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PRIME Leadership Standards

Changing Teacher Beliefs

PLCs in Guatemala

NATIONAL COUNCIL OF SUPERVISORS OF MATHEMATICS

Table of Contents

COMMENTS FROM THE EDITOR
The PRIME Leadership Framework 1
Gwen Zimmermann, Adlai E. Stevenson High School, Lincolnshire, Illinois

IT TAKES A VILLAGE:
Culturally Responsive Professional Development and Creating Professional Learning Communities in Guatemala 3
James Barta, Utah State University and Daniel Orey, California State University, Sacramento

A FRAMEWORK FOR ANALYZING DIFFERENCES ACROSS MATHEMATICS CURRICULA 10
Mary Ann Huntley, University of Delaware

INTERACTIONS WITH CURRICULUM:
A Study of Beginning Secondary School Mathematics Teachers 18
Laura R. Van Zoest, Western Michigan University and Shari L. Stockero, Michigan Technological University

GAUGING THE RELATIVE EFFECTS OF REFORM-BASED CURRICULUM MATERIALS AND PROFESSIONAL DEVELOPMENT IN PROMOTING CHANGES IN TEACHER BELIEFS 28
Damon L. Bahr, Brigham Young University, Michael J. Bossé, East Carolina University and Dennis Eggett, Brigham Young University

TEACHER KNOWLEDGE AND STUDENT ACHIEVEMENT:
Revealing Patterns 38
Mourat Tchoshanov, The University of Texas at El Paso, Lawrence M. Lesser, The University of Texas at El Paso and James Salazar, Ysleta Independent School District, El Paso, Texas

CURRICULUM STANDARDS, COURSE REQUIREMENTS, AND MANDATED ASSESSMENTS FOR HIGH SCHOOL MATHEMATICS:
A Status Report of State Policies 49
Dawn Teuscher, Arizona State University, Shannon W. Dingman, University of Arkansas, Nevels N. Nevels, University of Missouri and Barbara J. Reys, University of Missouri

Purpose Statement

The purpose of the National Journal of Mathematics Education Leadership is to advance the mission and vision of the National Council of Supervisors of Mathematics by:

- Strengthening mathematics education leadership through the dissemination of knowledge related to research, issues, trends, programs, policy, and practice in mathematics education
- Fostering inquiry into key challenges of mathematics education leadership
- Raising awareness about key challenges of mathematics education leadership, in order to influence research, programs, policy, and practice
- Engaging the attention and support of other education stakeholders, and business and government, in order to broaden as well as strengthen mathematics education leadership

It Takes A Village

James Barta
Utah State University

Daniel Orey
California State University, Sacramento

Culturally Responsive Professional Development and Creating Professional Learning Communities in Guatemala

"Our teachers are being transformed — they are becoming educators through these ongoing professional development opportunities. They are seeing the power of ideas, the excitement of a well-crafted lesson, and the creativity of learning in a pliable, responsive model, which incorporates and respects their local language and culture. As a result, the teachers are working long after the school day ends, coming back early, and wanting scholarships to take more course work in education. This process has caught their imagination and fueled their commitment to serve their people. There is nothing in their past experience or in the performance of their peers in other schools that would cause this redefinition of what teaching really is and can be."

Lois O'Neil
Educational Coordinator for HELPS International

First grade children in a rural highland village school in Guatemala participate excitedly as their teacher implements a collaboratively planned mathematics lesson in their home language, Ixil, created the previous day. The teacher's colleagues watch intently and note his actions and the children's responses as they make observations to be discussed at the post-instructional evaluation debriefing to follow. The instruction is in stark contrast to the typical Spanish language textbook guided education as students sit in rows of desks listening quietly to their teacher's presentation before completing a worksheet on which they practice multiple calculations using the procedure taught to them.

Teachers at the William Bonan School in Santa Avelina, Guatemala, participate regularly in a series of professional development activities designed to enhance their understanding of the mathematical content they teach and improve their teaching effectiveness. These activities are infused with local Mayan cultural connections and customary ways of knowing. Through this article readers will learn of the efforts of a team of American educators working to establish local culturally responsive professional learning communities in mathematics education focused on equity, teaching and learning, curriculum, and assessment. The model and methods described may serve as a suggested framework for other mathematics leaders involved in international efforts to improve mathematics education in the communities they serve.

