PRINCIPALS PARTNERING TO BUILD A VISION FOR SCHOOL MATHEMATICS

V. INGE
School of Continuing Studies, University of Virginia
Charlottesville, Virginia 22904

V. HODGES and P. ROBERTSON
Mathematics Outreach
Virginia Commonwealth University
Richmond, Virginia 23284-2014

Today more than ever principals and teachers are called upon to provide a rigorous mathematics program so that every student reaches mathematical proficiency. Schools in Virginia, as well as nationally, need support to increase their capacity in order to provide every student with mathematics learning experiences to attain the five strands of mathematics proficiency: 1) understanding, 2) computing, 3) applying, 4) reasoning, and 5) engaging [1]. The Virginia Mathematics Specialist Initiative (VMSI) began over fifteen years ago and continues today under the auspices of the Virginia Mathematics and Science Coalition (VMSC) and with endorsements from the Virginia Council of Teachers of Mathematics (VCTM) and the Virginia Council of Mathematics Supervisors (VCMS). The VMSI efforts have included securing funding from the State Council of Higher Education (SCHEV) and four National Science Foundation (NSF) grants to create, among other things, a model preparation program for Mathematics Specialists to enable them to provide school-based support for schools to improve their mathematics program. This article presents key events within the VMSI that revealed the critical role a principal plays in leading the school's mathematics program, and the need for a principal to engage in professional learning opportunities to increase his/her capacity to provide effective leadership for mathematics education. In addition, a description is shared of the subsequent evolution to a well-defined Principals Partnering Institute in order to develop principals' capacity to lead and share leadership for a rigorous mathematics program that prepares mathematically proficient students. Lastly, a description of curriculum that supports the Principals' Institutes and the efforts to take the Institutes statewide is presented.

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Setting the Stage: Early Grant Work

In 2002, the VMSC appointed a task force to investigate how a Mathematics Specialist embedded in a school could impact mathematics teaching and learning. The Mathematics Specialist Task Force was charged with making recommendations for the potential roles and responsibilities a Specialist might assume and about the preparation a Specialist would need to effectively support teachers and administrators in their efforts to improve student learning. The Mathematics Specialist Task Force recommended that well-prepared Mathematics Specialists be placed in elementary and middle schools to support teachers in developing stronger mathematics knowledge and instructional practices for teaching so that every Virginia student could reach higher levels of mathematics achievement.

More specifically, the Task Force report asserts the importance of the Mathematics Specialists "working with the building-level administrator" since classroom teachers "must make changes in their instructional program and practices" [2]. The need for the principal to provide effective leadership for improving mathematics instruction became increasingly clear when Virginia Commonwealth University (VCU), University of Virginia (UVA), Norfolk State University (NSU), University of Maryland (UM), and the VMSC, along with the school divisions, partnered in two National Science Foundation (NSF) grants: the "Mathematics Specialist: Research Study and Pilot Study" (2004-2009) supported by the Teacher Professional Continuum (TPC) program; and, the "Preparing Virginia's Mathematics Specialist," supported by the Mathematics and Science Partnership (MSP) program.

The NSF-TPC grant supported a comprehensive research study on the impact of two cohorts of twelve well-prepared Mathematics Specialists on student learning in the twenty-four treatment schools they served. To prepare for the roles of Mathematics Specialists, the teachers completed five mathematics content and three mathematics education leadership graduate courses that were collaboratively designed through partnership among six universities (University of Virginia, Virginia Commonwealth University, Norfolk State University, Longwood University, George Mason University, and Virginia Tech) and school division mathematics leaders. The first cohort (Cohort I) of twelve Mathematics Specialists assumed roles in the treatment schools in Fall 2005. A one-day seminar was provided in Spring 2005 for principals and their Specialists to raise principals' awareness about how a Mathematics Specialist was prepared to support teachers and

how they as principals could support their Specialist. Cohort II and their principals participated in a similar seminar in Spring 2006.

