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Counting Cailloux, Multiplying Mambos: An Analysis of Mathematics Education in Cameroonian Primary Schools

Rachel Elzinga
SIT Study Abroad

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Counting Cailloux, Multiplying Mambos

An Analysis of Mathematics Education in Cameroonian Primary Schools

Rachel Elzinga

SIT Study Abroad - Spring 2011

Cameroon: Social Pluralism and Development

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ISP Topic Codes: 200, 207, 210

Abstract

This paper summarizes the results of a four-week study of mathematics education in Cameroonian primary schools. In order to fully understand the topic, the research included not only mathematics curriculum, but also methods of instruction, the system for teacher preparation, and an evaluation of community perceptions. Data collection integrated participant observations in two francophone primary schools in Dschang, interviews with primary school teachers, interviews with ministry of education officials, and survey data from teachers and community members in Yaoundé, Ngaoundéré and Dschang. Overall, three conclusions were drawn from the data collected. First, that mathematics is perceived as important by the community and the same sentiment exists within the school environment. Second, that primary level mathematics content and pedagogy is almost identical between public and private schools; the more important factor in the quality of instruction is the individual teacher. Finally, although the idea of in-service training is praised, actual opportunities for teacher education specifically in math are limited.

Ce papier est un sommaire des résultats de quatre semaines de recherche sur l'enseignement des mathématiques dans les écoles primaires au Cameroun. Pour avoir une compréhension complète, la recherche comprend : le curriculum, les méthodes d'enseignement, le système de formation des enseignants, et une évaluation de la manière dont la communauté perçoit l'importance des mathématiques. La collection des données a intégré des observations participant dans deux écoles primaires à Dschang, des interviews avec les enseignants et avec les cadres du Ministère de l'Education de Base, et data des questionnaires remplis par les enseignants et les membres communautés à Yaoundé, à Ngaoundéré, et à Dschang. En tout, trois conclusions ressortent de ces données. Premièrement, les mathématiques sont perçues comme important par la communauté et le même sentiment existe dans l'environnement scolaire. Deuxièmement, le contenu et la pédagogie des mathématiques au primaire est très similaire entre les écoles qu'elles soient publique ou privée ; c'est l'enseignant qui a la plus grand influence sur la qualité d'instruction. Finalement, bien que l'idée de formation des enseignants soit importante, les opportunités réelles spécifiques des maths sont limitées.

Dedication

Les enfants, j'applaudirai toujours pour vous.
Les enseignants, bon courage car ce n'est pas un simple métier.
Les élèves maîtres, nos vies sont différentes mais nos cœurs sont les mêmes.

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Mom and Dad – Thanks for not only allowing me, but encouraging me to take advantage of the opportunity to spend a semester in Cameroon. Thanks for teaching me to be confident and assertive because those traits have served me well here. Thanks for modeling the grace and generosity that are required to overcome the challenges of cross-cultural living. Most importantly, thanks for being the family that I will always want to return to.

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Introduction

What does mathematics education look like in Cameroonian primary schools? This broad and over-arching question was formed in my mind before arriving in Cameroon; as an elementary education major with a concentration in mathematics, the original motivation for this topic was mere personal interest. But after learning more about Cameroon through both lectures and day-to-day conversations, it became clear that education, especially in terms of math and science, is extremely relevant to the development of this country. With both personal interest peaked and topical relevance established, exploring mathematics education in Cameroonian primary schools developed into the basis of my four-week independent study project.

The goal of the study was to examine primary level mathematics education within the context of Cameroon. For me, this meant looking at more than just student work, and in order to fully understand the topic I chose to explore three specific spheres of influence. First, the perceived importance of mathematics by both the general population and individuals specifically involved with the educational system. I hypothesized that if mathematics was perceived as important by the general community, then the same sentiment would exist in the school environment. The second area to explore was the current state of teacher education. I predicted that there would be little emphasis on providing training in mathematics content or pedagogy for primary school teachers. Finally, I wanted to examine the realities of mathematics instruction within Cameroonian primary school classrooms. In the weeks leading up to the project I had heard that there was a significant difference between public and private schools, and in response I decided to add a comparative element to my independent study. My third hypothesis stated that primary level mathematics instruction would be impacted by the type of school: public versus private. During the project I was able to validate or nullify each of the three hypotheses, and in the process I also discovered relationships between the three areas of study which added richness to my investigation.

The information that I collected could be useful to a number of people. Personally, the study provided me with insight into mathematics education in a culture very different from my own. I will take back some of the activities and strategies that I observed to use in my own future classroom and to share with other teachers. Outside myself, this research paper could serve as inspiration for future study by undergraduate students or more professional researchers. In this

case, the data obtained during my four-week study could provide a foundation of existing research on primary level mathematics education; although I acknowledge that the scope, depth, and authority of my work were limited by both time and my lack of research experience. The information I found could also be useful to teachers and administrators involved in creating or revising mathematics curriculum; especially in relation to the need for improved pre-service teacher training programs and continuing education.

Background Information

Before trying to understand mathematics education in Cameroonian schools today, I examined a variety of existing literature regarding the history of primary education and mathematics in developing countries. One of the most notable themes presented was the lasting impact of colonialism in many African nations, including Cameroon. In their study investigating the feasibility of a global curriculum, Bill Atweh and Philip Clarkson found that many former colonies “have modeled their education systems, including their teacher education programs, on that of the mandate countries.”¹ This is certainly true in Cameroon where the two educational systems are vestiges of the English and French colonial powers. Although both systems play an important role in Cameroonian education, I chose to focus solely on the Francophone system because it is the predominant system for public schools in Dschang, and I could not thoroughly evaluate two systems within a four week timeframe. The following chart summarizes the existing structure of the Francophone system.

The Francophone Educational System in Cameroon

School	Level	Class	Degree Earned Upon Completion
Primaire	Niveau 1	SIL = Section d’Initiation au Langage	CEP = Certificat d’Etude Primaire
		CP = Cours Préparatoire	
	Niveau 2	CE 1 = Cours Élémentaire 1	
		CE2 = Cours Élémentaire 2	
	Niveau 3	CM1 = Cours Moyen 1	
		CM2 = Cours Moyen 2	
Secondaire : Lycées et Collèges	1 ^{ère} Cycle	6 ^{ème}	BEPC = Brève d’Etudes du Première Cycle
		5 ^{ème}	
		4 ^{ème}	
		3 ^{ème}	
		2 ^{ème}	
	2 ^{ème} Cycle	1 ^{ère}	Probatoire
		Terminale	BAC = Baccalauréat

¹ Bill Atweh and Philip Clarkson, “Globalized Curriculum or Global Approach to Curriculum Reform in Mathematics Education,” *Asia Pacific Education Review* (2002): 160.

Even after fifty years of independence, the Cameroonian educational system remains almost an exact replica of the French system imported during the colonial era.²

Evolution of the Cameroonian Educational System

However, especially in recent years, there has been some progression of the educational system in Cameroon. For several decades there has been an emphasis on increasing the number of primary schools with the goal of establishing at least one school in every village.³ As a result of easier accessibility school attendance has increased. “Primary school enrollment has risen from 76% at the height of the economic crisis to 95% currently.”⁴ Unfortunately there has not been an increase in teachers to respond to the influx of students and student-teacher ratios are often very high. The prescribed limit is 60 students in a classroom, but even government officials recognize that does not always hold true.⁵ In reality primary school class sizes can be as large as 100 or more.⁶

Two other notable changes to the educational system have emerged since the turn of the 21st century. First, in the year 2000 President Paul Biya declared free access to public primary education.⁷ This mandate eliminated governmental fees, but did not completely eradicate the price of attending school. Parents are still responsible for the cost of books and other supplies, uniforms, transportation, food, and fees imposed by *l’APE: l’Association des parents d’élèves*.⁸ Despite the government’s best intentions, poverty remains a key obstacle in the fight for universal education.⁹ The second notable change came in 2004 when a set of decentralization laws were enacted. This distributed the powers and responsibilities of recruitment and staff management, school maintenance, and supply distribution to local and/or regional councils in hopes of streamlining these processes.¹⁰ Unfortunately, like “free” access to education, decentralization is another example of a well-intentioned idea that has resulted in little to no

² "Le Système Éducatif," *Accueil*, Ministère de l'Éducation Nationale, Web, 08 Apr. 2011.

³ Joseph Tsafak, interview held at the Ministry of Basic Education, Dschang, 07 Apr. 2011.

⁴ "Cameroon: Education," *Economist Intelligence Unit: Country ViewsWire*, published 13 November 2003, accessed online 28 February 2011.

⁵ Tsafak.

⁶ "Cameroon: Education."

⁷ Emmanuel Kendemeh, "Cameroon Strives for Universal Primary Education," *Cameroon Tribune*, (Yaoundé, Cameroon), published 25 February 2011, accessed online 28 February 2011.