It Takes A Village

The William M. Bonan School serves children from preschool to fifth grade in Santa Avelina; a small rural Mayan community nestled in the highlands of Guatemala. Its primary focus is on providing quality education to its students with a particular emphasis on reestablishing first language learning (Ixil – one of several Mayan dialects spoken in the Guatemalan highlands). For the past several years, through the efforts of HELPS International, a small team of US consultants provides educational professional development and support to the principal and her teachers. HELPS, a non-profit US based organization works in partnership with individuals, local and national governments to improve drinking water quality, medical care, education, housing, agricultural and economic development to the people of Guatemala. Educational efforts are focused to establish professional learning communities targeting optimizing mathematics instruction guided by research-based best practice while maintaining a culturally responsive pedagogy inclusive of local Mayan values and traditions.

All of the Santa Avelina teachers speak their native language, Ixil, and Spanish. They each hold a high school diploma and have participated in ongoing professional development to bolster their understanding and application of effective instruction. Their principal, Rosa Cordova Perez, holds a bachelors degree and actively supports the professional learning efforts and works to ensure that their implementation continues after the inservices are completed. The faculty's dedication to the profession and their desire to continually develop their instructional capacities provides them the motivation for continued learning.

The students are children in village families whose parents farm corn and other fruits and vegetables, raise chickens, and typically weave the beautiful and complex colorful fabrics from which clothing, scarves, bags, belts, and wraps are sewn. Most of what a family produces is for personal consumption and any excess is sold to generate much needed money for the basic necessities of living. Although a public school exists in the community, these parents send their children to this charter school to acquire an education from teachers who are constantly benefiting from inservice to improve their instruction with a special focus on home language learning and the infusion of culture in the curriculum.

A Focus on Equity

To fully understand equity issues in Santa Avelina it is important that one is knowledgeable of the history that shaped Guatemala. It is believed that numerous complex cultures have made this land their home since 10,000

BC. These prehistoric societies included some of the most advanced cultures in the world at that time and included the Olmec, Teotihuacan, Aztec, and the Maya. These cultures displayed amazing technological, scientific, and mathematical advancements reflected in networks of sociopolitical communities that were organized around highly religious customs, traditions, and ceremonies. For centuries these cultures thrived.

The Spanish conquest of Mesoamerica, which today comprises the vast area from southern Mexico and throughout Central America, took place in the 15th and 16th centuries. The invasions destroyed entire cultures and with these were lost vast amounts of intellectual, social, and political knowledge and practices. That imposition of Spanish culture and European customs on the indigenous cultures, customs including those of language, religion, education, and governance, still play a significant and influential role on the sociopolitical interactions in modern Guatemalan society.

While the majority of Guatemalans live rurally and are of ancient Mayan descent they are dominated politically by the "Ladinos," a term used to define the social and economic elite of mixed European and indigenous ancestry. Governmental representation for the indigenous culture remains limited at best. In early 1960 tensions over equity issues related to religious, political, economic, and social power erupted and ignited 36 years of civil war. The war ravaged the villagers who were often caught between the warring factions of the government forces and the freedom fighters. Remarkably only 14 years ago in 1994, a peace treaty was signed and the conflict ended.

The teachers with whom we work were all affected either personally by the atrocities of war or had friends and relatives of all ages who suffered. Burial grounds for those who died in the war may now be the village football field, and churches walls are adorned with small black crosses dedicated to those who were assassinated or mysteriously disappeared. The war affected people of all ages and social classes. Today, the survivors continue to rebuild their communities and few indications remain to remind one of those turbulent and tragic times. The country progresses yet the injustices of the past remain albeit much more subtly and much less violently.

Poverty remains high and rural villagers such as those in Santa Avelina work hard to sustain life for themselves and their children. The educational system in Guatemala is European based. Spanish typically is the language of instruction even though the Mayan majority speaks multiple indigenous dialects. Schools follow the official Guatemalan curriculum directed by the Ministry of Education, which typically omits Mayan language, culture, and history. Public school instruction for those who can attend (some children must work in the fields) is taught in Spanish and is typically teacher-centered and focuses on rote learning of skills and concepts. In mathematics for instance, instruction seldom includes connections to local culture and language, the use of research-based instructional techniques, discourse in the classroom, or discovery and problem solving orientation. Rather intentionally, it appears that the indigenous cultures and language are greatly devalued. In the name of "education," efforts are made to supplant them with Spanish, the "official" language, and European centered curriculum. D'Ambrosio (2001) asserts it becomes nearly impossible for children to meaningfully participate in their mathematics learning when the curriculum is so distant from what they actually experience in their lives. Rather than enriching their understanding of the role of mathematics in society, it becomes an isolated subject to study with little connection to their culture and community.

