

# PRINCIPAL AND MATHEMATICS COACHES' JOURNEY TO IMPROVE MATHEMATICS LEARNING

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## Abstract

My educational career path began as an elementary school teacher, then as an assistant principal, and now as a principal. With the educational experiences that I had at each level of my career, I was certain I would be able to handle an increase in the mathematical rigor presented to our students through the new *Mathematics Standards of Learning for Virginia Public Schools (SOL)* [1]. I found that, yes, I was able to understand the rigor. However, I found the challenge was providing the needed assistance to bring about results that would ultimately help our teachers and students be successful. I knew that something was needed, but what that something was I was not sure. Fortunately, Richneck Elementary was provided a wonderful opportunity of being assigned a mathematics coach for three years by way of a grant that the Newport News Public School division was awarded to support military-connected students. In addition, the grant supported teachers to work toward their Mathematics Specialist degree. As a result, Karen Joos, Mathematics Coach, received her master's in education with an endorsement as a Mathematics Specialist. David Hundley, Mathematics Coach Facilitator, provided support for coaches under this grant. This article will provide a road map for the journey: working with the mathematics coaches and understanding their processes, promoting my leadership philosophy in relation to the new rigor of the state standards, improving communication through lessons learned, and identifying the collaboration process to achieve the best results for the school and community.

## Richneck Elementary School: Collaborating to Improve Mathematics Learning

My life's work has been in the Newport News Public Schools (NNPS) system. My educational path began as a student in NNPS, and I now serve as the principal of one of its elementary schools, Richneck Elementary School. After fifteen years teaching elementary school, I accepted my first administrator's position as assistant principal at a Title I elementary school under an influential principal, Mary Ann Hutchinson. After three years and many wonderful learning experiences with Mary Ann's strong mentorship, I was ready to become principal at Yates Elementary School. I held the students' educational progress in my hands, but from a different viewpoint. I knew as a leader that I would need the support of the entire staff to ensure the success of each student. Through everyone's collaborative efforts, Yates reached full accreditation and met adequate yearly progress on the SOL assessments [1]. Six years later, I was

asked to take leadership of Richneck Elementary. At the same time, the SOL assessments would change, and the rigor would increase—hence, my challenge!

### **Partnering to Support Improving Mathematics Learning**

Fortunately at Richneck Elementary, we were afforded the opportunity to be part of a three-year Department of Defense Education Activity (DoDEA) 2011 grant. Little did I know but this grant was going to be just the support our school needed to guide our students toward proficiency in mathematics. The NNPS grant was entitled, “Boosting Students’ Mathematics Achievement and Promoting Positive Social Outcomes for Military-Connected Families at Targeted NNPS Schools.” Seven schools, five elementary and two middle schools, benefited from the acquisition of the DoDEA 2011 grant. There were two components of the grant: a military-connected student support system component, and a mathematics component of the plan. Both components were equally important and supported one another, but the mathematics component will be addressed here. The grant clearly and succinctly indicated the purpose and goal of the mathematics component:

- Purpose of Mathematics Component — The creation of a sustainable program to increase student achievement in mathematics at the upper elementary and middle school levels, such that the transition from elementary to middle school does not result in precipitous drops in mathematics achievement.
- Goal of Mathematics Component — Improve grades 3-8 mathematics achievement for all student subgroups by 5% (each year of the grant) on benchmark assessments and state standardized assessments.

There were several layers to the mathematics component. Beverly McDonald, the NNPS Grant Project Coordinator, was hired to oversee the grant, its operations, and results. The grant permitted mathematics coaches to be hired and, during the grant’s three-year span, these mathematics coaches supported the development of mathematical understanding with classroom-embedded professional development with the teachers. The grant speaks directly to our goal at Richneck to increase all students’ mathematical proficiency: “Mathematics Specialists, focused on building mathematical understanding and capacity within a school, will improve mathematics instruction that manifests as improved student mathematics engagement and achievement.” The grant also provided financial support for the coaches to work toward earning their Mathematics Specialist degree. They could earn their Virginia licensure endorsement as Mathematics

Specialists through Old Dominion University. Upon completion of the program, two coaches who already held a master's degree earned their Mathematics Specialist endorsement. Two other coaches earned their master's degree and the Mathematics Specialist endorsement simultaneously.