⁸ L’APE is the equivalent of a Parent Teacher Association.

⁹ Daniel Mongue, interview held at the National Ministry of Basic Education, Yaoundé, 11 March 2011.

¹⁰ Kendemeh.

improvement in Cameroonian classrooms, and there is a great need to “encourage the transparency and accountability of money earmarked for education.”¹¹

Current Issues in Mathematics Education

As described above, the educational systems of developing countries such as Cameroon face a host of challenges. In the shadow of colonialism and at the frontier of globalization, it is imperative that these countries are assertive in creating an educational system that can produce individuals ready to help develop their country.¹² This means addressing problems with education as a whole, but there are two contemporary issues specifically dealing with primary level mathematics: the debate over content vs. contextual teaching, and the role of the international mathematics community.

The question of *content* based instruction as opposed to *context* based instruction is at the forefront of curriculum development today. Sahar Sauian Mohd offers a clear explanation of both ideas in his paper “Mathematics Education: the Relevance of “Contextual Teaching” in Developing Countries.”

*Content-based teaching is basically teaching according to the given syllabus or curriculum... the responsibility of the teacher is to deliver the whole curriculum with minimum modifications. On the other hand, contextual-based teaching is teaching through focusing on selected topics and resorting to environmental orientations. The teacher does not necessarily complete the whole syllabus but he has the flexibility in choosing relevant topics for his class.*¹³

Advocates of contextual based teaching argue that diversity in students’ cultural backgrounds requires modifications to the curriculum. For example, urban Chinese students well accustomed to a modern business environment will view mathematics very differently than rural Malaysian students who have never encountered a large scale capitalist economy.¹⁴ Conversely, supporters of content based teaching assert that students everywhere require an equal foundation in mathematics in order to compete in an ever globalizing world. The president of the African Mathematical Union “warned against the over-emphasis on culturally oriented curricula for

¹¹ Hewlett Foundation, “Quality Education in Developing Countries,” accessed online 05 April 2011.

¹² Tsafak.

¹³ Sahar Sauian Mohd, “Mathematics Education: The Relevance of “Contextual Teaching” in Developing Countries,” accessed online 05 April 2011.

¹⁴ Ibid.

developing countries” stating that this could hinder their development progress. He called for “a global minimum curriculum below which no continent should be allowed to drift, however under-developed.”¹⁵ In theory, both schools of thought have their merits and downfalls, but there is still a significant lack of research on what actually works in classrooms of developing countries.¹⁶ The debate between contextual or content based teaching will continue until there is more data to support one side or the other.

The second contemporary issue is the determination of the role of the international mathematics community. Interest has been expressed by developed countries to aid in the creation and modification of curriculum and pedagogy in other countries with less developed educational systems. However, this alleged partnership raises fears of a new form of neo-colonialism. Not all countries have the financial resources to contribute to an international collaboration and those with limited fiscal abilities may be more like to simply import ideas from other countries, “rather than to critically and empirically reflect on their appropriateness to their local context.”¹⁷ Therefore, an international collaboration poses the risk of simply continuing the domination of Anglo-European thinking which already dictates mathematical instruction throughout the globe.¹⁸ At the same time, the only way to escape the current reality is by engaging the international mathematics community so that other cultural perspectives can be integrated. In the upcoming years, the role of the international mathematics community will be better defined; hopefully with the goal of “transparent, reflective, and accountable” partnerships which “empower individual countries to be self-reliant rather than to increase their dependency on ideas from more developed nations.”¹⁹

The existing research that I found helped create a foundational understanding for me before I actually began collecting data in schools. In the process of searching for relevant papers it also became apparent that there is a great need for more studies on primary level mathematics instruction in developing countries because there simply is very little existing research. Obviously a four-week, undergraduate case study of two schools in Dschang does not completely fill the void, but ideally the work I have completed will be a starting place for understanding and, if necessary, eventually improving mathematics education in Cameroonian primary schools.

¹⁵ Atweh, 163.

¹⁶ Hewlett.

¹⁷ Atweh, 165.

¹⁸ Id, 162.

¹⁹ Id, 165.

Methodology

Throughout the project, all decisions made and changes applied sought to build and protect the authenticity of the data collected. A simultaneous effort was made to ensure the confidentiality of informants and prevent the research from having any negative impact on those involved. All participation was voluntary and informants were given the option of remaining anonymous if desired. Outside of being passively observed, primary school children were deliberately excluded from the research because they fall below the age of consent and could not be ethically asked to participate. With consideration for the validity of the data and the protection of the informants in mind, a variety of research methods were applied in order to examine primary level mathematics education within the context of Cameroon.

Determining the most beneficial methods of data collection came naturally after establishing the target and sample populations. In this case, the target population included teachers, students, and any other individuals directly involved with mathematics education in Cameroonian primary schools. The sample population, those who would actually provide information for the study, included primary school teachers and community members in Yaoundé, Ngaoundéré and Dschang; along with administrators, teachers, pre-service teachers,²⁰ and ministry of education officials. Data collection varied depending on the specific group of people, but methods included surveys, interviews, and participant observations.

Surveys and Interviews

The first of three groups to be surveyed was community members in Yaoundé, Ngaoundéré, and Dschang. The community questionnaire was intended to collect information about the perceived importance and usefulness of mathematics in the daily lives of Cameroonian adults.²¹ The reasoning being that if the general population does not see math as important or useful, then there is no reason to use time and money to teach math in primary schools. Collecting data in all three cities was a strategy to increase the size and geographic coverage of the sample population so that the data would be more representative of Cameroon as a whole; there was never any intention of doing a comparative study between Yaoundé, Ngaoundéré and Dschang. In each city, I collected data from random individuals whom I encountered during day

²⁰ The term “Pre-Service Teachers” refers to individuals currently training to become teachers. They have varying levels of background in both content and pedagogy, but are not yet qualified to teach.

²¹ To view the entire community survey see the appendix, page 39.

to day activities; many I simply approached in the street. Therefore the sample was random, but slightly skewed by convenience. Fortunately, the pool of informants had a range of educational backgrounds from primary school to master’s degrees, and a variety of professional occupations [Figure 1]. At least ten surveys were collected in each city for a total of 33 community respondents.

Professions of Community Informants

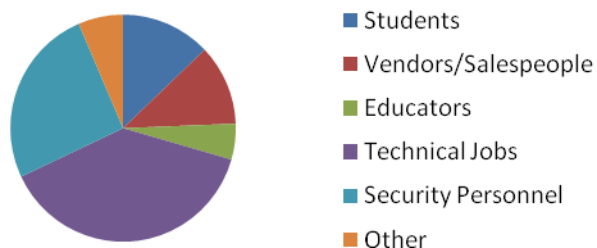


Figure 1: The distribution of community informants by profession.

The second group of surveys was designed specifically for primary school teachers. There is no question that teachers play an important role in mathematics instruction, and I hoped that collecting questionnaire data would allow me to extract the maximum amount of data with minimal interruption to the school day. The survey for in-service teachers was designed to provide information about the in-classroom realities of instruction, the history of teacher training, and the current state of continuing education for teachers.²² I collected data from a total of 38 teachers from four Cameroonian primary schools – a public school in Yaoundé, a public school in Ngaoundéré, a public school and a private Catholic school in Dschang.

Pre-service teachers made up the third group of survey respondents. I was personally interested in this demographic because I am a pre-service teacher, and I felt my own experiences in pre-service training would help me to competently analyze this part of the educational system. In order to speak with pre-service teachers I had hoped to gain access to the training school for nursery and primary school teachers in Dschang known as the *École Normale des Instituteurs de l’Enseignement Général, ENIEG*. I began with a protocol visit to the Ministry of Basic Education looking for contact information for the ENIEG. Unfortunately, the divisional delegate of Basic Education claimed that I needed authorization signed by the national minister of education before he could release this information to me. This requirement of authorization could not be verified by other officials, and has never been a problem for previous SIT students conducting educational research in Dschang. I was able to locate the ENIEG on my own, but when I arrived I discovered that the divisional delegate from the ministry had already been there and made it

²² To view the entire survey for in-service teachers see the appendix, page 38.

clear to the director of the ENIEG that he should not assist me with my research. In order to avoid negative consequences for the director of the ENIEG, I decided not to visit the training school to interview pre-service teachers. I was able to indirectly collect survey data from pre-service teachers because I did not personally enter the campus.²³ Although my research was impacted by my lack of interaction with pre-service teachers, the results of the questionnaires did provide valuable information on the current state of teacher education.

The data gathered from community, in-service and pre-service teacher questionnaires was supplemented by semi-formal and informal interviews in Dschang. I was able to speak in depth with a ministry of education official other than the divisional delegate about the governmental role in mathematics education. I also interviewed the directors at the two schools where I observed. These three interviews were all semi-formal and very informational. My interviews with teachers were almost entirely informal. Teachers were not interested in arriving early or staying late to talk with me, and I did not feel comfortable asking them to leave class for interviews – although I believe that many of them would have been willing to do so. Instead I would ask one or two questions whenever there was a quiet moment in the school day. This process took longer, but was equally as helpful in the end. Overall, the data I collected from surveys and interviews played a central role in my research.