Those indigenous children who do attend school tend to stay though grade six and a few continue onto higher grades. These children usually speak their home language but often are unable to read and write with it as the children are taught Spanish in schools. Those villagers who venture to the cities in search of work are often discriminated against for their lack of Spanish language skills, cultural background, and basic educational levels. They tend to work for the more educated and affluent Ladino population in low paying service jobs.

This short history has been shared so that the reader gains a sense of the inequities present in Guatemala in general and specifically in Santa Avelina. Our educational efforts are in response to these obstacles so that the children are provided access to high quality instruction inclusive of their culture and offered in the home language called "Ixil." This focus provides the purpose for the professional development to be described.

A Focus on Teaching and Learning

Teachers at the school have been involved in professional development efforts for more than five years and Principal Rosa Cordova Perez provides instructional leadership. Class size is typically around twenty students. Classrooms in the two-story cinderblock constructed school are airy and have the usual classroom furnishings of desks and tables.

Each student has a chair. Students sit in tabled rows and the teacher's desk and blackboard is at the front of the room.

Our professional development activities incorporate several key components. We work to help the teachers understand conceptual foundations of mathematical concepts to supplement their procedural understanding. We engage them in collaborative development of grade specific mathematics lessons that are then implemented, documented, evaluated, and revised in a lesson study approach. Lastly, we assist the teachers to better comprehend the role of culture in the process of teaching and learning. The authors have been involved in similar efforts for over a decade and a number of the insights gained are implemented with these teachers (see Barta & Shockey, 2004, and Orey & Milton, 2007). This cultural focus affects the curricular design and the context in which mathematics concepts are presented, the community connections made, and the pedagogy implemented.

Prior to our consultant work, teachers were not aware of the National Council of Teachers of Mathematics *Standards*-based instruction. Our professional development efforts center on helping the teachers learn and incorporate the NCTM (2000) *Principles and Standards for School Mathematics* into their instruction. The content standards are shared to expand the major focus on numbers and operations. The process standards are shared so teachers can envision and define their own instruction.

During one inservice session, teachers were presented with the following problem:

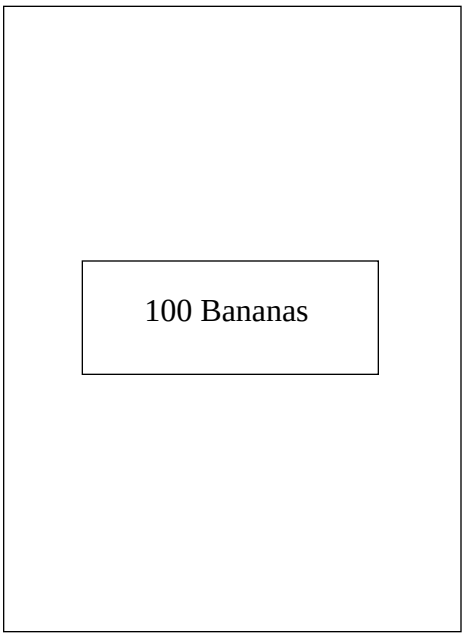
> A sack holds one hundred bananas that need to be shared with six families in the community. How many bananas will each family receive if each receive equal amounts?

At first glance this appears to be a simple division problem that could be quickly solved individually using the traditional procedure. Instead, teachers were asked to work cooperatively and interact with the drawing on this page (Figure 1) as they discussed possible solutions and answers.

Several teachers sketched different ways of subdividing the shape and ultimately divided the rectangular bag into six equal sized rectangular units. Then they used partial quotients to begin to "fill" the amount of each unit. They kept track of their amounts by writing them in the unit spaces (10 + 5 + 1=16). After this equal division process,

Figure 1

How can you share this bag of 100 bananas equally with six families? Use the figure to draw and calculate your answer. Be prepared to share your thinking.



four bananas remained. Teachers discussed giving the four to the largest family! This certainly was an appropriate real-life solution to the problem but we pressed them to use the model to find the exact amount. It was an amazing sight to hear the engaging discourse of the teachers as they presented and argued their answers. Teachers excitedly competed for the chalk with which to show others their solutions. The consultants who had formerly been seen as "the" teachers were now demonstrating their role as silent witnesses and facilitators of learning.