As Cohort I Specialists began working in the schools, the grant management team systematically solicited suggestions about additional support the Specialists needed to be successful. The management team was intentional about *listening* to central office mathematics leaders from the school divisions, as well as the Specialists themselves, when formal and informal opportunities arose to have conversations and collect data about what supports and assistance seemed to contribute to the effectiveness of the Mathematics Specialists in carrying out their roles and responsibilities. Virginia has agreed upon a statement concerning the work of full-time, school-based Mathematics Specialists:

> Mathematics Specialists are teacher leaders with strong preparation and background in mathematics content, instructional strategies, and school leadership.... Mathematics Specialists are former classroom teachers who are responsible for supporting the professional growth of their colleagues and promoting enhanced mathematics instruction and student learning throughout their schools. They are responsible for strengthening classroom teachers' understanding of mathematics content, and helping teachers develop more effective mathematics teaching practices that allow all students to reach high standards as well as sharing research addressing how students learn mathematics.

The statement then concludes with the specific responsibilities of all Mathematics Specialists.

The novice Mathematics Specialist received support through two-day, grant-supported workshops each semester of their first two years, and each Specialist was concurrently enrolled in the last of three leadership courses during their first year. A member of the grant management team and one of the authors of this article served as an instructor for the course and purposefully designed course projects, reflection journal prompts, and in-class activities to provide ongoing support for the novice Specialists.

The discussions during the workshops and the leadership course and, in particular the reflection journals, illuminated the Specialists' opinions that the principal was instrumental in

how effective they were in providing support for teachers and also impacting change in the school's mathematics program. For example, they believed that teachers more readily allowed the Specialist to come into their classrooms and accepted the Specialist's help with planning when the principal made public a clear vision for the school's mathematics program. In addition, when both the principal and the Specialist were advocating for a mathematics program that balanced understanding concepts with developing skills, the teachers were more open to moving away from a teacher-centered classroom to a more student-centered classroom. An emerging realization for the management team was that not every principal was proactive in letting teachers know his/her expectations for the mathematics program and ways the Specialist would support teachers. In some cases, teachers were receiving conflicting messages. The principal was directing teachers to concentrate on procedures and a narrow curriculum to prepare students for state assessments and the Specialist was encouraging teachers to use more tasks and engage students in inquiry learning. The information shared from central office leaders on the grant management team reflected what was shared by the Mathematics Specialists.

The feedback from principals of the NSF-TPC Cohort I Mathematics Specialists was positive and also provided information about what professional learning opportunities could be helpful for them. For example, a principal reported that having a Mathematics Specialist enabled her to gain valuable insight into how students process mathematics concepts. She attended grade-level meetings as often as she could to support the Specialist and to stay abreast of mathematics instruction. The principal also met regularly with her Specialist to discuss best practices in mathematics instruction. The principal believed her interactions with the Specialist increased her own confidence to provide instructional guidance for teachers to effectively differentiate instruction so that more students were becoming successful in mathematics. The lesson here was that a Specialist and principal with a robust collaborative partnership are better able to provide leadership for the school's mathematics program. Additional data provided insights into what the principal needed to know and do to support the Specialist.

A more formal gathering of information was facilitated through VCU's Commonwealth Educational Policy Institute (CEPI) as part of the NSF-TPC grant's policy component. Six of the twelve principals in treatment schools were interviewed at the end of their first year with a Specialist. According to policy analysts, the interviews revealed that one of the predominant factors that strongly influenced the "nature and quality of school-site implementation" was

whether the principal held a vision and demonstrated force to carry out the vision [3]. One of the principals shared, "The positive and active role of the principal is critical to the Specialist's acceptance and success. I was visible in supporting her, attending the grade-level planning meetings she held with the mathematics teachers, and meeting with her regularly." This substantiated the Specialists' feedback about what principal support increased their feelings of efficacy.

Continuing the Grant Work

As the first two NSF grants were ending, VCU, UVA, and NSU were joined by Longwood University (LU) in a partnership with VMSC and eleven school divisions in a new NSF Discover Research (DRK12) grant project (2009-2014), "Researching the Expansion of K-5 Mathematics Specialist Program into Rural School Systems." Based on the knowledge gained about how instrumental the principal is to the success of a well-prepared Mathematics Specialist during the two previous grants, this new grant included a component to provide professional development for the principals of the treatment schools where the twenty Specialists prepared through the grant would be placed.

