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Cognitive Complexity of Mathematical Tasks Embedded in Officially Approved Mathematics Textbooks Designed for Primary Schools

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Abstract. This study analyzed the level of cognitive demand of mathematical tasks embedded in the officially approved primary school mathematics textbooks for the years 2018 to 2023 for classes one to six of the English Subsystem of Education in Cameroon. Smith and Stein's (1998) framework was used to characterize mathematical tasks found in these textbooks as memorization (M), procedure without connection (PWoC) to any concept, procedure with connection (PWC) to a concept and doing mathematics (DM). Results show that in each of the mathematics textbooks, mathematical tasks were mainly of low cognitive demand (M and PWoC) and faintly of high cognitive demand (PWC and DM). Overall, about 99.8% of the mathematical tasks are of low cognitive demand (M and PWoC), about 0.2% are high cognitive demand. Emphasis in each of these textbooks is on mathematical tasks with low cognitive demand which might send a wrong signal to teachers and learners that the focus of mathematics is on calculations and answers. The study recommends that members responsible for designing and selecting didactic materials for learners to use in schools consider the cognitive levels of mathematical tasks as a key determinant of textbook quality.

Key words: Mathematics textbooks, mathematical tasks, doing mathematics.

Introduction

The 2018 curriculum reform in Cameroon for Primary School was motivated by the need to train students who are creative and who can think for themselves to solve real-life problems. With this in mind, the government of Cameroon recommended the use of a Competency-Based Approach (CBA)to teaching to support the desired learning. The CBA is an approach to teaching that is focused on the development of competencies in learners rather than skills. Many textbook publishers went into writing textbooks with CBA in mind. An important aspect of CBA is the kind of tasks students engage in as they are involved in the learning process. Although, the curriculum reform in Cameroon is for all subjects taught at the primary school level, this study is focused on tasks in mathematics.

Tasks assigned to learners in mathematics classrooms have been investigated for a long time. Doyle (1983, 1988) talked of the need for academic tasks in classrooms. More recently

Stein and colleagues (Stein et al., 1996; Stein & Smith, 1998; Smith & Stein, 1998) have researched mathematical tasks as they are set up by the teacher and implemented by the students. These researchers raised the awareness that tasks are critical in the learning of mathematics that is meaningful in school, as well as to solve real-life problems. Although all these researchers have researched the use of tasks, their emphases have been very different. Doyle (1983) talked of academic tasks and defined it as "the products that students are expected to produce, the operations that students are expected to use to generate those products, and the resources available to students while they are generating the products" (p. 161). The definition by Doyle focused mainly on students, what they are to produce and what they are to use to generate that product. While Doyle (1983) focused on the product, Stein, Grover and Henningsen (1996) define a mathematical task as "a classroom activity, the purpose of which is to focus students' attention on a particular mathematical idea" (p. 460) and placed emphasis on the mathematical idea to be learned. Stein, Grover and Henningsen (1996) now focused on the trajectory from set up of the task by the teacher and implementation of the tasks by the students to determine factors that are responsible for maintaining a high level cognitively demanding task at high level and factors that cause high level tasks to decline to low level tasks.

Stein, Grover and Henningsen (1996), Stein and Smith (1998) and Smith and Stein (1998) who have elaborated more on the enactment of mathematical tasks have argued that these tasks go through three phases. The first phase is as the task is represented in the curricular/instructional materials. This is where most teachers draw their tasks from before setting it up for the learners in the classroom. This first phase is strictly as seen by the curriculum or textbook designers. The second phase is the set up phase. In this phase, teacher is the main actor. How does the teacher set up the tasks for learners? These researchers identified factors that might affect the way the teacher sets up the task for the learners. The third phase is the task as implemented by the learners. What are the things learners do and what are the response of teachers at this phase that cause the decline of tasks from high level to low level or what teacher actions are responsible to maintain the cognitive demand of high level tasks at high level? Jones and Tarr (2007) used the Mathematical Task Framework developed by Stein, Grover and Henningsen (1996) to move the research on tasks to another direction. Jones and Tarr (2007) analyzed the cognitive demand of probability tasks in middle grades mathematics textbooks. Bennett and Deforges (1988) focused on whether mathematical tasks assigned to learners in the classroom matched their abilities. Not much focus has been invested to investigate the cognitive demand of mathematical tasks as they appear in textbooks or curricular/instructional materials for an entire textbook series used in the primary school. The focus of this paper is to investigate the cognitive demand of mathematical tasks as they are represented in approved mathematics textbooks in primary schools in Cameroon that use English as the medium of instruction. Two important questions: Why the focus on textbooks or curricular/instructional materials? Why the focus on mathematical tasks? need to be answered.

Why the Focus on Textbooks or Curricular/Instructional Materials?

Textbooks or curricular/instructional materials are critical resources that support teacher in teaching and students in learning. Even if all learners in a classroom do not have a textbook or curricular/instructional material, the teacher does or should have. In addition, given that primary school teachers teach all subjects every day in their classrooms, it might seem

impossible to expect that these teachers create tasks for each subject and still do the teaching effectively and efficiently. Therefore, the teachers have just to select tasks from the available textbooks. Tarr et al. (2008) reported that the type of mathematical tasks given to students from their textbooks impact students' mathematical abilities and problem solving skills. The underlying premise here is that if textbooks do not provide teachers with problematic tasks or high cognitive demand tasks, then they are unlikely to make such tasks available to learners. In addition, according to Atanga (2021), Cameroon adopted the one textbook policy where all classrooms throughout the country use the same textbook and teach the same content. This then justifies the need to examine these textbooks to determine what kind of mathematical tasks and reasoning Cameroon adopted for its learners.

Why the Focus on Mathematical Tasks?

Wittrock (1986) explained that learning from teaching is not automatic. This means something else mediates learning from teaching. Shavelson, Webb and Burstein (1986) argued that tasks are terrains that cause student learning from teaching. The National Council of Teachers of Mathematics (NCTM) (2000) and Watson and Mason (1998) recommended mathematical tasks as fertile soils to cultivate and grow students' mathematical thinking and hence described tasks as the epicentre for the learning of mathematics. This means, mathematical tasks are formidable vehicles to promote the type of high-level thinking desired in a mathematics classroom so that learners can learn appropriate mathematics. As such, mathematical tasks enable the learning of mathematics to go beyond knowledge to include mathematical processes (Schoenfeld, 1992; Kitcher, 1984; Lakatos, 1976). From this perspective, it can be seen that carefully chosen mathematical tasks can create opportunities for students to learn useful mathematical ideas and techniques. According to Doyle (1983), "tasks influence learners by directing their attention to particular aspects of content and by specifying ways of processing information" (p. 161). This declaration by Doyle about the power of tasks was further supported by other researchers. Harris, Marcus, McLaren, and Fey (2001) also argued about the importance of tasks to mathematics learningAs such, the learning of mathematics has moved beyond just organizing the content of the lesson and carrying out the activities in class into promoting high level thinking in students. These implies that tasks in general hold a very central place in the mathematical learning learners ought to develop and hence, the need for deeper investigation into the nature of mathematical tasks offered by textbook designers in Cameroon for the English subsystem of education. Since all learners take mathematics and use the same textbook in the learning of the subject, it therefore becomes important to examine what level of mathematical thinking is offered to these learners at the foundation or base of learning.