Participant Observations

Besides questionnaires and interviews, participant observation was the third research method applied in this study. I chose to observe in one private school and one public school in Dschang with the goal of sitting in on math lessons at a minimum of three grade levels. Actual time spent in the classroom allowed me to observe methods of instruction and mathematics content; these realities could then be compared with information from surveys and interviews. Sitting in the school also allowed me to draw conclusions about the general attitude towards math, and to note any environmental factors that could be impacting instruction.

For the first week of observations, I selected St. Albert Catholic School mainly because it was the only private school I found in Dschang using the francophone system. Although I reserved a full week for observations at St. Albert, due to school vacations and inspections I was only able to spend three days there. Fortunately, the school principal intervened on my behalf by

²³ To view the entire survey for pre-service teachers see the appendix, page 37.

asking teachers to reserve math instruction until I arrived in their classrooms. In three days I was able to observe math in every single classroom at St. Albert Catholic School, for a total of thirteen lessons at all six grade levels – well above my expectations. However, with such limited time I was not able to teach my own lesson at the private school.

The following week I spent time observing and teaching at a public school in Dschang. My access to this school was again impacted by school holidays and an approaching examination week, but I was able to observe for three days. In that amount of time, I saw math lessons at all but one grade level. On the fourth day, the time for the sixth observation was traded for the opportunity to teach an original math lesson. My research benefitted greatly from the time I spent in this school, and all of the staff there were extremely helpful. However, I have chosen not to reveal the identity of the public school, the director, or any of the teachers in order to prevent any potential conflict with the divisional delegate at the ministry. Although I was never explicitly told I could not enter the public school and I believe I took all reasonable measures of gaining approval for a small scale research project, it can be assumed that the ministry official would not have supported the continuation of my study in a school under his jurisdiction.

Data Analysis

Surveys, interviews, and participant observations generated a large amount of raw data and an organized system was put in place for storage and analysis. Each survey was given a unique numeric code and the responses were entered verbatim into an excel database. Then the responses were color-coded and grouped based on similar themes such as: the importance of mathematics, motivation for teaching, and examples of math in daily life. Interviews, both formal and informal, were transcribed and coded in a similar fashion to survey data using the excel program. Data from participant observations was mainly in the form of field notes. Key information was highlighted and copied into excel where it was also coded based on themes. Although some notes, such as classroom sketches and maps, were simply left in the work journal and the pages referenced in the database. The coding system allowed for the natural integration of survey data, interview responses, and participant observation field notes. With data collection complete and a successful system of analysis in place, my focus shifted to the confirmation or refutation of the three hypotheses.

The Perceived Importance of Mathematics Education

My first hypothesis stated that if mathematics was perceived as important by the general community, then the same sentiment would exist in the school environment. If the data collected revealed that mathematics was not perceived as important in either the general or school community, then this perception could impact the value of quality mathematics instruction for teachers and students. Therefore, it was important to establish the perceived importance of mathematics education before proceeding onto further research. In order to validate this hypothesis I used surveys and interviews to examine the perceived importance of mathematics in both the general community and the educational community.

In the General Community

The first clause of the hypothesis deals with the community's perception of the importance of mathematics, where community refers to the general adult population of Cameroon. I divided this into three specific research questions. First, does the community see mathematics as an important subject for primary school students? Second, does the community see mathematics as important in everyday life? Lastly, does the community see mathematics as useful in everyday life? I specifically separated 'important' and 'useful' in daily life so that I could more accurately analyze the data during analysis. The answers to these three research questions came from the community survey which was distributed to a total of thirty three Cameroonian adults in Yaoundé, Ngaoundéré, and Dschang.

The first method of establishing the perceived importance of mathematics for primary school students was asking a direct opinion question. One hundred percent of respondents said that yes, mathematics is important for primary school students. When asked to explain why, several people stated that having a strong foundation in mathematics is important so that students are able to succeed in later studies or in life after school. One person wrote "*...to help teach the children calculations, for there is nothing without calculations.*" Still others simply explained that without math children would not be able to buy beignets or candy after school. Whatever the reasoning, the overwhelming perception of the community was that math is important for primary school students.

However, the danger of asking a direct question like this one is that there could be a perceived right answer. In order to combat this potential problem I used an indirect question to

cross-check the responses. If the community truly did consider mathematics as important, then the responses to the direct question would be reinforced by the quantitative data generated by a comparative importance ranking.

In the indirect question, respondents were asked to rank six basic school subjects in order of importance for primary students. Sixty-nine percent of respondents placed math as second or third in importance. It was most often out placed by languages and/or practical activities.²⁴ When asked to explain further, most people said that a child's need to communicate or to contribute to the daily life of the family were more important than mathematics. However, math frequently ranked higher than history, science, and geography which were seen as less applicable to daily life and more important for students in secondary rather than primary school. This data combined with the responses to the direct question led to the conclusion that the general community does see mathematics as important for primary school students.

The second research question asked whether or not the general community sees mathematics as important in daily life. When directly asked, 94% of respondents said yes, math is important in daily life. One person chose not to respond and one said math was not important in daily life; however he orally explained that he did not consider basic arithmetic used for making purchases or taking measurements as part of mathematics and this perspective may have influenced his answer. Accordingly, the most common explanation of importance related to simple math required for buying or selling items. One respondent wrote, "*Juste si tu quittes le matin pour partir au marché, tu fais le calcul.*"²⁵ A few individuals said math was important in order to understand larger concepts such as business, the world economy, and good governance. For a variety of motivations, the data from respondents suggests that the general community sees math as important in daily life.

The last research question asked if mathematics was useful; in order to determine this, I asked survey respondents if they used math in daily life, and if so to provide examples. Ninety-four percent of informants said they personally used math in daily life, especially in their jobs. Fourteen people used math in their business – making change, conducting inventories, paying workers, or calculating profits. Other examples included a tailor who used math to take measurements and calculate the amount of fabric required for a garment, a farmer who needed

²⁴ Practical activities include lessons on basic personal hygiene, simple cooking, and other household tasks.

²⁵ Translation: "Even if you just leave in the morning to go to the market, you do simple math."

math to determine the proper dimensions for a new field in order to maintain the correct distance between crops, an accountant who used math for financial analysis, and a professor who relied on mathematical statistics in his research. From these responses it is clear that mathematics is useful in the daily lives of many people.

The results of the community survey clearly state that mathematics is not only viewed as important for primary school students, but also as important and useful in daily life. From this data it can therefore be concluded that overall the general community does perceive mathematics to be important. However, that is only the first half of the hypothesis. The other half states that if, as shown previously, math is perceived as important by the general community, then the same sentiment will exist within the school environment. In order to assess the perceived importance of math within the educational community I used surveys for pre-service and in-service teachers, supplemented by interviews with primary school teachers, primary school directors, and an official at the Divisional Delegation of Basic Education.

In the Educational Community

Within the educational community I wanted to know if mathematics was perceived as important at various levels of administration. I knew that if mathematics was not perceived as important by those in charge of creating and assessing curriculum, this could have a trickle-down effect on other members of the school environment. At the same time, if mathematics was not perceived as important by school directors or teachers, they would have little motivation to ensure the prescribed curriculum was delivered effectively. In order to assess the educational community's perception of the importance of mathematics I began at the top, with the ministry of basic education and continued down the chain of command until I arrived in the classroom.

To determine the government's perception of the importance of mathematics, I started with a review of government curriculum. All Cameroonian primary schools, public or private, are required to follow the national curriculum;²⁶ the prescribed content for each of the three primary levels is contained in a series of curriculum guides known as the "*Horaires et Programmes*."²⁷ The guide designates an hour to an hour and a half each day which should be

²⁶ Tsafak.

²⁷ Translation: "Schedules and Programs."

devoted to mathematics instruction or practice.²⁸ Out of a six hour school day that is a significant amount of time. The guide also describes the content and pedagogy of a well-prepared mathematics lesson. For each topic, teachers should move from a review of pre-requisite knowledge to a phase of discovery and investigation. Then there should be a period of guided analysis and formulation of key understanding. Finally, time for application of the new skill in a problem setting. This general format should guide teachers in instructing the five key areas of mathematics content: problem solving, numeration, operations, measures, and geometry.²⁹ In both content and pedagogy, the Cameroonian national curriculum is aligned with international standards for primary level mathematics education.³⁰ This indicates that the government of Cameroon has not taken shortcuts in regards to the national mathematics curriculum, which might have been the case if mathematics was not perceived as important.

