textbook has no stated unit outcomes at the beginning of each unit Table 2, even if it was stated in the Ministry of Education guideline.

**Table 2.** Alignment of learning outcomes between grade 1 textbook and the Syllabus.

Unit	Unit Outcomes	
	In Syllabus	In Textbook
1	(i) Read and write natural numbers up to 9, (ii) Order natural numbers up to 9, (iii) Use the symbols "<", ">" and "=" to compare natural numbers up to 9.	No
2	(i) Add natural numbers up to 9, (ii) Subtract natural numbers up to 9, (iii) Add three numbers whose sum is not more than 9.	No
3	(i) Show understand of zero and write the symbol for zero "0", (ii) Read, write and order whole numbers up to 20, (iii) Apply place value to numbers up to 20.	No
4	(i) Add up to 20, (ii) Subtract up to 20, (iii) Solve problems of addition and subtraction on whole numbers up to 20.	No
5	(i) Explain the need for measuring in everyday life, (ii) Use appropriate language to express length, capacity and weigh, (iii) Measure and compare length, capacity and weight using non-standard units.	No
6	(i) Divide a concrete object into two equal parts and show understanding of the term a "half", (ii) Divide objects into four equal parts and show understanding of the terms quarter and three quarters.	No
7	(i) Multiply whole numbers up to 10 by 2 and identify the symbol "x" for multiplication, (ii) Divide whole numbers up to 20 by 2 and identify the symbols for "÷" division	No
8	(i) Identify and draw straight and curved lines, (ii) Identify and draw simple geometric shapes - rectangles, circles, triangles	No
9	(i) Count in 10s up to 100, (ii) Add and subtract multiples of 10 which are less than 100, (iii) Read and write whole numbers up to 100, (iv) Compare whole numbers up to 100 using the symbols ">", "<" and "=", (v) Identify place value in tens and units.	No
10	(i) Recognize Ethiopian coins and notes, (ii) Tell the relationship between 10 cents and 1birr, (iii) Practice using Ethiopian currency for buying and selling	No
11	(i) Describe events of their lives according to the time of day- morning, afternoon and evening, (ii) Name the days of the week, (iii) Tell time in hours from an analogue clock	No
12	(i) Record data using simple pictures like the. daily weather, (ii) Read data from simple picture graphs, (iii) Continue and produce simple patterns of shapes, colors and numbers	No

**Table 3.** Alignment of learning outcomes between grade 2 textbook and the syllabus.

Unit	Unit Outcomes	
	In Syllabus	In Textbook
1	(i) Count, read, write, compare and order whole numbers up to 100, (ii) Add whole numbers whose sums are less than 100 without and with carrying, (iii) Subtract 1- and 2-digit number from 2-digit numbers without and with borrowing, (iv) Identify the relationship between addition and subtraction of numbers, (v) Solve word problems using addition and subtraction.	No
2	(i) Multiply and divide whole numbers up to 100 by 2 and 10 without remainder, (ii) Multiply by 0 and 1 and divide by 1 whole number up to 100, (iii) Multiply and divide whole numbers up to 100 by 1-digit numbers and 10, (iv) Solve word problems using multiplication and division by 1-digit numbers and 10	No
3	(i) Use the ones centimeter and meter in length, (ii) Add and subtract the same unit if length, (iii) Use the unit liter in capacity, (iv) Add and subtract liters, (iv) Use the unit kilogram in weight, (vi) Add and subtract kilograms.	No
4	(i) Identify halves and quarters, (ii) Divide objects into thirds, (iii) Show understanding of the relation between whole and halves, quarters and thirds, (iv) Write symbolic form of fractions for halves, quarters and thirds.	No
5	(i) Determine multiples of 100 which are less than 1000, (ii) Read, write the whole numbers from 101 to 1000, (iii) Describe the place value of numbers up to 1000, (iv) Compare and order whole numbers up to 1000, using the symbols "<",">" and "=".	No
6	(i) Draw lines using a ruler, (ii) Draw squares, rectangles, triangles and circles, (iii) Identify shapes in the environment.	No
7	(i) Add and subtract money using Ethiopian currency, (ii) Do role play of shopping using Ethiopian currency	No
8	(i) Tell the time in hours, half hours and quarter hours using an analogue and a digital clock, (ii) Describe the relation between hours and minutes.	No
9	(i) Collect simple data, (ii) Tabulate this data, (iii) Complete and compile simple patterns of shapes and numbers.	No

In the grade 2 mathematics syllabus, outcomes for all units are stated but in the corresponding textbook, it is difficult to get these outcomes. That is; the grade 2 mathematics textbooks have no stated unit outcomes at the beginning of each unit Table 3.