The validation on the decision to include the principal support component in the new NSF-DRK12 Rural grant came in Spring 2009. The impending conclusion of the NSF-TPC and NSF-MSP grant activities provided an opportune time to bring together all of the stakeholders: the grant management teams, the Specialists and their principals, and the researchers from the various studies conducted as part of the grant for a two-day "What We Have Learned Symposium." The rapporteur's report echoed earlier realizations: the role of building principal to the work of his/her Mathematics Specialist emerged as one of the five themes of the Symposium [4]. Furthermore, an analysis of individual participants' written reflections during the Symposium identified the need for principals and school divisions to increase their awareness of the research and need for Specialists, and increase their knowledge about what support is vital for effective Mathematics Specialists. The Symposium launched an investigation into what specific knowledge and experiences would increase a principal's capacity to provide leadership for a rigorous mathematics program and develop his/her understanding about how to partner and share leadership with a Mathematics Specialist.

Leadership Knowledge and Skills to Support the Schools' Mathematics Programs

A review of the literature and further consideration of the data gathered as part of the NSF-TPC and NSF-MSP grant project activities had made clear the importance of the principal's active leadership and supportive collaboration with his Mathematics Specialist in how effectively the Specialist could work with teachers to transform their practice. The question was, however, what specific knowledge and skills do principals believe are necessary to provide leadership for a mathematics program and support to a Mathematics Specialist to transform a school's mathematics program? A recognition luncheon in Fall 2009 for the principals and Specialists who were research participants in the two grants provided an opportunity to gather additional information from principals. Several members of the grant management team met with a focus group of principals to learn how they thought a principal should support a Mathematics Specialist. The meeting with the principals inspired the VMSC to support the creation of an advisory council, to include school division principals and central office administrators.

In Spring 2010, members for the Administrators' Advisory Council (AAC), fifteen middle and elementary school administrators who had Mathematics Specialists in their schools and three central office leaders, were identified. The Council meetings were facilitated by two VMSC board members (one had been a co-PI for the NSF grants and is also one of the authors of this article). The AAC members examined available information and research about Mathematics Specialists and their impact on instruction, as well as mathematics teaching and learning from an administrator's perspective. These activities served as a basis for informative discussions about their own leadership practices and how they worked with their Specialists. The VMSC facilitators analyzed the meeting discussion notes and artifacts in order to gain an understanding of principals' beliefs about effective mathematics teaching and learning. The meeting notes with the analysis were shared and discussed with VMSC and with grant management team leaders.

Planning for the First Professional Development Opportunities for Principals

As late as 2012 Lochmiller, Huggins, and Acker-Hocevar documented the importance of the principal's leadership; however, they also acknowledged that little had been presented about ways to prepare a principal with effective strategies to lead improvement efforts in mathematics instruction [5]. Indeed, in 2004 the authors of this article found sparse information available when they began to plan the professional development for principals in the NSF-DRK12 Rural grant project. They did learn about a curriculum developed at the Educational Development

Center (EDC) for working with principals, *Lenses-on-Learning: A New Focus on Mathematics and School Leadership*, that proved to be very helpful [6-8]. In addition, research conducted through EDC regarding administrators and the knowledge they need to lead a mathematics program was also informative [9]. Two additional publications— *Adding it Up: Helping Children Learn Mathematics* and *Administrator's Guide: How to Support and Improve Mathematics Education in Your School*—provided insights about how students need to know mathematics and what a principal should think about in building and supporting a successful mathematics program [1, 10].