Purpose of the Study

The purpose of this study is to determine the cognitive demand of mathematical tasks as represented in the approved primary school mathematics textbooks for use in the English subsystem of education in Cameroon. This study identifies the cognitive demand of mathematical tasks as represented in the approved textbooks that will be used from 2018 to 2023 from classes 1 to 6. Finally, the study looked at implications of the cognitive demands to students' conceptual understanding and their abilities to become thinkers and doers of mathematics. This kind of study offered the opportunity to determine the kind of mathematical thinking that is being fostered in primary school in the English subsystem of education in Cameroon and the implications.

Research Question

This study investigated the following research questions: What is the cognitive demand of mathematical tasks as represented in primary school mathematics textbooks approved for the English subsystem of education in Cameroon?

Theoretical Framework

This study is guided by the characteristics of cognitive demand of tasks shown in Figure 1.

Memorization (M): Mathematical tasks:

(a) involve either reproducing previously learned facts, rules, formulas, or definitions or committing facts, rules, formulas or definitions to memory
(b) cannot be solved using procedures because a procedure does not exist or because the time frame in which the task is being completed is too short to use a procedure
(c) are not ambiguous. Such tasks involve the exact reproduction of previously seen material, and what is to be re- produced is clearly and directly stated.
(d) have no connection to the concepts or meaning that underlie the facts, rules, formulas, or definitions being learned or reproduced

Procedures without Connections (PWoC): Mathematical tasks:

(a) are algorithmic. Use of the procedure either is specifically called for or is evident from prior instruction, experience, or placement of the task.
(b) require limited cognitive demand for successful completion. Little ambiguity exists about what needs to be done and how to do it.
(c) have no connection to the concepts or meaning that underlie the procedure being used
(d) are focused on producing correct answers instead of on developing mathematical understanding
(e) require no explanations or explanations that focus solely on describing the procedure that was

Procedures with Connections (PWC): Mathematical tasks:

(a) focus students' attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas
(b) suggest explicitly or implicitly pathways to follow that are broad general procedures that have close connections to underlying conceptual ideas as opposed to narrow algorithms that are opaque with respect to underlying concepts
(c) usually are represented in multiple ways, such as visual diagrams, manipulatives, symbols, and problem situations. Making connections among multiple representations helps develop meaning.
(d) require some degree of cognitive effort. Although general procedures may be followed, they cannot be followed mindlessly. Students need to engage with conceptual ideas that underlie the procedures to complete the task successfully and that develop understanding

Doing Mathematics (DM): Mathematical tasks:

(a) require complex and non-algorithmic thinking - a predictable, well-rehearsed approach or pathway is not explicitly suggested by the task, task instructions, or a worked-out example.
(b) require students to explore and understand the nature of mathematical concepts, processes, or relationships
(c) demand self-monitoring or self-regulation of one's own cognitive processes
(d) require students to access relevant knowledge and experiences and make appropriate use of them in working through the task
(e) require students to analyze the task and actively examine task constraints that may limit possible solution strategies and solutions
(f) require considerable cognitive effort and may involve some level of anxiety for the student because of the unpredictable nature of the solution process required

Figure 1: Characteristics of Cognitive Demand of Mathematical Tasks. (Source: Smith and Stein (1998), p. 348)

Methodology

Data for this study is collected from all mathematics textbooks from class 1 to class 6, that are approved for use in primary schools for the English subsystem of education in Cameroon for 2018 to 2023, a six-year period. This methodology begins by providing a brief description of each of the textbooks used in this study as they are written by different authors and publishers, followed by the data to be collected and how the data will be analyzed.

Brief Description of Each Textbook

Class 1 Mathematics Textbook

This book is published by Destiny Prints, and has the title *Innovative Mathematics for Primary Schools in Cameroon Class 1* with five authors. This textbook begins with a Forward and is then followed by a table of contents. This book has nine units and each has a theme. The theme for: unit 1 is the home, unit 2 is the village and town, unit 3 is the school, unit 4 is occupations, unit 5 is traveling, unit 6 is health, unit 7 is games, unit 8 is games and unit 9 is communication. There is variation in the treatment of each unit in this textbook. Some units begin with an explanation and then followed by expected learning outcomes while other units start with a definition of a mathematical concept and the followed by expected learning outcomes and some other units begin by stating the expected learning outcomes. At the end of some units, there is integration and evaluation, while in others, a sample project is added.

Class 2 Mathematics Textbook

This textbook, published by NMI Education, has as title, *Winners in Mathematics* and written by seven authors. This textbook begins with a preface, then moves to guideline notes for teachers, notes on Project Based Learning and Table of Content. The mathematical content of the textbook for class 2 is organized around eight monthly integrated themes. These themes are: the home, village and town, the school, occupations, travelling, health, games and communication. Each of these themes has four units. That means, in class 2, there are 32 units to be learned. For each theme, the competencies to be developed in learners are stated. Each unit has expected learning outcomes. Each unit has the following subheadings: let us observe, let us find out, let us summarize, let us practice and then some activities for learners to engage with.

In the "guideline notes for teachers," it is mentioned that teachers should make use of the exercises provided in the book under *let us observe, let us find out, let us summarize* and *let us practice*. In addition, teachers are informed that "the illustrations and images must be used in an interesting manner to catch and sustain the attention of learners at this stage" (Ngoe, Mogambe, Fotso, Foche, Bich, Ekema&Ule, 2020, p. iv).*Winners in Mathematics* also provide teachers with the philosophy in which the textbook is grounded. This happens on page v, under the title "Project Based Learning." Here, the publisher provides teachers with attributes of Competency Based Approach to teaching and the expectations of this approach. Furthermore, Project Based Learning is defined and procedure for enacting a project in any classroom is stated.