At the beginning of each unit in grade 3 textbooks learning outcomes of the corresponding syllabus are stated. All the outcomes of units 1, 2, 3, 4, 5, 7, and 8 are the same as the corresponding unit outcomes in the syllabus but in units 6 and 9, some mismatches were observed. That is; one unit outcome, the second outcome in the syllabus of unit 6 is missed in the textbook, and the first unit outcome of unit 9 was not similar to the corresponding unit outcome in the syllabus Table 4.

Table 4. Alignment of learning outcomes between grade 3 textbook and the syllabus.

Unit	Unit Outcomes	
	In Syllabus	In Textbook
1	(i) Read, write, compare and order whole numbers up to 1000, (ii) Perform the four fundamental operations on whole numbers up to 100, (iii) Read and write multiples of 100 and of 1000 up to 10,000, (iv) Read and write whole numbers up to 10,000, (iv) Compare and order whole numbers up to 10,000.	Yes
2	(i) Use the units mm, cm and m to measure length, (ii) Use the units ml and l to measure capacity, (iii) Use the units g and kg to measure weight (mass), (iv) Convert units of length, capacity and weight.	Yes
3	(i) Use previous knowledge of thirds, (ii) Identify unit fraction from $\frac{1}{2}$ to $\frac{1}{10}$ , (iii) Divide numbers into halves and quarters, (iv) Compare simple fractions.	Yes
4	(i) Add whole numbers up to 10,000, (ii) Subtract whole numbers up to 10,000, (iii) Solve word problems using addition and subtraction.	Yes
5	(i) Multiply multiples of 100 by 1-digit, (ii) Multiply multiples of 1000 by 1-digit numbers, (iii) Multiply whole numbers by 1-digit number product less than 10,000, (iv) Divide multiples of 10 and 100 up to 10,000 by 1-digit number and 10 with no remainder, (v) Divide whole numbers by 1-digit up to 10,000 with and without remainder, (vi) Solve word problems using relation between multiplication and division.	Yes
6	(i) Identify and sketch intersecting, parallel and perpendicular lines, (ii) Construct parallel and perpendicular lines, (iii) Identify and draw rectangles, squares, parallelograms and trapeziums, (iv) Construct circles.	Yes
7	(i) Convert Ethiopian coins and notes, (ii) Solve word problems concerning money	Yes
8	(i) Describe the relationship between hour and minutes, (ii) Read an analogue and a digital clock in hours, minutes, (iii) Relate days, weeks, months and years, (iv) Read a simple calendar.	Yes
9	• Construct simple picture graphs from data collected	Not consistent
	• Read data from simple picture graphs	Yes

In grades 4 textbook unit outcomes of the corresponding syllabus are written at the beginning of each unit. All the outcomes of units 1, 2, and 6 are the same as the corresponding unit outcomes in the syllabus but outcomes in the other units (units 3, 4, 5, and 7) of the textbooks showed some gaps. In unit 3 the fourth outcome and all outcomes of unit 4 are not consistent with the outcome in the corresponding syllabus, the first two outcomes of unit 5 and the first outcome of unit 7 are not similar to the corresponding unit outcomes in the syllabus Table 5.

Table 5. Alignment of learning outcomes between grade 4 textbook and the syllabus.