The documents and information mentioned above, along with suggestions for support identified in previous grants regarding the knowledge and skills that enable principals to lead effective mathematics programs and support the work of Mathematics Specialists, informed the design of the professional development component for principals as part of the NSF-DRK12 Rural project. Consultations with the partner school divisions led to planning a series of five 1-day professional development sessions for the principals. The central office liaison committed to attend the third day. Activities were designed to give principals the following opportunities: 1) address the need for change; 2) think about what makes a good lesson in mathematics; and, 3) consider further their role as an instructional leader and how to partner with their Mathematics Specialist. This series of professional development sessions was offered for principals in the treatment schools prior to the Mathematics Specialists assuming their roles in the schools. The sessions were held over the course of two days in the fall, one day in March, and finally, two days in June to allow principals time between sessions to integrate what they were learning into their practice. The work with the principals included the following guiding questions:

- What should good mathematics instruction look like?
- What supports are needed for high-quality mathematics instruction?
- What is the connection between high-quality mathematics instruction and student performance?
- How can a school-based mathematics Teacher Leader or Mathematics Specialist support teachers to improve instruction and student learning?

Between the sessions, principals were given specific assignments to help them reflect on the mathematics instruction in their own schools. They used an observation protocol based on the Virginia Process Goals identified in the *Mathematics Standards of Learning for Virginia Public Schools* to observe several teachers [11]. The principals were asked to identify action goals for improving their schools' mathematics programs. Principals, with their Mathematics Specialists-to-be, began to develop a vision for their schools' mathematics programs. This vision was to include what students should be doing and what teachers, Mathematics Specialists, principals, and central office representatives needed to do so that the students would be successful. One of the principals in the grant shared the following in an e-mail after the final workshop session for the NSF-DRK12 principals in the treatment schools:

> I just wanted to thank you for all the wonderful guidance you and your team have provided. I am truly excited about having Janice as a Mathematics Specialist in my school and know she will help us improve instruction...! I have truly enjoyed participating in all of the workshops provided and feel I am ready to guide Janice and help make the Specialist's position in my school what it was truly intended to be. ..... I'm thankful to be a part of this journey!

Students in the three NSF-DRK12 grant leadership courses were also given assignments that involved collaborating with the principal of the treatment school to which they would be assigned. During the first two leadership courses, they were still classroom teachers but not necessarily in the schools where they would be eventually assigned as Specialists. They began their role as Specialists while enrolled in the third leadership course. The first course required students to interview the principal they would later be working with so they could learn his/her philosophy about teaching mathematics, perception of the school's mathematics program, and what s/he believed was necessary to strengthen the school's mathematics instruction. The second leadership course required the student to use a particular protocol to analyze the various types of assessment reports for the grades 3-5 performance on the state assessments. The student and principal met to discuss the findings and to delve into what was happening in the instructional program that might lead to the assessment results. By the third leadership course, the students had assumed their role as Specialists. During the course, they completed a lesson study cycle and invited the principal to be a part of the lesson study process. They also collaborated with the

principal to determine a focus for professional development for teachers during their grade-level meetings. These opportunities helped make the first year of the principal and Specialist partnership a more productive year.

During the first year that the principal and Mathematics Specialist worked together, the principals requested a follow-up to the previous year's professional development sessions that they and their Specialists could attend together. So, a sixth session was held in Spring 2011 and provided an opportunity for each principal with his/her Mathematics Specialist to participate in more professional development, as well as share successes and challenges they encountered during their first year working together. In addition, they began developing an action plan for the next school year. This time, however, the sessions were held in two locations to decrease travel time. Following the session, both principals and Specialists shared that they missed having the entire group together.

Middle School Mathematics Specialists Task Force: Preparation Program and Principals' Work

In 2008, the VMSC appointed "The Middle School Task Force" to consider how the current K-5 Mathematics Specialist Preparation Program might be modified to better address the needs of middle school Mathematics Specialists so they, in turn, could better help middle school teachers and students. The Task Force research found significant differences in the needs of middle school students and teachers, as well as in their structure. They noted that in comparison to elementary schools, middle schools have students with a wider range of academic needs, learning gaps are deeper, the scheduling and organizational constraints are more involved, and student motivation and social pressures are greater issues. Furthermore, teachers assigned to mathematics classes are more likely to consider themselves "mathematically proficient" and principals are more likely to feel the need to delegate responsibilities specific to the mathematics program. The Task Force concluded that well-prepared middle school Mathematics Specialists could help schools address these concerns. Based on their findings the VMSC, in partnership with VCU, UVA and NSU, pursued and received a NSF-MSP grant, "Preparing Virginia's Middle School Mathematics Specialist" (2009-2014). The focus of the grant was to work with eighteen school divisions and prepare fifty middle school teachers to become Mathematics Specialists, and to study the impact of full-time Mathematics Specialists assigned to twelve treatment schools.