Class 3 Mathematics Textbook

This textbook is published by ATEMEC Plc. It has title *Primary Mathematics Pupil's Book 3* and has one author. This textbook begins with a Table of Content followed by a preface and then *Guideline Notes for Teachers*. The table of content is divided into eight integrated learning themes as in the class 2 textbook. This textbook has 40 units, five units per integrated learning theme. At the end of each integrated learning theme, there is an integrated activity/project. The textbook has guideline notes for teachers.

Guideline Notes for Teachers. This explains the set up of the textbook. It states an overarching goal of the textbook as "learners will be able to use the basic notions in mathematics drawn from the domain of basic knowledge" (Nkem, 2020, p. iv). This textbook has sections for observation, exploration, summary, team work, individual work and integrated activity.

Observation. Learners are expected to observe given pictures either as individuals or as a small group. After these observations, teachers are expected to generate and sustain discussions that will promote learning.

Exploration. After observation, learners are expected to engage in exploration. During this phase of the unit, learners are given the opportunity to explore the world of mathematics. Here, the author ask questions to learners that are expected to cause them to explore aspects of concepts they are to learn. Answers to exploration questions are then given to the learners as summaries.

Summary. The summary provides answers to the exploration questions and then provide further examples to illustrate the mathematical concepts to be learned.

Team work. After these summaries, team work follows and emphasizes the need for cooperation in learning. Sharing of experiences at this stage is expected to push learning of learners further.

Individual Work. This follows after the team work. Here, the publisher recommends that learners should be guided by teachers to go through the exercises successfully. At this point, teachers are expected to provide feedback to learners.

Integrated Activity/Project. This offer opportunities for learners to relate the subject back to real-life experiences. Projects are suggested that may be developed further.Each integrated theme begins with competence to be accomplished while each unit has expected learning outcome to be attained.

Class 4 Mathematics Textbook

The class four textbook is titled *Innovative Mathematics for Primary Schools 4* and published by Destiny Prints in 2020 with three authors. The preface is followed by "note to the teacher."These notes to the teacher states that the textbook is a "resourceful material written to facilitate the acquisition of mathematical knowledge, skills and attitudes as spelled out in the 2018 Cameroon Primary School Curriculum-English subsystem" (Tasah, Ndumbe&Enu, 2020, p. iv).The publisher further says the book draws its examples in mathematics from contexts that are common and familiar to Cameroonians so that maximum benefits can be derived by both the learner and the teacher. Also, the publisher calls on teachers to break down the given units into teachable lessons.

Next, the publisher gives a teaching algorithm to teachers. First, teachers are asked to introduce a lesson by presenting real-life situations, objects, charts and pictures that are found in this textbook. Then, teachers are asked to have learners observe those objects presented and then answer the questions that are presented in the textbook. This is then followed by the teacher solving three examples with the learners. During these solutions, the teacher should explain the procedures and formulas to the learners. Second, the teacher is called upon to ensure that learner practice competencies acquired during solving examples by engaging to solve practice problems by themselves either as individuals in class or at home or as a small group at school. Third, the teacher is asked to correct the work of the learners and provide remediation where necessary. According to *Innovative Mathematics for Primary Schools 4*, if teachers follow the above-mentioned teaching algorithm, "the acquisition of mathematical knowledge, skills and attitude by pupils shall exceedingly be enhanced with positive effects on pupils' acquisition of competencies in numeracy in particular and quality education in general" (Tasah, Ndumbe & Enu, 2020, p. iv). After "note to the teacher," the table of contents follow. On the table of content, there are five units and each unit has at least a theme. The theme for unit 1 is the home, unit 2 is village/town and the school, unit 3 is occupation/traveling, unit 4 is health/games and unit 5 is communications. Table of contents is followed by a unit by unit presentation of the mathematical content of the textbook. Each unit begins with the textbook specifying a set of expected learning outcomes to be achieved by the teacher during teaching. After all five units have been presented, the back cover page has "about the book." These notes, "about the book," explains the philosophy of the textbook series called *Innovative Mathematics*.

Class 5 Mathematics Textbook

The class five textbook has title *Foundation Primary Mathematics5* and published by ASVA Education in 2017 with two authors. The textbook opens with a preface followed by table of contents having twelve units. Then the content of each of the units follow from unit 1 to unit 12. For each unit, the objectives to be attained are stated just below the title of the unit. At the end of the textbook, there is a pedagogic guide. This guide has an introduction, methods, techniques and pointers, recommendations and conclusion.

Introduction. This part sets an introduction into what is contained in the book. It explains that the guidelines that follow are not enacted laws and that they are additional sources of inspiration to facilitate the task of anyone using the book.

Methods. This part explains that teachers will surely face challenges with learners during implementation of the lesson and so provision of some insights of the methods and techniques are provided. The publisher listed the New Pedagogic Approach, New Vision of Evaluation, Competence Based Approach and the techniques of problems before solutions as helpful resources to be explored and used by the teacher.

Techniques and pointers. Each unit has the "let's observe,""let's find,""lets retain" and "let's practice" components. In the let's observe component, learners are called upon to observe keenly the illustrations provided with the intentions of finding out: the what, which, how, when, why and where of the situations. The "let's find out" component takes learners to the "centre of interest" of the learning situations. Here, the textbook authors recommend that teachers should refocus learners to the core of the lesson so that their understanding is developed through a series of questions. The "let's retain" component highlights what

learning learners should take home to consolidate their understanding of the mathematical concepts learned. In addition, teachers are required to ask questions so that learners should be able to reconstruct their ideas and take home a great learning message. In the "let's practice," learners are expected to practice with numerous questions provided so that what they learned should be reified. The textbook further explains that in going through the exercises provided, learners master steps and methods that otherwise could not have been possible.

Recommendations. Here, general suggestions are give to the teacher. One of such suggestion is that teachers should neither be too fast nor too slow but ensure that all learners are on board as they teach. Another recommendation is that teachers should assist learners come up with definitions and derive formulas. In addition, teachers are called upon to employ group work so that learners interact and communicate with one another in the development of mathematical concepts.

Conclusion. The publisher concludes that what has been provided above does not capture all that is needed in teaching and further recommends that teachers can engage in research so as to fill in the gaps and teach effectively.

Class 6 Mathematics Textbook

The class six textbook has title *Foundation Primary Mathematics6* and published by ASVA Education in 2017 with two authors. The publisher of *Foundation Primary Mathematics 6* is the same as for *Foundation Primary Mathematics 5*, with the same features. In fact, the notes at the back of the book are exactly the same, word verbatim.

It is important to note that in all these textbooks, I have used "unit" as a common denominator found in all of them. However, these units do not all have the same title. The themes are the same throughout as they are drawn direct from the 2018 curriculum but have been compressed or expanded in different ways by each publisher.