The pictorial model of the four bananas was again divided into six equal pieces and those amounts again partitioned out. Teachers were amazed to "see" that each family would get four-sixths of a banana. When we debriefed the problem and the instructional techniques the consultants displayed, several new insights emerged. Teachers stated they were beginning to finally understand what division meant and that there are alternative instructional approaches they can use with their students to deepen their own conceptual understandings. The use of discourse with learners to facilitate rather than direct teaching was a revelation. Teachers exclaimed they enjoyed being able to think for themselves and loved seeing different ways their colleagues thought about their solution. Several stated they could use this technique in their classroom to supplement the more typical individual teacher-centered instruction.

A Focus on Curriculum

As previously mentioned the formal curriculum provided by the Guatemalan Ministry of Education is Spanish language and textbook driven. The scope and sequence is determined not by what students most need to learn but rather by the topic of the day presented in the book. Teachers seldom felt they possessed enough confidence or knowledge to create their own lessons. They simply had never had experiences doing this or knew the necessary components. To help them gain this knowledge we first asked them to define what they felt were vital components of a well-designed math lesson. We could have simply handed them a form that other experts had created or located a related research-based mathematics article. It wasn't that we were dismissive of such work, rather in our professional development efforts we believe that change must occur first occur from within. We wanted to validate the knowledge these teachers already possessed so they become more confident in their own abilities to grow and learn.

The list of key instructional dimensions included a number of important aspects and after much discussion we pared the list down to nine. The dimensions follow research-based recommendations for providing effective instruction, and we were gratified our list grew from the discussion of the teachers. The list included maintaining respect for the culture and language of the students, ensuring learning objectives were clearly stated, coherence between components of the lesson, and demonstration of teacher enthusiasm. A rubric was created of the dimensions. This was then used as the basis for the development of future lessons and was later used to evaluate the quality of the implemented lessons. This will be discussed further in a following section of this article.

Figure 2

Key Dimensions of Instructional Effectiveness

Topic: _____ **Grade Level** _____

		Strong	Average	Weak	
1	THE TEACHER SHOWS ESPECT FOR THE CULTURE AND LANGUAGE OF THE STUDENTS	3	2	1	___
2.	INSTRUCTION IS INTEGRATED WITH OTHER SUBJECTS/LIFE	3	2	1	___
3	THE TEACHER SHOWS GOOD PLANNING AND USE OF CURRICULAR RESOURCES	3	2	1	___
4	THE TEACHER IS DYNAMIC IN ACTION AND INSTRUCTION	3	2	1	___
5	INSTRUCTIONAL OBJECTIVES ARE CLEARLY ARTICULATED	3	2	1	___
6	CLEAR AND MULTIPLE ASSESSMENT TECHNIQUES ARE EVIDENT	3	2	1	___
7	THE TEACHER PROMOTES STUDENT COMMUNICATION AND INTERACTIVE PARTICIPATION	3	2	1	___
8	THE TEACHER ASKS QUESTIONS WHICH MAKE STUDENTS THINK	3	2	1	___
9	THE TEACHER DEMONSTRATES A POSITIVE ATTITUDE AND BEHAVIOR TOWARDS STUDENTS	3	2	1	___

OVERALL INSTRUCTIONAL EFECTIVENESS

Total Score _____/27

Comments:

The teachers grouped into grade specific learning communities after receiving instruction in the use of Lesson Study. Guided by the dimensions they had previously discussed, teachers collectively planned and documented several optimal lessons each at a different grade level to be taught. Teachers then discussed the lessons the following day. Excitement and some anxiety were apparent as instruction of the collaboratively constructed lessons began. Never before had these teachers planned instruction together much less observed each other in their teaching. The video camera, so necessary for later use to review and deconstruct the learning event, added another level to their nervousness. Eventually, teachers not only became accustomed to being videoed but enjoyed seeing themselves and their students. Several teachers remarked they appreciated being able to use this tool to evaluate their instruction. Seldom had such reflection taken place.

This professional development effort of Lesson Study was showcased so that after having constructed supportive professional development communities the inservice teachers could more frequently use this to improve their instruction. The lessons were a wonderful sight to behold. Teachers were implementing lessons in which children were engaged in learning mathematics concepts, progressing from a concrete to pictorial to symbolic stage. Discourse was much more evident as teachers moved from a role of "telling" to one of "asking." Once students got the idea it was not only acceptable but valued for them to speak up and share their ideas, the engagement heightened.

Manipulatives, which previously were a rarity in instruction, became customary. After some playful exploration, students began to use them to mirror and to guide their growing understanding. The instruction was provided in the home language of Ixil and key vocabulary documented in writing on the board.