As with the elementary Mathematics Specialist program, the question remained as to how best support the work of the Specialists. Since the principal's role was a critical component of this support, it was recommended that the highly successful program initiated with the elementary principals through the NSF-DRK12 Rural grant be emulated. The model of a five-day series was replicated, and principals of the teachers enrolled in the NSF-MSP Middle School grant program were invited to participate during the year prior to the teachers entering their schools as Specialists. Adjustments were made to the professional development agendas to address the needs of middle school principals and their staffs. Appropriate articles and tasks were selected, and the duties of the Mathematics Specialists were identified in the context of middle school structures. Again, the feedback was extremely positive, and the principals requested a sixth day be held the following year with principals *and* Specialists in attendance.

Goals for the professional development sessions included fostering the principals' understanding of good mathematics instruction, enlarging their capacity as instructional leaders in mathematics, and increasing their understanding of the role of the Mathematics Specialist. The activities engaged the principals in relevant professional learning activities. Videos, panel discussions by practitioners, and presentations provided opportunity for large- and small-group discussions involving instruction, the Mathematics Specialists' role, and supportive strategies principals could implement. Horizon Research, Inc (HRI) completed a study on the principal professional development sessions and developed a report, *MSP Institute: Mathematics Specialists in Middle Schools, Impact of Workshops for Middle School Principals: Summary of Interviews* [12]. During their research, HRI observed sessions, studied the exit slips, and interviewed principals. The report shared the principals' perceptions of their role in leading the mathematics programs in their buildings and their ability to carry out their role based on participation in this program. The report also shared numerous principal reflections, such as this one on instruction:

> It's more about getting students to struggle with the math. What I discovered through the workshop is that we as educators, for the sake of time, of planning, of staying on the pacing chart, we tend to give our students too much information to work with instead of helping them think through [the problem]. We need to let the kids struggle a bit. It's okay. Give them the skills and the foundation to

> work with, but we don't have to make it too easy for them. It's okay for them to think. For me, that was the biggest message, the major take-away.

In terms of supporting the Mathematics Specialist in their school, another principal said:

> Everything in my ten years of being a principal has told me that if I'm for it, it's going to happen, and if I'm not for it, it's not going to happen. So if I buy in, then I've got to get the school to buy in, and [the Specialist] needs my support for this buy-in. She needs my support to know that we set these goals and I'm meeting with the teachers to emphasize this.

The administrators consistently described the workshop activities as informative, practical, collegial, challenging, and highly engaging. As illustrated in the excerpts above, the interviews revealed that the school leaders were applying what they had learned. There seemed to be a high level of commitment among the participants to implement what they had learned [12]. Based on this success and the previous success of the NSF-DRK12 Rural grant professional development sessions, a decision was made to begin sharing these opportunities with a larger audience.

Expanding to Principals Partnering Institutes through Statewide Partnerships

Due to the positive feedback from the NSF-DRK12 Rural grant and NSF-MSP Middle School grant work with principals, the VMSC established an advisory committee of principals, mathematics supervisors, Mathematics Specialists, and university researchers to meet in Summer 2012 to determine *next steps.* The committee strongly recommended that the principal professional development series continue with enrollment open to all elementary and middle school principals across Virginia. The content in the five days was organized into a 3-day Institute, with a two-day session and then a one-day session two months later. The statewide Institutes were designed for principals who may or may not have a Mathematics Specialist assigned to their schools. They were designed to allow principals to achieve the following goals:

- Refine their own understanding of standards-based mathematics;

- Become more aware of what they should see students and teachers doing in classrooms that promote proficiency and understanding in mathematics; and,

- Develop a vision for their schools' mathematics programs.