Unit	Unit Outcomes	
	In Syllabus	In Textbook
1	(i) Read, write, compare and order whole numbers up to 10,000, (ii) Read and write multiples of 10,000 and 100,000 up to 1,000,000, (iii) Read and write whole numbers up to 1,000,000, (iv) Identify place value of 6-digit numbers, (v) Compare and order whole numbers up to 1,000,000, (vi) Approximate values of numbers by round off numbers to the nearest 10s, 100s, 1000, 10,000s and 100,000s.	Yes
2	(i) Add whole numbers up to 1,000,000, (ii) Subtract whole numbers up to 1,000,000.	Yes
3	(i) Identify fractions as parts of a whole, (ii) Compare and order fractions with the same denominator, (iii) Add and subtract fractions with the same denominator	Yes
	(iv) Identify and calculate equivalent fractions	Not consistent
	(v) Define and use tenths, hundredths and decimals	No
	(vi) Compare and order decimals with 2 decimal places, (vii) add and subtract decimals with 2 decimal place.	Yes
4	(i) Calculate using different units of length, (ii) calculate using different units of weight, (iii) calculate using different units of capacity	Not consistent
5	(i) Recognize and draw right angles, (ii) describe points, straight lines and planes	Not consistent
	(iii) Calculate the perimeter and area of rectangles and squares, (iv) Recognize and make models of simple solids.	Yes
6	(i) Describe the relationship between hours, minutes and seconds, (ii) Convert units of time, (iii) Compare units of time.	Yes
7	(i) Construct bar graphs from data collected	Not consistent
	(ii) Interpret data from bar graphs, (iii) Find average of up to 4 whole numbers	Yes

Generally, 41.1% of the unit outcomes in EGM syllabuses were present in the corresponding textbooks but 52.7% were not stated and 6.2% of the unit outcomes in the textbook were not consistent with the unit outcomes in the corresponding syllabus.

## 7. Discussion

An alignment of curricular materials is essential for the attainment of educational objectives (Ornstein, 1994). A textbook is one of the important curricular material and the alignment of textbooks with the corresponding curriculum helps to improve students learning in a given subject (Hadar, 2017). Moreover, learning at an early grade level needs effective use of materials like textbooks as all students at this level may not be capable to use other reference materials, and even if, they may not sufficiently access additional materials. The importance of quality textbook at this level is, hence unquestionable. The alignment of the textbooks with the corresponding curriculum is one of the criteria for quality textbook. In EGMTB, all the units and main topics of the syllabus are presented and outlined as listed in the syllabuses. This shows units and main contents in the textbooks are aligned with the units and main topics stated in the syllabus even if there is a gap in the alignment of the structure of contents among curricular materials (MLC document, syllabus, and flowchart document) (Aynalem & Kassa, 2021).

Stating the learning outcomes of the topic in a given textbook, based on the specified learning objectives in the curriculum benefits teachers, students, and parents, and hence it arouses students' motivation and achievement (MOE, 2018a; Stiggins et al., 2004). The national guideline and other literature also suggest the learning targets be presented in students' textbooks (Aggarwal, 2009; Hashmi et al., 2018; Taye, 2011). The interview analysis results and evaluators' general comment also supports this condition. In the evaluators' report, the importance of stating learning outcomes at the beginning of each unit in the textbooks was mentioned.

*Stating learning objectives in the early grade textbooks is very important for the teachers. If the contents in the textbooks are not adequate and appropriate in relation to the objectives of learning mathematics, stating learning objectives in the textbook can give an opportunity for the teachers to provide adequate and appropriate examples and exercises to students and equip them with the specified competencies.*

This shows the importance of stating learning outcomes in the student textbooks in order to enable the teacher to implement her/his lesson effectively. This can contribute to the attainment of the learning objectives. According to Hafees (2017) the quality learning outcome is the result of collaboration among different stakeholders in students learning. Since early grade level is basic parents and other elders' participation in guiding and assisting the children at this level is critical to ensure success. For this, they have to be aware of what is expected from the students and this can help them to assist the children accordingly. Moreover, stating learning outcomes in students' textbooks helps teachers to plan their lesson accordingly because they may not get adequate curricular materials like [reference materials and] teachers guide in their schools (Tilaye et al., 2018). It was also stated in the evaluators report that due to the scarcity of mathematics teachers' guide and other main curriculum materials the early grade mathematics teachers are using the students' textbook as a sole source to plan their lessons. However, grades 1 and 2 textbooks have no stated learning outcomes Tables 2 and 3. This indicates that teachers are forced to plan their lessons without any guide as to what was intended to be achieved, hence leaving quality delivery to the jurisdiction of teachers. Why were the learning outcomes missed at grades 1 and 2 textbooks was further examined, and the findings from the interview analysis indicated that this might have happened due to less attention given by the textbook developers to the importance of stating learning outcomes in the textbooks. This absence of outcomes stated may influence teacher's planning for the lesson and also students learning at the level because stating learning outcomes in students' textbooks could help not only teachers but also students to assess their learning and conduct self-assessment in relation to the objectives. Most of the unit outcomes in grade 3 and grade 4 textbooks are well stated, but in some units, some outcomes seem to be interpreted differently, while some others are not presented consistently with the unit outcomes in the syllabus. Some are not also elaborated well (Tables 4 and 5). Hence, it is possible to say that there is a gap in meeting complete alignment of unit outcomes of EGMTB and the corresponding syllabus. This can affect the attainment of the goals set in the curriculum and can also affect children's learning at the level.

