

WHAT DOES IT MEAN TO BE AN ELEMENTARY SCHOOL MATHEMATICS SPECIALIST?

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Introduction

An elementary school Mathematics Specialist is a change agent, a continuous learner, a facilitator, a person who keeps up with the research on best instructional practices—in short, the Mathematics Specialist is on a continuous journey of improvement. S/he arrives at school early, stays late, collaborates with teachers and administrators, and does whatever it takes to ensure students are learning mathematics with meaning and understanding. The Mathematics Specialist does not pull out small groups of students, but instead works with a school (or schools) to develop a Professional Learning Community in mathematics, provide job-embedded professional development, and enhance best instructional practices which ultimately will improve student understanding of mathematical concepts.

This can look different at every school and can be challenging, yet quite rewarding. Knowing the mathematics vision for the school, communicating the role of the Mathematics Specialist, organizing, planning ahead, and thinking about the desired outcomes will help to maintain the focus on best instructional practices and student learning. The contents of this article will describe a few elements that are advantageous in the role of a Mathematics Specialist in Virginia.

What Will We Teach and How Will We Know If They Have Learned It?

Ensuring that each teacher has the necessary curriculum documents to facilitate the learning of the mathematical concepts is an important component of student learning. During grade-level meetings, the contents of the documents and teaching tools (listed below) can be reviewed and discussed.

Mathematics Standards of Learning Curriculum Framework — This document describes every objective students must learn and be able to do by the end of the given grade level. It also provides clarity of the specific objectives [1].

Standards of Learning Test Blueprints — This document lists every objective that students must learn for the *Standards of Learning* Test beginning at grade three [1].

Standards of Learning Released Test Items — The state releases many of the test questions from previous tests. Reviewing (or even working through) the released tests is helpful in gaining a deeper understanding of what is expected from students at each grade level [1].

Curriculum Map or Pacing Guide — Whether the county school system has a preferred pacing guide or teachers create one, this document helps to keep the focus on and the momentum of what is to be learned.

Common Assessments — Many school systems or grade-level teams collaborate to develop common assessments to use throughout the school year. These assessments can be tools for determining if what is instructed is learned.

Assessment Data — This data may be extracted from at least three different sources: common assessment data; informal assessment data (analytical notes); and, *Standards of Learning* Assessments. Discussing assessment results, students' thinking, and planning next steps is an essential component for evaluating what and how the students are learning. Some questions that may be helpful in the discussions include:

- Which students do not understand the concepts?
- Which concepts are still challenging for many students?
- Which students must be challenged or enriched?
- What new instructional practice could be explored?
- What is the plan for addressing the above?
- What are common errors of students?

The answers to this last question are easy to identify when students show their thinking directly on the assessment. An item analysis is another helpful tool; for example, "If the correct answer is 'B,' why did most of the students select 'C' for their answer?"

Articles and Instructional Practices — Sharing information or articles on best instructional practices, or even working through mathematical concepts with teachers is another technique to promote and encourage teachers to keep up with the current research and understand the mathematics they are teaching.

How Will We Teach?

Numerous research studies have recommendations for best instructional practices for how students learn mathematics. Which of those practices are in the school improvement plan? Observing and listening in classrooms is one technique for gaining an understanding of the

mathematics culture in the school and for identifying components that are strong and those that may need improvement. Together with colleagues and administrators, an area of focus can be determined. A few elements that many Mathematics Specialists look for and continue to focus on are outlined below.

Communication in Math Class

- Are students writing and talking about the mathematics they are learning?
- Are students showing their thinking and explaining their reasoning?
- Are students justifying and sharing their solution strategies with peers and adults?
- Are students making connections and conjectures?

Problem Solving

- Is there a problem-solving approach to instruction?
- Are the math problems based on real life and meaningful to the students?
- Are students encouraged to explore multiple solution paths and strategies for solving problems?
- Are students encouraged to solve math problems in their own way?

Reasoning Abilities

- Are students encouraged to make sense of the mathematics they are learning?
- Are students reasoning and drawing logical conclusions?