In order to further support the idea that the government sees mathematics as important, I also interviewed an official at the Delegation of Basic Education in Dschang. I wanted to determine if the government was taking any active steps to promote mathematics content or pedagogy in primary schools. However, when I began inquiring specifically about mathematics I repeatedly received no response because “...au primaire il n’y a pas de spécialisations.”³¹ As a result, the government does not take any measures to ensure that teachers are trained specifically in mathematics or to measure the quality of mathematics instruction. However, the official did explain that in public schools over which the ministry has jurisdiction, there are inspectors and examinations several times each year to ensure that the curriculum as a whole is being taught appropriately.³² After a long conversation, I came to the conclusion that the government does see mathematics as important, just not any more important than any of the other primary school subjects.

After determining the relative importance of mathematics to the Cameroonian government, I needed to determine whether or not this position continued down the administrative chain to school directors. This was accomplished through interviews with the

²⁸ Ministère de l’Éducation du Base, *Horaires et Programmes*, accessed at the Arrondissement d’Inspection de l’Éducation du Base Dschang, 18 April 2011.

²⁹ Ibid.

³⁰ Institute of Education Sciences, “Trends in International Mathematics and Science Study (TIMSS),” *National Center for Education Statistics*, Web, 25 Apr. 2011.

³¹ Translation: “In primary school, there are no specializations.”

³² Tsafak.

directors at both the public and private school where I conducted observations. In both cases, I received similar responses about the lack of specialization in primary school. The public school director did not mention any training or evaluation specifically in mathematics for students or teachers.³³ However, the private school director did state that because math is a difficult subject for students to understand, it is always included in continuing education classes for teachers.³⁴ In summary, school directors did not express math to be a high priority, but echoed the ministry official's position that mathematics is equally important to all other primary school subjects. Finally, I turned to those directly involved in mathematics instruction: teachers. Similar to the community survey, pre-service and in-service teachers were asked to rank the comparative importance of six primary school subjects. As shown in Figure 2, 75% of primary school teachers ranked math as

number two in importance. Ninety-four percent ranked math as number two or three. Pre-Service teachers felt the same way and 62% ranked math as first or second in importance.

Among both samples, it was most often out placed

by languages, because teachers reasoned that you cannot teach math until students can speak, listen, read, and write. When asked to elaborate in an interview one teacher told me that math is important because it is a very practical subject, one that students can use every day, even outside the classroom.³⁵ In comparison to the somewhat vague position on mathematics by both the ministry official and the school directors, those actually teaching mathematics clearly revealed that it is an important subject.

At this point, the only place left was the actual classroom itself. If, as I had been told by the ministry official, school directors, and teachers themselves, mathematics was an important subject, then that should be reflected in the amount of time used for teaching math in primary

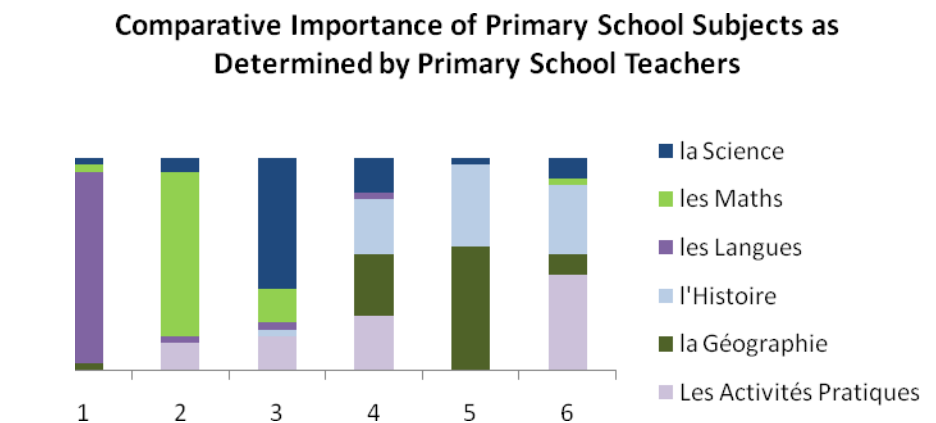


Figure 2: Subjects ranked from 1-6, with 1 being the most important.

³³ Anonymous, Public School Director, Interview held in Dschang, 20 April 2011.

³⁴ Collette Koumo, Private School Director, Interview held at St. Albert Catholic School, Dschang, 14 April 2011.

³⁵ Ephrasie Dounking, Interview held at St. Albert Catholic School, Dschang, 14 April 2011.

schools. According to the national curriculum, an hour to an hour and a half should be devoted towards mathematics instruction each day. This is approximately 20% of the school day, and 30% of actual instruction time. When primary school teachers were asked to estimate what percentage of their teaching was consumed by mathematics, many teachers revealed they actually use more than the required number of hours for mathematics [Figure 3]. The most common explanation was that math is one of the hardest subjects to teach and therefore it simply requires more time. Another possible explanation is that math often overlaps with other subjects—ex: systems of measurement used in science.

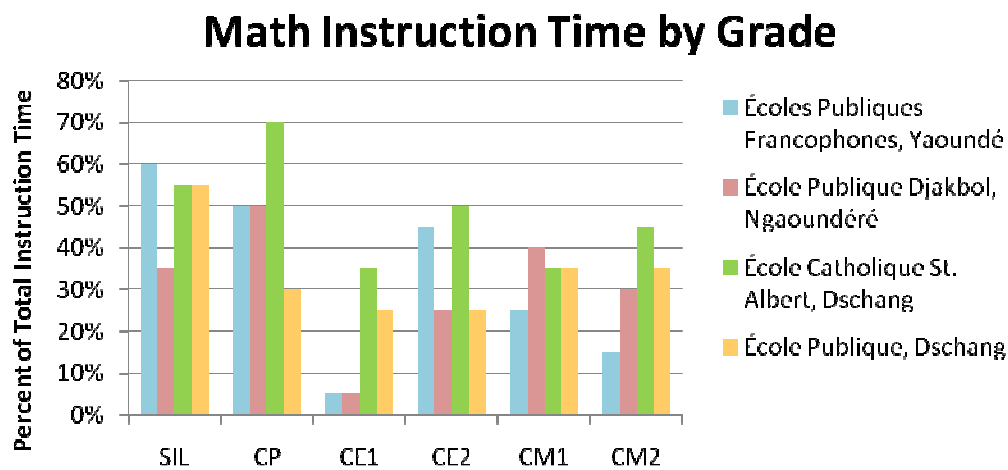


Figure 3: A graph depicting the average amount of time spent on mathematics instruction at each grade level.

If, in general, teachers are using more than the prescribed amount of time to teach mathematics, there is a consequent loss of time in other areas.³⁶ Although this raises questions about the value of a nationally mandated schedule for the school day, the willingness of most teachers to make this sacrifice further indicates that mathematics is perceived as important by the educational community.

After reviewing the educational community from the ministry down to the classroom, the data suggests that within the school environment mathematics is perceived as important. Although administrative figures hesitate to place math as a higher priority than other school subjects, teachers not only rank mathematics as one of the most important, they also reflect that importance in how they manage their instructional time during the school day. This is the same

³⁶ Note: three responses fall below the recommended amount of time for mathematics; however it is important to remember that this data was an estimate subjective to each teacher’s opinion and these outlying values should not skew the data as a whole.

sentiment as the importance of mathematics expressed by the general community; thus validating the first hypothesis.

The Realities of Mathematics Education in Primary School Classrooms

After establishing the perceived importance of mathematics, I moved to studying the realities of math instruction. I had already determined that the general population perceived mathematics as important, and I wanted to determine whether or not that translated into high quality instruction. I hypothesized that mathematics instruction would be impacted by the type of school – public versus private – where it took place. This initial assumption was based on what I had heard from Cameroonians in general, and reports of earlier research in schools.

In order to comparatively analyze mathematics instruction in public and private schools, I looked for differences in three specific areas: environment, content and pedagogy. Content addresses the prescription and substance of mathematics curriculum, the resources used for instruction, and the process of accountability for content. Environment looks at how other factors such as student-teacher ratios and physical surroundings might impact mathematics instruction. Pedagogy analyzes the role of the teacher and his or her methods in mathematics instruction. I used two primary schools in Dschang as a case study. The time I spent at both schools included observing in classrooms, interviewing teachers, and interviewing directors.

Environment

St. Albert Catholic School is located very close to central Dschang. It is one of several private schools serving the area, but may be the only private school where the francophone system is available.³⁷ Mme. Collette Koumo is the director of Group 1 which includes 793 students split into 13 classrooms – two sections of each grade level with the exception of SIL which has three sections this year due to an increase in student population.³⁸ To enter the school you pass through a large iron gate which is locked at the end of the day and on weekends. Upon entering there is a large central courtyard where the children gather in the morning to raise the Cameroonian flag and where they play during breaks. The courtyard is well kept, but unpaved; as a result dust is one of the main problems in keeping both the school and the students clean.