## 8. Conclusions and Recommendations

From the above findings and discussion, it can be seen that the EGMTB in Halaba Zone are aligned with the corresponding syllabus in relation to the units and main topics but gaps were observed in relation to the alignment of learning outcomes in the textbooks and the corresponding syllabuses. This led to the conclusion that EGMTBs were not completely and in all forms aligned with their corresponding syllabus as expected. This implies the need to give a special focus on the alignment of a textbook with the corresponding curriculum, especially learning outcomes when developing the textbooks. The gaps observed in the alignment of learning outcomes of EGMTB and their corresponding syllabus may negatively contribute to the quality of organization and presentation of detailed contents in the textbooks. They may also cause missing of some of the outcomes during instruction, if teachers could not access the unit outcomes up-front on the textbooks. And this can be determined by evaluating the adequacy and appropriateness of contents in a given textbook. This shows the need for evaluating the extent to which contents in the EGMTB are adequate for the attainment of the specified learning objectives and hence to equip early grade children with the necessary knowledge and skills expected at the level. Therefore, this study suggests additional research on the adequacy of content presentation in early grade mathematics textbooks to equip early grade children with the necessary knowledge and skills, and hence to attain the specified learning objectives at the level.

The attainment of educational objectives is determined by effective implementation of the curriculum. If the teachers are not supported by well-aligned curriculum materials, they will not be able to perform their teaching effectively (Polikoff, 2012). Thus, the teachers have to get a consistent message from curriculum components (syllabus & textbook) so as to implement the curriculum effectively. Therefore, this study recommends special attention to be given to the alignment of EGMTs with their corresponding curriculum in all forms including learning outcomes.

Textbooks are basically textbook developers' explanation and reflection of the intended curriculum in the textbook development process (Fan, 2010). According to Fan, the textbook developers must have a good knowledge

of the curriculum, and an experience of teamwork and getting feedback from curriculum developers. Therefore, this study suggests subject specialist and language experts' participation in textbook development and more care to be taken when selecting textbook developers. In addition, the study suggests intensive training to be given for the textbook developers about the curriculum and criteria of developing quality textbooks, specifically alignment related issues.