Each year of the grant, the teachers grew in their mathematical understanding as a result of the classroom-embedded professional development provided by our mathematics coaches. I have to say, so did I. We all grew in our mathematical understanding, and we began to teach mathematics differently. During Year 1 of the grant, our mathematics coach was David Hundley. While David did not pursue the Mathematics Specialist endorsement from the grant, his educational path certainly provided many opportunities for him to impact mathematics instruction. David had been in education for thirty-four years. His years of experience included teaching for seven years in Isle of Wight County and twenty-seven years in Newport News. While in Newport News, he taught for ten years at Richneck Elementary, eight years of which he served as mathematics Lead Teacher. David's last seven years with Newport News was as instructional coach with a concentration in mathematics. He retired in 2011; however, he was soon hired part-time as the Year 1 mathematics coach under the grant. We were grateful he was assigned to Richneck Elementary.

When David began his role as mathematics coach at Richneck, no specific coaching model had been identified. The grant was just beginning to be implemented, so there were no specific teacher assignments or time requirements. As a result, he acted more as a resource for the teachers supporting their mathematical instruction. He would spend time in all of the mathematics classes. Observations were focused on seeing the instruction through the eyes of the student. He would also review student work with the teachers. During their conversations, the focus was more about the student's mathematical understanding and how the teacher's instructional strategies supported that understanding. At times, he also would support teachers by working with students who were struggling in their classes. David attended grade-level meetings where he engaged in discussions about teaching strategies and their impact on student learning. Professional development was embedded within these grade-level meetings. He modeled the use of the sequential method of instruction known as "Concrete-Representational-Abstract" (CRA) with the varying mathematical concepts identified by the *Mathematics Standards of Learning and Curriculum Framework* [2]. Initially, David felt as though he had more influence with the teachers in the group settings than he did on an individual basis. This helped to build mutual trust

and increased mathematical knowledge specific to the grade level. As a result, David experienced greater success in working with teachers individually.

David provided the beginning phase toward defining a Mathematics Specialist role at Richneck. He helped to bring some issues to light that needed to be addressed. The journey toward improving mathematics learning began when I understood and then accepted that I did not know everything about teaching and learning mathematics. As the administrator and instructional leader of the school, I had to place myself in a vulnerable and humbling position. I had to open up to learn and grow along with my staff of teachers and paraprofessionals. During the first year with David, I was able to listen to his knowledgeable explanations about how students learn mathematics and his views on where Richneck needed to begin to move toward a more rigorous program for all. We worked together in setting up a direction for the school's mathematics program. First, the mathematical focus was on engaging the teachers in using the curriculum framework from the VDOE to direct their instruction. He designed a format based on a similar format being used in northern Virginia in which the teachers would "unpack" the standards. This allowed for mathematical discussion as they looked in depth at the mathematical understanding that the students were required to attain. Then, there was a focus on the sequential CRA method of instruction. The teachers were building their lessons on the premise that learning begins at the concrete level using concrete materials. Once there was an understanding at this level, the teachers would help the students make the connection between the concrete to the representational and, eventually, to the abstract. David worked with the teachers in grade-level meetings to model and explain the use of various concrete materials. He walked away from these meetings with the feeling that, at the very least, the seed was planted. David had helped the teachers see the importance of building student understanding of mathematics by using multiple strategies to make connections between concrete, representational, and abstract levels of thinking. He recognized that not all teachers were quick to adopt this instructional approach, but he believed that, with time and practice, it would become an additional tool in their toolbox of instructional delivery. At the end of the first year, both David and I walked away with positive feedback, and evidence that there were pockets of mathematical change occurring within the building.

As we continued into the second year of the grant, David was hired as Instructional Mathematics Coach Facilitator (mentor) for all of the instructional mathematics coaches hired for the second and third years of the grant. Since David accepted this new position, Richneck anticipated that a new mathematics coach would be assigned through the grant. Karen Joos

accepted the position as Richneck's new Mathematics Coach. While Karen did not teach at Richneck, she had taught for twenty-six years at the elementary and middle school level in Newport News. Her positions ranged from middle school special education resource teacher, special education self-contained teacher, and K-5 and general education teacher in a collaborative setting. She had also served as a grade-level lead and social studies lead teacher, and served as a member of school improvement teams. During her last years of teaching, Karen taught fourth grade mathematics, science, and Virginia studies. She took advantage of the opportunity to earn her endorsement through the grant. Karen began and completed the work on her Mathematics Specialist endorsement degree while serving as our mathematics coach for the remaining two years of the grant. Karen revealed a passion for mathematics and shared it with the staff.