³⁷ St. Albert Catholic School Group One, where I observed, follows the francophone system; the school also has Group Two which uses the Anglophone system of education.

³⁸ Koumo.

The courtyard is completely surrounded by light yellow painted buildings which house the director's office and the classrooms. Each classroom has its own entrance directly into the courtyard.

All of the classrooms have cement floors and walls, with large blackboards at the front of each class. Many teachers also have a smaller side board hanging near their desk. In the back, paintings of Jesus or other religious figures represent the spiritual part of the school environment. In most classrooms there is no storage space for teachers, but this does not pose a problem as most teachers do not have manipulatives or other materials to store. Any supplementary resources belonging to the school are kept in the director's office. The classrooms have large windows high on the wall which provide adequate lighting; this is important because not all classrooms are electrified. However, in some classrooms the windows do not have screens or bars, and birds flying into the room can be distracting. The students sit on long benches with corresponding tabletop desks. In young classrooms students often sit six to eight per bench, but as children get older the average number decreases to four or five. The total number of students per class varies, but the average is approximately 60 students to one teacher.

Overall, the physical environment at St. Albert Catholic School is conducive to learning. Classrooms are cemented, well-lit, and furnished with desks appropriately sized for the students. Teachers have large blackboards which erase fairly well in most cases. In addition, the majority of students have the proper books and materials to actively participate in the lesson. Other than birds flying into classrooms, no environmental factors were observed to have a negative impact on instruction.

At first glance, the environment at the public school in Dschang is very different from that of St. Albert Catholic School. The school is located outside of town, in a residential neighborhood. There are 59 public schools in Dschang, and this is one of the smaller ones with only 444 students.³⁹ Both SIL and CP have two sections while the other four grades have only one, for a total of eight classrooms with approximately 60 students in each. Unlike St. Albert, the school campus is not enclosed. Instead it is bordered by a road in the front and fields of palm trees and raffia on the other three sides. Despite these superficial differences, the overall set up of the school and the general atmosphere is quite comparable to the private school.

³⁹ Tsafak.

The classrooms are separated into three buildings around the main courtyard. Each building was constructed by a different group – the local parent-teacher association, the African bank for Development, and the state of Cameroon – and the quality of each of the three segments varies accordingly. The youngest children, SIL, are housed in the first building which was constructed by the parents association. Classrooms are equipped with large chalkboards at the front, but the floors here are not cemented and the walls remain the dark bleak color of concrete. Unfortunately, the small windows do not provide strong lighting to most of the classroom. In addition, the benches are attached to the desks, and the distance between the seat and the writing surface is far too big for many of the young children. In these classrooms, poor lighting and improper desk size could have a negative impact on instruction, although both the students and the teacher seem to be well adapted to the realities of their classroom.

CP and CE1 classes are held in the building put up by the state. Here the walls are painted and the windows are larger so the lighting is much better, and light bulbs and wires indicate that the classroom is electrified, although I never saw it put to use. The floor is entirely cemented and includes a raised platform at the front of the class for the teacher. The problem of improperly sized desks continues here, but is less noticeable than in the youngest grades. Overall, the environment seems to have little to no impact, positive or negative, on these students.

The rest of the level two and level three students are in all in the building created by the African Development Bank. Here the floors are about 90% cemented and also include a raised area at the front of the class for the teacher. The lighting is much better; most likely a result of the large windows covering the majority of the two side walls. Each classroom also includes two built-in storage cabinets, although they do not appear to be storing much of anything. Interestingly, the desks in these classrooms are often too small for students and would be better served in CP or CE1 classes, but they are cemented to the floor and therefore cannot be traded for the larger desks in other classrooms.

Despite certain difficulties, the overall atmosphere at the public school is positive; the school is well kept and the students seem to take pride in keeping it clean. Improper desk size is the biggest potential problem, and was the most frequent complaint by teachers. However, students seem to have adjusted to the reality of their seats. Most students come to class equipped with the necessary materials, although the observed amount of students without books or slates

may be slightly higher here than at the private school. In general, the public school environment appears very conducive to learning.

Despite some differences, the overall environments of the public and private school are fairly similar. In terms of physical setting, only one specific building at the public school has really poor lighting and dirt floors; in terms of class size and resources, there is basically no difference. That is not to say that improvements in environment couldn't be made at both schools, but they may not be truly necessary because the teachers and students seem very well adapted to their surroundings. Although there are certain factors of the classroom setting which have the potential to influence mathematics, all of my observations indicate that the environment has little to no impact on classroom instruction in either the public or the private school.

Content

Early on in my investigation of content I discovered that the origin of mathematics curriculum is identical for both private and public schools, although the application may be different. The National Ministry of Basic Education has prescribed a national curriculum that all schools follow; although only public schools are regulated by regional and local ministry offices. In mathematics this includes problem solving, numeration, operations, measures, and geometry. All of the public schools which I observed used the series "*Réussir les Maths*" as their textbook.⁴⁰ St. Albert Catholic School used a different curriculum chosen by the regional diocese, but the topics covered were the same.

Accountability for teaching the curriculum for public schools comes from the ministry and the diocese for the Catholic school. Both administrative bodies use in-classroom inspectors to evaluate the effective delivery of content. In the private school, inspections occur once a month; in fact it was an inspection which prevented me from visiting the school for the fourth day.⁴¹ In the public schools, inspections should occur at least three times each year, but the ministry official told me "*C'est théorique, souvent il n'y a pas de l'argent pour ces promenés.*"⁴² He also explained that rather than observing actual instruction, inspectors often simply look over the teacher's lesson plans.⁴³ Although public and private schools have the same prescribed

⁴⁰ Translation: "Succeed in Math."

⁴¹ Koumo.

⁴² Translation: "It's theoretical, often there isn't the money for these visits."

⁴³ Tsafak.

curriculum, the system for accountability is stronger in the private school system. However, this does not by itself indicate that mathematics instruction is of better quality in private schools. After finding great similarity between the public and private school in terms of curriculum and accountability, I turned to classroom observations over a variety of grade levels and topics for more information about mathematics content.

At both the public school and the private school, I observed a lesson on a specific number in a SIL class. In the private school the students were learning about the number 14. The teacher began with a review of what they already knew about 13 using small pebbles, known as *cailloux*, as manipulatives. She then added one to each pile and had several students count aloud, discussing each time that the number had changed from 13 to 14. In conclusion, the students practiced writing the number 14 several times on their slates; the teacher moved through the class to supervise and physically guided the hands of struggling students. In the public school, it was the number 20 and the lesson was almost identical. Students began with a review of 19 before moving up to 20. Activities included individual students counting aloud, the class counting in unison, and students drawing 20 circles on their slates. However, the teacher was not able to finish the lesson before the morning break and students did not get to practice writing the numeral. Overall, I was surprised how few differences existed between the two lessons at two different schools.

At the second level, which includes CE1 and CE2, I observed math lessons on slightly different topics, but there were still many similarities. These students have advanced from simple skill-building to applied problems. I observed one class learning about the calendar using addition, subtraction, and multiplication to discuss the relationships between days, weeks, months, trimesters, and years. Another class was practicing the same math skills while exploring the connections between cost, profit, and loss. A third class used the same knowledge to calculate the area and perimeter of a farmer's fields. No matter the specific topic, each teacher began with a review of pre-requisite skills in mathematics necessary, and then followed with an application problem. The observations at level two supported the idea that there are few differences in content between public and private schools.

In all three CM1 lessons observed, (two at the private school, one at the public school), students were practicing multiplication with large numbers and fractions. The similarity of content might have been especially high during this part of the year, because the last week in

April is reserved for evaluations and all CM1 students are preparing to be tested. Not only were students at both schools learning the same content, but they all used the same algorithm for solving the problems. This was surprising to me because in the United States the use of multiple solution paths is highly emphasized in classrooms and many algorithms are taught. However, I recognize that this is my own cultural bias, and that does not mean that teaching a single process for multiplication is a better or worse strategy. In fact, the use of one algorithm actually appeared to be quite successful as the students had a consistent series of steps to follow for each problem. In the CM1 classes, the trend of high similarity between public and private schools continued.

Many other lessons were observed and they all supported the conclusion that there are little to no differences between public and private schools in terms of mathematical content. Not only does curriculum originate from the same National Ministry of Basic Education, but actual observations clearly illustrated that content is almost identical in the two settings. Combined with the fact that there are few differences in the environment, the similarity of content already generates considerable doubt about the validity of the hypothesis that mathematics instruction is impacted by the type of school where it takes place. The last area to comparatively evaluate between the public and private schools was pedagogy.

Pedagogy

Even with great similarities in environment and content, teachers have the power to completely alter the dynamic of a mathematics lesson; therefore a comparison of instruction would not be complete without an examination of pedagogy. Observations proved the most effective way to analyze pedagogy, and I took detailed field notes during all 18 lessons. Afterwards, I looked for trends within the data to determine what teaching strategies are used for primary level mathematics instruction, and if there were any significant differences between public and private school teachers. What emerged were four main methods of mathematics instruction: use of the *ardoise*,⁴⁴ direct instruction, whole class involvement, and individual student participation.