Data collection

This study is about determining the level of cognitive demand of mathematical tasks embedded in all mathematics textbooks in primary schools approved for the English Subsystem of Education Cameroon from class 1 to class 6 for the period 2018-2023. Each of these mathematical tasks were coded for their cognitive demands. Stein and Smith (1998) define a mathematical task "as a segment of classroom activity that is devoted to the development of a particular mathematical idea" (p. 269). Elaboration of this definition by Stein and Smith (1998) states that "a task can involve several related problems or extended work, up to an entire class period, on a single complex problem" (p. 269). Because Stein and Smith observed implementation of mathematical tasks in classroom and this study is about mathematical tasks as represented in textbooks, I define mathematical tasks as a segment of questions with reference to a picture, diagram, illustrations or a set of problems that is devoted to the development of a particular mathematical idea in a textbook. This therefore means that a task could be a problem, series of problems, question or series of questions that are geared towards the development of a particular mathematical idea. For example, an exercise with several problems might be considered as just one task if all the problems are intended to develop only one mathematical idea. In *Innovative Mathematics for Class 4*, exercise 1.2 has two questions (see Figure 2), all emphasizing the idea of an element of a set and the use of the symbol $\in$. So, even though there are two questions, it is just one task.

1. Present other elements of set A, on page 3 above. For example:  ∈ A
   a) _____
   b) _____
2. Present other elements of set B, on page 3 above. For example: $a \in$ B
   a)
   b)
   c)
   d)
   e)
   f)

Figure 2: Sample task from *Innovative Mathematics for Class 4*, p. 4

Every page of each mathematics textbook from class 1 to class 6 was examined to identify mathematical tasks. These mathematical tasks were either learning tasks or practice task. Learning tasks are those that refers learners to a representation or representation and questions are provided that motivate and stimulate thinking in learners. Practice tasks are those that give students opportunities to rehearse learned concepts to reinforce their understanding.

Analysis of Identified Mathematical Tasks

The cognitive demands of mathematical tasks (learning and practice) identified were coded by the author using the characteristics in Figure 1. Learning and practice mathematical tasks were coded as memorization, procedure without connection, procedure with connection or doing mathematics. *Learning tasks*. These were coded as a whole and practice tasks were also coded as a whole. For example, a learning task such as below was coded as a single task, even though it has many questions involved. A second coder, an experienced mathematics teacher, independently coded these textbooks to identify mathematical tasks. Then he coded the mathematical tasks for their cognitive demands. The two coders had a 95% agreement for the different mathematical tasks identified in all the textbooks. After discussions, the 5% disparity was resolved. The second coder, coded each identified mathematical task for their cognitive demands. The two coders had 90% agreement on the level of cognitive demand of the mathematical tasks. After a discussion between the two coders the disparities were resolved.

Learning tasks: How to identify objects (by their shapes, colour, sizes etc)

Look at the following objects in the picture and answer the questions below orally.

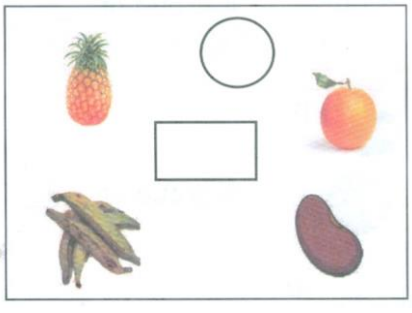


Figure 3: Sample of a learning task from Innovative Mathematics for Primary Schools in Cameroon, Class 1, p. 1

(a) Identify the objects in the box.

(b) Which objects in the box are round.

(c) Name the fruits in the box.

(d) Name the food items in the box.

This whole task in Figure 3 was coded as *Memorization* (M). This is because the questions that are asked are not ambiguous and involved the reproduction of facts (name of fruits etc).

Practice tasks. These were also coded by chunks. In case the practice task requires learners to follow a procedure or formula previously demonstrated through the use of an example or used a definition that has been previously provided, then it is coded as Procedure Without Connections. For example, the practice task in Figure 4 was coded as *Procedure Without Connections* (PWoC) to the concept. This is because before the practice task, an explanation had been provided, followed by an example to demonstrate how the explanation works. Therefore, the practice task simply requires the use of the algorithm that is presented, no explanation, no demand for meaning, limited cognition, and just the answer. Hence, all 10 questions were coded as one instance of PWoC. A few practice tasks were coded as *Procedure With Connections* (PWC) to the concept. For example, the practice task in Figure 5 was coded PWC because some of the problems focus on the concept of area. Although the concept of area is defined and a formula to find area of rectangle and square provided just above, some of the problems in the *let's practice* tasks will not require exact use of the formula or algorithm. These require an understanding and application of the concept to find the area. For example, in questions 1, 3, and 5, the shapes are not rectangles and so the formula cannot be directly applied. Some reasoning is needed in a non-algorithmic way to get to the result. Counting the number of unit squares will solve the problem. This is the concept of area, the number of unit squares that occupy a surface. Hence, the let's practice task in Figure 5 was coded PWC as it focused on the concept of area.

Let's retain

To multiply decimals by whole numbers, count the number of decimal places in the decimal fractions, multiply normally and mark off the same number of decimal places in the product.

Examples:a) 3.25 by 7

	3	.	2	5
×				7
2	2	.	7	5

b) 3.24 and 16

	3	.	2	4
×			1	6
	1	9	4	4
	3	2	4	0
	5	1.	8	4

Let's practise: Solve the following in your exercise book.

1) 4.11 × 5	3) 5.03 × 15	5) 7.09 ×16	7) 8.295 × 20	9)35.04 × 21
2) 4.29 × 5	4) 5.06 × 16	6) 8.25 ×17	8) 21.35 × 25	10) 49.75 × 36

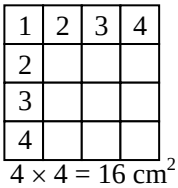
Figure 4: Sample of a practice task from *Foundation Primary Mathematics 5, p. 54*

Let's retain

Area is the total surface in square units that a shape or something occupies. We can also say that area is the size of a flat surface calculated by multiplying its length by its width. To calculate area, we divide the surface area into square units.

Examples:

$4 \times 5 = 20\ cm^2$



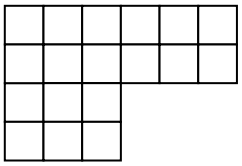
$4 \times 4 = 16\ cm^2$

N.B

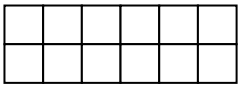
All areas are calculated in square units

Let's practice: Below are some shapes. Calculate their areas in your exercise books.