Our adventure was unique in that we were able to take advantage of the knowledge of a Mathematics Specialist, although under the grant, the position was still classified as a mathematics coach. However, in contrast to the first year of the grant, Year 2 and Year 3 of the grant-supported position included a specific coaching model design developed at Ohio State University. The design of our instructional coaching model has molded some aspects of the coach/principal relationship. Under this instructional coaching model, Karen was scheduled to work at two different schools. She coached at an elementary school and a middle school. Under the new model, both the coach and the teacher worked together for a predetermined time period that will be referred to as a "cycle." While Karen was working at one school for a cycle, she would still visit the other school once a week to touch base with the teachers. At each school site, the teachers volunteered to work with Karen. She worked with three to four teachers specifically in a coaching cycle. All teachers were afforded the opportunity to be coached. Many teachers who did not volunteer to be coached on an individual basis did request, at times, other kinds of support concerning mathematical instruction.

New teachers as well as veteran teachers were seen as having the ability to learn and grow in their mathematical understanding with the support of the mathematics coach. In Year 2 of the grant, the cycles of coach and teacher working together lasted five weeks. In Year 3, the cycles were eight to nine weeks which permitted more time for coaching. Karen's work was embedded in the classroom setting for three to four days a week for the entire mathematics block. Additionally, she provided assistance to the grade-level teams in their planning sessions and in professional development as needed, based on our discussions. The driving purpose of coaching was to improve both the teacher and student mathematical understanding, and to shift instruction to a design that would reduce time spent on direct instruction and increase time spent on student

exploration and dialogue. The teachers chose their own goals to improve their mathematical instruction and their students' mathematical understandings and applications. Those goals were most often geared toward instructional delivery, but could address any aspect of teaching mathematics to include planning and assessments.

In order to coordinate Karen's work between the two schools, Lisa Gatz, the middle school principal, and I met to develop the coaching cycle schedule based upon the criteria from the grant and the school calendar. Before Karen began as the mathematics coach, Beverly, David, Karen, and I met to discuss the coaching cycles for her first year. Then, Karen was introduced to the staff and her role as mathematics coach was explained. At this time, teachers were given the opportunity to think about volunteering to be coached. Karen worked at the middle school level for four days each week during the first cycle of coaching, and worked at Richneck one day each week to establish a connection with the staff. This coaching model permitted collaboration between the schools. Toward the end of the first cycle, Karen led a professional development with Richneck and grade 6 mathematics teachers from the middle school. The collaboration was to review unpacking the standards and to delve into the vertical articulation of a standard. This provided an opportunity for the grade 6 teachers to share their problem-solving technique which Richneck adapted to the elementary level.

Since Karen was new to Richneck, one of her first tasks was to develop a rapport with the staff by assisting with classroom preparations, initiating mathematical discussions, and having conversations to get to know the teachers on a personal level. Building rapport and learning the new position of being a mathematics coach proved to be a challenging endeavor. Although Karen put forth great effort to build trust and confidence, developing a trusting relationship requires time. Ideally, a coach should have a time frame to build this rapport before beginning to coach a teacher. Using this time to support daily teaching activities allows personal relationships to grow. In our situation, Karen attempted to build rapport and transition into a new coaching role, simultaneously. To assist in that transition, David, in his new position as mentor, was very helpful. His guidance in supporting Karen with daily interactions with teachers and administrators proved to be indispensable.

The first year had permitted David to be a first-year coach at one school which allowed him to be readily accessible to teachers at any time. As Karen assumed the role of first-year coach in two different schools during Year 2 of the grant, the professional development embedded within the classroom was a strong aspect of the transition from the Year 1 coaches'