Manipulatives

- Are manipulatives within arms' reach of the students in the mathematics classroom?
- Are students using the manipulatives to make sense of the mathematics and to solve math problems?

Evaluation

- What method is used to determine if students really understand what is instructed?
- How are students applying their understanding?
- How is the information from formal and informal assessments used?
- Are teachers able to take what they know about their students and build on it?

Mathematical Content

- Does every math teacher understand the mathematical concepts that are to be learned?
- What method is used for handling misconceptions?

Mathematical Knowledge

- Do the students have the conceptual knowledge to understand the procedural knowledge?
- Are students learning mathematics conceptually?

Teacher as Facilitator

- Does the teacher provide engaging problems for the students?
- Does the teacher listen intently to students' ideas and value student thinking?
- Does the teacher encourage students to listen to students?
- Does the teacher continually ask questions to elicit, clarify, and extend student thinking?

Some of these questions might include:

“How did you figure that out?”

“Is there a different way to solve that problem?”

“Will that strategy always work?”

“How do you know?”

“What would happen if...?”

“How are these strategies alike/different?”

“How could you make this a more challenging problem for yourself?”

Coaching, Planning, and Teaching

What are the mathematical goals for the children? What will they be able to do by the end of the lesson? How will they communicate their understanding? What misconceptions or confusions might the student(s) have? What will and how will the tasks or problems be presented? These are just a few questions to consider in planning lessons with teachers. In *Content Focused Coaching*, a lesson design is used as a structure for planning lessons [2]. Addressing such questions help to keep the focus on student learning.

There are a variety of methods for working in classrooms with teachers. Some Mathematics Specialists work side by side with three or four teachers for two or three weeks in a row, then move on to a new set of three or four teachers. Others might work with one grade level at a time. There are other Specialists that work based on need or specific focus. In the latter example, perhaps there is a grade-level team that would like some assistance in enhancing students' test taking strategies. This may require planning with a team together, and then rotating through each teacher's room to assist (or coach) each teacher as s/he tries a new strategy. This method also works if a grade-level team is trying to improve their questioning strategies, set up learning centers, explore a new teaching technique, or perhaps try their own version of the Japanese Lesson Study.

Teaching conceptually may be new to many teachers. The Mathematics Specialist can encourage teachers to give students the opportunity to explore and solve problems in ways that

make sense to them. S/he can also encourage the students to talk about their thinking and assist teachers in planning meaningful real-life tasks, facilitate lessons together, and debrief the learning afterward. These ideas will gradually lead toward teaching conceptually.

Planning and Debriefing

Defining the roles of Mathematics Specialists and teachers, ascertaining effective methods of information dissemination, and organizing uniform data collection are all efficient means of translating the day-to-day teaching activities into viable assessments for long-range planning. It is not enough for the Mathematics Specialist to meet the daily demands of the position; s/he must also keep an eye on the big picture. Some of the questions below may provide several different perspectives toward this end.

- What is the role of the Mathematics Specialist and what is the role of the teacher when facilitating math lessons in the classroom?
- When will the planning, debriefing, and examining of students' work samples and thinking take place with teachers?
- How will common assessments be developed and how will assessment results be recorded, shared, and used?
- When and how will analyzing of assessment results with teachers and with students take place?
- What method will be used for sharing and discussing current research articles or information?
- What method will be used to determine and provide professional development in the school?
- How will the professional development sessions meet the goal of the school vision for mathematics?

How Does a Mathematics Specialist Know S/He Is Making a Difference in Student Learning?

Elementary Mathematics Specialists want students to understand the mathematics they are learning, and to be confident and successful problem solvers who are eager to take on the challenge of any math problem. When a student stops you in the hall to describe how s/he solved the math problem that day, or you receive an e-mail from a teacher expressing how much she is learning from her students and that math is once again fun to teach, you know are making a difference. ■

References

- [1] Virginia Department of Education website, Internet: <http://www.pen.k12.va.us/VDOE>
- [2] L. West and F. Staub, *Content-Focused Coaching: Transforming Mathematics Lessons*, Heinemann, Portsmouth, NH, 2003.