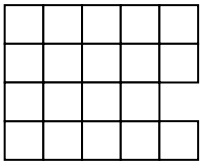
1)



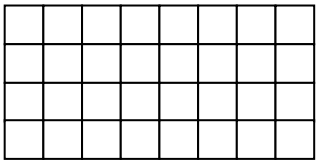
2)



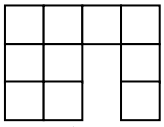
3)



4)



5)



6)

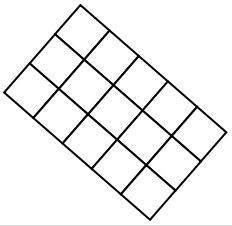


Figure 5: Sample of a practice task from *Foundation Primary Mathematics 5, p. 106*

Results

Class One textbook. Table 1 shows the breakdown of the 161 mathematical tasks that were identified in this textbook by unit. Eight of the nine units assessed have no mathematical task classified as PWC while all nine units have no mathematical task classified as DM.

Table 1.*Categories of Mathematical Tasks in Class One Textbook*

UNITS	M	PWoC	PWC	DM	TOTAL
Unit 1: Objects and sets	17 **(53 %)**	15 **(47 %)**	0 **(0 %)**	0 **(0 %)**	**32**
Unit 2: Numbers and operations	10 **(50 %)**	10 **(50 %)**	0 **(0 %)**	0 **(0 %)**	**20**
Unit 3: Addition and subtraction	8 **(30 %)**	19 **(70 %)**	0 **(0 %)**	0 **(0 %)**	**27**
Unit 4: Multiplication and division	5 **(20 %)**	20 **(80 %)**	0 **(0 %)**	0 **(0 %)**	**25**
Unit 5: Fractions	2 **(29 %)**	5 **(71 %)**	0 **(0 %)**	0 **(0 %)**	**7**
Unit 6: Measurements	12 **(60 %)**	7 **(35 %)**	1 **(5 %)**	0 **(0 %)**	**20**
Unit 7: Length, mass and capacity/volume	3 **(30 %)**	7 **(70 %)**	0 **(0 %)**	0 **(0 %)**	**10**
Unit 8: Geometry	4 **(36 %)**	7 **(64 %)**	0 **(0 %)**	0 **(0 %)**	**11**
Unit 9: Statistics and graphs	0 **(0 %)**	9 **(100 %)**	0 **(0 %)**	0 **(0 %)**	**9**
TOTAL	**61 (37.9%)**	**99 (61.5 %)**	**1 (0.6 %)**	**0 (0 %)**	**161**

Note: Memorization (M), Procedure Without Connection (PWoC) to the concept, Procedure With Connection (PWC) to the concept and Doing Mathematics (DM).

Generally, of the 161 mathematical tasks found in the class one textbook, approximately 37.9% of them are memorization, approximately 61.5% of them are procedure without connections to the concept, less than 1% of them are procedure with connections to the concept and 0% of them are doing mathematics. Approximately 99.4% of the mathematical tasks in class one textbook are of low cognitive demand, requiring that learners use only memorized facts and procedures without connection to any concept.

Class Two textbook. Table 2 shows that class Two textbook has 112 mathematical tasks.

Of these 112 mathematical tasks, approximately 42% are memorization, approximately 58% are procedures without connection to any concept, 0% are procedures with connection to a concept and 0% are doing mathematics. All mathematical tasks in this textbook are of low cognitive demand.

Table 2.*Categories of Mathematical Tasks in Class Two Textbook*

UNITS	M	PWoC	PWC	DM	TOTAL
Unit 1: Sets and logic: Revision of sets	4**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**4**
Unit 2: Number and operations: counting 100-200	3**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 3: Measurement and size: lengths in metres	1**(25%)**	3**(75%)**	0**(0%)**	0**(0%)**	**4**
Unit 4: Geometry and graphs: Locating points on a number line up to 50	0**(0%)**	2**(100%)**	0**(0%)**	0**(0%)**	**2**
Unit 5: Sets and logic: Differentiate between sets	1**(20%)**	4**(80%)**	0**(0%)**	0**(0%)**	**5**
Unit 6: Number and operations: Writing in words 101-200	3**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 7: Number and operations: Odd and even numbers	3**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 8: Measurement and size: Measuring capacity in litres	1**(33%)**	2**(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 9: Sets and logic: Elements of a set	0**(0%)**	3**(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 10: Number and operations: Horizontal addition 100	2**(40%)**	3**(60%)**	0**(0%)**	0**(0%)**	**5**
Unit 11: Number and operations: Vertical addition	0**(0%)**	3**(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 12: Geometry and graphs: Different patterns of curves and lines	0**(0%)**	3**(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 13: Sets and logic: Intersection and union of sets	0**(0%)**	2**(100%)**	0**(0%)**	0**(0%)**	**2**
Unit 14: Number and operations: Subtraction of numbers	0 **(0%)**	1**(100%)**	0**(0%)**	0**(0%)**	**1**
Unit 15: Measurement and size measuring: Weight in grams	0**(0%)**	4**(100%)**	0**(0%)**	0**(0%)**	**4**
Unit 16: Geometry and graphs: 2D shapes	0 **(0%)**	3**(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 17: Sets and logic: Intersection of sets	1**(20%)**	4**(80%)**	0**(0%)**	0**(0%)**	**5**
Unit 18: Number and operations: Multiplication by 2, 3, 4, 10	0**(0%)**	3**(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 19: Measurement and size: Reading the time clock	3**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 20: Geometry and graphs: Identifying 4D shapes	5**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**5**
Unit 21: Sets and logic: Intersection of sets	3**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 22: Number and operations: Division by 2 and 3	1**(20%)**	4**(80%)**	0**(0%)**	0**(0%)**	**5**
Unit 23: Measurement and size: The days of the week	2**(67%)**	1**(33%)**	0**(0%)**	0**(0%)**	**3**
Unit 24: Geometry and graphs: Statistics: Tally in 4s and 5s	1**(33%)**	2**(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 25: Sets and logic: Set symbols	2**(40%)**	3**(60%)**	0**(0%)**	0**(0%)**	**5**
Unit 26: Number and operations: Fractions	0**(0%)**	3**(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 27: Measurement: The months of the year	2**(67%)**	1**(33%)**	0**(0%)**	0**(0%)**	**3**
Unit 28: Geometry, graphs and statistics: Presenting data	3**(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 29: Number and operations: counting in 2s, 5s and 10s	1**(33%)**	2**(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 30: Measurement and size: Identifying currency up to 200	4**(80%)**	1**(20%)**	0**(0%)**	0**(0%)**	**5**
Unit 31: Number and operations: Shopping up to 200frs	1**(25%)**	3**(75%)**	0**(0%)**	0**(0%)**	**4**
Unit 32: Geometry, graphs and statistics	0 **(0%)**	5**(100%)**	0**(0%)**	0**(0%)**	**5**
TOTAL	**47 (42%)**	**65 (58%)**	**0(0%)**	**0(0%)**	**112**

Note: M = Memorization, PWoC = Procedure Without Connection to any concept, PWC = Procedure With Connection a concept and DM = Doing Mathematics.