With support from the VMSC, and endorsement from the VCTM and the VCMS, a series of 3-day Principals Partnering Institutes were advertised in Fall 2012, one in Roanoke and two in Richmond. Within forty-eight hours, all three Institutes were filled! Prior feedback from principals was very positive and the demand was obviously great, so VDOE contributed support allowing three additional 3-day Institutes to be scheduled in Spring and Summer 2013 in Roanoke and Richmond.

Continuing the expansion into Summer 2013, the VMSC and the Virginia Department of Education (VDOE) collaborated to offer three Principals Partnering Institutes in Roanoke, Newport News and Falls Church, and opened the registration up to all elementary and middle school principals from across the Commonwealth. The Institutes met for two days in July and a third day in October. After the first two days of the first round of statewide Principal Institutes, the VMSC requested that Horizon Research prepare a preliminary report on what resonated with the principals, what they planned to take back to their schools to improve instruction, and what questions they still had. A HRI communication stated that there was evidence of a positive impact on principals after just the first two days of the Institute. An overarching theme for principals' responses to a questionnaire was that the Institute engaged them in thinking deeply about mathematics instruction and their role in it:

- Principals left the Institute with a clear focus on effective mathematics instruction.

- Principals were focused on their role in promoting effective mathematics instruction.

- Principals have questions about how to implement changes in mathematics instruction in their schools and what resources may be available to help them make those changes.

With regard to the principals' questions in the last statement, Day 3 of their Institute was designed to help answer some of these questions.

In Spring 2013, due to the continuing demand for the Principal Institutes, the VMSC approached the Virginia Association for Supervision and Curriculum Development (VASCD) about partnering to offer more Institutes with the continued endorsement of the VCMS, VCTM, and VDOE. With the VASCD joining the partnership, along with the VMSC and VDOE, to make additional Institutes available, three more 3-day Principals Partnering Institutes were planned for Fall and Winter 2013-2014 in Newport News, Roanoke, and Harrisonburg. A registration cost was imposed for the first time to help cover expenses. Despite this new requirement, the three Institutes filled quickly, and plans were made to offer more Institutes in Spring 2014. At the conclusion of the workshops in Fall 2013, over 350 principals had been served statewide.

Partnerships continued to expand. A series of three Principals Partnering Institutes in schools identified by the VDOE Office of School Improvement were planned for them. Those Institutes took place in Chesterfield, Norfolk, and Lynchburg by meeting two days in January and the third day in March. The content of the Principals Partnering Institute curriculum was revised to bring particular attention to the state accountability requirements specified in the essential actions for the lesson planning category included in the "Essential Actions for School-Level Reviews." Emphasis was placed on making explicit the alignment between the Institute activities and the research-based strategies in planning and implementing instruction in schools identified by the VDOE Office of School Improvement.

With the growing interest among principals to attend a Principals Partnering Institute, the need emerged to have additional well-prepared facilitators. In conjunction with the VDOE partnership, a train-the-trainer, multi-day academy is planned for Summer 2014 to prepare additional facilitators. At least two participants per Superintendent's Region will be invited to learn the curriculum and develop strategies to effectively lead discussions and facilitate a

Principals Partnering Institute in their region. The goal of the facilitator academy is to build a cadre of leaders who can help sustain and support this work across Virginia.

Factors Contributing to the Demand for and Success of the Principals Partnering Institutes

The move to take the Principal Institutes statewide was timely because they focused on the new rigor in the state revised 2009 *Mathematics Standards of Learning* and resulting rigor in the revised 2012 state assessments, as well as on the national attention on the importance of preparing all students for STEM-related career opportunities. Others from outside Virginia can appreciate this new pressure through the Common Core State Standards (CCSS). Planning for the statewide Principals' Institute also included consulting with the Virginia Association of Elementary School Principals (VAESP), and the Virginia Association of Secondary School Principals (VASSP), as well as a careful review of the curriculum from feedback from previous Principal Institutes.

The review of the written feedback from previous Institutes had been very positive; principals noted that they found the activities and discussions enlightening, and they appreciated the time to network and learn from their peers. Some curriculum adjustments were necessary since expansion of the audience opened participation to principals who might or might not have a Mathematics Specialist embedded in their school. However, the intention of the professional development was the same: to build principals' capacity to effectively lead a rigorous mathematics program where every student could become mathematically proficient.