In both the public and private school, I did not observe a single lesson without the use of the *ardoise*, also known as a slate. Young students used the slate to practice writing numerals, or how to properly align the numbers in a two-digit addition problem. As they worked the teachers

⁴⁴ Translation: slate, or miniature chalkboard used by primary school students.

could circulate and correct individuals as needed. Older students used the slates to solve more intensive math problems; when children held the slates up in the air the teacher could see both the process and the final answer. Some teachers used the slate as a way to gauge the general comprehension of the whole class; others used the slates to give oral feedback to each individual student. The only problem which occasionally arose was that not all students had a slate or chalk. Many teachers had extra chalk or students borrowed from each other; some classrooms even had extra slates, if not students simply wrote on their desks. In both the private and public school, the slate is an excellent resource for mathematics education because the questions and skills can change while the medium for giving the response remains the same.

Before students can begin solving problems on their slates, the teacher needs to provide some content; most often this occurred through direct instruction. This involves the teacher explicitly giving new information or reviewing what has already been learned, while students simply listen and follow along. Because my observations came near the end of the year, and especially close to examination week, most of the lessons I saw were primarily revision with a small extension added at the end. This helps to explain why only four teachers began with a whole class example problem; all the rest simply started by giving a problem for students to solve. However, in every class except SIL at both schools, teachers were observed resolving or reviewing a problem after the students had had a chance to solve it independently. During periods of direct instruction, public school teachers often asked children to flip over their boards as a way to prevent them from being distracted by their own work. This particular method was not observed at the private school, but teachers had other ways of controlling student attention such as asking them to cross their arms or hold their ears. These tiny variations in method are insignificant in comparison to the overall pedagogical trend of direct instruction which was used in both the public and private school.

When the teacher was not providing direct instruction, the most common occurrence was whole class involvement in some type of activity. This occurred regardless of the type of school in several ways. Sixty-seven percent of classes involved all the students speaking in unison, usually this meant reading a contextual problem or counting aloud. One hundred percent of classes included periods of student work time for the whole class, whether that meant copying numbers from the board or solving problems on the slate. All grades CP and higher concluded with a written summary and a portion of time was committed to allow each student to copy the

summary into his or her notebook. These whole class activities occupied the majority of time in the lessons observed, and practically no pedagogical differences were noted between the public and private school in terms of group instruction.

Although whole group activities dominated class time, in all 18 lessons there was at least one instance of an individual student doing some type of demonstration for the class. In 82% of lessons observed, at least one student was called to write or solve on the board. This is a good way for students to learn from each other, one of Mohd's characteristics of a great lesson, as they watch a peer go through all the steps necessary to arrive at the final answer.⁴⁵ Other observed examples of individual student participation included students reading a problem aloud to the class, students counting manipulatives as the class followed along, and students orally explaining how to solve a problem. Engaging individual students is a key component of well-rounded pedagogy, but cannot be used too often for fear of losing the attention of other students – especially in classrooms where the student: teacher ratio is so high. Based on my observations, individual participation was used effectively in both the public and private school environments.

In summary, the data taken from observations indicates that there are no important differences in mathematics pedagogy between public and private schools. There was some diversity in pedagogical style between individual teachers, but overall the same four methods of instruction appeared time and again. These findings correspond with previous information about the other areas of comparison between public and private schools. To put it briefly, I did not find significant differences in environment, content, or pedagogy; therefore it can be concluded that mathematics instruction is not impacted by the type of school where it takes place, thus nullifying the second hypothesis. At this point, my attention shifted to the third hypothesis examining the current state of teacher education.

The Current State of Teacher Education

Lydia Eveny'a Luma, an educational psychology professor with a master's degree in education, once wrote "good teaching implies good training."⁴⁶ Meaning that in order to teach something, the teacher must understand the material him or herself. Therefore, systems have been put in place to prepare individuals who have decided to become educators. The question

⁴⁵ Mohd.

⁴⁶ Lydia Eveny'a Luma, *The Education of African Teachers*, Cameroon, SOPECAM (1983): 174.

becomes does this pre-service training adequately equip teachers to provide mathematics instruction. In my third and final hypothesis, I predicted that there is little emphasis on providing training specifically in mathematics content or pedagogy for primary school teachers. This meant examining the current state of both pre-service training and training for in-service teachers, also known as continuing education.

The Need for Competence

In Cameroon, pre-service training takes place at the ENIEG. Once an individual has earned a *Certificat d'Aptitude Professionnelle d'Instituteur de l'Enseignement General*⁴⁷ from the ENIEG, he or she is qualified to teach in any Cameroonian primary school.⁴⁸ Although teachers all leave with the same degree, that does not necessarily mean they will be of equal quality as teachers. Consider the following comparison of three teachers who are all in their first year of classroom service after completing training at the ENIEG; names and identifying features have been removed for anonymity.

The first teacher had a very clear lesson objective and used mostly direct instruction. Throughout the lesson this teacher relied on notes prepared before class including example problems and a final summary. Although there were few opportunities for students to work independently or to actively explore the concepts presented, with the help of well written lesson notes this teacher competently covered the necessary material to meet the lesson objective. Even with room for improvement, the overall goal of the lesson was accomplished and can be considered a success.

The second teacher lacked a clear lesson objective from the beginning, and seemed less prepared. A lot of class time was spent with the students unengaged as the teacher wrote problems on the board, something that could have been done before class. Throughout instruction students were observed playing, fighting, talking, and otherwise not paying attention, but the teacher did not take any action to regain their focus. As a result of several factors, this lesson was less successful than the first.

The third teacher had a calm, confident, attitude which transferred to the students. The lesson was well organized from a review of pre-requisite material, an introduction of a new

⁴⁷ Translation: Certificate of Professional Aptitude for General Education Teachers.

⁴⁸ Tsafak.

concept, and several example problems. Throughout the class the teacher did not stay at the front of the room, but circulated between the desks giving correction and praise to individual students. What these three teachers illustrate is that even after earning a degree from the ENIEG, not all teachers are equally trained in mathematics instruction. So what makes the difference? In order to gain a better understanding of what skills are required to teach math in a Cameroonian primary school, I took advantage of the opportunity to instruct my own lesson.

Before entering the classroom, I spent a lot of time preparing to teach. In order to have control over the material and because I am not certified in Cameroon, I choose to create an original lesson as opposed to teaching one from the school curriculum. The lesson I created was a review of geometric characteristics of several shapes in the form of a simple game. I chose a game because I wanted to expose the students to a different format of teaching than what I had observed; I also created a simple paper manipulative for each student to make the game more interactive. I prepared a lesson plan which included objectives, scripting, a sketch of the chalkboard, possible extensions, and adaptations.⁴⁹ The lesson plan was reviewed by my academic advisor, who is also a teacher, to ensure that the material would be appropriate for the grade level and that everything had been clearly translated into French. I studied related French vocabulary for general classroom management and specific to geometry so that I would not need to look up words during the lesson. I also spent two days observing in the classroom where I would teach so that the students would be more accustomed to me. By the time I stepped up to the chalkboard I felt well prepared.

Overall, the lesson went well, but in the process I learned about two key skills necessary to successfully teach a mathematics lesson in a Cameroonian primary school. The first thing I noticed was the need for competence. Kids will always ask questions that were not anticipated beforehand, and they expect the teacher to have the answer. Without a level of mathematical competence above what is required to count or add, teachers cannot always properly respond to these questions. This can result in a lesser rapport with students, and also be damaging to the confidence of the teacher.⁵⁰ On the other hand, a high level of competence allows teachers to rise to the occasion when a mathematical discussion demands it. This not only increases the

⁴⁹ To view the complete lesson plan see the appendix, page 41.

⁵⁰ Luma, 276.

confidence of the teacher, but can also encourage students to continue asking critical thinking questions.

The other notable skill was flexibility. After all of my preparation I had to make several changes to the lesson while I was teaching because the directions were not clear enough or students did not understand. The ability to instantaneously adapt a lesson requires flexibility which also comes from a high level of competence in the subject. Teachers who only know what they have written in their notes cannot easily find another way to explain the concept if students do not understand. Based on my experience, competence is a key skill for teachers of mathematics; this is why it was important for me to investigate the current state of teacher training to determine if opportunities exist to competently prepare teachers in mathematics content and pedagogy.