Class Three textbook. Table 3 shows that class Three textbook has 145 mathematical tasks. Of these 145 mathematical tasks, approximately 38% are memorization and approximately 62% are procedures without connection to any concept. In all forty units assessed, no mathematical task was found in the categories of procedures with connection to a concept and doing mathematics.

Table 3.*Categories of Mathematical Tasks in Class Three Textbook*

UNITS	M	PWoC	PWC	DM	TOTAL
Unit 1: Universal and subsets	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 2: Numbers	1 **(13%)**	7 **(87%)**	0**(0%)**	0**(0%)**	**8**
Unit 3: Introduction to metric systems	1 **(25%)**	3 **(75%)**	0**(0%)**	0**(0%)**	**4**
Unit 4: Circles	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 5: Data collection and tallying	1 **(20%)**	4 **(80%)**	0**(0%)**	0**(0%)**	**5**
Unit 6: Finite and infinite sets	3 **(100%)**	0 **(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 7: Numbers up to 500	3 **(100%)**	0 **(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 8: Metric system: Length measurements mm, etc	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 9: 3D shapes	3 **(100%)**	0 **(0%)**	0**(0%)**	0**(0%)**	**3**

Unit 10: Ranking	2 **(40%)**	3 **(60%)**	0**(0%)**	0**(0%)**	**5**
Unit 11: Equal and equivalent sets	0 **(0%)**	3 **(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 12: Greater than, equal to and less than	0 **(0%)**	3 **(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 13: Metric system: Volume measurements	0 **(0%)**	2 **(100%)**	0**(0%)**	0**(0%)**	**2**
Unit 14: Constructing 3D Shapes	0 **(0%)**	1 **(100%)**	0**(0%)**	0**(0%)**	**1**
Unit 15: Pie chart	0**(0%)**	4**(100%)**	0**(0%)**	0**(0%)**	**4**
Unit 16: Set symbols and elements of a set	0 **(0%)**	3 **(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 17: Place values of numbers	1 **(20%)**	4 **(80%)**	0**(0%)**	0**(0%)**	**5**
Unit 18: Metric system: Weight (mass) measurement	0 **(0%)**	3 **(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 19: Shapes	3 **(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 20: Representations: Histograms and bar charts	5 **(100%)**	0**(0%)**	0**(0%)**	0**(0%)**	**5**
Unit 21: Worded problems on sets	3 **(100%)**	0 **(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 22: Place value of numbers	1 **(20%)**	4 **(80%)**	0**(0%)**	0**(0%)**	**5**
Unit 23: Calendar: Ordinary and Leap Year	2 **(67%)**	1 **(33%)**	0**(0%)**	0**(0%)**	**3**
Unit 24: The circle	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 25: Mapping and grid reference	2 **(40%)**	3 **(60%)**	0**(0%)**	0**(0%)**	**5**
Unit 26: Counting in 5s	3 **(100%)**	0 **(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 27: Counting in 6s	2 **(67%)**	1 **(33%)**	0**(0%)**	0**(0%)**	**3**
Unit 28: The calendar	3 **(100%)**	0 **(0%)**	0**(0%)**	0**(0%)**	**3**
Unit 29: Number line	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 30: Mapping and grid referencing	4 **(80%)**	1 **(20%)**	0**(0%)**	0**(0%)**	**5**
Unit 31: Counting in 7s	1 **(25%)**	3 **(75%)**	0**(0%)**	0**(0%)**	**4**
Unit 32: Division of numbers by 5 and 6	0 **(0%)**	5 **(100%)**	0**(0%)**	0**(0%)**	**5**
Unit 33: Division of numbers by 7	0 **(0%)**	3 **(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 34: Time and clock	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 35: Time	2 **(40%)**	3 **(60%)**	0**(0%)**	0**(0%)**	**5**
Unit 36: Multiples of numbers up to 100	0 **(0%)**	3 **(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 37: Addition of fractions	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 38: Subtraction of fractions	0 **(0%)**	3 **(100%)**	0**(0%)**	0**(0%)**	**3**
Unit 39: Money: Addition and Subtraction	1 **(33%)**	2 **(67%)**	0**(0%)**	0**(0%)**	**3**
Unit 40: Money: Shopping	1 **(20%)**	4 **(80%)**	0**(0%)**	0**(0%)**	**5**
TOTAL	**55 (38%)**	**90 (62%)**	**0(0%)**	**0(0%)**	**145**

Note: M = Memorization, PWoC = Procedure Without Connection to any concept, PWC = Procedure With Connection a concept and DM = Doing Mathematics.

Class Four textbook. Table 4 shows that class Four textbook has 155 mathematical tasks. Of these 155 mathematical tasks, approximately 26% are memorization and approximately 74% are procedures without connection to any concept. In all five units no mathematical task was found in the categories of procedures with connections to a concept and doing mathematics. Therefore, all mathematical tasks in this textbook are of low cognitive demand, requiring learners to use only memorized facts and engage in procedures without connection to any mathematical concept.

Table 4.*Categories of Mathematical Tasks in Class Four Textbook*

UNITS	M	PWoC	PWC	DM	TOTAL
Unit 1: Set and logic	8**(27%)**	22 **(73%)**	0**(0%)**	0**(0%)**	**30**
Unit 2: Numbers and operations/ Fractions	26**(32%)**	56**(68%)**	0**(0%)**	0**(0%)**	**82**
Unit 3: Measurements and size	3**(12%)**	23**(88%)**	0**(0%)**	0**(0%)**	**26**
Unit 4: Geometry and space	3**(38%)**	5**(62%)**	0**(0%)**	0**(0%)**	**8**
Unit 5: Graphs and statistics	1**(11%)**	8**(89%)**	0**(0%)**	0**(0%)**	**9**
TOTAL	**41 (26%)**	**114 (74%)**	**0(0%)**	**0(0%)**	**155**

Note: M = Memorization, PWoC = Procedure Without Connection to any concept, PWC = Procedure With Connection a concept and DM = Doing Mathematics.