way of supporting teachers, to the Year 2 more defined coaching cycle model. The first vital step in the coaching cycle was individual teacher planning with the coach. Karen adjusted her planning time with a teacher depending on their needs. During the planning phase, they had discussions about the mathematical concepts to be taught and the varying strategies that supported them. The underlying emphasis was always on leading the teachers to deliver instruction that was based on providing a conceptual understanding of the mathematics. After planning with a teacher, Karen then observed the teacher and the students. This was followed by a discussion of the lesson with the teacher. Karen was able to provide feedback and research-based articles on problem solving, mathematical discourse, and developing a conceptual understanding of the mathematics concept. Leading teachers to a conceptual understanding of mathematics allowed them to help students replace their instrumental understanding. Getting the teachers to start teaching conceptually helped them to replace the “tricks” and develop their understanding of why the “tricks” worked mathematically. The end result was that the students could articulate their own mathematical thinking. At first, the focus was on various strategies which then led to the discussions of why these strategies were important to the students’ learning. Discussion of these strategies would often refer back to the curriculum framework and the CRA method that was introduced and expounded upon in the previous year.

### **Reflection on the Impact of Richneck's Three-Year Journey**

As indicated previously, changing mindsets takes time, with each step of the journey building on previous steps. With the increase in rigor in the 2009 Virginia mathematics SOL, one of our first steps was to delve into the Virginia Department of Education’s *Mathematics Standards of Learning and Curriculum Framework* to determine what the students would need to know in order to apply their mathematical conceptual understanding to the SOL assessments [2]. The question we asked was, “What are the students expected to do based upon the Virginia Department of Education *Curriculum Framework* and not just our division’s curriculum?” Once this was understood, the instructional practices needed to be examined and changed. The curriculum framework was the first step. Other questions followed:

- Where do I begin?
- What are the expectations?
- What vocabulary needs to be introduced to the students?
- What essential prerequisite skills should the students be able to do to meet a particular standard?

- What instructional strategies and experiences should the students have so they may gain an understanding and apply what is taught?

All of these questions were addressed as we began a process we call “Unpacking the *Standards*.” That first year, David provided professional development in “Unpacking the *Standards*” and how to use the information gained. He showed the teachers how to take a current standard and “unpack” it to gain a true understanding of what the students had to do. David created an “Unpacking” form for the teachers to use to record their findings. This became an effective way for teachers to begin planning, and really streamlined our planning and instructional delivery. Any time a teacher asked about mathematics instruction, the response would be “What does the *Curriculum Framework* say?” or, “Have you checked the *Curriculum Framework*?” We respected David’s expertise and learned a great deal. Once we determined what the students had to learn, we knew that we needed to adjust our instructional delivery to meet the standards. The question was where to begin? In the second and third years, Karen provided additional professional development built on the foundation of looking at the *Curriculum Framework* to now address the mathematical understanding that was necessary for the teachers. The teachers’ personal understanding of mathematics grew deeper, and the conceptual level of instruction in the classrooms showed evidence of increased rigor.

I am responsible for making instructional decisions that affect student achievement. In addition, I am also charged with developing my staff professionally by providing learning experiences that can stretch the staff and make them better educators. After professional learning on unpacking the *Standards*, we then worked toward implementing effective instructional strategies and connecting the concrete, representational, and abstract levels of mathematical reasoning. What does this mean? Aren’t we doing this already? This is where having a Mathematics Specialist/coach was vital. The Mathematics Specialist/coach taught us what research-based, student-centered instruction meant, and framed it by letting us understand what it is and what it is not. We also learned from the Mathematics Specialist/coach that we needed to stay at the concrete and representational stages as long as necessary for the students to gain mathematical conceptual understanding. Listening to the Mathematics Specialist/coach improved staff learning in this area. I was an active participant at every staff development session because I wanted my staff to know that I was learning right along with them to effect this change positively. My participation also allowed me to grasp the concepts and be able to articulate what I should be observing and why. It gave me a new way of looking at how we develop our students and staff. I had grown as a principal and thus changed how I viewed a mathematics lesson. My observations



of mathematics in the classroom were not just about the teacher's delivery, but also about student engagement and the students' ability to articulate what they were learning. My participation and learning permitted consistency and continuity in communication with the teachers about what the Specialist/coach and I were both trying to convey. As a principal, I'm ultimately responsible for the entire school. The Mathematics Specialist/coach is focused strictly on mathematics. This is why collaboration and communication are so important, and why I collaborated with the Mathematics Specialist/coach to prepare an agenda and to schedule the staff learning.