Pre-Service Training

As mentioned above, it is the CAPIEG degree from the ENIEG that qualifies someone to teach in Cameroonian primary schools.⁵¹ Ideally, this means that all ENIEG graduates are competent enough to teach primary subjects, including mathematics. However, the case study of the three first year teachers demonstrates that the ENIEG is not equally preparing all teachers. In fact, as part of the pre-service teacher survey some respondents admitted they did not feel they had received a satisfactory training in order to prepare them for mathematics instruction. One said it was because the formation of teachers was too short and tried to encompass too much material at once. Another said the material taught was not applicable to actual primary school classrooms. Other pre-service teachers said they do feel prepared to teach math, but often cited classes from high school or their own personal interest as the source of their preparation rather than the ENIEG. In addition, surveys revealed that 53% of in-service teachers did not receive training in mathematics at the ENIEG, but that their most recent course in mathematics occurred in another venue; 29% had not taken math since high school, 16% since primary school. Teachers teaching primary school math, based on math they learned in primary school; is primary school really where pre-service teacher training should take place?

This data should not undermine the role of the ENIEG in preparing teachers for the classroom; this institution is not centered on mathematics instruction and that should not be its

⁵¹ Tsafak.

main focus. However, the data collected from pre-service teachers said they do not all feel prepared to teach mathematics, and the ENIEG is one possible solution because it is an existing institution already prepared to train this demographic. Additional courses in mathematics content or pedagogy could be added to requirements or simply offered as an elective. I am certainly not qualified to critique the system of pre-service training in Cameroon, but the data that I collected from pre-service teachers suggests that at the present time there are limited opportunities for teacher education specifically in math. The data further indicates that a review and perhaps revision of the ENIEG could be an important step in the on-going effort to improve the country's educational system.

In-Service Training

While it is important to look at pre-service training, there is also a need for continuing education to impact teachers already serving in the classroom. In interviews with primary school teachers, several told me that math was one of the hardest subjects in terms of pedagogy because students are all at different levels.⁵² A few other teachers told me they enjoyed teaching mathematics; often because it had been their favorite subject in school and it continues to be an area where they feel competent.⁵³ To be clear, the need for in-service teacher education is not to say that there aren't lots of great teachers already doing their jobs well. Continuing education is intended to help both students and teachers by increasing the teacher's ability in terms of both mathematics content and pedagogy.

However, opportunities for in-service training are limited. In the public schools, *les journées pédagogiques*⁵⁴ are led once a year by state inspectors⁵⁵ and do not necessarily include training in mathematics.⁵⁵ The diocese in charge of regulating teacher formation for the Catholic schools holds in-service days several times a year; they are led by instructors from the ENIEG and always include mathematics.⁵⁶ Unfortunately, I was unable to observe an in-service day or obtain continuing education materials so I cannot draw any conclusions about the content of teacher training, but the fact that at most teachers only receive a few hours of mathematics each year indicates that there is room for improvement.

⁵² Jacquie Akafak, interview held at St. Albert Catholic School, 13 April 2011.

⁵³ Anonymous, SIL Teacher, interview held at a public school in Dschang, 14 April 2011.

⁵⁴ Translation: Pedagogy Days, also known as professional development or in-service days.

⁵⁵ Anonymous, Public School Director, interview held in Dschang, 20 April 2011.

⁵⁶ Koumo.

Besides helping teachers become more competent in mathematics, in-service teacher education is an ideal venue for distributing new and innovative methods in pedagogy. Logically, without this link to teachers who are already in place, new ideas do not come into fruition until existing teachers are gradually replaced by a younger generation. This process takes much longer and by the time new methods of pedagogy arrive in the classroom, they are already outdated. When asked why they chose education as a career, ten teachers specifically said they wanted to teach the children who will become tomorrow's leaders because they will help develop Cameroon. But if there is no system for current ideas in education to efficiently reach existing teachers, won't the Cameroonian educational system continue to graduate students at a disadvantage in an ever-modernizing world? By this reasoning, an improved system of teacher education would not only increase the competence of teachers today, but could have positive consequences for the educational system in general.

In summary, the data collected confirmed the third hypothesis that there is little to no emphasis on providing training specifically in mathematics content or pedagogy for primary school teachers. Training at the ENIEG and some continuing education exists, but many teachers rely on what they learned during their own education, even if they have not taken a math class since primary school. Some openly admit that they do not feel adequately prepared to teach mathematics. However, there is a saying among Cameroonian teachers that education is more than just a simple profession. Even in the limited amount of time I spent in schools, I encountered dozens of teachers dedicated to their jobs regardless of their background in mathematics. They care about the students in their class, they work hard, and make the most of the resources they do have. One teacher told me that since the school does not have manipulatives for mathematics, she searches for materials at the market to fabricate her own.⁵⁷ Another teacher described how he stays after class three days a week to go over mathematics lessons with struggling students, and sometimes parents come for help too.⁵⁸ These and many other examples illustrate that even with the current state of teacher education Cameroonian teachers are not failing, not by any means.

⁵⁷ Akafak.

⁵⁸ Norbert Mekontchou, interview held at St. Albert Catholic School, 13 April 2011.

Conclusion

At the conclusion of the four week study, not only do I have a much greater general understanding of mathematics education in Cameroon, but all three hypothesis have been specifically addressed. It has been determined that the perception of both the general and educational communities is that mathematics is important. The prescribed content and pedagogy reflect this perception, and in many ways mathematics education is unaffected by the type of school – public vs. private – where it takes place. The mathematical competence of the teacher has a much greater impact on the quality of instruction. Unfortunately, there is little emphasis on providing specific training in mathematics content or pedagogy for primary school teachers.

Although the initial questions have been answered, several new issues were raised during the study that could be addressed with future research. Most notably, the concerns about the adequacy of pre-service teacher training and continuing education; if teachers themselves admit that they do not feel they have received adequate training what can be done to ameliorate the situation in a cost effective and time efficient way? Another issue that was raised by observations in classrooms was the effect of bullying on primary school children. Is bullying a significant problem, and if so are schools doing anything to protect the safety and security of their students? As noted during the review of existing literature, there is a general lack of serious research on educational programs in developing countries. Therefore, whether future researchers choose the questions raised above or others, the hope is that more and more information will be collected with the goal of understanding and improving education in Cameroon, in sub-Saharan Africa, in developing countries, and around the world.

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Appendix

List of Contacts
Pre-Service Teacher Survey
In-Service Teacher Survey
Community Survey
Interview Questions
Lesson Plan

List of Contacts

M. Joseph Tsafak – 77.78.30.02

Civil Servant at the Ministère de l'Éducation de Base, Dschang (Francophone)

Monsieur Tsafak was one of my first contacts, and of all the Ministry officials he was by far the most helpful. In several extended conversations, he provided me with more information than I could use. He was a teacher before coming to work at the Ministry and is extremely knowledgeable about the Cameroonian educational system.

M. Albert Etienne Temkeng – 33.45.11.46

Directeur de l'ENIEG, Dschang (Francophone, but also speaks moderate English.)

Monsieur Temkeng was very interested in helping with my research, and even offered advice on how to work with the Ministry of Education. He provided me with information about the teacher training schools, and the educational system in general.

Mme. Colette Koumo – 77.74.22.13 / 95.79.66.78

Directrice de l'École Catholique St. Albert Groupe 1, Dschang (Francophone)

Madame Koumo is the principal at St. Albert Catholic School which is located just down the road from Café UCCAO in Dschang. She was extremely helpful during my project, from distributing surveys to all of the teachers to rearranging the daily schedule so that I could see as many math lessons as possible in a short amount of time.

Mme. Collette Kemfack – 74.83.11.70

Université de Dschang (Francophone)

Madame Collette often works in partnership with SIT when the program is based in Dschang and she greatly appreciates when students return to see her during the independent study period. She is a great reference for general questions and can connect you to university resources or professors if needed.

L'Alliance Franco-Camerounaise, Dschang

Although not an actual contact, the Alliance was an important part of my independent study. I negotiated a one month membership which included use of the Alliance library, two hours of daily internet, and access to a quiet place to work. There is also a restaurant next door which has excellent Ndolé. I would highly recommend the Alliance as a place to do research and/or work on the actual writing of the ISP.

Pre-Service Teacher Survey

Bonjour, je m'appelle Rachel Elzinga et je suis étudiante américaine au Cameroun. Je fais des études sur l'enseignement mathématiques au primaire. Je vous remercie de m'aider avec ce questionnaire. Votre aide est volontaire ; vous pouvez arrêter de participer à n'importe quel moment et vous êtes aussi libres de refuser de participer. Je respecterai votre anonymat si vous le désirez. Si vous avez des questions, posez les-moi.

S'il vous plaît, répondez aux questions ci-dessous. Si vous avez besoin de plus d'espace, utilisez le recto du papier. Merci beaucoup pour votre aide et votre temps consacré.

Sexe:

Masculin Féminine

Votre diplôme le plus élevé:

Décrivez votre motivation pour être un enseignant.

Selon vous, donnez l'ordre d'importance des sujets suivants. (1 est le plus important et 6 est le moins important)

_____ les Activités _____ la Géographie _____ l'Histoire
Pratiques

_____ les Langues _____ les Maths _____ la Science

Encerlez tous les sujets de mathématiques que vous avez étudiés.