Class Five textbook. Table 5 shows that class Five textbook has 193 mathematical tasks. Of these 193 mathematical tasks, approximately 49% are memorization, approximately 50% are procedures without connection to any concept and approximately 1% are procedures with

connection to a concept. In all twelve units assessed, no mathematical task was found in the category of doing mathematics.

Table 5.*Categories of Mathematical Tasks in Class Five Textbook*

UNITS	M	PWoC	PWC	DM	TOTAL
Unit 1: Sets and logic	10**(56%)**	8**(44%)**	0**(0%)**	0**(0%)**	18
Unit 2: Basic Number operations	9**(47%)**	10**(53%)**	0**(0%)**	0**(0%)**	19
Unit 3: Number and Numeration	8**(50%)**	8**(50%)**	0**(0%)**	0**(0%)**	16
Unit 4: Number and Numeration	25**(56%)**	20**(44%)**	0**(0%)**	0**(0%)**	45
Unit 5: Proportions and ratios	4**(50%)**	4**(50%)**	0**(0%)**	0**(0%)**	8
Unit 6: Modular arithmetic and number bases	10**(48%)**	11**(52%)**	0**(0%)**	0**(0%)**	21
Unit 7: Measurements	9**(47%)**	10**(53%)**	0**(0%)**	0**(0%)**	19
Unit 8: Money and shopping	3**(50%)**	3**(50%)**	0**(0%)**	0**(0%)**	6
Unit 9: Simple Interests	4**(44%)**	5**(56%)**	0**(0%)**	0**(0%)**	9
Unit 10: Speed, distance and time	3**(50%)**	3**(50%)**	0**(0%)**	0**(0%)**	6
Unit 11: Areas and volumes	5**(50%)**	4**(40%)**	1**(10%)**	0**(0%)**	10
Unit 12: Statistics and graphs	5**(31%)**	10**(63%)**	1**(6%)**	0**(0%)**	16
TOTAL	**95 (49%)**	**96 (50%)**	**2 (1%)**	**0 (0%)**	**193**

Note: M = Memorization, PWoC = Procedure Without Connection to any concept, PWC = Procedure With Connection a concept and DM = Doing Mathematics.

Class Six textbook. Table 6 shows that class Six textbook has 284 mathematical tasks. Of these 284 mathematical tasks, 50% are memorization and 50% are procedures without connection to any concept. In all twelve units assessed, no mathematical task was coded as procedures with connection and doing mathematics. Therefore, the mathematical tasks in this textbook are of low cognitive demand, requiring learners to use only memorized facts and procedures without connection to any mathematical concept.

Table 6.*Categories of Mathematical Tasks in Class Six Textbook*

UNITS	M	PWoC	PWC	DM	TOTAL
Unit 1: Set Theory	11**(50%)**	11**(50%)**	0**(0%)**	0**(0%)**	22
Unit 2: Numbers and Numeration	10**(53%)**	9**(47%)**	0**(0%)**	0**(0%)**	19
Unit 3: Basic Number Operations	7**(50%)**	7**(50%)**	0**(0%)**	0**(0%)**	14
Unit 4: Base System	7**(47%)**	8**(53%)**	0**(0%)**	0**(0%)**	15
Unit 5: Fractions and Decimals	30**(52%)**	28**(48%)**	0**(0%)**	0**(0%)**	58
Unit 6: Modulo Arithmetic	4**(44%)**	5**(56%)**	0**(0%)**	0**(0%)**	9
Unit 7: Rate, Ratio and Proportion	10**(50%)**	10**(50%)**	0**(0%)**	0**(0%)**	20
Unit 8: Simple Interest	5**(45%)**	6**(55%)**	0**(0%)**	0**(0%)**	11
Unit 9: Distance, Speed and Time	5**(50%)**	5**(50%)**	0**(0%)**	0**(0%)**	10
Unit 10: Measurements	15**(48%)**	16**(52%)**	0**(0%)**	0**(0%)**	31
Unit 11: Geometry: Area and plane figures	28**(51%)**	27**(49%)**	0**(0%)**	0**(0%)**	55
Unit 12: Graphs and Statistics	10**(50%)**	10**(50%)**	0**(0%)**	0**(0%)**	20
TOTAL	**142 (50%)**	**142 (50%)**	**0 (0%)**	**0 (0%)**	**284**

Note: M = Memorization, PWoC = Procedure Without Connection to any concept, PWC = Procedure With Connection a concept and DM = Doing Mathematics.

Discussion/Implications

The results of this study reveal an interesting trend of mathematical tasks found in approved mathematics textbooks used from classes one to six in the English subsystem of education in Cameroon. Although the textbooks are written by different authors and published by different publishers, the pattern observed in these results reveals the typical style in preparing primary school pupils to face mathematics in the future. All the textbooks have emphasized mathematical tasks of lower cognitive demand for the learners. Table 7 shows that overall, 1050 mathematical tasks were identified in the textbooks used from Class One to Class Six. Table 7 also shows that the distribution of the mathematical tasks in these textbooks as 42% memorization, 57.8% procedure without connection to any concept, 0.2%

procedure with connection to a concept and 0% doing mathematics. Putting these together, we see that 99.8% of the tasks are in the lower level cognitive demand category while only 0.2% are in the high cognitive demand category. That means the mathematical task emphasis in these textbooks is from memorization to procedure without connection to any concept. Mathematical tasks that demand procedure with connection to a concept is very faint while high level cognitively demanding mathematical tasks of doing mathematics are completely absent in all the approved mathematics textbooks from class one to class six for the English subsystem of education in Cameroon. This could be as result of authors of these textbooks failing to identify mathematical tasks within the culture that can be of high cognitive demand to learners. Such mathematical tasks that are culturally relevant can act as a motivating factor, stimulating learners to engage deeply with great commitment and hence might begin developing desired mathematical disposition.

This study identified a pattern of mathematical tasks in primary school textbooks used in the English subsystem of Education in Cameroon that reveal little or no progress in the reform process of 2018 instituted by the Ministry of Basic Education in the country. Having the bulk of mathematical tasks in the lower categories (M and PWoC) and little or nothing in the upper categories (PWC or DM) of the cognitive demand scale reveals that growth in mathematical thinking is still not an emphasis for curriculum developers in Cameroon.

The fact that all the mathematics textbooks written by different authors and published by different publishers have the same mathematical emphasis is not just a coincidence, but perhaps a systemic problem that needs to be addressed. This study reveals that learners in all the classes are not being exposed to the kind of mathematical tasks that engage them develop greater and deeper understanding of key mathematical concepts they are to learn.