Along with confirmation about what experiences the principals valued in the grant-supported Institutes, a review of the literature provided additional validation for what was important to consider in establishing the goals and curriculum for the statewide Principals Partnering Institutes. Nelson and Sassi reported that a principal needs to know how to make sense of what s/he observes in a mathematics classroom, and form an opinion about the quality of instruction [13, 14]. However in an earlier work, they had cautioned, "...the principal's belief about what constitutes mathematics as a field of study and how mathematics should be learned" [9]. These beliefs influence the opinions they draw about the teaching and the learning they observe in classrooms, as well as the judgments they make about how to support teachers. Since a principal is responsible for creating and making public a shared vision for the mathematics

program that makes transparent the expectations for every student the beliefs the principal holds carries great potential for shaping the vision [15].

If the expectations to "raise the floor and the ceiling" for mathematics learning is to be realized, it requires a more rigorous mathematics program for all students while also closing the achievement gaps between various student populations. How can a lone principal provide the school-based leadership necessary? Elmore asserts that, in organizations such as schools, "There is no way to perform these complex tasks without widely distributing the responsibility for leadership" [16]. The expertise and leadership capacity to improve teaching and learning requires a leadership *mix*: principals, formal Teacher Leaders, and informal teacher leaders [17]. Considering these ideals, the goals of the statewide Principal Institutes, entitled "Principals Partnering to Raise the Floor and the Ceiling in the New Era of Mathematics Standards," were defined:

- Understand the need for a more rigorous mathematics program and ways to effectively support school staff in moving toward a more rigorous mathematics program;

- Recognize instructional practices that increase rigor for all students in order to increase mathematics proficiency and to close the achievement gap; and,

- Recognize the importance in collaboratively developing an action plan for the school mathematics program that shares leadership to increase rigor and to increase mathematics proficiency for every student.

These goals provided standards to guide the selection of mathematics tasks so principals could *do mathematics* together, and to identify articles and books to bring *expert voices* to the principals' discussions. All activities encouraged principals to examine their beliefs about mathematics teaching and learning. Videos of classrooms provided the context for rich discussions. These videos also allowed principals to simulate observing students and teachers using a protocol based on the Virginia process goals in order to become more aware of what they should see students and teachers doing in classrooms that promote instructional rigor and mathematical proficiency for students [11]. The Institute activities allowed opportunities for principals to reflect on how more rigorous and effective instruction can also increase student achievement on the revised assessments for the state assessments in mathematics since student

achievement determines how schools fare under the state accountability system. Principals learned about the many resources for teachers' professional development and for developing classroom lessons available at the VDOE website.

The Institute goals also influenced the scope and sequence of the activities that took place during the Institute, and served as connecting threads running through each of the three days of activities. Facilitation for the Institute activities mirrored best instructional practices for mathematics classrooms to further develop the principals' mental model of effective mathematics; inquiry learning took place around completing rich tasks and discussions in small groups, and in whole groups using videos of classroom practice. Throughout each day's activities, various protocols were used that allowed the principals to reflect on their own schools' mathematics programs and on their own leadership: to share, raise questions in a secure environment, and network with colleagues from across the Commonwealth.

Table 1 shows each of the Institute goals and identifies the main activities and resources employed to address each goal during the three days of the Institute. For clarity in the presentation of this information, each entry in the table is associated with one goal; however in many cases, an entry supports multiple goals of the Institute.

Table 1
Principals Partnering Institute Statewide Goals Connected to Daily Activities

Goals	***Day 1***	***Day 2***	***Day 3 (2-3 months after Day 2)***
Understand the need for a rigorous mathematics program and ways to effectively support school staff in moving toward a more rigorous mathematics program.	**Read and Discuss:** *-Never Say Anything a Kid Can Say* [18] *-Improving Mathematics Teaching* [19] *-What to Look For in Your Mathematics Classroom* [13] *-From Critic to Catalyst* [20] The 2009 *Virginia Standards of Learning Curriculum Framework,* SOL 5.17 [21]	**Read and Discuss:** *Helping Children Learn Mathematics* [22]	**Read and Discuss:** *-Orchestrating Classroom Discussions* [23] *-Modifying Our Questions to Assess Student's Thinking* [24] *-The Principal as Formative Coach* [25] *-What Can We Do about Resistant Teachers?* [26] Excerpts from: *Administrator's Guide: How to Support and Improve Mathematics Education in Your School* [10]