Arithmétique Mesures Statistiques
Algèbre Calculs Mathématiques Appliquées
Géométrie Trigonométrie Autre : _____

Quand avez-vous pris votre cours de mathématiques le plus récent ? (Encerlez la bonne réponse)

Au Primaire Au lycée À l'université ENS Autre : _____

Pensez-vous que vous avez reçu une bonne formation et des connaissances nécessaires pour enseigner les maths ? Pourquoi ou pourquoi pas?

Selon vous, quel est l'obstacle le plus grand pour les enseignants au primaire ?

Optionnelle : Écrivez votre contact seulement si vous voulez m'aider au cas où j'ai d'autres questions.

Nom : _____ Téléphone : _____

In-Service Teacher Survey

<p>Bonjour, je m'appelle Rachel Elzinga et je suis étudiante américaine au Cameroun. Je fais des études sur l'enseignement mathématiques au primaire. Je vous remercie de m'aider avec ce questionnaire. Votre aide est volontaire ; vous pouvez arrêter de participer à n'importe quel moment et vous êtes aussi libres de refuser de participer. Je respecterai votre anonymat si vous le désirez. Si vous avez des questions, posez les-moi.</p> <p>S'il vous plaît, répondez aux questions ci-dessous. Si vous avez besoin de plus d'espace, utilisez le recto du papier. Merci beaucoup pour votre aide et votre temps consacré.</p>		
L'école ou vous enseignez:		
Niveau de votre classe:		Année(s) d'expérience au primaire:
Sexe: Masculin Féminine	Votre diplôme la plus élevé:	
Décrivez votre motivation pour être un enseignant.		
Encerclez tous les sujets de mathématiques que vous avez étudiés.		
Arithmétique	Mesures	Statistiques
Algèbre	Calculs	Mathématiques Appliquées
Géométrie	Trigonométrie	Autre : _____
Quand avez-vous pris votre cours de mathématiques le plus récent ? (Encerclez la bonne réponse)		
Au Primaire	Au lycée	À l'université ENS Autre : _____
En moyenne, quel pourcentage de vos enseignements est occupé par les maths quotidiennement ? (Encerclez la bonne réponse)	Selon vous, donnez l'ordre d'importance des sujets suivants. (1 est le plus important et 6 est le moins important)	
Moins de 10%	_____ les Activités Pratiques	
10 – 20%	_____ la Géographie	
20 – 30%	_____ l'Histoire	
30 – 40%	_____ les Langues (Français / Anglais)	
40 – 50%	_____ les Maths	
Plus de 50%	_____ la Science	
Optionnelle : Écrivez votre contact seulement si vous voulez m'aider au cas où j'ai d'autres questions.		
Nom : _____ Téléphone : _____		

Community Survey

Bonjour, je m'appelle Rachel Elzinga et je suis étudiante américaine au Cameroun. Je fais des études sur les écoles primaires. Je vous remercie de m'aider avec ce questionnaire. Votre aide est volontaire ; vous pouvez arrêter de participer à n'importe quel moment et vous êtes aussi libres de refuser de participer. Je respecterai votre anonymat si vous le désirez. Si vous avez des questions, posez les-moi.

Si'il vous plaît, répondez aux questions ci-dessous. Si vous avez besoin de plus d'espace, utilisez le recto du papier. Merci beaucoup pour votre aide et votre temps consacré.

1. Quel est votre diplôme le plus élevé ? _____

2. Quel est votre profession? _____

3. Pensez-vous que les mathématiques sont importantes à l'école primaire ? Oui Non

Expliquez _____

4. Pensez-vous que les mathématiques sont importantes dans la vie quotidienne ? Oui Non

Expliquez _____

5. Encerclez tous les sujets de mathématiques que vous avez étudiés.

Arithmétique

Mesures

Statistiques

Algèbre

Calculs

Mathématiques Appliquées

Géométrie

Trigonométrie

Autre : _____

6. Est-ce que vous utilisez les mathématiques dans votre vie quotidienne, surtout dans votre travail ?

Encerclez la bonne réponse. Oui Non

Si oui, donnez les exemples : _____

7. Selon vous, donnez l'ordre d'importance des sujets suivants pour les élèves au primaire.

(1 est le plus important et 6 est le moins important)

_____ les Activités
Pratiques

_____ la Géographie

_____ l'Histoire

_____ les Langues

_____ les Maths

_____ la Science

8. Optionnelle : Écrivez votre contact seulement si vous voulez m'aider au cas où j'ai d'autres

questions. Nom : _____ Téléphone : _____

Interview Questions

Questions for Ministry Officials

1. Qu'est-ce qu'on a besoin de faire pour être qualifié d'enseigner à l'école primaire ? Depuis quand est-ce que ces règles ont existé ? Changent-ils ?
2. Est-ce qu'il y a une différence entre des qualifications des instituteurs publique et privée ?
3. Comment est-ce que le gouvernement s'assure que les enseignants sont qualifiés, surtout dans les maths ?
4. Est-ce qu'il y a une différence entre des programmes publique et privée ?
5. Quels topiques sont incluses dans les mathématiques au primaire ?
6. Comment est-ce que le gouvernement s'assure que les écoles enseignent bien ces programmes?
7. En moyenne, combien d'élèves restent avec un seul enseignant ? Est-ce qu'il y a une limite de nombre d'élèves par adulte ? Pensez-vous que la proportion des étudiant par enseignant peut influencer la qualité de l'éducation ?

Questions for Teachers

1. Pouvez-vous décrire votre motivation pour être enseignant ?
 2. Pouvez-vous décrire le processus pour être enseignant ?
 3. Quel matière est votre préféré d'enseigner ? Pourquoi ?
 4. Aimez-vous enseigner les maths ? Pourquoi ou pourquoi pas ?
 5. Quelles ressources avez-vous pour enseigner les maths ? Est-ce qu'il y a des autres que vous voulez ?
 6. Qu'est-ce que vous feriez si vous aviez un élève qui ne comprend pas les maths ?
 7. Quels obstacles existent pour les enseignants au primaire ?
8. Si vous aviez un trillion francs pour améliorer les écoles primaires, qu'est-ce que vous feriez?

Lesson Plan

Titre: Jeu des figures !

Objectifs :

1. Chaque élève révisera les caractéristiques simples des figures suivantes : triangle, carré, rectangle, pentagone, hexagone, octogone, cercle, trapèze, losange, et étoile.
2. Chaque élève apprendra le jeu des figures.
3. Chaque élève pratiquera les nombres et couleurs en anglais.

Matériaux :

1. Une figure pour chaque élève : triangle, carré, rectangle, pentagone, hexagone, octogone, cercle, trapèze, losange, et étoile.
2. Les prix pour les gagnants : crayons et bracelets
3. La craie

Durée: 30 – 45 Minutes

Introduction : Saluer la classe et me présenter brièvement. Expliquer que je vais enseigner un jeu sur la géométrie que les élèves jouent dans les salles de classe aux États-Unis. Garder les figures dans un sac comme un secret mais laisser le sac sur la table pour intéresser les élèves.

Procédure :

1. Avant la classe, dessiner les 10 figures au tableau.
2. Remplir le tableau avec l'aide des élèves.
3. Distribuer les figures géométriques pendant que les élèves relèvent dans leurs cahiers.
4. Expliquer « Le jeu des figures » aux élèves : « Le jeu des figures est un jeu que les élèves aux États-Unis jouent souvent pendant les cours de maths. Je vais choisir une figure, mais vous ne devez pas savoir ce que j'ai choisi. Au début, tout le monde va se lever. Puis, je vais dire une phrase qui décrit la figure géométrique que j'ai choisie. Si ma phrase décrit la figure géométrique que tu as entre les mains, tu restes debout. Si la phrase est fautive pour ta figure, tu t'assois. Tu restes dans la chaise jusqu'à ce que je choisisse la prochaine figure. Donc, chaque tour plusieurs élèves vont s'asseoir, mais aucun ne va se lever. À la fin, seuls les élèves qui ont la même figure que moi restent debout. Ils gagnent un petit prix ! Avez-vous des questions ? »
5. Jouer « Le Jeu des Figures » cinq fois. Les enfants qui gagnent peuvent choisir un prix.
6. Ajouter les mots en anglais pour les nombres et les couleurs sur le tableau.
7. Jouer encore cinq fois en utilisant les mots anglais.

Adaptations :

1. Permettre aux enfants de travailler ensemble et d'aider leurs voisins avec les indices.

Extensions :

1. Demander aux élèves de créer une liste des objets dans la vie quotidienne qui ressemblent aux figures de la leçon.

Évaluation :

1. Effacer le diagramme d'information sur le tableau et jouer encore pour évaluer si les élèves ont appris les caractéristiques des figures.