## References

- Aggarwal, J. (2009). *Principles, methods & techniques of teaching* (2nd ed.). New Delhi: Vikas Publishing House Pvt Ltd.
- Anderson, L. W. (2002). Curricular alignment: A re-examination. *Theory Into Practice*, 41(4), 255-260. Available at: [https://doi.org/10.1207/s15430421tip4104\\_9](https://doi.org/10.1207/s15430421tip4104_9).
- Aynalem, T., & Kassa, M. (2021). Ethiopian Early grade mathematics curriculum organization. *Journal of Education and Practice*, 12(25), 18-27.
- Bhatti, A. J., Jumani, N. B., & Bilal, M. (2015). Analysis of alignment between curriculum and biology textbook at secondary level in Punjab. *Pakistan Journal of Social Sciences (PJSS)*, 35(1), 261-272.
- Bhatti, A. J., Khurshid, K., & Ahmad, G. (2017). Curriculum alignment: An analysis of the textbook content. *Pakistan Journal of Social Sciences (PJSS)*, 37(1), 30-43.
- Bhola, D. S., Impara, J. C., & Buckendahl, C. W. (2003). Aligning tests with states' content standards: Methods and issues. *Educational Measurement: Issues and Practice*, 22(3), 21-29. Available at: <https://doi.org/10.1111/j.1745-3992.2003.tb00134.x>.
- Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university*. UK: McGraw-Hill Education.
- Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record*, 115(6), 1-29.
- Clements, Douglas, H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach* (Second ed.). New York: Routledge.
- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, 43(6), 1428-1446.
- Fan, L., & Zhu, Y. (2000). Problem solving in Singaporean secondary mathematics textbooks. *The Mathematics Educator*, 5(1-2), 117-141.
- Fan, L., & Zhu, Y. (2007). Representation of problem-solving procedures: A comparative look at China, Singapore, and US mathematics textbooks. *Educational Studies in Mathematics*, 66(1), 61-75.
- Fan, L. (2010). *Principles and processes for publishing textbooks and alignment with standards: A case in Singapore*. Paper presented at the Paper presented at the APEC Conference on Replicating Exemplary Practices in Mathematics Education, Koh Samui, Thailand.
- Fdre, F. D. R. G. O. E. (1994). *The education and training policy*. Addis Ababa St: George Printing Press.
- Fredriksen, B., & Brar, S. (2015). *Getting textbooks to every child in Sub-Saharan Africa: Strategies for addressing the high cost and low availability problem*. USA: World Bank Publications.
- Fuchs, E. (2013). *Textbook quality: A guide to textbook standards* (Vol. 2). Germany: Göttingen: Vandenhoeck & Ruprecht.
- Geary, D. C. (2011). Consequences, characteristics, and causes of mathematical learning disabilities and persistent low achievement in mathematics. *Journal of developmental and behavioral pediatrics: JDBP*, 32(3), 250. Available at: <https://doi.org/10.1097/dbp.0b013e318209edef>.
- Gove, A., Dombrowski, E., King, S. J., Pressley, J., & Weatherholt, T. (2018). Persistence and fadeout of preschool participation effects on early reading skills in low-and middle-income countries. *Global Education Review*, 5(2), 85-109.
- Hadar, L. L. (2017). Opportunities to learn: Mathematics textbooks and students' achievements. *Studies in Educational Evaluation*, 55, 153-166. Available at: <https://doi.org/10.1016/j.stueduc.2017.10.002>.
- Hafees, S. (2017). Factors affecting the quality Of primary education In Kerala. Research scholar, school of foreign languages (pp. 2319-7129). New Delhi: IGNOU.
- Hashmi, A., Hussain, T., & Shoaib, A. (2018). Alignment between mathematics curriculum and textbook of Grade VIII in Punjab. *Bulletin of Education and Research*, 40(1), 57-76.
- Khan, L. A. (2015). What is mathematics—an overview. *International Journal of Mathe'matics and Computational Science*, 1(3), 98-101.
- Lee, P. Y., & Fan, L. (2002). *The development of Singapore mathematics curriculum—understanding the changes in syllabus, textbooks and approaches*. Paper presented at the Paper presented at the A talk given at the Chongqing conference August.
- Leung, K.-C., Leung, F. K., & Zuo, H. (2014). A study of the alignment of learning targets and assessment to generic skills in the new senior secondary mathematics curriculum in Hong Kong. *Studies in Educational Evaluation*, 43, 115-132. Available at: <https://doi.org/10.1016/j.stueduc.2014.09.002>.
- Mahmood, K. (2010). Textbook evaluation in Pakistan: Issue of conformity to the national curriculum guidelines. *Bulletin of Education and Research*, 32(1), 15-36.
- Martone, A., & Sireci, S. G. (2009). Evaluating alignment between curriculum, assessment, and instruction. *Review of Educational Research*, 79(4), 1332-1361. Available at: <https://doi.org/10.3102/0034654309341375>.
- Miguel, A. (2005). History, philosophy, and sociology of mathematical education in teachers training: A research program *Education and Research*, 31(1), 137-152.
- Mithans, M., & Grmek, M. I. (2020). The use of textbooks in the teaching-learning process. *New Horizons in Subject-Specific Education: Research Aspects of Subject-Specific Didactics* (pp. 201-227): University of Maribor, University Press.
- MOE. (2009a). *Curriculum framework for Ethiopian education (KG - Grade 12)*. Addis Ababa: Ministry of Education.
- MOE. (2009c). Mathematics syllabus (Grade 1-4), Unpublished.
- MOE. (2015). *Education sector development program V (ESDP V) 2015/2016 - 2019/2020*. Addis Ababa: Ministry of Education.
- MOE. (2016). *Formative evaluation of the implementation of primary and secondary school curricula in Ethiopia final report*. Addis Ababa: BDS Center for Development Research CMC Road.
- MOE. (2018a). *Ethiopian education development roadmap (2018-30): An integrated executive summary*. Addis Ababa: MOE.
- Ng, L. E. (2002). *Representation of problem solving in Singaporean primary mathematics textbooks with respect to types*. Polya's Model and Heuristics (Doctoral Dissertation).
- Oakes, J., & Saunders, M. (2002). *Access to textbooks, instructional materials, equipment, and technology: Inadequacy and inequality in California's public schools*. Los Angeles: University of California.
- Okeeffe, L. (2013). A framework for textbook analysis. *International Review of Contemporary Learning Research: An International Journal*, 2(1), 1-13.
- Olasunkanmi, A., & Mabel, M. (2012). An input-output analysis of public and private secondary schools in Lagos. *International Journal of Humanities and Social Science*, 2(18), 85-96.
- Ornstein, A. C. (1994). The textbook-driven curriculum. *Peabody Journal of Education*, 69(3), 70-85. Available at: <https://doi.org/10.1080/01619569409538778>.
- Phaeton, M. J., & Stears, M. (2016). Exploring the alignment of the intended and implemented curriculum through teachers' interpretation: A case study of A-level biology practical work. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(3), 723-740. Available at: <https://doi.org/10.12973/eurasia.2017.00640a>.
- Polikoff, M. S. (2012). Instructional alignment under no child left behind. *American Journal of Education*, 118(3), 341-368. Available at: <https://doi.org/10.1086/664773>.
- Polikoff, M. S. (2015). How well aligned are textbooks to the common core standards in mathematics? *American Educational Research Journal*, 52(6), 1185-1211. Available at: <https://doi.org/10.3102/0002831215584435>.
- Romano, E., Babchishin, L., Pagani, L., & Kohen, D. (2010). School readiness and later achievement: replication and extension using a nationwide Canadian survey. *Developmental Psychology*, 46(5), 995-1007. Available at: <https://doi.org/10.1037/a0018880>.
- Saeed, M., & Rashid, S. (2014). Alignment between chemistry curriculum and textbooks at secondary level. *The Sindh University Journal of Education*, 43(2014), 29-46.



