

THE MATHEMATICS SPECIALIST FROM A DUAL LANGUAGE IMMERSION PERSPECTIVE

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I was motivated to go into teaching mathematics after joining a Teaching for Understanding group. I met monthly for three years with other elementary teachers in the public school system in Arlington, Virginia. Under the leadership of our mathematics county supervisor, we looked at teaching the Mathematical Big Ideas, and instructional practices that foster deep mathematical understanding in our students. Every month, we would bring samples of students' work to learn how they were developing mathematical ideas. We discussed instructional practices which we would then try in our classes, and then share our experiences. I started to take courses, attend math conferences and training sessions. In addition, I relearned math content in a very different way from the way in which I was previously instructed. It was then that I realized I needed to become an expert in mathematical ideas to help my students develop mathematical proficiency, and that learning with understanding is essential for this mathematical proficiency.

I work at Key Elementary School, a Spanish Dual Language Immersion school in Arlington County, Virginia. Key School/Escuela Key is a two-way, Spanish-English immersion school. Forty-seven percent of our students are Hispanic. Every student at Key School/Escuela Key participates fully in Two-Way Spanish-English Immersion. This internationally recognized program is designed to teach children a foreign language in a natural way through everyday conversation and content instruction. Students at Key learn Arlington County's elementary curriculum. Math, Science, and Spanish Language Arts are taught in Spanish, while Social Studies and English Language Arts are taught in English. The students use each other as language models and, by the fifth grade, are able to communicate effectively in two languages. We celebrate bilingualism and our diversity.

Our school system lessons and materials follow the *Principles and Standards for School Mathematics* from the National Council of Teachers of Mathematics (NCTM) [1]. Our school system's mathematics program aims to help all students achieve mathematical proficiency by developing both conceptual understanding and procedural proficiency. In my school, we put specific emphasis on communication and discourse within the context of mathematical problem

solving. We pay specific attention to the assessment component of units as a way of ensuring that students make adequate progress in mathematics and that "no child is left behind." We use pre- and post-assessment for every unit to assess enduring understanding of the Mathematical Big Ideas. Since I started as a Mathematics Specialist, I meet with math teachers biweekly to analyze students' work and to determine intervention strategies.

I have developed specific materials and lesson plans to promote language accessibility, cultural relevance, enhanced thinking, and discourse in the mathematics class of the dual language immersion program. Furthermore, I have gathered a diverse collection of strategies, materials, and technology to address the specific needs of the second language math student in the dual immersion program. The lessons are based on an integrated approach where vocabulary and materials are carefully chosen and adapted in order to provide comprehensible input. These activities are student-centered, hands-on experiences that enhance students' thinking skills. I regularly visit the math classrooms to demonstrate how the use of technology and diverse media—graphs, everyday objects (realia), contextualized problems, and demonstrations—make the second language as comprehensible as possible. I also lead regular, whole school in-services where we discuss the importance of culturally relevant activities and how to make mathematics multicultural through meaning and empowerment.

We have integrated both mathematical concepts and processes to develop a meaningful understanding of mathematics. The concepts of mathematics are organized under the six main mathematical strands and developed through the four mathematical processes: problem solving, communication, reasoning, and connections. Our goal is to help develop mathematical proficiency so that students understand basic concepts, are fluent in performing basic operations, reason clearly, formulate, represent, and solve mathematical problems and maintain a positive outlook toward mathematics [2].

Having a Mathematics Specialist in the school has been a very positive influence on student performance and teacher confidence. Our school has been fully accredited every year for the *Standards of Learning (SOL)* Test since 2001 when I started as a Mathematics Specialist [3]. More than 70% of the students in the math acceleration project in kindergarten through third grade have mastery of not only their own grade-level objectives, but most have some mastery of the next grade-level objectives. Teachers in our school attend monthly meetings to discuss assigned articles and reading related to math instruction and best practices, evaluate student portfolio pieces, and plan mathematic instruction for understanding. Teachers in our school now

place more emphasis on curricular goals based on inquiry and problem solving. More efforts are now made to engage students in higher-order thinking skills and meaningful math exploration.

I believe that as a Mathematics Specialist, I have a catalytic role in:

- Monitoring and analyzing student achievement results;
- Developing daily and long-range plans and strategies with teachers;
- Developing organizational and flexible grouping procedures with teachers;
- Demonstrating teaching strategies and methods for teachers through model lessons with students;
- Coordinating and facilitating communication about mathematics across grade levels and within grade levels;
- Helping implement our Math Acceleration Project;
- Planning and providing appropriate professional development to grades K-5 teachers (e.g., *Investigations*, integration of technology, manipulatives, and integration of *Understanding by Design* in math lessons) [4-5];
- Providing assistance to classroom teachers in implementing ideas and techniques gained through the professional development provided; and,
- Facilitating parent and teacher communication about mathematics.

I also conduct parent outreach programs, in the PTA forum or during informational coffees, to inform them about content from NCTM standards, and how to prepare for the math *SOL*. I have put a specific emphasis in creating a series of hands-on demonstrations and workshops to invite parents to challenge students at home through “good questions” and games. In addition, I also meet with our “Padres Unidos,” the Latino parent support group in our school, to provide the same information in Spanish and address specific issues to help our Latino students succeed in mathematics.

I feel fortunate and very proud to have the opportunity of inspiring and guiding my teaching colleagues through the process of creating an inviting classroom environment based on trust and high expectations. I would like them to pose mathematical tasks that will engage *all* students to figure things out and make sense of mathematics. I hope they engage their students in mathematical discussions and that they listen actively to how their students develop reasons and offer explanations. I would like them to look at their students’ math work to inform their

instructional decisions. I believe that “Mathematics is the science of pattern and order” [6]. I agree that mathematics discovers, explains, represents, and formulates this order that manifests itself in nature, art, engineering, music...and that we use it to improve our lives and further our advancement. As a Mathematics Specialist, I have experienced how students of all ages love math when it is presented this way and they become absorbed in this wonderful creative exploration and discovery of pattern and order. ■

References

- [1] *Principles and Standards for School Mathematics*, National Council of Teachers of Mathematics, Reston, VA, 2000.
- [2] J. Kilpatrick, J. Swafford, and B. Findell (eds.), *Adding It Up: Helping Children Learn Mathematics*, National Academy Press, Washington, DC, 2002.
- [3] *Standards of Learning for Virginia Public Schools*, Board of Education, Commonwealth of Virginia, Richmond, VA, 1995.
- [4] *Investigations in Number, Data, and Space*, TERC, Cambridge, MA, 1998, Internet: <http://investigations.terc.edu>.
- [5] G. Wiggins and J. McTighe, *Understanding by Design*, Association for Supervision and Curriculum Development, Alexandria, VA, 1998.
- [6] *Everybody Counts—A Report to the Nation on the Future of Mathematics Education*, National Research Council, Washington, DC, 1989.