Table 7.*Mathematical Tasks from Classes One to Six*

CLASS	M	PWoC	PWC	DM	TOTAL
CLASS ONE TEXTBOOK	61	99	1	0	**161**
CLASS TWO TEXTBOOK	47	65	0	0	**112**
CLASS THREE TEXTBOOK	55	90	0	0	**145**
CLASS FOUR TEXTBOOK	41	114	0	0	**155**
CLASS FIVE TEXTBOOK	95	96	2	0	**193**
CLASS SIX TEXTBOOK	142	142	0	0	**284**
TOTAL	**441 (42%)**	**606 (57.8%)**	**3 (0.2%)**	**0 (0%)**	**1050**

Note: M = Memorization, PWoC = Procedure Without Connection to any concept, PWC = Procedure With Connection a concept and DM = Doing Mathematics.

This outcome is in contrast to the recommendation by Stein, Smith, Henningsen and Silver (2000) which advocates that at each class, learners should be exposed to opportunities to encounter high level mathematical tasks so that they could engage and develop "deeper, more generative understandings regarding the nature of mathematical processes, concepts, and relationships" (p. 15). In addition, the NCTM (1989, 2000) also recommended the use of high level cognitively demanding mathematical tasks so that learners can be supported to develop sound conceptual understanding of mathematical concepts. Many other researchers have called for the use of high cognitively demanding mathematical tasks to teach because of the benefits to learners. Some of the benefits include gains in students' mathematical thinking (Boaler & Staples, 2008; Stein & Lane, 1996), improvements in students' fluency performance and problem solving performance (Russo & Hopkins, 2019) and positive change of attitude towards the learning of mathematics (Jones &Tarr, 2007).

The absence of high level cognitively demanding tasks in all mathematics textbooks from class one to class six for the English subsystem of education in Cameroon means the learners might be disfavoured and hence "mathematically malnourished" (Atanga, 2021, p. 221).The very low level of mathematical tasks presented in all of these textbooks might influence both teachers and learners negatively. It might influence learners and teachers to see mathematics as consisting of a collection of standard formulas and algorithms which could drive them to see the focus of the subject as calculation of answers only. This might cause teachers only to focus on looking for and following standard formulas and algorithms in a mindless way and learners only involved in calculations to get answers without paying attention to the meaning of what they found. The focus on getting the answer only with no sense making involved is destructive to the learning of mathematics. Learning mathematics is more than the use of standard formulas and algorithms as these present mathematics to learners as static. According to Schoenfeld (1992, 1994), students should have a more dynamic notion of mathematics so that during learning, learners develop and acquire mathematical disposition for proficiency. Schoenfeld (1992) explained mathematical disposition to mean exploration and searching for pattern so as to identify structures and relationships, making use of available resources to construct and solve, making sense of mathematical ideas, thinking and reasoning in flexible ways, making conjectures, generalizing patterns, justifying claims and generalizations as well communicating their mathematical ideas and making decisions whether or not the mathematical outcomes or results make sense. The kind of mathematical work described by Schoenfeld above can only be encountered when learners engage with mathematical tasks that demand the use of procedures with connections to a concept and doing mathematics. A focus on standard formulas or algorithms short-circuits deep mathematical engagement of learners, thereby forfeiting the required mathematical disposition and mathematical habits of mind that fosters growth in mathematical knowledge.

This article does not claim that mere insertion of more demanding mathematical tasks in mathematics textbooks for primary schools in the English Subsystem of Education in Cameroon will automatically improve learning and teaching. This is because for teaching and learning to improve, a number of components must be in harmony. First, high cognitive demand of the mathematical tasks is a foundational component to be considered. Second, teacher's ability to enact and sustain such mathematical tasks at high cognitive level throughout the lesson is necessary. Third, the motivation of learners to remain engaged with the task and not press for answers that might decline the demand (Stein, Grover & Henningsen, 1996) is critical. The motivation of learners is an essential component because as Watson and Ohtani (2015) put it, design of task has both a cognitive and cultural significance. This means the design must be balance as the learner comes from a cultural background that drawing from can ignite optimum engagement for greater learning. Therefore, design of high level cognitively demanding mathematical tasks is critical and training of teachers, textbook authors and leaders of mathematics at senior levels in the Basic Education Ministry in Cameroon to achieve this is paramount to understand basic principles of mathematical tasks design. Also, training of teachers to build their capacity to enact such high level mathematical tasks and sustain engagement with learners to achieve desired learning is also important to consider. Lastly, these textbooks do not clearly distinguish between learning tasks and practice tasks, a distinction which could provide teachers with greater clarity on how to enact their teaching plan. As such, further research is

thus needed to investigate the impact on student learning when learning and practice mathematical tasks are designed from the learners' culture with high cognitive demand. Such a study is expected to provide greater insights into culturally relevant mathematical tasks that can enhance teaching and learning for optimal output experiences.

Recommendations and conclusion

This study has identified a major limitation in all approved mathematics textbooks for primary school learners in the English subsystem of education in Cameroon. The results of this study can be useful for textbook authors, mathematics educators, teachers and members of the national book commission responsible for the selection of textbooks for learners. The methodology of this study can serve as a model for other researchers to examine textbook use in their situation.

The mathematical tasks in all of the textbooks examined have low level of cognitive demand, which greatly falls short of research recommendations and the goals of the Ministry.

The NCTM (1991, 2014) suggested that high cognitive demanding mathematical tasks be used to teach mathematics because they develop learners' mathematical dispositions and mathematical habits of mind (Stein et al., 2000) and improves mathematical achievements of learners (Boaler & Staples, 2008; Russo & Hopkins, 2019; Stein & Lane, 1996). Such mathematical tasks should demand the use of procedures with connections to mathematical concepts and doing mathematics which are absent from the textbooks examined in this study. Therefore, mathematics textbook authors and publishers should consider the design of high level mathematical tasks a top priority so that learners who use their textbooks should engage in mathematical processes that offer them opportunities for deep and profound learning of key concepts. Teacher educators have great advantage to repackage professional development programs to draw teachers' attention to the importance and need to examine mathematical tasks presented in textbooks. Then, build teachers' capacity to modify the cognitive demand of mathematical tasks in their textbooks to include those at high levels.

The result of this study align with Jones and Tarr’s (2007) claim that the analysis of cognitive demand of mathematical tasks could now be seen as one important measure to determine the quality of mathematics in textbooks for approval. Therefore, members of the national book commission in Cameroon responsible for the selection of textbooks for use in schools, and those in similar positions at other locales, should consider examining the cognitive demand of mathematical tasks as a key determinant of textbook quality.

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