Recognize instructional practices that increase rigor for all students in order to increase mathematics proficiency and to close the achievement gap.	**Doing Math:** - Mental Math: Make explicit the different kinds of mathematical thinking in a computation problem. - Patio border problem: Bridging from arithmetic to algebraic thinking to symbolic representation. **Lesson Planning Tools:** Analyze cognitive demand framework to aide in selecting tasks. **Video Of Classroom Practice:** *Lenses on Learning* Module 1 Session: Students in small groups using mathematics language to discuss their thinking about their solutions [6]. **Bridging to Practice:** Review and discuss the VDOE Essential Actions for Lesson Planning. Revisit this set of research-based practices throughout the workshop.	**Doing Math:** -Fraction tracks: Identify mathematics content and reasoning in a rich task. **Lesson Planning Tools:** Analyze the Virginia Process Goals as a planning tool to develop mathematical proficiency and to differentiate learning experiences. **Video Of Classroom Practice:** Use Virginia Process Goals observation protocol to observe lesson involving fraction tracks. **Video of Clinical Interview:** *Lenses on Learning* Module 1 Session 3: Examine a student's responses and discuss the implication for instruction and developing mathematical proficiency [6].	**Doing Math:** -Marbles in a bag ratio task: Examine what it means for a task to have multiple entry points and how sharing different ways of thinking deepens students' mathematics understanding. **Simulation of a Grade-Level Planning Meeting:** Investigate how doing the mathematics enables teachers to identify what misconceptions may emerge and prepare questions to move students forward. Then, engage in looking at student work samples to inform next instructional steps. **Bridging to Practice:** Principals reflect on and discuss their own teacher observations in relationship to the Virginia Process Goals.
Recognize the importance in collaboratively developing an action plan for the school mathematics program that shares leadership to increase rigor and to increase mathematics proficiency for every student.	**Teacher Effectiveness Continuum:** Individually, principals reflect and locate classrooms/teachers on a continuum from least to most effective in teaching for deep understanding. **Characteristics of a Highly Effective Classroom:** Whole group—Develop a set of descriptors for an effective mathematics classroom-what will teachers be doing, what will students be doing? Revisit and revise throughout the Institute.	**Bridging to Practice:** Develop individual action plans with no more than two steps to foster instruction for developing mathematical proficiency; include the drivers and challenges for taking the steps.	**Bridging to Practice:** Use a backward design to map out a vision for the school's mathematics program: 1.What are students doing? 2. What do teachers have to do to enable students to engage in that way? 3. What does the school mathematics leadership team need to do with teachers in order for them to have the knowledge/skills to do this? 4. What support does the mathematics leadership team need from the principal to accomplish this? *5.* What support does the mathematics leadership team and the principal need from central office to accomplish this?

At the end of each day, facilitators would carefully read and reflect on the exit slips so that adjustments could be made to the following day's activities in response to the feedback. Facilitators would be explicit in sharing any adjustments with participants, and appreciative of suggestions to make the program more effective. As in previous Institutes, the intent was that this responsiveness and respect of the principal's role would add to the collegial atmosphere.

Vision for Principals Partnering Institutes

As of today, more than 500 principals have participated in the Institutes. The vision is that, through the support of the Coalition, VCTM, VCMS, VDOE and VASCD, the statewide "Principals Partnering to Raise the Floor and the Ceiling" will continue being offered to support these leaders in providing leadership for a rigorous mathematic program that ensures mathematical proficiency for every student. In addition, the Institutes will continue to encourage principals to nurture additional leadership in their schools, such as Mathematics Specialists or mathematics Teacher Leaders. Steps are also being taken to make the detailed workshop materials available nationwide to mathematics leaders who would like to develop comparable workshops for their principals.

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