### **Lessons Learned During the Journey**

Continuous communication between the principal and the coach is vital to collaborating effectively with each other. In addition, there must be follow-through on the collaborations so that the program remains consistent and that the results garnered are on target. During Karen's first year, we met after each cycle to review our progress. We discussed what was accomplished, growth areas, and next steps. In looking back, I realize that having more meetings with Karen and the teachers being coached would have assisted in more effective coaching cycles. Meetings were scheduled, but I did not always follow through with them. We had several impromptu conversations, but we did not really sit down regularly to discuss our progress. The life of an administrator can be busy; however, it is critical to maintain the pre-arranged meetings to ensure that both the principal and the coach are on the same page. This will also allow the school to see the principal and Mathematics Specialist/coach as united and focused on mathematics. This was certainly a lesson learned. At the beginning of Karen's second year, I asked her to provide a staff development to six new teachers and, with my new insight, we met to plan the professional development. Karen submitted *PowerPoint* slides to be used during the presentation, and together we went over it. We met again to finalize the details. Ultimately, the presentation was well received. Our collaborative efforts helped the teachers to begin their year at Richneck with the mathematical learning that the current Richneck staff had already received. Supporting the Mathematics Specialist/coach in this way continued to help support our relationship.

A principal has to be willing to learn and grow. As a result of our work over the last three years, I am now in a position to work with other mathematics coaches more effectively. I have brought forward the lessons I have learned from this experience. I offer these lessons to all principals embarking on this journey of collaboration with a Mathematics Specialist/coach:

- Examine your data together and look for trends in your data;
- Make observations together and compare viewpoints about what you are seeing;

- Be direct in communicating expectations with the Mathematics Specialist/coach and staff;
- Provide checkpoints along the way to ensure that everyone is on the same page and that you are seeing the results you wish to see;
- Hold regular meetings to maintain the progress that is expected; and,
- Make communication a priority as it is of the utmost importance.

Our story has a happy ending—Richneck Elementary School has continually progressed in the area of mathematics based upon the results of the Virginia SOL. We were at 90% of our third, fourth, and fifth grade students passing the mathematics SOL test in 2010-2011. Then in assessment year 2011-2012, our SOL percentages decreased to 59% due to the increased rigor of the new *Standards of Learning* and new assessments. With the support of our Mathematics Specialist/coach, we achieved an increase in the percentage of students passing the mathematics SOL assessment in 2012-2013 to 71%. Our school has increased the overall percentage of students passing the mathematics SOL by 12 percentage points! Each grade level increased their percentage of students passing in the following manner: third grade up 12%; fourth grade up 11%; and, fifth grade up 16%! Our hope is that we, as educators, will continue to grow in our mathematical knowledge and provide instruction to our students that will allow them to be proficient in articulating their mathematical thinking.

## **Conclusion**

My personal perspective of this collaborative effort as a principal is one of introspection, success on many levels, and lessons learned. My self-examination has led me to be a better principal and a better collaborative partner. David, Karen, and I grew to respect and trust each other professionally. This collaborative effort began by building that trusting relationship. We were all excited about effecting change in the area of mathematics and realized that change does not happen overnight. It also does not happen by chance. Trying to change mindsets on mathematics instruction has taken time and courage to implement. It required a new way of thinking and a new way of delivering instruction. I, too, had to depart from the way that I had learned mathematics as a student and later how I taught mathematics as a teacher. Leaving the mindset of “tricks” and mnemonics in mathematics instruction was difficult. The staff and I came to realize that tricks only allowed students to develop short-term strategies and pass the computational level of mathematics assessments. We had found success in what we were doing

on the previous state *Standards of Learning* assessments, but that was not enough with the new rigor of mathematics measured on the current assessments. We were doing our students a disservice by not assisting them in building a mathematical understanding that would be their foundation for other mathematics concepts. The students had to be able to apply their mathematical conceptual understanding to the new and rigorous tasks presented to them. The new rigorous tests also did not support the old adage that there is one answer to each problem on the test—A, B, C, or D. These new assessments made the students grapple with tasks that required them to create graphs, use an on-line ruler, solve multi-step (really triple-step) problems, represent fractions, and a host of other higher-level thinking items. Some of these questions were presented to our third, fourth, and fifth grade students with more than one answer. The students had to show their proficiency performing these mathematical tasks. Our school was in need of an instructional shift, and that shift needed the support of a Mathematics Specialist. During the three years of having mathematics coaches, we have seen great growth in our teachers and in the students' understanding of mathematics. There is still much to learn, but we are well on our way!

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