- Spillane, J. P. (2005). Standards deviation: How schools misunderstand education policy. *CPRE Policy Briefs*. Available at: 10.12698/cpre.2005.rb43.
- Stabback, P. (2016). *What makes a quality curriculum? In-Progress Reflection No. 2*. Paris: UNESCO.
- Stiggins, R. J., Arter, J. A., Chappuis, J., & Chappuis, S. (2004). *Classroom assessment for student learning: Doing it right, using it well*: Assessment Training Institute.
- Sunday, A. S. (2014). Mathematics textbook analysis: A study on recommended mathematics textbooks in school use in southwestern states of Nigeria.
- Sunday, A. S., & Adebowale, A. I. (2013). Mathematics textbook attributes as predictor of students' attitude to mathematics. *European Scientific Journal, 9(9)*, 159-170.
- Taye, M. (2011). *Guideline for preparing and evaluating teaching - learning materials*. Addis Ababa: Ministry of Education.
- Tilaye, K., Emanuel, G. Y., & Ermias, K. (2018). *Status of textbook-student ratio by regions, grades and subjects; and textbook utilization in Ethiopia*. Addis Ababa: Ministry of Education.
- Webb, N. L. (2007). Issues related to judging the alignment of curriculum standards and assessments. *Applied Measurement in Education, 20(1)*, 7-25. Available at: <https://doi.org/10.1080/08957340709336728>.
- Wijngaards-de Meij, L., & Merx, S. (2018). Improving curriculum alignment and achieving learning goals by making the curriculum visible. *International Journal for Academic Development, 23(3)*, 219-231.