Cultural connections are a key element of our efforts. The following story must be shared for the reader to understand why we felt this so necessary. As students attended school to learn the traditional subjects we were told of a chasm that was developing in how some children were misperceiving their parents. Some children seemed to be begin to despise their parents for their lack of education. It was shared that when some children came home and needed help with reading, writing, or school arithmetic, parents were not able to help them even at the most elementary levels. Some children, believing their parents were not smart began acting rudely to them. In the quest for education, tension in some families grew.

Using a "Funds of Knowledge" approach (Gonzales, Moll, & Amanti, 2005), we saw it necessary to connect what we were teaching in the school with their rich culture and language experience. We wanted to sincerely validate the intelligence of the mother who weaved mathematically complex garments or the father who grew crops successfully in their field. As part of our ethnomathematical approach of connecting mathematics and culture our teachers conducted mathematical cultural interviews during our professional development inservice. Neighbors and family members were interviewed relative to daily universal activities (counting, measuring, designing, locating, explaining, and playing) incorporating mathematics (Bishop, 1991). The house builder for instance was asked how he made his calculations, designed the rooms, located spaces, explained costs or determined the necessary slope of the stairs. The mother was asked to explain her daily uses of mathematical activities from measuring the corn meal needed for the tortillas to be made to how to get the best bargain for necessary staples at the market.

With this interview information teachers created and illustrated books in their new technology center. Books had such titles as *Maria, My Mother is a Mathematician* or *Mathematics in Our Village* and depicted people the children knew displaying mathematical knowledge and application. One mother later stated that she was very glad to know she is now a "mathematician!" She explained that she never described to her children how she went about calculating the best price for items when at the market with them. She declared that from now on she will!

These books provided a contextual foundation for the instruction that followed. Our professional development efforts provided a model for looking "for the mathematics that lives in any activity." We shared that children love to know they are important and valued and their parents are smart! Our teachers began to see how easy and beneficial it was for them to adapt their standard instruction. For example, word problems could be edited to use names of class members and items and activities they felt valuable. A teacher using the "Mathematics of the House Builder" book could have students explore how to create, mark, and measure the corners for a room. Concepts such as area, perimeter, and angles can be illustrated as real life activities as the mathematics in the activity is experienced and learned.

A Focus on Assessment

Our efforts to improve assessment capabilities continue. Teachers, having learned to clearly define their instructional objectives, are challenged to write assessment procedures for the objectives prior to the design of instruction. We insist this alignment of teaching and assessment is paramount if teachers are to explicitly know what they are teaching and whether students are learning.

We stress the importance of the teaching of mathematical vocabulary and ensuring that this too is assessed. Educators at Santa Avelina are learning alternative assessment techniques to supplement the standard paper and pencil tests. Students are now being asked to draw models to represent their thinking and to write explanations of their thought processes. Teachers are learning to purposely observe multiple predetermined aspects of student involvement and learning.

Most surprising to many teachers was the idea that assessment was not complete after the student self reported or drew a model. Teachers became aware that this merely provided them data that required further analysis and documentation. Teachers began to learn to look for gaps in understanding displayed in students' errors. They began to see how assessment guides instruction and how what was or was not learned today influences what needs to be taught tomorrow. Documenting this data over time allowed teachers to look for clusters of students needing extra help or seeing trends in learning.

The assessment component of our professional development also consisted of teacher self-evaluation. As teachers debriefed the films of the lesson study they were asked three questions. Each teacher who provided the collaborative instruction was first asked to reflect upon and describe what he or she felt were effective aspects of their lesson. They were then asked what they thought was less than satisfactory. Lastly they were asked to suggest what they would do differently next time. The collaborative group was then asked to provide their input as we guided the process to ensure that all were reminded we were evaluating the

cooperative lesson rather than the individual teachers. A supportive environment was maintained. Plans for lesson modifications were discussed and with the guidance of the principal, the cycle of planning, teaching, and revising as teachers strive to improve their knowledge and practice of mathematics teaching will continue.

It Takes A Village

It has indeed been a humbling and gratifying experience to be a member of the consultative team working with Guatemalan colleagues in the village of Santa Avelina. After each inservice it feels that we come away with more insight and knowledge than we shared. A community of likeminded teachers separated by thousands of miles has evolved because of this international collaborative relationship. Such is the power of mathematical leadership to transform and be transformed regardless of the distance. Mathematics as a universal language has brought us closer. Our professional development continues to be shaped and guided by our pledge to be culturally responsive and culturally respectful. Obviously we share an educational target but the humanistic interactions warm our hearts and souls. Teaching and learning is not an individual act. It requires dedicated involvement from parents, administrators, teachers, and students. For rich mathematics learning to occur it indeed "takes a village."

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